

2012

Factors that Influence Food Access in the United States: A Snapshot of Food Access in Ohio and Kentucky

Maimouna Falls

Wright State University - Main Campus

Follow this and additional works at: <https://corescholar.libraries.wright.edu/mph>

 Part of the [Endocrinology, Diabetes, and Metabolism Commons](#), [Nutritional and Metabolic Diseases Commons](#), and the [Public Health Commons](#)

Repository Citation

Falls, M. (2012). *Factors that Influence Food Access in the United States: A Snapshot of Food Access in Ohio and Kentucky*. Wright State University, Dayton, Ohio.

This Master's Culminating Experience is brought to you for free and open access by the Master of Public Health Program at CORE Scholar. It has been accepted for inclusion in Master of Public Health Program Student Publications by an authorized administrator of CORE Scholar. For more information, please contact corescholar@www.libraries.wright.edu, library-corescholar@wright.edu.

Factors that Influence Food Access in the United States

A Snapshot of Food Access in Ohio and Kentucky

Maimouna Falls

Wright State University

Acknowledgements

I would like to thank the entire Wright State University Master of Public Health faculty and staff, specifically Dr. Khalil & Dr. Spears for all the support and expertise that they have provided me during the completion of my Culminating Experience.

Table of Contents

Abstract	4
Introduction.....	5
Statement of Purpose	6
Literature Review.....	6
Research Question	16
Methodology.....	16
Results.....	17
Discussion.....	23
Solution/Conclusion.....	24
References.....	26
Appendix A – List of Public Health Competencies Met	29

Abstract

Background: The United States is one the richest countries in the world with a Gross Domestic Product (GDP) per capita of \$ 48,442, yet many communities lack access to affordable nutritious food. Access to food impacts health outcomes such as obesity and diabetes. The purpose of this study was to determine the association between food access and rates of obesity and diabetes in the states of Ohio and Kentucky.

Methods: County level food access data from 120 counties in Kentucky and 88 counties in Ohio were obtained from the USDA website. The dataset included demographic variables and poverty rates. Food access variables comprised of full service restaurants, grocery stores, and convenience stores; as well as rates of obesity and diabetes. Pearson Correlation was used to analyze association between food access variables and rates of obesity and diabetes. Linear regression was used to determine food access variables that were significant predictors of obesity and diabetes rates.

Results: In Ohio, both diabetes and obesity rates increase significantly when the numbers of grocery stores increase. Diabetes rates increase with an increase in convenience stores. There is a negative correlation between obesity and diabetes and full service restaurants in Ohio. Strong positive correlation only exists between diabetes and the number of grocery stores in Kentucky. There is a negative correlation between full service restaurants and diabetes in Kentucky. Poverty did not have a significant correlation on diabetes or obesity in Ohio and Kentucky.

Keywords: *obesity, diabetes, food access*

**Factors that Influence Food Access in the United States - A Snapshot of Food Access
in Ohio and Kentucky**

The increase in the rate of obesity and its related chronic diseases such as diabetes has been a public health concern in the United States in the past decades. This increase in obesity and diabetes rates has been linked partly to poor diets. Access to food plays a major role in health outcomes; some communities in the United States have very limited access to affordable, nutritious foods.

Food access is a term that describes the ability to have easy access and affordability of nutritious food such as whole grains, fresh low fat dairy products, low fat meat, fish, fruits and vegetables. This limited access to affordable nutritious food is thought to be due to the lack of full service grocery stores, supercenters, full service restaurants, lack of transportation and limited income (poverty). These communities instead sometimes rely on fast food restaurants, and convenience stores that only offer a limited variety of foods that are usually high in trans-fat, high in sodium, and contain large amounts of refined carbohydrates.

According to the Centers for Disease Control and Prevention (CDC) in 2010, 17.2 million households in the United States, or 14.5 percent of households (approximately one in seven) were food insecure, the highest number ever recorded in the United States. Food insecurity has increased in the US in 2010, about one-third of food-insecure households (6.7 million households, or 5.4 percent of all US households) had very low food security, compared with 4.7 million households (4.1 percent) in 2007 (Coleman-Jensen, Nord, Andrews, & Carlson, 2011).

Statement of Purpose

This CE addresses the followings research questions: what are the factors that influence access to food in the United Sates? What are the impact of food access on health outcomes such as obesity and diabetes?

Literature Review

The Relationship between Obesity and Diabetes

Cost of obesity.

Rising health issues related to poor diets such as high rates of obesity, diabetes, and hypertension are public health concerns. The direct and indirect cost of obesity is as high as \$147 billion annually in the United Sates (Centers for Disease Control and Prevention, 2006). In 2006, obese patients spent on an average \$1,429 more for their medical care than did people within a normal weight range, that is a 42 percent higher cost for people who are obese. Medicare, Medicaid and private insurers increased spending due to obesity from 6.5 percent in 1998 to 9.1 percent in 2006 (Centers for Disease Control and Prevention, 2006).

Cost of diabetes.

Type 2 diabetes is linked to obesity as obesity is a precursor for diabetes. A healthy diet is the first step that the American Diabetes Association suggests as prevention against diabetes. The cost of diabetes in the US in 2007 exceeded \$174 billion; this estimate includes \$116 billion in excess medical expenditures attributed to diabetes, as well as \$58 billion in reduced national productivity. People with diagnosed diabetes on average have medical expenditures that are approximately 2.3 times higher than the expenditures would be in the absence of diabetes. Approximately \$1 out of every \$10 health care dollars spent is attributed to diabetes. Indirect

costs of diabetes include factors such as absenteeism from work, reduced productivity, and lost productive capacity due to early mortality (American Diabetes Association, 2007).

Race and obesity.

African Americans face significant health challenges and disparities relative to other ethnic group in the United States. The prevalence of obesity and diabetes is increasing among all age and racial groups in the United States. However, there is a disproportionate rise in the prevalence of obesity and diabetes among African-Americans in the Unites States. The increased burden of these health outcomes in African Americans is partly due to lack of food access as racial disparities play an important role in access to affordable nutritious food (Ogden et al., 2006).

In the United States, four out of five African Americans are overweight or obese. In 2010 African Americans were 1.4 times likely to be obese compared to non-Hispanic whites. In the same year; African Americans women were 70 percent more likely to be obese compared to non-Hispanic whites. Moreover, African Americans girls were 80 percent more likely to be obese compared to non-Hispanic white girls (Ogden et al., 2006).

Race and diabetes.

In the United States, diabetes is one of the leading causes of death affecting nearly 8 percent of the entire population. The American Diabetes Association reported that, compared to the general population, African Americans are disproportionately affected by diabetes. Approximately 3.7 million, or 14.7 percent, of all African Americans aged 20 years or older have diabetes. Compared to non-Hispanic whites, African Americans are 1.6 times more likely to have diabetes (Songer, 2011).

What is Healthy Food?

Healthy food provides nutrition and vitamins to the body and helps maintain and improve general health. The United States Department of Agriculture (USDA) Center for Nutrition Policy and Promotion (CNPP) works to improve the health and well-being of Americans by developing and promoting dietary guidance that links scientific research to the nutrition needs of consumers. MyPlate is USDA's primary food group symbol (grains, lean protein, vegetables, fruits, low fat dairy Omega oil), that serves as an educational tool and reminder to people to make healthy food choices and to build a healthy plate at mealtimes. It is a visual cue that identifies the basic food groups from which consumers can choose healthy foods to build a healthy plate. The USDA has guidelines on servings for each of the food group based on daily calorie intake. For example: for an adult consuming 2,000 calories daily, their food plate should have the followings per week: 6-8 servings of whole grains, 4-5 serving of vegetables, 4-5 serving of fruits, 2-3 servings of fat free or low fat milk or milk products, 6 or less serving of lean meats, poultry or fish, 4-5 servings of nuts, seeds and legumes, 2-3 servings of Omega fats and oils (Britten, Cleveland, Koegel, Kuczynski, & Richardson, 2012).

What are nutritious foods?

A healthy diet with regular exercise helps maintain and improve general health. A healthy diet involves consuming appropriate amounts of all essential nutrients by consuming food such as whole grains, lean meats, fish, low-fat dairy foods, and fresh fruit and vegetables. Grains such as whole grains should be part of a healthy diet because they provide several health benefits. Grains provide essential nutrients and help reduce the risk of developing chronic diseases. Fruits and vegetables do not have any cholesterol, and most fruits and vegetables are naturally low in fat and calories. Vegetables are a great source for potassium, dietary fiber, folic

acid, vitamin A, vitamin E, and vitamin C. Fish is quality protein and is filled with omega-3 fatty acids and vitamins such as D and B2 (riboflavin). Fish is also rich in calcium and phosphorus and a great source of minerals, such as iron, zinc, iodine, magnesium, and potassium. The American Heart Association recommends eating fish at least two times per week as part of a healthy diet (Britten et al., 2012).

Benefits of Eating Healthy Food

Benefits of eating healthy food include lowering risk of many chronic diseases, such as obesity, heart disease, diabetes, hypertension and cancer. Food such as fish is packed with protein, vitamins, and nutrients that can lower blood pressure and help reduce the risk of a heart attack or stroke. Moreover, according to the American Heart Association, low-fat dairy foods are associated with a reduced risk of stroke in adult men and women compared to those who ate full-fat dairy foods. Low-fat dairy is one part of the Dietary Approaches to Stop Hypertension (DASH) Diet, which effectively reduces blood pressure, a major risk factor for stroke (American Heart Association, 2010).

Access to Healthy Food by Income (SES)

Accessing healthy nutritious food is a challenge for many Americans living in low income neighborhoods. Many rural and urban communities with lower social economic status lack access to healthy nutritious food. Socio-economic status tends to determine access to many things including healthy and nutritious food such as whole grains, lean meat, fish, fresh fruits and vegetables. Eleven and half million Americans live in low income areas (more than 40 percent of the population has income at or below 200 percent of Federal poverty thresholds, which is \$3,432 gross income for a family of four) and live more than one mile from a supermarket or large grocery store (United States Department of Agriculture Economic Research Service, 2009).

Many studies have documented the disparity in the number of supermarkets in poor communities compared to wealthier communities. For example, middle- and upper-income communities in Los Angeles County have twice as many supermarkets per capita as low-income communities. A study of several states found that wealthy neighborhoods had over three times as many supermarkets as low-income neighborhoods (Gottlieb, 2010).

In 2006, a study was conducted in the upper east side of Manhattan (higher income neighborhood), and the east and central Harlem, and north and central Brooklyn (lower income neighborhoods). It was concluded from the study that the prevalence of obesity in affluent areas was less than 9 percent compared to 21 to 30 percent among adults living in poorer neighborhoods. Moreover, the prevalence rate of diabetes was lower in the well-off sections as well (5 percent), but was three times higher in poorer areas (10-15 percent) (Beaulac, Kristjansson, & Cummins, 2009). The researchers also found that access to food was a determining factor for the low income neighborhoods' higher rates of obesity and diabetes. The low income neighborhoods were mostly dominated by fast food restaurants (Beaulac et al., 2009). In addition, there were two supermarkets in the Upper East Side (median household income \$95,552 a year) compared to one supermarket in East and Central Harlem and one supermarket in North and Central (median household income range \$25,130 to \$26,512) (Gordon et al., 2011).

Availability of healthy foods.

Food availability in the US.

Food availability in the United States is not uniform in every state; every city and even in every neighborhoods. Availability of healthy food in the United States varies tremendously and

is influenced by factors such as socio economic status (income), and race, which in turn determine residency (environment).

Two studies compared food availability and their prices in large and small stores across neighborhoods of varying income levels in New Haven, Connecticut. The findings suggest that supermarket access in lower-income neighborhoods has improved since 1971, and average food prices are comparable across income areas. However, stores in lower-income neighborhoods compared to those in higher-income neighborhoods stock fewer healthier varieties of foods and have fresh produce of much lower quality (Krukowski, West, Harvey-Berino, & Prewitt, 2010).

The study found that disadvantaged populations often live in areas with limited access to healthy nutritious food; their choices are sometimes limited to processed foods are high in sodium, trans fat which in turn affect their diet, weight, and health. The study noted some indication that poor Americans face higher food prices because of differences in the food retail landscape between low-income and wealthier neighborhoods. Neighborhoods with higher median income seemed to have greater access to large grocery stores in some suburbs than in inner-city which explains some of the higher prices paid by the poor (Krukowski et al., 2010).

Race and access to healthy food.

Access to affordable nutritious food is a problem in many states in United States; however some areas are more food deprived than others. African-American neighborhoods generally have fewer supermarkets and the aggregate availability of fresh fruits and vegetables is lower compared to white neighborhoods (Franco et al., 2008).

A study done in Baltimore, Maryland compared food availability in two neighborhoods, Baltimore City and Baltimore County. Baltimore City is 97 percent African American and has a median household income of \$20,833. Baltimore County is 93 percent Caucasian with a median

household income of \$57,931. The study was investigating the availability of the following food items in Baltimore City and Baltimore County: skim milk, fruits, vegetables, lean meat, low sodium foods, 100 % whole wheat bread, and low sugar cereals. The study found the foods availability index was higher in Baltimore County than Baltimore City. For example: the availability index of vegetables in the higher income area was four (4) compared to three (3) in lower income; 100 percent whole wheat bread availability index was four (4) in the higher income neighborhood compared to two (2) in the lower income neighborhood (Franco et al., 2008).

Similarly, some African American residents in the city of Chicago, IL (32 percent African American) also lack access to affordable nutritious food. In a typical African American neighborhood in Chicago, the nearest grocery store is roughly twice as far than the nearest fast food restaurant. The study also found that African American Chicagoans travel the farthest on average to reach any type of grocery store (0.59 miles) (Mari Gallagher Research & Consulting Group, 2006).

Likewise, the Environmental Justice Resource Center at Clark University in Atlanta, GA found that affluent neighborhoods have more than three times as many supermarkets as lower income neighborhoods. When examined along racial lines, researchers found that there are four times as many supermarkets in predominantly white neighborhoods than black neighborhoods. The study also found that only 8 percent of African Americans live in a census tract with a supermarket, compared to 31 percent of Caucasians (Mari Gallagher Research & Consulting Group, 2006).

Barriers to access to healthy food.

Poverty is one of the barriers to obtain healthy food. For instance, New Orleans has a high African American population (about 68 percent). In 2010, New Orleans ranked 8th nationally for the percentage of its population living in poverty. Moreover, about 60 percent of New Orleans residents say they have to choose between buying food and paying utility bills. There are currently only 20 actual grocery stores/supermarkets in New Orleans not including corner stores that serve 16,000 people (Mari Gallagher Research & Consulting Group, 2006).

Access to food outlets.***Convenience stores.***

Convenience stores are small store that stocks a range of everyday items such as groceries, toiletries, alcoholic beverage, soft drinks, tobacco products, and newspapers. People that reside far from full service grocery stores sometimes rely on convenience stores that may not carry all the foods needed for a healthy diet. The foods offered in convenience stores are often high in sodium, trans-fats and empty carbohydrates (Walker, Keane, & Burke, 2010).

Full service restaurants.

Full service restaurant offers fine dining with a wide selection of foods and beverages, and table service. It may also have attached coffee shop and specialized (ethnic) and fast food restaurants. Simulations indicate that, between 2000 and 2020, per capita spending could rise by about 18 percent at full-service restaurants, versus about 6 percent for fast food. Higher income household spend more money away from home in full-service restaurants because full service restaurants tend to offer more variety of foods (Walker et al., 2010).

*Spatial barriers to food stores.**Distance.*

Some communities have limited access to affordable nutritious food because they live far from full service grocery stores/supermarkets and do not have access to any mode of transportation. In 2007, 2.3 million people in the United States or 2.2 percent live more than a mile from a full service grocery store/supermarket and did not have access to a vehicle. Moreover, 3.4 million households or 3.2 percent of all households in the US live between one half to one mile from a grocery store/supermarkets and do not have access to a vehicle (US Department of Agriculture Economic Research Service, 2009).

Another study was done in three counties in New York to investigate if communities that have access to healthy food retail stores tend to eat more fruits and vegetables. The study also looked at fruits and vegetable consumption trend in neighborhoods that have limited access to healthy food retail stores. The study found that environmental barriers such as the limited availability of fresh produce in local retail stores determined the consumption of fruits and vegetables. Moreover, individuals living in close proximity to supermarkets were more likely to consume fruits and vegetables than people living in neighborhoods without supermarkets or that are located farther away from supermarkets (Hosler, Rajulu, Fredrick, & Ronsani, 2008).

Race.

The inverse association between distance to the supermarket and fruits and vegetables consumption appears to be pronounced among African Americans and low-income individuals. One study found that urban African American women who shopped at their neighborhood small-food stores consumed fewer fruits and vegetables than did their higher-income peers who were able to shop in suburban supermarkets. The study suggests that consumption of fruits and

vegetables by disadvantaged individuals can be increased if they have access to a supermarket or food store that provides an adequate amount of affordable fresh produce (Hosler et al., 2008).

However, during the last few decades spatial disparities in access fresh produce such as fruits and vegetables have increased considerably. Supermarkets and grocery stores with produce departments are much less likely to be found in low income and minority neighborhoods than in middle-class or affluent white neighborhoods (Hosler et al., 2008).

Food Access and its Association with Obesity and Diabetes in Ohio and Kentucky

The states of Ohio and Kentucky both have communities that lack access to affordable nutritious food. Both states share some similar characteristics in regard to demographics. The two states border each other's and to some degree their economies are interdependent (Cincinnati Northern Kentucky Chamber of Commerce, n.d.).

Ohio and Kentucky are no exception to the national trend in diet related diseases such as obesity and diabetes. Kentucky and Ohio obesity rates are respectively 30.4 percent and 29.6 percent compare to 35.7 percent nationally. Diabetes rate for Ohio is 10.1 percent and 11.4 percent for Kentucky compared to 8.3 percent nationwide (Ohio Department of Health, 2009).

Similarly, some areas in Ohio face the same public health issues such as Kentucky. Twenty four percent of rural Ohio households live outside of a 10-minute drive to a retail grocery store, those rural Ohio households living within a 10-minute drive, 3.8 percent do not own a vehicle reference. Seventy five percent of rural Ohio households live outside of a one-mile walk of a retail grocery store of any size. Only 29.5 percent of rural households (583,271 households) live in areas where there is some competition between large supermarkets, which can keep food prices lower; 6.3 percent of these 268,333 households (or 16,786 households) do

not have cars to drive to a more competitive large retail supermarkets (Ohio Department of Health, 2009).

Research Question – Factors that influence food access in Ohio and Kentucky

To examine if food access factors addressed in the literature review such as race, socioeconomic status, availability of grocery stores, full service restaurants and convenience stores influence chronic health outcomes of obesity and diabetes in the states of Ohio and Kentucky.

Methodology

Data were collected from the United States Department of Agriculture Economic Research website (<http://www.ers.usda.gov/data-products/food-environment-atlas/documentation.gov>). The data consisted of food access and demographic variables from 88 counties in the states of Ohio and 120 counties in Kentucky. The variables includes demographic characteristics such as race, poverty rates, food access variables such as full service restaurants, grocery stores, and convenience stores per 1,000 population. The health outcome variables (in adults) used from this data included: 1) obesity rate, 2) diabetes rate for both Ohio and Kentucky.

Using IBM Statistical Package for Social Sciences (SPSS) for Windows, version 20 (IBM, 2012) software, descriptive analysis was run for all the access variables to get the mean and standard deviation for continuous variables, and number and percentage of the categorical variables. Pearson Correlation was used to determine if there is an association between obesity rates, diabetes rates and the food access variables. Linear regression was used to analyze which food access variables were significant predictors of obesity and diabetes rates by state separately.

Since the food access variables were available as per 1,000 population, to make rates more easier to understand, they were multiplied by 100 (to make the final rates out of 100, 000 population)

Results

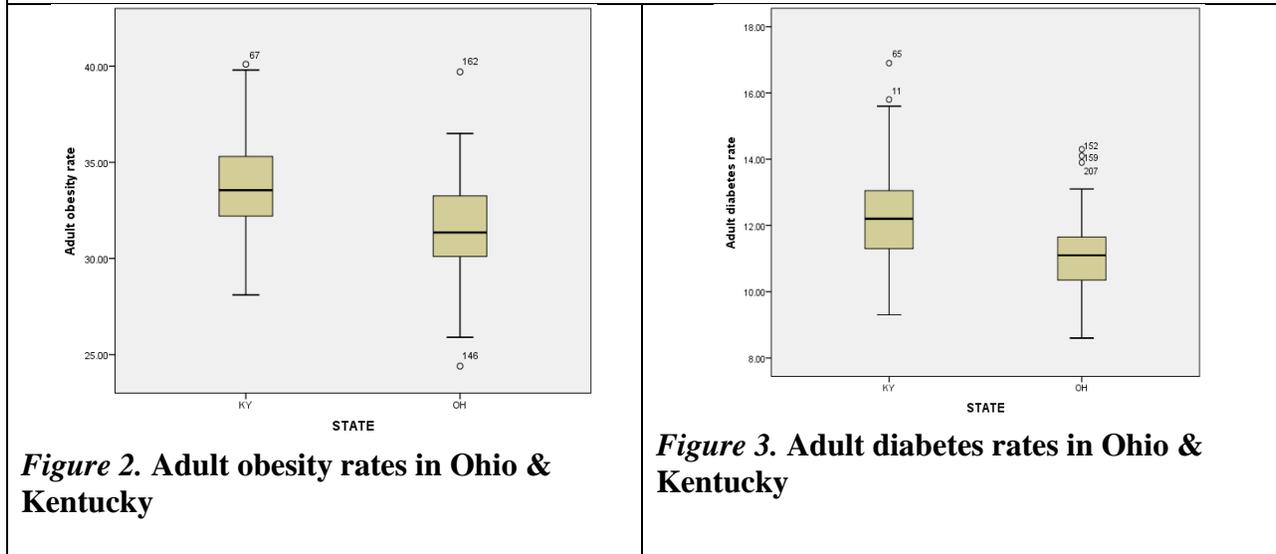
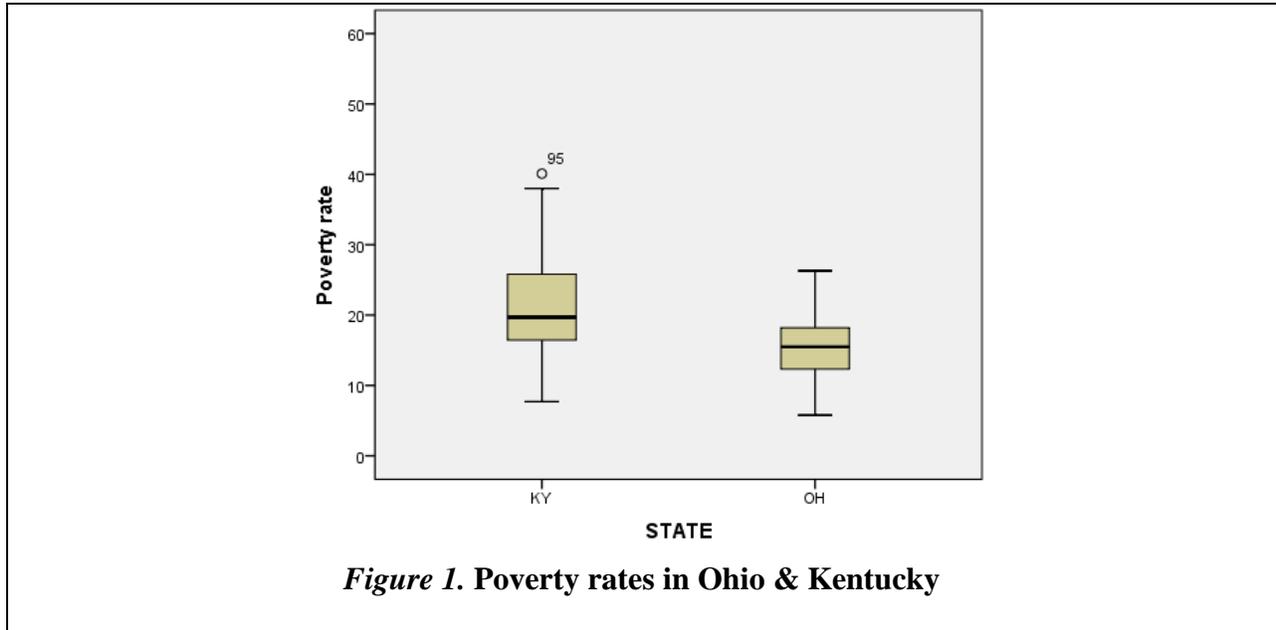


Table 1. Descriptive statistics of food access variables/100,000 population in Ohio

Variables	Mean	SD*
Poverty rate	15.3	--
Full-service restaurants/100,000 population	56.0	17.0
Adult diabetes rate	11.0	--
Adult obesity rate	31.5	--
Grocery stores/100,000 population	18.0	6.0
Convenience stores/100,000 population	45.0	12.0

*Standard Deviation

Poverty is 15.3 percent (Figure 1) which is close to the national poverty rate (15.1 percent). Obesity and diabetes rates are 11 percent, and 13.5 percent respectively (Figures, 2, 3).

Table 2. Racial composition of population in Ohio

Race	Percentage
Caucasian	91.2
African-American	4.0
Asian	0.8
Hispanic	0.2
Native Americans	0.0

The population of Ohio is mostly dominated by Caucasian Americans which constitute about 91 percent of the population. African Americans are the biggest minority group in Ohio 4 percent.

Table 3. Correlation of food access variables with diabetes and obesity rates in Ohio

Food Access Variables	Adult Obesity rate	Adult Diabetes rate
Poverty rate	-0.05	0.04
Full Service Restaurant per 100,000 population	-.21*	.03
Grocery stores/100,000 population	0.26*	0.35**
Convenience stores/100,000 population	0.24*	0.07

*Correlation is significant at 0.05 level (2 tailed)

**Correlation is significant at 0.01 level (2 tailed)

Ohio shows a strong positive correlation between both obesity and diabetes rates and the number of grocery stores and convenience stores. Both diabetes and obesity rates increase significantly when the number of grocery stores and convenience stores increase. Adult obesity and diabetes rates go up respectively 0.26 and 0.35 with an increase of grocery stores. Adult obesity goes up 0.24 with an increase in convenience stores.

However, adult obesity goes down with an increase in full service restaurants (-.12).

Table 4. Linear regression of food access variables per 100,000 predicting adult obesity rate in Ohio

	Unstandardized Coefficients		Standardized Coefficients	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta		Lower Bound	Upper Bound
(Constant)	30.311	1.600		0.000	27.128	33.494
Poverty rate	-0.026	0.058	-0.045	0.649	-0.141	0.089
Grocery stores*	10.899	3.871	0.289	0.006	3.200	18.597
Convenience stores*	3.524	1.934	0.184	0.072	-0.323	7.371
Full service restaurants*	-3.677	1.476	-0.254	0.015	-6.612	-0.741

*Per 100,000 population
 R^2 : 0.178, P-value <.001

Table 5. Linear regression of food access variables per 100,000 predicting adult diabetes rate in Ohio

	Unstandardized Coefficients		Standardized Coefficients	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta		Lower Bound	Upper Bound
(Constant)	8.662	0.724		0.000	7.221	10.102
Poverty rate	0.014	0.026	0.053	0.591	-0.038	0.066
Grocery stores*	5.518	1.752	0.317	0.002	2.034	9.002
Convenience stores*	2.518	0.875	0.285	0.005	0.777	4.259
Full service restaurant*	-0.041	0.668	-0.006	0.951	-1.370	1.287

*Per 100,000 population

R²: .207, P-value <.001

Diabetes rates increase with an increase in convenience stores and full service restaurants in Ohio. Poverty did not have a significant correlation on neither diabetes nor obesity in Ohio.

Table 6. Descriptive statistics of food access variables/100,000 population in Kentucky

Variables	Mean	SD*
Poverty rate	21.1	--
Full-service restaurants/100,000 population	48.0	24.0
Adult diabetes rate	12.3	--
Adult obesity rate	33.7	--
Grocery stores/100,000 population	24.0	11.0
Convenience stores/100,000 population	58.0	22.0

*Standard Deviation

The poverty rate in Kentucky (21.1 percent) is well above the national poverty rate of 15.1 percent (Figure 1). Obesity and diabetes rates are 12.3 and 33.7 percent, respectively (Figures 2, 3).

Table 7. Racial composition of population in Kentucky

Race	Percentage
Caucasian	92.5
African-American	3.5
Asian	0.4
Hispanic	0.2
Native Americans	0.0

Kentucky has about 92 percent Caucasian population; African Americans are the biggest minority group in Kentucky (3.5 percent of the population).

Table 8. Correlation of food access variables with diabetes and obesity rates in Kentucky

Food Access Variables	Adult Obesity rate	Adult Diabetes rate
Poverty rate	-0.07	-0.05
Full Service Restaurant per 100,000 population	-0.37**	-0.36**
Grocery stores/100,000 population	0.14	0.37**
Convenience stores/100,000 population	0.11	0.12

*Correlation is significant at 0.05 level (2 tailed)

Kentucky shows a strong negative correlation between adult obesity and diabetes rates and full service restaurants. Adult obesity and diabetes rates go down respectively -.37 and -.36 with an increase in full service restaurants. Kentucky also shows a positive correlation between adult diabetes rates and grocery stores (.37 with an increase in grocery stores).

Table 9. Linear regression of food access variables per 100,000 predicting adult obesity rate in Kentucky

	Unstandardized Coefficients		Standardized Coefficients	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta		Lower Bound	Upper Bound
(Constant)	34.086	1.091		.000	31.924	36.248
Poverty rate	0.025	0.031	0.068	0.430	-0.037	0.087
Grocery stores*	2.017	1.836	0.097	0.274	-1.619	5.654
Convenience stores*	0.631	0.942	0.059	0.504	-1.235	2.498
Full service restaurant*	-3.680	.888	-0.357	0.000	-5.440	-1.921

*Per 100,000 population

R²: .158, P-value <.001

Table 10. Linear regression of food access variables per 100,000 predicting adult diabetes rate in Kentucky

	Unstandardized Coefficients		Standardized Coefficients	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta		Lower Bound	Upper Bound
(Constant)	12.326	0.619		0.000	11.100	13.551
Poverty rate	-0.007	0.018	-0.034	0.678	-0.042	0.028
Grocery stores*	4.235	1.041	0.338	0.000	2.173	6.296
Convenience stores*	0.138	0.534	0.021	0.797	-0.920	1.196
Full service restaurant*	-2.045	0.504	-0.330	0.000	-3.043	-1.047

*Per 100,000 population

R²: .252, P-value <.001

Poverty did not have a significant correlation on diabetes or obesity in Kentucky.

Discussion

The results of this study show that in Ohio there exists a strong correlation between both obesity and diabetes rates and the number of grocery stores. Moreover, diabetes rates increase with an increase in convenience stores. There is a negative correlation between obesity and diabetes and full service restaurants.

Compared to Ohio, Kentucky only shows a strong correlation between diabetes and the number of grocery stores. There is a negative correlation between full service restaurants and diabetes rates in Kentucky. However, there is positive correlation between grocery stores and diabetes rates.

Contrary to previous literature cited, poverty rates were not significantly correlated to obesity and diabetes rates. Moreover, contrary to previous studies stated in the paper, obesity and diabetes rates both increase in Ohio and Kentucky with an increase in grocery stores. One of the limitations of the data is the fact that it does not tell us the exact classification of the grocery stores - we do not know whether they are full service grocery stores, bodegas, or large convenience stores that carries limited produce as the same relation does not exist between supercenters and obesity and diabetes rates. However, diabetes rates increases in Ohio with an increase in convenience stores as well.

There was also a limitation in establishing that being a minority is a factor in access to health nutritious food. Most of the research done in this area is based on African Americans and Hispanics. There was very little research found on other minorities' access to food such as Native Americans and Asians. Therefore we cannot conclude that all minorities group struggle with access to healthy nutritious food as African Americans. Also, race did not have a

significant correlation on neither diabetes nor obesity in neither Ohio nor Kentucky which does not reconcile with Hosler's findings.

Solution/Conclusion

Providing access to affordable nutritious food for all is a public health challenge. Solving this challenge will require all public health players to work together in to make policy changes and work actively with the communities that are impacted. This effort will require facilitating access to nutritious food and by bringing in new vendors, and /or encourage the existing vendors (corner stores) in the impacted communities to start carrying healthier food options.

At governmental level policy changes will be required for certain programs such as the food stamp program. The USDA first began offering food stamps after passage of the Food Stamp Act of 1964. Over 10 million households received food stamps in the United States, making the food stamp program a component of the social safety net (Joliffe, Gundersen, Tiehen, & Winicki, 2003). However, food stamp recipients are allowed to purchase many types of unhealthy food, including packaged foods that are high in sugar, sodium and trans-fat. This non regulation of the food stamp program does not promote the consumption of more nutritious food by low income families. The food stamp program can mirror other federal government administers programs for promoting nutrition such as WIC (Women, Infants and Children). WIC is a program exclusive to women who are pregnant or have children up to 5 years of age. WIC comes in the form of vouchers that recipients can turn in for specific food products only, giving the government much greater control in promoting healthy eating (Joliffe et al., 2003).

Moreover, policy changes in the community level to bolster easy access to nutritious food will also be required. One of the more successful models in bringing fresh fruits and vegetables to communities is the New York City's Green Cart initiative. Since 2008, the city has made

provisions to authorize 1,000 new permits for street vendors who can sell only raw fruits and vegetables in areas of the city that had limited access to fresh produce. The idea is to empower residents to have their own small business while addressing a social problem in a sustainable way (New York Times, 2012). Another channel to get fruits and vegetables to communities is to help the owners of corner stores and bodegas succeed in selling them. New York runs a Healthy Bodegas Initiative, which provides businesses with grants for refrigeration or shelving, and advice on marketing, provided they stock various categories of healthy food (New York Times, 2012).

References

- American Diabetes Association.* (2007). Retrieved June 20, 2012, from American Diabetes Association: www.diabetes.org
- American Diabetes Association.* (2010). Retrieved June 20, 2012, from American Diabetes Association: www.diabetes.org
- American Heart Association.* (2010). *Getting healthy.* Retrieved from website: http://www.heart.org/heartorg/gettinghealthy/Fatsdnoils/meetthefats/meet-the-fats_UCM_304495_Article.jsp
- Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease, 6*(3), A105. Retrieved from www.scopus.com
- Britten, P., Cleveland, L. E., Koegel, K. L., Kuczynski, K. J., & Nickols-Richardson, S. M. (2012). US Department of Agriculture food patterns meet goals of the 2010 dietary guidelines. *Journal of the Academy of Nutrition and Dietetics (in press)*.
- Centers for Disease Control and Prevention.* (n.d.). Retrieved August 16, 2012, from CDC website: www.cdc.gov/obesity/data/adult.html
- Centers for Disease Control and Prevention.* (2006). Retrieved June 20, 2012, from CDC website: www.cdc.gov
- Cincinnati Northern Kentucky Chamber of Commerce. (n.d.). *Regional economy growth.* Cincinnati, OH: www.nkychamber.com
- Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2011). US Department of Agriculture, Economic Research Service. *Household food security in the United States in 2010.* Retrieved from website: http://www.ers.usda.gov/media/121076/err125_2_.pdf

- Joliffe, D., Gundersen, C., Tiehen, L., & Winicki, J. (2003, September). Food Stamp Benefits and Childhood Poverty in the 1990s. *Food Assistance and Nutrition Research Report (FANRR33)*.
- Franco, M., Diez-Roux, A. V., Nettleton, J. A., Lazo, M., Brancati, F., Caballero, B., Glass, T., & Moore, L. V. (2008). Availability of healthy foods and dietary patterns: the multi-ethnic study of atherosclerosis. *The American Journal of Clinical Nutrition*, 89(3), 897-904. doi: 10.3945
- Gordon, C., Purciel-Hill, M., Ghai, N. R., Kaufman, L., Graham, R., & Van Wye, G. (2011). Measuring food deserts in New York City's low-income neighborhoods. *Health & Place*, 17(2), 696-700. doi: 10.1016
- Gottlieb, R. (2010). *Food justice*. (10 ed., Vol. 1, p. 27). Cambridge: MIT PRESS.
- Hosler, A. S., Rajulu, D. T., Fredrick, B. L., & Ronsani, A. E. (2008). Assessing retail fruit and vegetable availability in urban and rural underserved communities. *Preventing Chronic Disease*, 5(4), A123.
- IBM. (2012). SPSS Statistics, Release 20.0.0. IBM Corp.: Armonk, NY.
- Krukowski, R. A., West, D. S., Harvey-Berino, J., & Elaine Prewitt, T. (2010). Neighborhood impact on healthy food availability and pricing in food stores. *Journal of Community Health*, 35(3), 315-320.
- Mari Gallagher Research & Consulting Group. (2006). *Examining the impact of food desert on public health in Chicago*. Retrieved from website:
<http://www.marigallagher.com/projects/4>
- New York Times*. (2012, April 18). Retrieved June 15, 2012, from New York Times website:
www.nytimes.com

Ogden, C. L., Carroll, M. D., Curtin, L. R., Mcdowell, M. A., Tabak, C. J., & Flegal, K. M.

(2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of the American Medical Association*, 295(13), 1549-1555.

Ohio Department of Health. (2009). *The Ohio obesity prevention plan*. Retrieved from website:

[http://www.healthyohioprogram.org/en/resources/datareports/~media/4.ashx](http://www.healthyohioprogram.org/en/resources/datareports/~/media/4.ashx)

Songer, T. (2011). Centers for Disease Control and Prevention, Division of Diabetes Translation.

Studies on the cost of diabetes. Retrieved from CDC website:

<http://www.cdc.gov/diabetes/pubs/costs/intro.htm>

United States Department of Agriculture Economic Research Service. (2009). Retrieved June 20,

2012, from United States Department of Agriculture Economic Research Service

website: www.ers.usda.gov

US Department of Agriculture, Center for Nutrition Policy and Promotion. (n.d.). *Updated*

Department of Agriculture food patterns meet goals of the 2010 guidelines (10.1016).

Retrieved from website: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines>

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the

United States: A review of food deserts literature. *Health & Place*, 16(5), 876-884.

Appendix A – List of Public Health Competencies Met

Domain #1: Analytic/Assessment
Identify the health status of populations and their related determinants of health and illness (e.g., factors contributing to health promotion and disease prevention, the quality, availability and use of health services)
Describe the characteristics of a population-based health problem (e.g., equity, social determinants, environment)
Use variables that measure public health conditions
Identify sources of public health data and information
Recognize the integrity and comparability of data
Identify gaps in data sources
Adhere to ethical principles in the collection, maintenance, use, and dissemination of data and information
Describe the public health applications of quantitative and qualitative data
Collect quantitative and qualitative community data (e.g., risks and benefits to the community, health and resource needs)
Use information technology to collect, store, and retrieve data
Describe how data are used to address scientific, political, ethical, and social public health issues
Domain #2: Policy Development and Program Planning
Gather information relevant to specific public health policy issues
Describe how policy options can influence public health programs
Explain the expected outcomes of policy options (e.g., health, fiscal, administrative, legal, ethical, social, political)
Gather information that will inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political)
Describe the public health laws and regulations governing public health programs
Participate in program planning processes
Incorporate policies and procedures into program plans and structures
Identify mechanisms to monitor and evaluate programs for their effectiveness and quality
Domain #3: Communication – N/A
Domain #4: Cultural Competency
Recognize the role of cultural, social, and behavioral factors in the accessibility, availability, acceptability and delivery of public health services
Respond to diverse needs that are the result of cultural differences
Domain #5: Community Dimensions of Practice
Demonstrate the capacity to work in community-based participatory research efforts
Identify stakeholders
Collaborate with community partners to promote the health of the population
Maintain partnerships with key stakeholders
Use group processes to advance community involvement
Describe the role of governmental and non-governmental organizations in the delivery of community health services
Domain #6: Public Health Sciences
Retrieve scientific evidence from a variety of text and electronic sources
Discuss the limitations of research findings (e.g., limitations of data sources, importance of observations and interrelationships)
Domain #7: Financial Planning and Management- N/A
Domain #8: Leadership and Systems Thinking
Identify internal and external problems that may affect the delivery of Essential Public Health Services
Describe the impact of changes in the public health system, and larger social, political, economic environment on organizational practices