

Food Accessibility in Cincinnati, Ohio: Measuring the Effect of Census Tract Poverty Rate on Grocers

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Researchers consider an area with a poverty rate above 20 percent without a grocery store within one kilometer walking distance an urban food desert. Using this definition, this study uses a regression equation to examine food distribution in Cincinnati, Ohio and evaluate whether that distribution includes a large number of food deserts. Because we cannot know the exact distance between a neighborhood and a grocer, the presence of a grocer within a census tract serves as a substitute for distance. Access is measured by the number of full-service grocers, defined as having more than 50 employees, in each census tract. Stores with more than 50 employees serve as a proxy for stores that are large enough to offer a variety of food options including healthy alternatives. This definition also prevents convenience stores, which offer few if any healthy options, from being included as full-service grocers that do provide healthy alternatives. The regression equation measures the impact of income on the number of full service grocers in a neighborhood while controlling for other factors such as differences in population, the number of convenience stores, and the number of fast food restaurants. The results of this analysis will be useful in determining if future policies are needed regarding store location, zoning, and food accessibility.

In the past few years, there has been growing evidence that high poverty areas have fewer grocers and more limited access to produce and other nutritious groceries that are part of a healthy diet. The phenomenon has been termed food deserts. No formal definition exists, but most studies define food deserts as areas with a poverty rate over twenty percent without a grocer within one kilometer walking distance.

While no study has satisfactorily shown the large scale existence of food deserts, many have succeeded in showing limited food access in high poverty areas. Neil Wrigley (2002) conducted the first study of food access almost twenty years ago in the United Kingdom. He measured the effect of a new grocery retailer in a neighborhood on health and wellness outcomes as a new form of health and diet policy. He found that the additional retailer had a small positive effect on community health. Wrigley's study began the growing area of research regarding health and food accessibility.

Numerous studies have been done to evaluate the prevalence of food deserts at the state and county levels. Scheutz et. al's (2012) study of retail deserts using employment density in urban areas serves as a model for this study. They used a cross-sectional regression model to estimate the effect of income on the number of retailers. They found that the average establishment size increases with income for all retail types. Further, high poverty zip codes

have lower employment density for supermarkets, food service, laundry facilities, and retail overall.

This study will examine the distribution of grocers in Cincinnati, OH in relation to the distribution of income and population. Healthy, accessible food, for the purposes of this study, is defined as grocer offering a variety of nutritious options, measured by employment density, within a census tract. I will use a cross sectional regression to evaluate the effect of an increase in the poverty rate on the number of grocers in an area.

The analysis finds that high poverty areas in Cincinnati, Ohio have fewer grocers on average than low poverty areas. The effect of increasing the poverty rate is negative but small for the overall population. Among tracts with low population, there is no significant relationship between poverty and the mean number of grocers. Among high population tracts, however, there is a relationship. Among high population tracts, being in a tract with a poverty rate of 20 percent or higher reduces the average number of grocers from 0.42 to 0.12.

Information about the prevalence, depth, and causes of food deserts can help policymakers evaluate welfare programs such as food stamps as well as determine future policy to serve those in low-income areas. The results of this study may illustrate the need for further research regarding the root causes of food inaccessibility. Combined with others' research on the impact of affordability and personal attitudes toward food on community health outcomes and attempts to improve community health, the results can inform effective policy decisions in regards to diet, health, and food access.

The rest of the paper is as follows: Section 2 reviews previous scholarship relevant to this study. Section 3 describes the source of the data used in this study and defines the parameters of study. Section 4 examines the summary statistics of the data. Section 5 explains the model and regression specification. Section 6 shows and discusses the results. Section 7 discusses improvements for this study, future research opportunities, and gives final conclusions.

Literature Review

Since Wrigley's study in the UK, food deserts have arisen as a topic of social and popular discussion about health and poverty. Most of the work concerns creating a definition of a food desert and creating an accurate measure to determine food accessibility in an area. Hillary J. Shaw (2006) defines ten types of food deserts, resulting in a three-fold classification to tackle the issue of food deserts. The classification includes ability, assets, and attitude. Ability relates to the physical accessibility of food, which is what is normally measured in respect to food accessibility. The lack of the financial capacity to buy healthy food that is physically accessible and that consumers want to buy is classified under assets. She defines attitude as the desire to eat the healthy food that the consumer has access to and can afford. This threefold approach not only changes how we define, examine, and measure food deserts, but it also changes how we approach eliminating them. The solution may not simply be more healthy food retailers in food deserts. On the contrary, more retailers will not help with lack of financial ability or a lack of desire for healthy food.

Where Shaw focuses on defining food deserts, many studies focus on what should be included in measuring food accessibility. Bader et. al (2010) believe that too much focus has

been put on physical distance between people and healthy, quality food. They set out to examine “the relationship between physical distance and travel burden”. They examine how car ownership, crime, and public transit affect measured disparities in New York City. They found that incorporating vehicle ownership and crime increased disparities while public transit decreased disparities. Farmer’s markets and other fruit and vegetable markets also greatly contributed to the density of healthy food outlets.

Jiao et. al (2012) also examine physical accessibility of supermarkets via modes of transportation but in King County, Washington. They divided physical access by walking, biking, taking public transit, or driving. Jiao et. al also incorporate the cost of the supermarket that is most physically accessible to account for economic accessibility as well. They found that supermarkets in King County are accessible for most of the population via a 10-minute car or bus ride. However, the more vulnerable population had low access to a low cost supermarket by walking.

Betsey Donald (2013) argues that there are three crucial areas the future study of food deserts based on Neil Wrigley’s study in the UK. The first is that researchers need to use the before and after retail intervention approach used by Wrigley almost 15 years ago. The second important research factor is that studies cannot be done without considering the changing global retail market which influences how people access their food. The third area that must be considered is how affordability and need in the US are unique from Wrigley’s study.

All of the above studies are data centered. However, Bitler and Haider (2010) consider food deserts from an economic perspective. They look to see if any empirical literature has been able to discern if food deserts are problematic in the United States. They found that while studies have been able to document the local existence of food deserts, none have shown convincingly either the presence or absence of food deserts on a national scale. The primary shortcoming in these studies is the availability of data. Further, no currently completed study or research can offer insight into why food deserts might exist.

Some studies have used surveys instead of quantitative data to measure food deserts. Pearson et. al (2005) conducted a cross-sectional survey study to measure the impact of supposed food deserts in the consumption of fruit and vegetables. Their purpose in examining fruit and vegetable consumption in food deserts is to determine if food deserts are an important factor in poor diet. They ran a standard regression of the responses to their survey, they had 426 respondents out of 1000 people invited to participate. The results showed no statistically significant relationship between deprivation, price, or distance to the grocery store and fruit and vegetable consumption. The results contend the existence of food deserts and particularly their relevance to poor diet. Community health is the primary motivator behind exploring and trying to eliminate food deserts. If they are not a contributing factor to poor diet, than they quickly become far less relevant to the general public. The results of this study suggest that the primary influences behind healthy food consumption are not related to accessibility at all. Instead, they are primarily cultural or educational. If this is true on a larger scale, the focus for eliminating food deserts needs to shift towards educational campaigns, not economic incentives.

Walker et. al (2012) evaluate the buying practices of residents of food deserts versus the buying practices of resident of food oases in Boston using a mixed-methods approach. This

approach allows the study participants to rank and organize their perceptions about buying food. Their results show that residents of both food deserts and food oases rank factors related to shopping similarly. The fact that these residents agreed on their preferences for the most part would suggest that cultural preferences are not as significant. This contradicts the Pearson article as well as part of Shaw's conclusions about other factors contributing to food deserts. However, the study was also small which could skew the results since there were barely over thirty participants in each group.

Hamrick and Hopkins (2012) focus specifically on the amount of time people spend going to the grocery store. They use time use diaries which include information about where and when respondents travel. To show how this complex data set can be applied, the authors measure average time spent on traveling to the grocery store. They found that individuals in low-income areas have a significantly longer commute to the store than the national average. These individuals also shop less frequently. This survey attests to the quantitative studies on physical accessibility as a significant factor in measuring food deserts.

Other studies have focused on examining previously developed measures or improving them. The USDA's Economic Research Service has identified more than 6,500 food deserts, based on 2000 Census data and 2006 location data of food retailers. Dutko et. al (2012) review the primary demographic characteristics and other influential factors to see how food desert tracts differ from other tracts. They found that food desert status tracts have smaller populations, more abandoned homes, and residents with less education, lower incomes, and higher unemployment. They also found that food desert tracts generally have higher poverty rates and a higher concentration of minorities.

In May of 2011, the USDA Economic Research Service created a food desert locator that defined food deserts as communities with low-income and low access. However, this definition has been criticized for not accounting for detailed spatial variations of population demand, the food supply and the interactions between them. Ning (2012) addresses these criticisms by applying a GIS-based two-step floating catchment area (2SFCA) method to better measure spatial accessibility in Hamilton County, Ohio. This more detailed method could help policy makers identify and delineate food deserts more accurately.

As briefly described in the introduction, Scheutz et. al's use of a cross-sectional regression model to estimate the effect of income on the number of retailers. They measure not only the number of retailers but also the size of retailers, proposing that not only number but also size of retailer will decrease as income decreases. They use the number of employees at each location in a zip code to measure the size of the retailer, a method that will be used to measure food deserts specifically in this paper. The advantage of incorporating the size of the retailer is that it creates a clearer picture of the variety of products being supplied. There could be a large number of small retailers all selling the same goods which seems more accessible but still does not provide a variety of products. On the other hand, a small number of large retailers could provide the variety that many low income areas generally lack. As stated above, they found that the average number of establishments and size increases with income for all retail types.

Data Description

This study will examine and analyze the distribution of diverse food sources in Cincinnati, Ohio by regressing food retailers on income measures. While there is no official definition of a food desert, the most frequently used measure is an area with a poverty rate over twenty percent, as a measure of area income, without a full service grocery store within one kilometer. For rural areas, the distance expands to ten miles since those living in rural areas are more likely to have a vehicle. Because this study is only examining the city of Cincinnati and not its surrounding areas, the urban measure is sufficient.

Information about the poverty rate was collected from the U.S. Census Bureau's American FactFinder. The sample includes the 121 census tracts that the Census Bureau measures as inside the city limits. Tracts that were partially within the city of Cincinnati were included. Census tracts were chosen as the unit of measure as opposed to zip codes because they are smaller, more uniform units of measurement. Each census tract has a population around 4000. The population density is less variable across census tracts, although density will be used as a control variable in the regression analysis.

This study cannot measure the actual distance from the center of a census tract or zip code to the nearest grocery store. Using a regression equation, it is only possible to measure if there is a full service grocery store within the unit of measurement. It is not possible to sufficiently map the stores to see if a grocery store is located in the adjacent tract. Because exact distance cannot be measured, using census tracts gives the best picture of accessibility. If there is a full service grocer in the census tract, it is very likely that most of the residents of that tract are within one kilometer of a grocer. If there is not, most residents of that tract are likely further than one kilometer from a full service grocer. Unfortunately, this measurement does not allow us to know whether the nearest grocer is just across the tract boundary, less than one kilometer away, or if the nearest grocer is miles away. However, it gives us the best picture possible given the data constraints.

All information concerning grocery store location and the size of the retailer was collected from the database Reference USA and sorted by census tract to count the number of grocers with more than fifty employees in each census tract. The size of a grocery retailer is used as a proxy to measure food retailers that offer healthy food options. Any store that sells food items can be considered a food retailer, including convenience stores and gas stations. However, including such retailers in the measure of food accessibility does not provide an accurate measure of access to healthy food.

Food deserts are areas that have less access to healthy food. Convenience stores do not provide nutritious options in low income areas. More employees indicate a larger number and variety of product to stock and sell. The goal of this measure is to eliminate convenience stores and fast food restaurants being counted as grocers. It is not possible to know exactly what is in each store or how much it costs without visiting and surveying individual stores. The number of employees is an indicator that a store carries healthy options. A large variety of products likely includes a variety of both healthy and non-healthy choices, giving consumers the option to choose healthy alternatives. Reference USA was also used to collect information on convenience store locations.

Summary Statistics

This section uses summary statistics to create a framework for the following analysis of the data described in the previous section. Table 1 shows the means and standard deviations of each major variable described above. Food Oases is used to describe any area that is not a food desert or has sufficient access to food variety, meaning at least one grocer in the census tract. Before running the regression, it is possible to see some trends in the data based solely on the summary statistics in Table 1. The average poverty rate in food desert listed in Table 1 measures the poverty rate in tracts without a grocery store.

Table 1: Variable Means by All, Food Desert, and Food Oases Census Tract.

Variable	All	Food Desert	Food Oases
Poverty Rate	0.28 (0.18)	0.29 (0.11)	0.21 (0.15)
Population	2971.08 (1557.81)	2797.79 (1605.1)	3709.48 (1771.43)
Grocery	0.25 (0.57)	0 (0)	1.3 (0.56)
Convenience Stores	.93 (1.01)	.84 (.92)	1.35 (1.23)

*Standard Deviation in (.)

High income areas are less likely to have large, chain stores because the members of that community have the affluence to prevent chains from building in their neighborhood. High income individuals often prefer to not have large stores that create traffic and noise near their residence. While there is not a full service grocer in such high income tracts, the residents of that tract can afford and are capable of travelling further than one kilometer on foot to shop for their groceries. Table 1 also shows that there is an average of only 0.15 full service grocers in food deserts and an average of 1.3 in food oases.

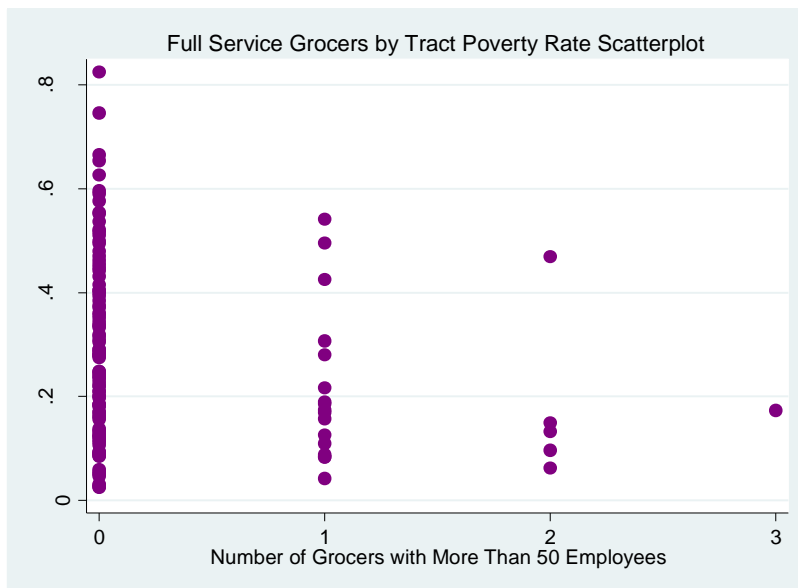
Table 2: Fraction of Tracts with at least one Full Service Grocer

	Fraction of Tracts with at least one Full Service Grocer		
	Low-Income (n=70)	Middle- Income (n=30)	High-Income (n=21)
Percent of Tracts with a Grocer	10%	33%	29%
Percent of all Grocers in Cincinnati	27%	47%	27%
Percent of Population	49%	27%	23%

The means in Table 1 tell part of the story. However, the distribution of income, grocers, and population shows the discrepancy between the distribution of grocers relative to the population distribution. Table 2 looks at these distributions. Low-income tracts have a poverty rate above 20 percent, middle-income tracts have a poverty rate between 10 and twenty percent, and high-income tracts have a poverty rate below 10 percent.

Table 2 shows that 33 percent of middle-income tracts have at least one grocery store. Among high-income tracts, 29 percent have a full service grocer. Only 10 percent of low-income tracts have full-service grocers. Further, middle-income tracts contain 47 percent of all the grocers in Cincinnati while only containing 27 percent of the population. Low-income tracts, on the other hand, contain 49 percent of the population but only 27 percent of the grocery stores. Middle-income tracts have double the number of grocers for half as many people as low-income tracts. Among high-income tracts, the percent of grocers is roughly proportional to the percent of the population living in those tracts.

Figure 1: Full Service Grocers by Tract Poverty Rate



To better visualize the discrepancy described above, Figure 1 shows the poverty rate of each tract and how many grocers are in that tract. While there are a large number of tracts without grocers with varying poverty rates, the range of poverty rates decreases as the number of grocer increases.

Model and Regression Specification

As illustrated in the section above, there is a discrepancy between the distribution of grocers and the distribution of population. Poverty rate may play a role in this discrepancy. In order to better understand the location decisions made by grocers, we must start with a basic assumption: Grocery retailers, like all retailers, operate by maximizing profit.

To understand how population and poverty rate impact profit maximization, we will begin with a basic profit equation:

$$\Pi = TR - TC$$

where π represents profit based on the quantity demanded, given by the function:

$$Q_d = \beta_0 + \beta_1 P + \beta_2 \text{ Income} + \beta_3 \text{ Population}$$

where P represents output price of each individual good sold. Solving the function of quantity demanded for P:

$$P = \frac{A - Q_d}{B}$$

where A represents both income and population by census tract together. TR stands for total revenue, which equals output price multiplied by quantity demanded:

$$TR = \sum \frac{A - Q_d}{b} * Q_d$$

and TC stands for total cost:

$$TC = p * Q_d - m$$

where p is the price of each of the inputs or goods sold and m are the fixed costs associated with opening a grocer. By constructing this basic profit function, we can hypothesize about the impact of income and population on the number of profit-maximizing grocers. Taking the partial derivative of the profit equation in respect to Q_d and solving for Q_d , we find:

$$Q_d = \frac{A - P * b}{2}$$

We can then take the partial derivative of quantity demand in respect to income and population separately to predict the impact of increasing income and population on the number of grocers. If we look at income, we would expect quantity demanded to increase with income because consumers can afford to buy more goods and demand higher quality goods that are more expensive:

$$\frac{\partial Q_d}{\partial \text{income}} > 0$$

The positive correlation shown above suggests that we would expect quantity demanded to increase with income which would increase total revenue more than it would increase total cost, leading to more profit. Consequently, we would expect grocers to locate in high income areas because they would anticipate larger profits from higher prices.

Second, we can look at the effect of population on quantity. An increase in population would increase demand and increased quantity demanded:

$$\frac{\partial Q_d}{\partial \text{population}} > 0$$

If this assumption holds, grocers would prefer to locate in high population areas because the larger quantity purchased would increase total revenue more than it would increase total cost since the increase in cost is input price times quantity which would be smaller than output price times quantity. This would also lead to higher profit.

This is a basic theoretical model with easily accepted assumptions. Based on these assumptions, we would expect to see more grocery retailers in high income, high population areas. Now, we need to test the model to see if it is supported by the data.

A cross-sectional regression will be used to estimate the relationship income, population, and number of convenience stores on the presence of a full service grocer in a tract. The regression specification is:

$$\text{Grocers}_i = \beta_0 + \beta_1 \text{Poverty Rate}_i + \beta_2 \text{Population} + \beta_3 X_i + U_i$$

X_i = control variables \equiv Convenience Stores and Fast Food Restaurants

The variable *Grocers* is the number of grocers in census tract *i* in 2013, *Poverty Rate* is the census tract's poverty rate, *Population* is the population measured by the Census Bureau in 2010 by census tract, *Convenience Store* is the number of convenience stores in the tract, *Fast Food Restaurants* is the number of fast food restaurants in the tract, and U_i is the error term. The error term includes anything that influences the number of grocery stores not included in the regression equation such as price elasticity, preferences for prepared or fast food, or a high rate of theft in low-income areas. Additional regressions include a binary variable for a high poverty tract and high population as well as an interaction term between the binary poverty and binary population variables, which will be explained in the results section below.

Results

This section shows and interprets the results of the regression specification described in the preceding section. Table 3 shows the results of the linear regression measuring the effect of census tract poverty rate on the number of grocers in that census tract without additional controls. The regression in Column 1 indicates that regardless of poverty rate, the base number of grocers per census tract is 0.41 when the poverty rate is 0 percent. This means that at a poverty rate of zero, there would be an average of 0.41 grocers in a census tract. For each one percent increase in the poverty rate, the number of grocers decreases by .006. The coefficient is statistically significant at the 5% level. Included in the error term are any other factors that could be influencing the number of grocers in a tract, some of which will be controlled for in

additional regressions. The regression in Column 1 has an R-squared value of .035 which means that 3.5% of the factors contributing to grocer location are accounted for.

Table 3: Base regression estimating the effect of neighborhood poverty rate on number of grocery stores

Dependent Variable: Number of Grocers					
VARIABLES	(1)	(2)	(3)	(4)	(5)
Poverty Rate	-0.0060** (0.0029)		-0.0047 (0.0031)	-0.0044 (0.0031)	-0.0035 (0.0027)
Population		0.000061* (0.000033)	0.000043 (0.000035)	0.000035 (0.000035)	3.8e-06 (0.000031)
Convenience Stores				0.093* (0.051)	0.011 (0.046)
Fast Food Restaurants					0.12*** (0.018)
Constant	0.41*** (0.094)	0.065 (0.11)	0.25 (0.16)	0.18 (0.17)	0.12 (0.15)
Observations	121	121	121	121	120
R-squared	0.035	0.029	0.047	0.073	0.312

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Column 2 looks at the effect of population on the number of grocers. The coefficient is statistically significant, but only at the 10% level. The coefficient is so small because it measures the impact of one more person in the census tract on the population. Column 3 measures the effect of the poverty rate on grocers when controlling for population size. The coefficient for poverty rate is still negative, but smaller and no longer statistically significant. This suggests that poverty rate does not have a significant impact on the number of grocers.

Columns 4 and 5 add controls for the number of convenience stores and the number of fast food restaurants in a tract. Convenience stores and fast food restaurants are included in the term food retailers. In order to more precisely measure the accessibility of healthy food in a tract, it is necessary to control for these other sources of food that are not healthy but very prevalent in high poverty tracts. When these additional variables are controlled for, the effect of poverty rate continues to decrease and loses significance. However, the point-estimate remains negative suggesting there is still some relationship.

In Column 5, poverty rate, population, and convenience stores are all statistically significant. The number of fast food restaurants increases the number of grocers in a tract. This statistically significant correlation could be explained by retail agglomeration in the food industry. Agglomeration is the tendency of similar businesses to cluster together to capture the

full demand brought to an area and reduce the cost of common inputs. Further, the variable fast food restaurants could be capturing a different effect such as a preference for food. People come to areas with fast food restaurants to eat. Grocers may capitalize on this population looking for food by locating in areas that attract people looking for food.

The regressions shown in Table 3 indicate no significant relationship between the number of grocers in a census tract and the poverty rate, suggesting that food deserts which have high poverty and few grocers are not prevalent in Cincinnati. Even when controlling for population in the regression above, having a high population or a low population influences the number of grocers and could mask the effect of poverty rate. Areas with low population will have fewer grocers regardless of poverty rate. Poverty rate is more likely to matter in high population areas.

Table 4: Linear regression measuring the effect of tract poverty rate number of grocery stores controlling for high vs. low population tracts

Dependent Variable: Number of Grocers			
VARIABLES	(1)	(2)	(3)
Poverty Rate	-0.011** (0.0044)	-0.010** (0.0044)	-0.0056 (0.0039)
Low Population	-0.39** (0.19)	-0.35* (0.19)	-0.12 (0.17)
Interaction Low Population and Poverty Rate	1.04* (0.60)	0.98 (0.59)	0.37 (0.53)
Convenience Stores		0.087* (0.051)	0.010 (0.046)
Fast Food Restaurants			0.11*** (0.019)
Constant	0.57*** (0.12)	0.46*** (0.14)	0.19 (0.13)
Observations	121	121	120
R-squared	0.068	0.091	0.315

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To better examine the role of population, I created a binary variable for population using high and low population, where high population is above the median population for all census tracts and low population is below the median population. Low Population equals one if the population is below the median and zero if it is above the median. The results using this binary variable along with an interaction between low population and poverty rate are listed in Table 4.

Column 1 of Table 4 shows that a one percent increase in the poverty rate decreases the number of grocers in a tract by 0.011 in a high population tract and is significant at the five percent level. Having a population below the median lowers the number of grocers in a tract by

0.39, also at a significance of five percent. The interaction variable shows the effect of increasing the poverty rate where there is low population. The interaction is significant at the 10 percent level with an F-stat of 3.06. This coefficient is positive, which means that increasing the poverty rate increases the number of grocers in low population tracts. In low population areas, limited access to grocers store is primarily dependent on a small number of consumers.

However, in high population areas, as the coefficient for poverty rate tells us, an increase in the poverty rate decreases the number of grocers in that tract. After low and high population tracts, poverty rate is associated with a decrease in the number of grocers in high population areas, suggesting that there are food deserts in Cincinnati. The results are only marginally different and remain statistically significant when controlling for the number of convenience stores in Column 2. However, population and poverty rate are no longer significant once the number of fast food restaurants is controlled for, shown in Column 3.

Table 5: Condensed Tables 1 and 3 using a binary poverty rate variable

Dependent Variable: Number of Grocers in Tract.			
VARIABLES	(1)	(2)	(3)
Binary Poverty Rate	-0.30*** (0.10)	-0.25** (0.11)	-0.17* (0.096)
Population		0.000025 (0.000034)	2.2e-07 (0.000031)
Convenience Stores		0.090* (0.050)	0.012 (0.046)
Fast Food Restaurant			0.11*** (0.019)
Constant	0.42*** (0.075)	0.23 (0.15)	0.14 (0.13)
Regression Type	OLS	OLS	OLS
Observations	121	121	120
R-Squared	0.068	0.100	0.320

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Tables 3 and 4 estimate the effect of a one percent change in the poverty rate on the number of grocers. However, these estimates do not directly relate to the established definition of a food desert which is an area without a grocer within one kilometer, estimated by census tracts in this study, with a poverty rate over 20 percent. Table 5 replicates the results in Tables 3 and 4 using a binary variable to measure the poverty rate. I created a binary variable that measures whether a tract has a poverty rate above or below 20 percent where below 20 percent poverty rate equals zero and above 20 percent poverty rate equals one.

According to the results in Column 1, being in a tract with a poverty rate above 20 percent reduces the number of grocery stores by 0.3 on average, holding all else constant. Using the full specification, tracts with a poverty rate below 20 percent have 0.42 grocers on average while those with a poverty rate above 20 percent have 0.12 grocers on average. This coefficient

decreases but remains statistically significant after controlling for convenience stores and fast food restaurants.

Discussion and Conclusion

The results detailed above suggest that the data does match the theoretical model proposed earlier in the paper. Grocers, as profit-maximizing retailers, increase the quantity demanded and the number of store locations as income and population in the census tract increase. While there is an issue with the current food distribution in Cincinnati, how we approach a solution is very important. While this paper will not detail specific policy solutions, it offers a frame of reference and important considerations for future policy decisions.

Currently, grocers will not locate in low-income and low population areas because it is not profitable. Incentives must change in order for the profit equation to change in a way that would make it profitable for grocers to locate in these areas. However, the issue of a lack of grocers or other nutritious food retailers in low-income areas goes beyond simply profit maximization. There is also an issue of cultural preferences. Establishing grocers and farmers markets in low-income area will not help the residents if they do not have the resources or the desire to consume these goods. Even with food stamps, nutritious food is more expensive and requires more time to prepare. Those with low income may not have the time or money to eat a more nutritious lifestyle. More importantly, the cultural preferences of low-income areas must be acknowledged as well.

Rebecca Goldberg (2013) examines how many laws, especially laws related to the food movement, intended to help disadvantaged groups are often paternalistic in nature and potentially discriminatory because they ignore the preferences and rationality of the people they are intended to serve. She defines "'strong' paternalism [as] one party taking action to benefit a second party without the second party's consent, and in a way that is either coercive or involves a restriction of liberty" (65). Such laws, especially when they single out a particular disadvantaged group, are a form of discrimination and, therefore, could be generally unjust, though there is debate. However, for her argument, she assumes that 'strong' paternalistic laws are sometimes appropriate. This discussion and caution about paternalistic policies is extremely important to note when discussing solutions to the issue of food inaccessibility.

Goldberg summarizes four arguments against paternalistic laws and four arguments in favor of paternalistic laws. The first argument against paternalistic laws returns to the criticism of Michael Pollan and the food movement. Many policymakers are likely to be separated socially from the populations that the law targets. The lack of understanding of the target population that arises from this social separation could result in harmful, ineffective, or unnecessary paternalistic laws. The second argument is a byproduct of that social separation, which is that the target population may not trust the policymaker. This problem is magnified if the target population is not involved in the decision-making process surrounding the law. Third, paternalistic laws that reduce a population's freedom or rights can perpetuate and reinforce stereotypes that the disadvantaged are inferior to the advantaged population. The fourth argument against paternalistic laws is that they do not allow members of a community to decide what is best for their community. Paternalistic laws could prevent communities from solving their own problems and giving themselves the tools to solve problems in the future.

Paternalistic laws can harm the community they are meant to help and continue to cripple them by creating additional obstacles for those community members to overcome.

Goldberg also presents four counterarguments in favor of paternalistic laws. First, because disadvantaged populations are particularly in need of help, the cost of reduced freedom and autonomy may be smaller than the benefit they would gain from paternalistic laws. The second argument in favor of such laws is that the preferences of the disadvantaged are shaped by situational factors such as limited experience. Consequently, since these preferences are not freely formed, the government can justifiably override them with paternalistic laws. The third argument is that it opposes the ideal of equality to deny the disadvantaged of benefits that improve the general population as well. And finally, the fourth argument in favor of such laws is that they could level the playing field. Each of these arguments focuses on the significant obstacles that disadvantaged communities face and acknowledges that they may not be able to overcome them without outside help.

Within these four point and four counterpoints, there are several significant issues regarding recognition which are related to the three theories of poverty. The three theories of poverty each hypothesize a root cause of poverty: flawed character, restricted opportunity, and big brother. Flawed character is the idea that those in poverty are poor because they are lazy and not willing to work. Restricted opportunity holds that those in poverty do not have the same opportunities to work or to advance themselves as the advantaged. The third, big brother, is that government benefits are too generous and it pays too well to be poor. No one theory fully encompasses the causes of poverty, and it is most likely a combination of all three. However, these three theories can help contextualize the arguments summarized above.

The first two arguments against paternalistic laws have less to do with the causes of poverty and are more related to the way we approach the issue of food justice. However, the third argument against paternalistic laws coincides with the flawed character theory of poverty. Paternalistic laws have the ability to perpetuate the idea that those living in poverty are doing so because of some flaw in their character such as laziness. These laws reduce the freedom of one specific, disadvantaged group by no longer allowing them access to something the rest of the population has access to. Such laws treat disadvantaged groups as less human, having fewer rights, than the rest. This is a serious issue of misrecognition. Would such laws improve public health and encourage that community to do what is “better” for them? Potentially yes. However, this comes at far too high a cost. The redistribution of healthy, fresh food is not worth sacrificing recognition as being fully and equally human.

The second argument in favor of paternalistic laws, which contends that disadvantaged groups do not freely form their preferences, correlates with the restricted opportunity theory of poverty. It is true that disadvantaged groups often have a limited experience from which to form their preferences. If food is rare and expensive, eating as much as cheaply as possible is a rational preference. Does this mean that those with more experience have the right to override their preferences? Absolutely not. Policymakers overriding the disadvantaged group’s preferences are also severely limited in experience. The social separation mentioned above means that policymakers often do not understand the experience of the disadvantaged group. This suggests that policymakers are imposing their experience as better than the experience on the disadvantaged group. It is right to want to open doors and create opportunities for

disadvantaged groups to gain other experiences, but asserting that one group's preferences are superior to another group's preferences implies that one group is better or more worth recognizing than another. This is another way in which a paternalistic approach to food justice violates equal and full recognition between groups.

The third theory of poverty asserts that too much government intervention incentivizes people to live in poverty. It is dependency on the government that prevents people from being able to pull themselves out of poverty. The arguments in favor of paternalistic policies seem to emphasize that disadvantaged groups are not capable of creating a better life for themselves if they so choose. It suggests that dependency on the government is superior to living in their current conditions. This returns to the fourth argument against paternalistic laws in that they may prevent the community from creating solutions to their problems and empowering themselves. For many communities in poverty, they feel powerless to change the situation already. More important than laws that change the situation for them and leave them dependent on the government is to recognize these groups as equal individuals with the power to change their situation. It is important to empower the community to strive for the changes it needs and wants, not the changes other impose on it.

Based on the arguments for and against paternalistic laws that Goldberg summarizes, she created a series of questions to help analyze proposed laws that target disadvantaged groups. Though all the questions she suggests are valid, I will chose to focus on only a few that help speak to recognition. Her first question is: "Is there a problem that needs to be solved, or does it just appear that way to policymakers because of social separation from the target population?" (76). This is a reiteration of the question posed at the beginning of this paper. It can be asked of government and policymakers or of activists in the food movement. Before acting, it is important to evaluate whether or not there is actually a problem in the community or if one class or group is simply imposing its preferences on another group. As mentioned above, preferring one group's priorities over another denies equal recognition to the priorities of the disadvantaged group. Some may counter that many people in impoverished areas want increased access to healthy food and that wealthier citizens are not simply imposing. That is certainly true, and in those circumstances, there is not a lack of recognition. That is the purpose of asking this question. It also further emphasizes the importance of community and grassroots involvement in policy to make sure that the policy is addressing an actual need in the community in a way that community members will respond to and participate in.

The second question Goldberg creates that I want to mention is asking if a group's preference formation has been impeded. This area has far more gray than the question above. Reflecting back on Shaw's third part of her classification, attitude, it is important to know that culture, both racial and socio-economic shape preferences. One way around this issue is to focus on policies that create opportunity instead of trying to enforce a particular idea or fill one specific gap. Increasing SNAP benefits is supported by anti-hunger, anti-obesity, and food justice advocates because it allows recipients to buy more food and have the money for healthier food. This would improve public health, inform preferences, and open opportunities without compromising racial or cultural identity, particularly in relation to food. This is one way of recognizing the equal freedom to choose of disadvantaged groups. While not perfect, it is just one example of taking the larger picture into consideration when creating policies.

While the results above may suggest that food deserts exist in Cincinnati, the available data do not provide the whole picture. The results show a correlation between the poverty rate and the number of fifty plus employee grocers in the census tract. This does not fully measure food accessibility because it excludes smaller retailers that provide healthy food alternatives but are not full scale grocers. Bader, et. al found that only 36.1 percent of the healthy food outlets were supermarkets. The larger portion, 57.3 percent, was fruit and vegetable markets and 6.6 percent were farmers' markets.

This study excludes farmers markets and fruit and vegetable small markets. Further, recall that using grocers with fifty or more employees is a proxy for healthy food, not a measure of healthy food itself. It is unknown precisely what products are in each store, their quality and their price. A more ideal data set would account farmers' markets, fruit and vegetable markets, as well as the price, quality, and quantity of healthy food alternatives in a grocer location. Also, census tracts are used as a proxy of distance because it was not possible for this study to measure the average distance precisely between consumers and the closest supplier of healthy food. Future studies could develop a more precise measure for distance.

Once population is adequately controlled for, there is a significant relationship between the poverty rate in a tract and the number of grocers located in that tract for most specifications. In high population areas, increasing the poverty rate by one percent decreases the number of grocers by .011. As shown in Table 5, there is a significant correlation between being in a high poverty tract, a poverty rate over 20 percent, and decreased access to a grocer. Grocers, as profit maximizing retailers, select location taking income and population into account. These results suggest that food deserts are prevalent in Cincinnati, Ohio and more research should be done concerning the best way to alleviate the lack of food accessibility through policy or other initiatives, keeping in mind that we need to grant full recognition to the populations we try to help and avoid paternalistic policies.

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