THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF BIOBEHAVIORAL HEALTH

IS THE DISTANCE TO SUPERMARKETS RELATED TO CHILDHOOD OBESITY?

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SPRING 2012

A thesis
submitted in partial fulfillment
of the requirements for a baccalaureate degree
in Biobehavioral Health
with honors in Biobehavioral Health

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ABSTRACT

Background: The purpose of this study was to examine the association between the distance to supermarkets/large grocery stores and childhood obesity rates, particularly in low-income, preschool-aged children. Areas where people do not have easy access to healthy, fresh foods, which are defined as food deserts, were of particular interest in this study. The study also examined how different types of food stores impacted obesity rates in this particular population of children. **Methods**: Data were drawn from a nationally compiled obesity surveillance dataset (Food Environmental Atlas), obtained at the state and local level for low-income, preschool aged children (n=2,222,410). Distance was measured from the center of 1-kilometer grids to the nearest supermarket for the entire U.S. population and median distances to the nearest supermarket were calculated for the nation as a whole and across different sub-regions. Counties were broken down as being either metro or non-metro. Obesity was measured using the child's height and weight to calculate sex-and-age specific body mass index (BMI). **Results**: Distance to supermarkets alone was not associated with obesity rates in low-income, preschool-aged children in metro or non-metro counties. When other factors such as types of food stores (i.e. grocery stores, convenience stores, fast food restaurants) were included in the analysis, the distance to supermarkets still was not significantly associated with obesity rates in low-income, preschool-aged children in metro or non-metro counties. **Conclusions**: These findings suggest that children who live in food deserts have limited access to large grocery stores and supermarkets, however the results do not suggest that food deserts in metro and non-metro counties are associated. Future research needs to focus on ways to provide individuals who live in food deserts with better access to fresh and healthy foods at affordable prices.

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ACKNOWLEDGMENTS

I would like to express my greatest gratitude to those who helped make this thesis possible. First and foremost, I would like to thank Dr. Lori Francis for her continued support and guidance throughout the thesis process. It was her passion and expertise in the field of childhood eating behaviors that inspired me to write this paper. I would also like to thank Dr. Linda Wray for her constructive criticism, which allowed me to fully develop my thesis. I would not have been able to run my data analysis without the help of graduate T.A. Cindy McCrea. Finally, I would like to thank my family and friends for their support and encouragement through this entire process.

INTRODUCTION

Overweight and obesity in children has become a major health concern in the United States. In 2007, 16% of children between the ages of 6 and 19 were overweight (Odgen, Flegal, Carroll & Johnson, 2002) and that number is expected to rise. Obesity is now starting to affect children at earlier ages as well, with the prevalence of overweight and obesity increasing in 4-and 5-year-old children (Odgen, et al., 1997). Childhood obesity is an important concern because it has been shown to have long-term health consequences (Must, 1996). Not only are children who are overweight at greater risk for developing obesity as an adult (Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007; Kipke, et al., 2007), but they are also at risk of insulin resistance, hypertension, hypertriglyceridemia, cardiovascular diseases, non-insulin dependent diabetes, certain cancers, and overall mortality (Newby, 2007). The dramatic increase in the rate of obesity in children over the past few decades suggests that risk factors are predominately influenced by the environment such as increased food intake and decreased physical activity (Newby, 2007).

A food desert is defined as "an area where people do not have easy access to healthy, fresh foods, particularly if they are poor and have limited mobility" (Elliot, 1997). Food deserts share a number of common characteristics. When compared to non-food desert counties, food deserts tend to have higher poverty rates, lower median family incomes and lower access to large food retailers (Morton & Blanchard, 2007). Food deserts are most commonly found in low-socioeconomic communities.

Although food deserts are prevalent in both rural and urban neighborhoods (Ploeg et al., 2009), researchers have found that overweight and obesity are more prevalent in

individuals who live in rural communities when compared with individuals who live in metropolitan areas (Gamm, Huchison, Dabney, & Dorsey, 2003). Food deserts particularly affect children living in rural communities. A study by Lutfiyya et al. (2007) concluded that children living in rural communities are 25% more likely to be overweight or obese than are their metropolitan counterparts. An explanation for the higher rates of obesity in rural communities may be a result of there being significantly lower numbers of food-stores, particularly chain supermarkets, available to rural area residents (Powell, Slater, Mirtcheva, Bao & Chaloupka, 2006).

Families who live in food deserts have lower access to supermarkets where they can obtain healthy and nutritious foods. The availability of chain supermarkets – which are less likely to sell a wider selection of healthier and more nutritious foods – was found to be 7.4 times greater in urban areas when compared to rural areas (Powell et al., 2006). Differences in price and food availability between neighborhoods have shown that 'healthier' foods are more expensive and less readily available in poorer communities (Cummins & Macintyre, 2005). In a study conducted by Sturm & Datar (2005) found that "children who lived in communities where fruits and vegetables were expensive were more likely to gain excessive amounts of weight than children who lived in areas where fruits and vegetables were less expensive" (pg. 342). The availability of supermarkets has also been associated with higher fruit and vegetable intake, healthier diets and lower rates of obesity (Morland, Wing, Diez Roux, & Poole, 2002a, 2006; Laraia, Siega-Riz, Kaufman & Janes, 2004).

Individuals who live in food deserts often depend on small grocery stores and convenience stores to obtain their food. However, these types of stores tend to provide

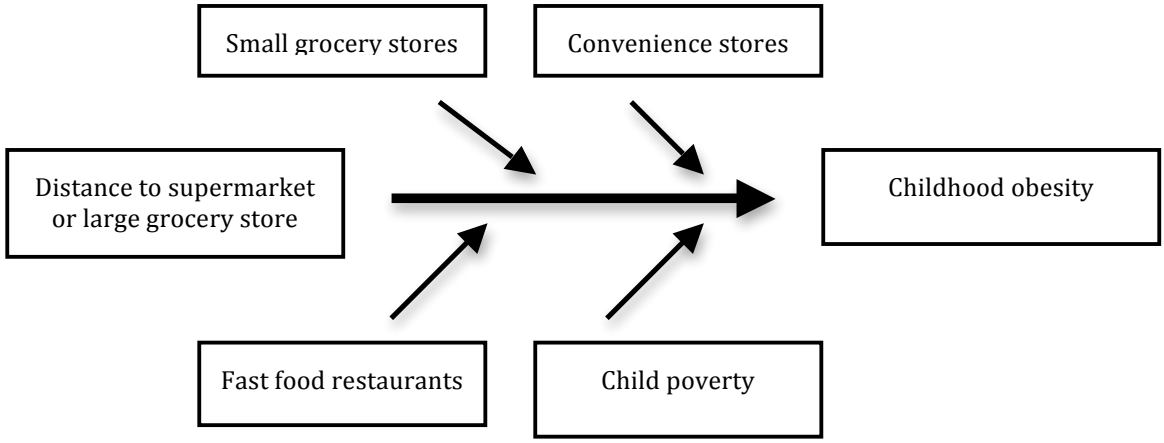
cheaper, higher-fat, higher-sugar, and processed foods; and they offer a more limited selection of more healthful foods (Treuhaft & Karpyn, 2010). Kipke et al. (2007) examined community-level risks associated with childhood obesity in East Los Angeles, a community with one of the highest rates of childhood obesity and 190 food outlets. One in three (62) of these food outlets were small grocery stores; and only 18% of these sold fresh fruits and/or vegetables of good quality. According to Kipke et al. (2007), only four grocery stores that sold fresh fruit and/or vegetables were within walking distance of a school. Children who live in similar food environments may find it difficult, if not impossible, to make healthy dietary choices. In another study, Moreland, Diez-Roux, & Wing (2006) reported that the presence of grocery stores and convenience stores was positively associated with an increased prevalence of overweight and obesity.

Fast food has also become a staple in the American diet as a result of the convenience they provide and the fast-paced lifestyle of most Americans. The number of fast food outlets has increased from 30,000 in 1970 to 222,000 locations in 2001 (French, Harnack, & Jeffery, 2000). Children and adolescents who reported eating fast food on a particular day had a significantly lower intake of bread, cereals, dark green vegetables and other vegetables, but consumed more fried potatoes on the same day (Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003). These same researchers also reported that the intake of other fruits and juices, milk, and legumes was lower compared to other participants who did not report eating fast food. Cummins & Mcintyre (2006) reported that poorer neighborhoods had 2.5 times more fast food outlets, compared to more affluent neighborhoods; and Morland and colleagues (2006) the prevalence of obesity was higher in areas with at least one franchised fast-food restaurant. In many cases, fast food restaurants

are most likely to be common food options for individuals living in food deserts since the restaurants are in close proximity to their homes.

The preceding literature suggests that the lack of access to healthy and nutritious food is a contributing factor to obesity found in individuals who live in food deserts. This study aims to at measure the association between food deserts and childhood obesity, particularly in low-income, preschool-aged (ages 2-5) children. It is hypothesized that preschool-aged children who live in food deserts will have higher rates of obesity when compared to their urban counterparts. Figure 1 presents a conceptual framework showing how distance to supermarkets is associated with childhood obesity and what other factors might influence that relationship.

Figure 1.



METHODS

The Food Environment Atlas is an online mapping tool that compares the food environment of United States counties (U.S. Department of Agriculture: Economic Research Service, 2009). It was launched by the USDA's Economic Research Service as a tool for providing a spatial overview of a community's ability to access healthy food (2009). The Food Environment Atlas contains 90 food environment indicators, most of which were obtained at a county level as well as information on per-capita consumption of foods such as fruits and vegetables, soft drinks, and fats. It also reports the concentration of grocery stores, convenience food stores and fast-food establishments in a given county (2009).

In 2008, data were compiled from 43 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands and six Indian tribal organizations (Centers of Disease Control and Prevention, 2009). More than 8 million children were included in the Centers for Disease Control and Prevention's Pediatric Nutrition Surveillance System (PedNSS) in 2008. Of all of the children that were included in this study, 41.3% were between the ages of 2 and 5 (U.S. Department of Health and Human Services, 2008). The majority of the children involved in this sample were classified as either Hispanic (41.4%), non-Hispanic white (32.0%), non-Hispanic black (19.0%); Asian or Pacific Islander (2.7%), American Indian or Alaska Native (1.0%), and 3.9% were of multiple or unspecified race and ethnicities (U.S. Department of Health and Human Services, 2008).

Procedures

The Food Environment Atlas includes data from 3,141 U.S. counties. To determine which areas in the United States have limited access to affordable and nutritious food, the USDA has collected information on food spending, food access and adequacy, and sources

of food and nutrition assistance for the U.S. population every year since 1995 (U.S. Department of Agriculture, 2009). Information was collected in an annual food security survey by the Current Population Survey (CPS), which is a nationally representative sample selected by the Census Bureau for the Bureau of Labor Statistics (2009). About 50,000 households responded to the food security questions as well as to questions about food spending and the use of Federal and community food assistance programs (2009).

Measures

The measures that were included in this study examined how particular food environmental factors interacted to influence childhood obesity rates in low-income, preschool-aged children.

Childhood Obesity Rates – Obesity rates in low-income preschool children were reported by the Centers for Disease Control and Prevention's Pediatric Nutrition Surveillance System (PedNSS). PedNSS is a state-based surveillance system that monitors the nutritional status is children from birth through age 4 years in federally funded programs that serve low-income children (Centers of Disease Control and Prevention, 2009). Children were seen twice a year and data was collected on weight, height, age, sex and race/ethnicity of the child. The CDC used height, weight and age data to calculate body mass index (BMI). BMI is a number calculated by dividing a person's weight in kilograms by the square of the height in meters (Calle, Thun, Petrelli, Rodriguez, & Heath, 1999). For children aged 2-4 years, obesity was defined as BMI-for-age >95th percentile based on the 2000 CDC sex-specific growth charts.

Number of Households without a car & >10 Miles to Store, 2006 – The key analytic measure in this study was the number of households in the county that had no cars and

that were located more than 10 miles to a supermarkets, that is, the number of households with low proximity to food stores. Data on the distances to supermarkets/large grocery stores came from households surveyed in 2001 (U.S. Department of Agriculture, 2009). Distances were measured from the center of 1-kilometer grids to the nearest supermarket for the entire U.S. population and median distances to the nearest supermarket were calculated for the nation as a whole and across different sub regions. Based on the grid measure of distance to the nearest supermarket, three categories of access or proximity (high, medium, and low) were created for driving access. Proximity was categorized as high (supermarket within 10 miles), medium (supermarket between 10 and 20 miles) or low (supermarket greater than 20 miles away). The distance or proximity to the nearest supermarket or large grocery store was used as a proxy for the availability of affordable and nutritious food (U.S. Department of Agriculture: Economic Research Service, 2009).

Metro vs. Non-metro counties, 2000 – Counties were classified as either metropolitan (metro) or nonmetropolitan (non-metro). Metro areas were defined for all urbanized areas regardless of total area population. Outlying counties were also categorized as being metropolitan counties if they were economically tied to the central counties. Non-metropolitan counties were defined as counties if they lie outside the boundaries of metropolitan counties and no cities within them exceed 50,000 residents (U.S. Department of Agriculture, 2009).

Grocery Stores/1,000 population, 2008 – To measure grocery stores, the number of supermarkets and grocery stores in each county was counted per 1,000 county residents. Grocery stores were defined according to the U.S. Census Bureau as "establishments that were known as supermarkets and smaller grocery stores that are primarily engaged in

retailing a general line of food" (U.S. Census Bureau: County Business Patterns; U.S. Census Bureau: Population Estimates, 2008).

Convenience Stores with No Gas/1,000 Population, 2008 – The number of convenience stores in each county that did not sell gas was measured per 1,000 county residents. Convenience stores that do not sell gas typically limit their goods to milk, bread, soda and snacks (U.S. Census Bureau: County Business Patters; U.S. Census Bureau: Population Estimates, 2008).

Fast-Food Restaurants/1,000 Population, 2008 – Fast-food restaurants were measured as the number of limited-service restaurants in a county per 1,000 county residents. Limited-service restaurants included places that primarily engage in providing food services (except snack and nonalcoholic beverage bars) that customers typically order or select and pay for before eating (U.S. Census Bureau: County Business Patters; U.S. Census Bureau: Population Estimates, 2008).

Given that Food Environment Atlas is relatively new (2009), there have been no published reports of the validity or reliability of the data. However, the government has constructed an interactive website in which users can see a spatial overview of a community's ability to access healthy food.

Statistical Plan

Data were imported from the Food Environment Atlas to SPSS® Statistics version 19 in order to be analyzed statistically (IBM Corporation, Somers, New York). A bivariate statistics was run as a background for describing the study's sample. Two regressions were run to determine how our variables affected obesity rates in low-income, preschool aged children. A linear regression was run to analyze how distance to supermarkets and grocery

stores alone affected childhood obesity rates. A multiple regression was run to determine whether the distance to supermarkets had an effect on obesity rates in low-income preschool aged children. Each variable was assessed for normality and the a priori alpha level was set to 0.5 for statistical significance for both regressions.

RESULTS

Information on the participant's demographics can be found in **Table 1**. Of the 8 million children whose data were collected in PedNSS, 2,222,410 (41.3%) children were between the ages of 2 and 5 years old and those subjects were included in this study. Data were collected from 3,141 counties; however, 396 (12.6%) counties were excluded as a result of missing data on low-income, preschool obesity rates. The counties with missing data were typically small counties in hard to reach areas of the United States (i.e. Alaska). The average obesity rate for low-income, preschool aged children in this sample was 14.13% (SD=3.64). The counties had an average of 39.74 (SD=84.66) households that did not have a car and that were located more than ten miles to the nearest food store. The sample as a whole had an average of 0.27 (SD=3.62) grocery stores, 0.07 (SD=.09) convenience stores, and 0.80 (SD=.62) fast-food restaurants per 1,000 persons.

Table 1. Descriptive Statistics on all Counties included in the Study

Variable	*n*	Mean	*SD*
Low-income, preschool obesity rates	2745	14.13	3.62
# Households, no car & >10 mile to store	3109	39.74	84.66
Grocery stores (per 1,000 pop.)	3140	.27	.24
Convenience stores, no gas (per 1,000 pop.)	3140	.07	.09
Fast-food restaurants (per 1,000 pop.)	3140	.80	.62
	n	**%**	
Age			
2-5 years old	2,222,410	41.3	
Metro or Non-Metro Counties			
Metro	1089	34.7	
Non-Metro	2052	65.3	

The data were split into two separate categories – counties that were either metropolitan or non-metropolitan – to analyze the differences between obesity rates in low-income, preschool-aged children in these areas. As shown in Table 2, 1,713 counties

were classified at non-metropolitan and 1,028 counties were classified as metropolitan. Both metro and non-metro counties had very similar rates of obesity, 14.14 (SD=3.36) and 14.12 (SD=3.77), respectively. Non-metro counties had a greater number of households without a car and that were located more than 10 miles to a supermarket or a large grocery store (46.45 (SD=92.79)), compared to metro counties (27.22 (SD=65.10)). Non-metro counties also had a slightly greater number of grocery stores (0.32, SD=0.27) and fast-food restaurants (0.87, SD=0.72) per 1,000 residents when compared to their metro counterparts, 0.18 (SD=0.09) and 0.67 (SD=0.34), respectively. The number of convenience stores in metro and non-metro counties was very similar, with metro counties containing 0.07 (SD=0.06) convenience stores per 1,000 residents and non-metro counties containing 0.06 (SD=0.10) convenience stores per 1,000 residents.

Table 2. Differences between Metro and Non-Metro Counties.

Variable	***Metro***	***Non-Metro***
Low-income, preschool-aged obesity rates, 2009	14.14 (3.36)	14.12 (3.77)
# Households, no car & >10 miles to supermarket or large grocery store	27.22 (65.10)	46.45 (92.79)
Grocery stores (per 1,000 pop.)	0.18 (0.09)	0.32 (0.27)
Convenience stores (per 1,000 pop.)	0.07 (0.06)	0.06 (0.10)
Fast-food restaurants (per 1,000 pop.)	0.67 (0.34)	0.87 (0.72)

Linear regression analyses(**Model 1** in **Table 3**) assessed the association between the number of household without cars in low proximity to supermarkets and obesity rates in low-income, preschool-aged children living in non-metropolitan counties. The distance to the nearest supermarket or large grocery store was not significantly associated with obesity rates in this particular population in non-metro counties, β=-.020, t=-.835, p>.05.

A multiple regression analysis assessed the association of our key analytic (number of households with no car & >10 mi to store) and three covariates (grocery stores per capita, convenience stores with no gas per capita, fast-food per capita) with obesity rates in low-income preschool children (**Model 2** in **Table 3**)**.** Even with the addition of the covariates, the number of households with no car located more than 10 miles to food stores in non-metro counties was not significantly associated with obesity rates in low-income, preschool-aged children (β=-.031, t=-1.306, p>.05). However, the presence of grocery stores (β=-.076, t=2.972, p<.05), convenience stores with no gas (β=-.104, t=4.364, p<.05), and fast-food restaurants (β=-.127, t=-4.949, p<.05) were significantly associated with obesity rates in low-income, preschool-aged children living in non-metro counties.

Table 3. Summary of Regression Analysis for Variables Predicting Childhood Obesity Rates in Non-Metro Counties.

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
# Households, no car & >10 miles to store, 2006	-.001***	.001***	-.020*	-.001**	.001***	-.031*
Grocery stores (per 1,000 pop.)				1.698	.571	.076
Convenience stores, no gas (per 1,000 pop.)				4.592	1.052	.104
Fast-food restaurants (per 1,000 pop.)				-.971	.196	-.127
R^2		.000***			.026*	

*p<.05, **p<.01, ***p<.001.

Parallel analyses determined if there were differences between obesity rates in low-income, preschool-aged children living in metro counties. First, a linear regression

(**Model 1** in **Table 4**) assessed if the number of households without car that were located more than 10 miles from a supermarket or large grocery store was associated with obesity rates in low-income, preschool-aged children living in metropolitan counties. The distance to the nearest supermarket or large grocery store was not significantly associated with obesity rates in this particular population in metropolitan counties, β=-.051, t=-1.629, p>.05.

Second, multiple regression analyses assessed if the key analytic measure (number of households with no car & >10 mi to store) and three covariates (grocery stores per capita, convenience stores with no gas per capita, fast-food per capita) were associated with levels of obesity in low-income preschool children (**Model 2** in **Table 4**)**.** These variables in combination were not significantly associated with obesity rates in low-income, preschool-aged children living in metropolitan counties (β=-.052, t=-1.685, p>.05). However, like their counterparts in non-metropolitan counties, the presence of grocery stores (β=.202, t=6.157, p<.05), convenience stores with no gas (β=.103, t=3.276, p<.05), and fast-food restaurants (β=-.110, t=-3.349, p<.05) were significantly associated with obesity rates in low-income, preschool-aged children living in non-metro counties. The results revealed that distance to food stores in both metro and non-metro counties were not associated with childhood obesity rates in low-income preschool children.

Table 4. Summary of Regression Analysis for Variables Predicting Childhood Obesity Rates in Metro Counties.

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
# Households, no car & >10 miles to store, 2006	-.003**	.002**	-.051	-.003**	.002**	-.052
Grocery stores (per 1,000 pop.)				7.747	1.258	.202
Convenience stores, no gas (per 1,000 pop.)				5.511	1.682	.103
Fast-food restaurants (per 1,000 pop.)				-1.173	.350	-.110
R^2		.003**			.052	

*p<.05, **p<.01, ***p<.001.

DISCUSSION

The purpose of this study was to measure the association between food deserts (defined by proximity to food stores in households with no cars) and childhood obesity, particularly childhood obesity in low-income, preschool-aged children. It was hypothesized that preschool-aged children who live in food deserts would have higher rates of obesity when compared to their urban counterparts.

The results from Model 1 in Table 3 and Model 1 in Table 4 both revealed that the distance to a grocery store were not associated with obesity in low-income, preschool-aged children living in either non-metropolitan or metropolitan counties. We expected our results to show that the distance to supermarkets or large grocery stores were associated with childhood obesity rates in non-metropolitan counties but not in their metropolitan counterparts. However, our findings led us to reject our hypothesis. The findings were also contradictory to findings from other studies that tested the effects of similar indicators of food availability and poverty. Morland, Diez-Roux & Wing (2006) found that the presence of supermarkets in the United States was associated with a lower prevalence of obesity: people who live in areas with at least one supermarket had a 9% lower prevalence of overweight and a 24% lower prevalence of obesity, compared to people who live in areas without any access to supermarkets. Morland and colleagues (2006), however, measured number of supermarkets and other food stores in census tracts containing 3,000 to 4,000 individuals as proxy for neighborhoods, whereas our study measured distance to grocery stores from the center of a 1-kilometer grid to the nearest supermarket. The differences in how distance to food stores was measure in each of the studies could account for the discrepancies that were found when we compared the results. In another study, Rose and

Richards (2004), found that proximity to a supermarket was associated with higher fruit and vegetable intake and a better diet quality in people from low-income households. Finally, Morland & Evenson (2009) also found that obesity rates were lower by 0.73 in areas that had at least one supermarket.

When the measures of food availability per capita (i.e. grocery stores, fast food and convenience stores) were included as covariates, distance to supermarkets and large grocery stores were not associated with obesity rates in low-income, preschool-aged children in either non-metro and metro counties (Model 2, Table 3 & Model 2, Table 4, respectively). However, each of the covariates were significantly associated with obesity rates in low-income, preschool-aged children in both metro and non-metro counties. In a study by Cummins and Macintyre (2006) examining the relationship between food stores and obesity, accessibility to supermarkets was poorer in low-income communities, but there were more small independent grocery stores and convenience stores available to local residents. However, small groceries stores and convenience stores typically have a limited variety of fresh produce and healthy foods. Morland et al. (2006) found that the presence of small grocery stores was positively associated with the prevalence of overweight and obesity. We were surprised to find that fast food per capita was negatively associated with obesity rates in low-income children since most food that is served in fast food restaurants is typically high in fat and sugar. Results from other studies have found that the prevalence of obesity rates is higher in areas with larger numbers of fast food restaurants (Morland & Evenson, 2009).

When we examine how the distance to food stores affected childhood obesity rates alone, we did not find significance between the two variables. When the covariates (stores

per capita) were added to the regression, the distance to grocery stores still were not associated with obesity rates in either metropolitan or non-metropolitan counties. There are a few explanations for why this may have occurred. First, individuals who live in food deserts are typically those of lower socioeconomic status. In some communities, there may not be a problem of overeating, but a problem of food insecurity, which is defined as an inadequacy in the amount of food intake because of a lack of money or resources to access enough food (Casey, Szeto, Lensing, Bogle & Weber, 2001). Food insecurity used to mean that an individual was malnourished, but in today's society, many individuals who are food insecure are overweight or obese. According to the Food Research and Access Center (2010), households with limited resources to buy enough food often try to stretch their food budgets by buying cheap, energy-dense foods. Individuals who are food insecure may also overeat when food does become available. Given this information, it does not seem as if food insecurity would have had a major influence on the outcome of the data. Another explanation for the non-significant associations when the other variables were added to the models could be that individuals who live more than 10 miles to the nearest grocery store may also live the same distance from other food sources such as fast food restaurants and convenience stores. These individuals may obtain their food from other resources such as farmer's markets.

Although this study provided interesting results regarding food deserts and low-income childhood obesity rates, limitations must be acknowledged. First, a major limitation was the data itself. Although the data were collected and available on the Food Environmental Atlas website, there was no indication that other studies have been conducted using this data. There were a number of outliers found in each respondent's

data, which led me to believe that the data were not cleaned. Unclean data can cause the results to be misleading. Second, there were a limited number of existing studies that used the same data as in this study. Due to this low number, it was difficult to validate the data that were tested. Lastly, the data were only collected for low-income preschool aged children. Although the data provided a large sample of children, it would have been beneficial if the data included a greater variety of income demographics in order to compare obesity rates in low-income children to obesity rates in high-income children.

The results from the present study do not suggest that food deserts are associated with obesity rates in low-income, preschool-aged children. However, further research needs to focus on ways to develop programs that help to educate individuals that live in food desert communities on how to maintain a healthier lifestyle. Although obesity is a relatively new phenomenon in today's society, there have been plenty of studies that have also concluded that food deserts are associated with obesity. Local food environments deserve greater attention from obesity researchers. Future research needs to focus on ways to provide individuals who live in food deserts with access to fresh and healthy foods at affordable prices.

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Academic Vita

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EDUCATION

The Pennsylvania State University, University Park, PA — Spring 2012

- Schreyer Honors College
- Bachelor of Science in Biobehavioral Health
- Thesis Title: *Distance to Supermarkets as a Predictor for Childhood Obesity*
- Thesis Supervisor: Dr. Lori A. Francis

HONORS

- Dean's List Recognition — Spring 2009-Fall 2011 (except Fall 2010)
- Phi Eta Sigma Honors Society — Spring 2009-present
- The National Society of Collegiate Scholars — Spring 2009-present
    - Selected for recognition of excellent academic achievement

ACTIVITIES

Women's Club Lacrosse — Fall 2008-present

- Vice President (Fall 2010-Spring 2011)
    - Assisted President with coordinating schedule of regular season, tournaments, and daily practice schedules
    - Helped plan, organize and lead pre-season tryouts to choose new team roster

Special Olympics — Fall 2009-present

- Vice President (Fall 2011-present)
    - Delegated tasks and held meetings to create stimulating social events for Centre County, PA Special Olympics athletes
- Secretary (Fall 2010-Spring 2011)

Penn State Dance MaraTHON — Fall 2008-Spring 2010

- Largest student-run philanthropy that raised over $10.68 million in 2012 for pediatric cancer
- Rules and Regulations Committee
- OPPerations Committee