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An Evaluation of the East Indianapolis Food Desert

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An Evaluation of the East Indianapolis Food Desert

A Thesis

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Abstract

The Indy East Food Desert (IEFD) appears to suffer from many common conditions noted by various scholars as food desert identifiers. Yet, its situation still remains unique. Though there is a prevalence of minority populations, low-income households, and low-education attainment levels, there are also factors of low-access, poor food options (within the limited food outlets in the neighborhoods), and poor eating habits which shape the situation of the community. In an attempt to alleviate the food desert problems, the Indy East Food Desert Coalition (IEFDC) was formed. IEFDC partnered with Butler University's Center for Urban Ecology in order to assess the coalition's conditions and its needs. This study sought to identify the unique conditions of the IEFDC communities, and offer solutions to combat the area's conditions.

The conclusions drawn from the study show that the IEFDC residents are affected by several problems that result from their unhealthy eating habits. Consumption of fruits and vegetables is well below the recommended five servings per day. IEFDC residents make an abundance of purchases at gas stations and fast food locations. Additionally, transportation and distance negatively influences food choices towards more convenient unhealthy foods. Finally, the study findings show that income is the greatest impediment to food access.

In order to remedy the symptoms of food deserts, the report suggests several solutions should be embraced by both community leaders and residents to ensure successful improvement in these areas. General solutions include the use of price subsidies, increasing local access, and improving education. For the IEFDC, partnerships among public and private individuals or groups should be sought out. Farmer's markets and other healthy food outlets should be strategically located along bus routes. There needs to be an increase in healthy and fresh food options at food pantries. Finally, wellness coordinators should be hired to employ or expand health and nutrition information programs.

Introduction

Constructing a nutritious and delicious meal is a struggle; not because there is a shortage of ingredients or food in the refrigerator or pantry, but because there are a multitude of obstacles preventing food obtainment such as institutional impediments, economic hurdles, and racial barriers. Despite options like fresh broccoli, kale, and asparagus, the desire for something quick and convenient, like a burger and fries, tempts the palate, both because there's a lack of time to cook vegetables and there is a desire for something unhealthy. Unfortunately, not everyone has access to fresh produce. These conditions stem from the environment, meaning food deserts are a problem of environment and space.

Individuals who are forced to eat cheap, unhealthy meals with limited access to grocers carrying fresh fruit and vegetable options, live in areas described as food deserts. Food deserts are rampant among many nations, as seen in studies conducted throughout the United States, Canada, and the United Kingdom. The United States Department of Agriculture's Economic Research Service's Atlas tool identifies 8,959 food deserts in the states (USDA, 2014). The growing research of food deserts has created definitional derivatives of the term. However, there are several phrases consistent among the definition derivatives: poor or limited access; low-income or socially-distressed neighborhoods; and lack of nutritious or healthful food options. As defined by the United States Department of Agriculture, food deserts are areas in the United States "with limited access to affordable and nutritious food, particularly an area composed of predominantly lower-income neighborhoods and communities" (USDA AMS, 2009).

The limited access and lack of affordable and nutritious food is not only a national phenomenon, but also local one. The shortage of grocery stores seen in food deserts is also evident in the Indianapolis area, particularly in Marion County. The county is comprised of 212 census tracts, of which fifteen are identified as food deserts. According to a county study, the most prevalent food retailers are convenience stores. Additionally, 36% of residents have low-access to food and must travel more than a mile to reach the nearest supermarket. Nineteen percent of Marion County's population lives in high or extreme poverty (Elliot et. al., 2011). Within the county, perhaps the most extreme local examples, there is a collection of several food desert census tracts that have identified itself as the Indy East Food Desert (IEFD). It is the object of this study. The IEFD is marked by the boundaries of 56th Street to the north, 30th Street to the south, Carroll Road to the east, and Fall Creek Parkway Drive to the west, seen in figure 1.



Figure 1: Map of Indy East Food Desert Boundaries

The boundaries of the IEFD surround several communities. A few of these neighborhoods participated in a community food study. The study reveals that the challenges of the IEFD food desert are as follows: demographics; retail; nutrition

education; location and transportation; and choice. The conclusions drawn from the study are that the IEFD population suffers from a low consumption of fruits and vegetables. There is an abundance of purchases made at gas stations and fast food locations. The lack of transportation and large distances to grocery stores influence individual preference towards junk food. Finally, income is the greatest impediment to food access. After assessing local conditions and scholarly literature, the study concludes that some of the foremost challenges in the IEFD can be alleviated. Partnerships among public and private individuals or groups should be formed. Farmer's markets and other healthy food outlets need to be strategically located along bus routes. Food pantries should also increase healthy and fresh food options. Lastly, wellness coordinators should be utilized to employ or expand health and nutrition information programs.

Background and Method

In order to better understand the situation of the IEFD, a compilation of its demographic data, grocery store data, and resident experience data was created. For the demographic data the use of Indiana Market Maker, SAVI.org, and the USDA's website contributed to the collection of the information. Demographic information for the IEFD was compiled based on census tracts as presented in figure 2.

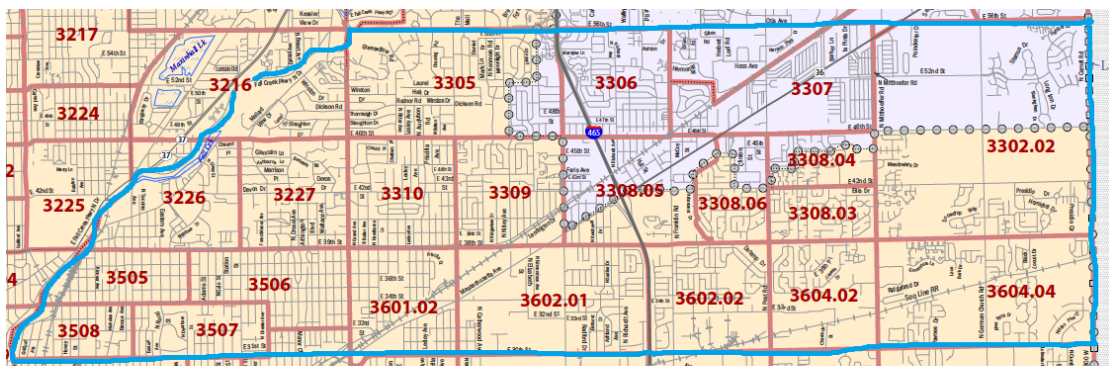


Figure 2: Outline of census tracts used for demographic research

The IEFD grocery store data was collected by creating a grocery list to compare availability and price of various food items. Inventory was taken from five stores based on the grocery list. The Department of Health and Human Services and the USDA's MyPlate campaign served as the basis for the grocery list items. A spreadsheet rows show the item, type, and quantity of the inventory list. The columns identify the food outlet. Under each food outlet every listed item has either a price or a dash. The dash indicates the item was unavailable. The inventory can be found in Appendix A. Of the stores inventoried, three of the food outlets were located within the food desert area. The stores inventoried were: BP/ Ricker's, located along the western border of the food desert area; Los Compadres, located in the eastern region of the food desert boundaries; Marsh, located near the north border of the service area. They were compared to two organic food outlets located outside the food desert area: Trader Joe's and Whole Foods Market, both located north of the food desert communities.

These demographic and grocery store data combined with personal responses to support and further identify the needs of the desert. The survey used to analyze the IEFD communities asked questions pertaining to transportation conditions, shopping choices, cooking and eating habits, as well as household demographic information. Butler University's Center for Urban Ecology staff helped create the survey used to shed light on the circumstances of the IEFD residents. Forest Manor Multi-Service Center, United Northeast Community Development Corporation, and Community Alliance of the Far Eastside distributed hard copies of the survey, found in Appendix B. There was also an online option. To provide incentive for residents to participate in the survey, there was a drawing for a \$50.00 gift card to a local food retailer. Of the more than 800 recorded

responses, error and incomplete surveys left between 650 and 750 responses to be used in the analysis of the community areas. In addition to the surveys, interviews were conducted and recorded. There were nine individuals who participated in the twenty to thirty minute in person interviews used to gain detailed personal perspectives on the community conditions; the questions are presented in Appendix C.

In addition to studying the local demographic, consultation of national scholarship helped achieve a more holistic understanding of food deserts trends. This includes articles regarding food deserts in minority heavy areas as identified by Besharov et. al. and Raja et. al.; articles pertaining to the lack of, or limited, transportation in food desert areas as identified by Jiao et. al, Rice, and Dutko; and articles identifying large numbers of convenience and fast food eateries with limited nutritious options as presented by Larsen and Gilliland, and Weatherspoon et. al. According to Weatherspoon et. al. (2013), in a survey conducted in Detroit, less than 50% of respondents had access to a vehicle. These individuals also lacked access to cooking facilities, safe storage, and utilities—problems that increase reliance on packaged products provided in convenience stores of food desert neighborhoods. Also according to the USDA, 2.3 million households live more than a mile from a supermarket and don't have a vehicle (Tecco, 2011). Additionally, high reliance on convenient store processed food and a lack of nutrition education has taken a toll on the health of the younger generations. In Houston, Texas, the community of Kashmere Gardens reports that more than half of the kids are overweight or obese (Weldon, 2013).

Summary of Findings

Among the elements found to influence the eating habits of IEFD citizens, demographics, the food outlets, nutrition knowledge, location and transportation, as well as choice steer individual purchasing decisions. Current unhealthy eating habits reflect the limited nutrition education of residents in the IEFD communities. Likewise, limitations from income in conjunction with high costs of food products further promote the consumption of cheap, unhealthy food products. Transportation and location of food outlets are among these limiting factors. While there are plenty of food outlets in many food desert regions, and even in the IEFD communities, the restricted choices in food outlet options, within reasonable distances, prevents residents from accessing the adequate food resources to help them lead healthy eating lifestyles. Finally, the element of choice plays a significant role, not in the food options available per say, but in the food consumption.

Demographic Data

An analysis of the IEFD demographic information allows for solutions that are better catered to the conditions of the residents of the area. Understanding elements such as socio-economic well-being and education level, will allow future solutions to take into account resident situations, and it will also allow the public to understand how the IEFD communities fit into the food desert classification.

Collectively, the IEFD communities studied have a total population around 90,306 individuals. Of the population, 63% is African American, 27% is Caucasian, and 10% is Hispanic. Additionally, of those living in the coalition area 35.82% of the population only has a high school diploma (U.S. Department of Commerce). Almost a

quarter, 21.61%, of the population has no high school diploma¹. The minority population and the limited education in the IEFD are two defining characteristics identified by scholars. This is not to say that food deserts are located in areas solely of minority populations, but that many food deserts happen to appear in areas with the characteristics. For example, in Houston, the community of Kashmere Garden is populated predominantly by African-Americans or Hispanics (Weldon, 2013), and according to Larsen and Gilliland (2008), London, Ontario is home to food desert areas with large numbers of Hispanics and African-Americans.

Along with ethnic composition, poor education attainment trends tend to define food desert communities. The nutritional knowledge of residents is reflected in their education level. Low education levels reflect low nutritional knowledge resulting in a continuous cycle of misunderstood health benefits of fruits and vegetables (Bonanno, 2012; Dutko, 2012). Younger generations are exposed to this misunderstanding since they practice what they grow up learning (Tecco, 2011).

In addition to ethnicity and education, income and poverty level play a role in defining the well-being of those living in food desert communities. As a collective whole, the majority, 32.86%, of IEFD households have an income of \$25,000 to \$49,999 a year. A significant number of households, 25.03%, make between \$10,000 to \$24,000 a year. Furthermore, 23.77% of the population lives in poverty. The issue of food insecurity grows with the increase in poverty. Food insecurity is defined as not having enough food for an active, healthy lifestyle (Ploeg, 2010). Dutko (2012) notes that census tracts with higher poverty rates tend to suffer from low access. This low access

¹ This information was retrieved from SAVI.org through use of census tract numbers. These numbers are for the 2010 year.

translates into food insecurity since fewer dollars can be put towards obtaining food that would sustain a healthy lifestyle. Unsurprisingly, variables that have a negative relationship with food insecurity are income, education level, and age—income and education being the two most significant variables affecting food insecurity (Rice, 2010). As these variables increase, food insecurity decreases, explaining why wealthier neighborhoods suffer less from food insecurity. Economic measures such as housing and employment are also related to food insecurity. This insecurity is prevalent among households with single mothers (Miller, 2010). This is particularly significant in relation to the demographic served by Forest Manor Multi-Service Center, located in the IEFD, where 90% of females are single mothers with at least two children.²

The correlation between higher income and greater fresh produce consumption suggests that even if residents increase their awareness to their dietary needs of fresh fruits and vegetables, income level and cost of goods will still impede their ability to consume fresh produce. Additionally, the age of respondents serves as a division point in fresh produce consumption; young adults are less likely to consume the recommended 5 servings of fresh fruits and vegetables—only 6.2% of survey respondents under the age of 31 years old eat the recommended number of servings.

In respect to income, individuals making greater than \$50,000 are twice as likely to eat the recommended 5 servings of fresh fruits and vegetables illustrating the current barrier to improving food habits of low- and medium-income food desert residents (15.4% of high-income individuals are more likely to eat the recommended servings of fruits and vegetables compared to 9% of low- income individuals and 3.1% of medium-income individuals). In comparison to high-income individuals, low-income residents

² This information is found on Forest Manor's "About FMMSC" page.

use food assistance more than medium- and high-income residents. They also travel outside their neighborhoods less and frequent convenience stores the most. Medium-income residents, those who make between \$20,000 and \$50,000 a year, are the ones who frequent fast food restaurants the most and they use emergency food systems less often than low-income residents. However, they frequent grocery stores at about the same rate as high-income IEFD residents.

In the IEFD communities, when survey respondents were asked about their eating habits, 54% selected the option of they tried to eat healthy but they "sometimes" or "often" can't. Of those who selected those responses, 42% stated that their choices were swayed by price, and many of the healthy foods were too expensive. Of those who listed healthy food options as too expensive, 66.9% of those respondents make less than \$30,000 a year. More than half of total respondents, 55%, are low-income individuals making less than \$20,000 a year.

An interviewee from the IEFD community stated that food choices are based on prices and that healthy eating is limited because healthier food options are expensive. Another interviewee noted that many people go to McDonald's in the community because it's cheaper and the individual's food choices are based on both price and convenience. Additionally, one claimant stated that "healthy produce is so expensive" and that "a bag of apples is \$4.99, eggs are almost \$3, and milk is almost \$4." These prices are steep when compared to the prices of ALDI's produce: a bag of apples is \$3.99, eggs are less than \$2, and milk is in the \$2 range.

Depicting the gap between fresh produce intake among the wealthy and the poor, it is noted that "Obesity has risen... more than a third of US adults and 17% of children

are obese and the problem is acute among the poor" (Miller, 2010). Furthermore, according to University of Washington epidemiologist, Adam Drewnowski, between 2004 and 2008 Seattle-area supermarkets saw a rise in food prices, but "the most nutritious foods rose 29 percent, while the least nutritious foods rose just 16 percent" (Miller, 2010). Lack of affordability drives the demand for produce in convenience stores down. Easy access to prepackaged or ready-made food are made more enticing than their price- inflated, preparation-required fruit and vegetable counterparts, further aggravating the obesity epidemic in food desert regions.

Grocery Store Data

In the boundaries of the IEFD, there are 22 grocery stores, 29 convenience stores, 8 food pantries, 67 restaurants, and 8 ethnic stores. There are no farmers markets in the area and the closet one is Binford Farmer's Market located on the corner of Binford Blvd and E. 62nd Street.³ The table created for the food inventory shows a limitation in the food outlet analysis which is the variability within product packaging. Each store's products varied in the quantity within packages. This also illustrates that the grocers within the service area seem to have greater differences in packaging sizes as well as less variety in the products they provide.

Beginning with the BP gas station located across from the Indiana State Fairgrounds, the store inside had the smallest selection in fresh food. There were no vegetables from the grocery list found in this food outlet. However, there was a large collection of snack foods and canned items. The small refrigerated section of ready to eat

³ This assessment was done by looking at data from SAVI.org, Indiana MarketMaker, and Google Maps. These numbers are as of 2012 for food pantries and farmer's markets and 2010 for convenient stores, grocery stores, and restaurants. Google Maps help locate ethnic store locations.

foods with some nutritious content had sandwiches (priced at \$3.09), single serving yogurt and parfait cups, individual slices of cheese, and a limited selection of fruits consisting of bananas, apples, and oranges. Though the prices of the food items in the gas station were not the most expensive among its compared counterparts, the quantities provided were much smaller than the quantities of the other food outlets. For example, each fruit item was priced per fruit and its cereal items were in 2 ounce packages verses the standard size packages. Additionally, its healthy snack packages of nuts were significantly smaller than the typical 16 ounce packages. Almonds were sold in 4.5 ounces packages and peanuts were sold in 9 ounce containers. As stated previously, the prices of the grocery list items in the gas station were not the most expensive among all the compared food outlets. However, the gas station appeared to have the least number of healthy food options and more of the most expensive grocery store items.

During the course of inventorying Los Compadres, it was observed that there was a greater variety in food products. The produce section was fairly large and most of the foods listed on the grocery list were found in the store. Whereas the gas station convenience store was devoid of all vegetable options, Los Compadres only lacked two of the vegetable items on the grocery list. The store was larger and had a wide selection of vegetables, fruits, meats, and dairies. Even though Los Compadres appears to have some of the cheapest prices, their quantities were smaller as seen in their pasta packages; most of their pasta packages were between 6 ounces and 7 ounces compared to the traditional 12 ounce to 16 ounces packages. Their frozen vegetables were also sold in slightly smaller packages than an average 16 ounce bag (they were typically 14 ounce packages). Even though Los Compadres fulfilled a majority of the food items on the

grocery list, there were still a few items not found in the grocery store (this includes chicken and turkey, bagels and oatmeal, walnuts and almonds). Finally, even though there were a wider variety of fresh produce in comparison to the gas station convenience store, these products were not as fresh as those that were sold in the compared Marsh, Trader Joe's, and Whole Food's.

Marsh had resources for all the provisions listed on the grocery list. Additionally, Marsh had many affordable options in comparison to the other inventoried food outlets within the service area. Though the food outlet did not possess all the cheapest food items, many of the prices were competitive in relation to the cheapest food items identified on the grocery list. For example, a pound of colored bell peppers at Marsh costs \$1.99, while the cheapest pound of colored bell peppers costs \$1.19 (note that the comparisons are made between the listed food outlets). The affordability and the variety make the grocery store an asset to the community. However, the location of the store is not convenient. This Marsh store also appeared to be comparable to those in other areas of Indianapolis. It is also notable that the fresh produce offered at Marsh was much fresher than those offered at Los Compadres. The difficulty in optimizing the resources of this Marsh is, as stated earlier, the location of the store.

In comparison to the food outlets located in the service area, the two located outside the area (Trader Joe's and Whole Foods) appear to carry the most expensive food and produce items, especially Whole Foods. However, it was observed that the food products, particularly fresh produce, tend to be organic and typically fresher than the food products to which they were compared. Trader Joe's even carried some less expensive food items than the Marsh located within the service area. Some of these food items

include carrots (.89 per pound at Trader Joe's versus .99 per pound at Marsh), rice (2.99 at Trader Joe's for 32 ounces versus 2.15 at Marsh for 14 ounces), and pasta (.99 at Trader Joe's for 16 ounces versus 1.19 at Marsh for 16 ounces). The food outlets located outside of the service area carried the necessary grocery list items, with the exception of cabbage at Trader Joe's. Additionally, both of the food outlets outside the service area contained a wider variety of fresh produce and a greater assortment of healthier snacks that were not included on the grocery list.

As displayed by the inventory of food outlets within and outside of the food desert boundaries, the finding is that the prices of typical household staples are more expensive in convenience stores. Generally, convenience stores have food options, especially healthy options, priced well above those of their supermarket counterparts and many healthier food options are not available. This is evident in the grocery list inventory. High prices of healthy food options and groceries, in general, make the seemingly cheaper fast food options more appealing. According to the USDA's Economic Research Service analysis of milk, cereal, and bread prices, convenience store prices were greater than those of grocery stores; "Milk prices were 5 percent higher; cereal, 25 percent; and bread, 10 percent" (Ploeg, 2010). Additionally, the quality of fresh produce in food desert areas tends to be poorer as many smaller convenience stores carry limited quantities of what could be second hand produce. In a Milwaukee study "quality of produce was generally high in medium and large stores, while wilted, damaged, or spoiled produce was not uncommon in smaller stores" (Raja et. al, 2008).

It is important to consider that even though food desert studies emphasize lack of access to healthy food, there is an overabundance of easy to access, affordable unhealthy

options in food desert communities. This does not discount the fact that supermarkets also carry unhealthy foods, but emphasizes that convenience stores provide fewer healthy food options. Easy access and affordability have led to high rates of obesity in these communities especially since many health problems are associated with low fresh fruit and vegetable consumption, in addition to consumption of large amounts of sugary and high fat foods (Larsen and Gilliland, 2008).

Eating Habits and Nutritional Knowledge

The conclusion deducted from the surveys is that the IEFD population has poor eating habits. Only 8% of respondents eat the recommended 5 servings of fruits and vegetables per day. Eleven percent of respondents eat fresh produce 0 to 1 times per week and one third of respondents say they only eat fresh fruits or vegetables 2 to 4 times per week. Infrequent homemade meals aggravate the population's unhealthy eating habits. Only 1% of survey respondents cook at home every day. The majority reported that they cook at home at least three times a week. It should be noted that even with home cooked meals, there is still a chance of reliance on pre-packaged foods lacking nutritional value, and though unhealthy meals can be made at home, these meals tend to have lower levels of sodium and sugar and tend to be less frequently fried.

However, the lack of education in relation to nutrition has led to skewed views of healthy eating. For example, in response to the question asking if an individual eats healthy, one long interview participant answered yes and followed up the response with the typical dishes eaten: fried chicken and fried fish. Yet, other interviewees noted a lack of fresh produce hindering their ability to consume more fruits and vegetables. However, without nutritional knowledge and motivation, affordability and availability will be less

instrumental in defining the word healthy in food desert communities (Wrigley et. al., 2002).

Location and Transportation

Another problem preventing better diets in food desert communities is the issue of location of grocers and transportation. 46% of survey respondents said that there was a convenience store where they shopped regularly. There is very little variation in the percentage of residents who shop at convenience stores three times a week, one time a week, and two times a month (all around 10%). A comparison of food purchases at convenience stores to fast food restaurants shows that individuals procure food from fast food restaurants more frequently than from convenience stores—28% of respondents buy food at convenience stores once a week or more, while 45% of respondents purchase food at a fast food restaurant once a week or more. The prevalence and accessibility of fast food restaurants and convenience stores in food desert areas is reflected by the survey responses. The health implications connected to the deficiency of grocery stores is reflected in the higher number of incidences of negative health outcomes (Raja et. al., 2008).

Choice

While many of the results reflect the characteristics distinctive of food deserts, the deficiency of fresh fruit and vegetable produce intake is also explained by choice. There are four categories that define an individual's choice. These categories are the desire to eat healthy, cultural and social conditions (both of which can either positively or negatively affect nutritional education), affordability, and ability to reach healthy food (McEntee, 2009). The power of choice in relation to any of the aforementioned factors

shapes food behavior which can either lead to purchases of fresh fruits and vegetables, or purchases of unhealthy food products.

Take for example the impact cultural and social conditions have on an individual's desire to eat healthy. Both of these impact one's desire to eat healthy as cultural norms, and even household norms, shape the taste preferences of both children and adults. These cultural and social norms include restrictions in diets such as exclusion of certain meats from one's diet, like beef for Hindus and pork for Jewish. There have also been studies which identify past historical contexts and food associations as the reasons for food culture. For example, in one study "food choices of black Americans were distinctively influenced by both custom as well as past slavery and discrimination" and in another study "comfort food consumption [is] motivated by the maintenance or enhancement of positive emotions for individuals with French cultural background[s]" (Airhihenbuwa & Kumanyika, 1996; Dubé et. al., 2005).

While it is argued that those who live in food desert regions choose their diets based on a lack of nutritional knowledge, University of Washington epidemiologist, Adam Drewnowski, concludes that though lower-income families frequently feast on junk food and fast food, it is not because "they lack nutritional education... [they] choose sugary, fat, and processed foods because they're cheaper—and they taste good" (Miller, 2010). This illustrates that not only does the income of families dictate purchase patterns, but so does taste.

Even though many of the underserved areas are populated by minorities and associated with low income levels, the population makeup has as much sway on the foods that stock the shelves as the actual purchases themselves. It is commonly known that

supply is driven by demand. In this sense, ethnic composition is a factor of demand which influences the items that stock grocery shelves since their purchases will reflect their cultural food choices. The choices the individuals make, in addition to their nutrition education, dictates the demand which results in a supply of food products that generate the most revenue for grocers (Besharov et. al., 2011; Bonanno, 2012). This suggests that perhaps it is not a matter of access, but a matter of preference which creates the notion of lack of access to fresh produce in areas dubbed food deserts.

Another factor influencing choice is time. Many of the potential time costs associated with fresh food preparation can influence an individual's decision to purchase the healthier, but already prepared foods (Besharov, et. al, 2011). Transportation time to food outlets that provide more affordable and fresh produce may also hinder a busy individual's decision to purchase the more expensive, and less fresh, fruit and vegetable options in their food desert community.

In several interviews conducted in the IEFD communities, the presence of choice is reflected in many of the interviewee responses. For one interviewee, the ability to reach healthy produce is a 20 minute drive away—and that's only to the store itself. The food outlets near her are described as full of junk food. Easy access to unhealthy foods for those who have no transportation options, leads to many residents choosing to eat unwholesome, prepackaged goods. Both the desire to eat healthy and cultural or social conditions influence preference in food choices. Six out of nine interview respondents referenced taste or preference as their main reason for choosing the food products they consume. The other three respondents noted convenience and price as the persuasive

reasons influencing food choices. These responses reflect the choice factors of affordability and ability to reach healthy foods noted by McEntee.

Solution and Recommendations

In order to combat food desert issues, a range of solutions, from local level to government level intervention, can promote greater accessibility and affordability for food desert residents. A few cities and states have already implemented policies to help alleviate the effects of food deserts including Michigan, California, New York City, and Cleveland. The single greatest criticism to proposed solutions is the lack of understanding of economic implications of the responses. When solutions lack economic understanding there's a greater risk for the solution to be ineffective (Besharov et. al., 2011). However, the following solutions can have economic benefits if they are properly implemented.

Collaboration

The idea behind collaborative projects is that a mutual goal serves as a connecting point for those involved in accomplishing a task or alleviating a problem. Partnerships between and among both public and private partners optimize the resources and efforts of those who join together for a common cause. For example, the Indy East Food Desert Coalition (IEFDC) is a collaborative alliance between three community groups: Forest Manor Multi-Service Center, United Northeast Community Development Corporation, and the Community Alliance of the Far Eastside. Their mutual goal of bringing food and wellness to the eastside of Indianapolis drives their efforts towards improving access to fresh produce. Particularly essential to food desert collaborations is the need to reduce current enrollment barriers to the Supplemental Nutrition Assistance Program (SNAP)

and the Special Supplemental Program for Women, Infants, and Children (WIC). These programs have not been fully utilized by eligible individuals. In Marion County, the county in which the IEFD exists in, approximately 28% of eligible participants do not utilize the federal benefit. This results in a potential \$18,000,000 loss in federal funds in the IEFD area alone.

Collaborative efforts have been seen between farmers' markets and state programs such as Double-Up Bucks in Michigan, Health Bucks in New York City, and Fresh Bucks in Washington State. These programs all utilized a dollar-for-dollar matching incentive for individuals purchasing fresh fruits and vegetables at participating farmers' markets (Weatherspoon et. al., 2012; Ploeg, 2010; WSFMA, 2014). Indianapolis has also become a recent champion of this solution with its implementation of Indy Fresh Bucks at the end of the 2013 year (Smith, 2013). Similar to other monetary initiatives, Indy Fresh Bucks aims at improving SNAP recipient access to "fresh, healthy, local produce at farmers' markets" through a dollar-for-dollar matching program, up to \$20 per visit (EAT, 2013). Use of SNAP benefits at farmers' markets in the whole state of Indiana is at \$30,300 compared to \$149,000 SNAP dollars spent at Minnesota's farmers' markets. Indy Fresh Bucks will help increase the amount of SNAP benefits used at farmers' markets while also increasing fresh produce availability for those in low-access areas (EAT, 2013).

Successful partnerships have been identified between not only grocers and farmers, but also between grocers and residents. Relationships between grocers and residents allow the food provider to better serve the needs of the community. For example, Philadelphia grocery owner, Jeff Brown, opened supermarkets in areas listed as

food deserts and hired from within the neighborhoods as well as added specialty items that the residents liked. He also added health clinics and community meeting rooms inside his stores (Bare, 2013). Through hiring from within a community and providing goods tailored to community preference, a stronger sense of locality is formed. As familiarity and consumer tastes are matched at these local grocery stores, residents in underserved areas will gain greater access to food products and it will reduce the need to take timely trips to supermarkets outside of community areas.

In the latter relationship, between grocers and farmers, the hindrance of receiving shipments of fresh produce from major distributors will no longer be a problem. Sourcing fresh produce from local farmers increases the revenues of the farmers working within the community and it allows for easier obtainment of small fresh produce orders (Hagan and Rubin, 2013). The problem of receiving fresh produce from large distributors is that since many of the distributors require a minimum purchase requirement it is impractical for small retailers to purchase large quantities of produce that may not be consumed before their dates of expiration. For many convenience stores, the inability to purchase fresh fruits and vegetables has led to fresh produce items that are old, as observed by one interviewee. He noted that sometimes old meat from a Marsh is taken to the food desert neighborhood to be sold. By creating relationships with local farmers, community corner stores will be able to carry fresh produce its patrons desire without foregoing quality.

Local Food Around Local Routes

Many solutions to improving affordability are not viable if food outlets providing the affordable fresh produce are not accessible. Transportation is one of the greatest

barriers to food access, especially for those with the lowest income. These individuals relied more on buses for transportation than any other group (18% compared to 2.4% of high income individuals and 7.8% of medium income individuals). The solutions aimed at utilizing the resources available within food desert communities include the use of farmers' markets and existing convenience stores. Enticing larger stores into low-income communities is difficult. The lower purchasing power of low-income families coupled with stereotypes of food desert communities, which include higher rates of shoplifting and population migration, make it unappealing for large grocery store chains to open or keep stores open in these areas (Rice, 2010). Furthermore, many supermarkets need minimum sales to remain profitable.

However, by improving the selections at the smaller grocery stores and convenience stores, access to fresh produce can be improved (Dutko, 2012). Raja et. al. (2008) states "creative planning and policy support for networks of existing small grocery stores may be a more efficient strategy" suggesting that the time and effort involved to open a large, chain grocery store could out-weight the benefits. The need for improved fresh food selection in the IEFD is evident by the percentage of survey respondents who regularly shop at convenience stores: 46%. Additionally, 63% of survey participants responded that they live within ten minutes of a convenience store. These numbers imply that the popularity and proximity of convenience stores to residents in the food desert community provides an opportunity to provide fresh products to the communities which will improve accessibility through offering the healthy goods at already frequented locations.

To further ensure that those with the greatest transportation impediments are reaping the benefits of increased locality, the relocation or placement of farmers' markets, stands, or any temporary means of selling fresh produce, should take into account the food desert public transportation or bus routes. Currently in the IEFD, 39% of survey respondents live within ten minutes of a grocery store, and those who are lower-income residents are six times more likely to use public transportation to reach food destinations. Keeping in mind the frequency with which public transportation is used, these routes and options should be expanded simultaneously as localization efforts expand in order to help increase and enable greater food access. Examples of successful grocery localization plans include New York City's Healthy Bodegas program and Cincinnati's Do Right! Corner Store campaign.

Increase Access to Healthy and Fresh Food

A major opportunity in food deserts is the presence of food pantries and the widespread use of food pantries by food desert residents. Food pantries are "public or private nonprofit organizations that distribute food to low-income and unemployed households" to alleviate emergency and distress situations (Cornell University Law School, 2014). Since these food outlets are utilized as more than emergency food and since they are frequented almost as often as fast food outlets, it would be beneficial to patrons to have the opportunity to obtain healthy and fresh food options from these food sources. The food pantries typically serve the most vulnerable residents of the IEFD who make less than \$10,000 a year. The lowest- income residents are the primary visitors of food pantries since many of the medium-income and high-income residents have the ability to leave their neighborhoods to pursue produce.

However, there is another solution which benefits all residents regardless of income level. The solution of a community garden increases access to fresh produce in the community and emphasizes localization for areas with limited transportation options. The American Community Garden Association has championed this solution by providing resources to over 18,000 community gardens in both the U.S. and Canada (Loots, 2013). Not only does this solution help the community in terms of food access, but the return generated from \$1 invested in a garden plot is about \$6 (Hagan and Rubin, 2013). Illustrating the viability and economic practicality, community gardens also create community development and offer an opportunity to reduce the cost of obtaining fresh fruits and vegetables. In Oakland, California, City Slicker Farms "surveyed its backyard garden participants and found that 92% of participants saved money because of their garden" (Hagan and Rubin, 2013). Additionally, in the IEFD community, an interviewee expressed community interest in creating a garden and another expressed interest in providing community residents more information about gardening options.

Spread Knowledge Through Wellness Instructors

Another solution option which addresses the concern of education limitation, is hiring a wellness coordinator to develop or expand programs that increase knowledge about cooking and nutrition in community specific ways. Increasing healthy food access requires educating residents about nutrition and cooking. Without these skills, the skewed perceptions of healthy versus unhealthy food would do little to improve fresh fruit and vegetable consumption even if access issues are eliminated. Education is needed to understand meal planning, the relationship between food and personal nutrition, the relationship between cooking and personal nutrition, and budgeting.

Providing opportunities to become educated on nutrition and cooking is essential, especially at food pantries considering that the surveys reveal low-income participants are more likely to cook at home compared to medium- and high-income residents. Successful education classes are utilized in Providence Rhode Island's Broad Street Farmer's Market. In addition to "leveraging funds and increasing the purchasing power of low-income consumers" the farmer's market offers nutrition classes and cookbooks (Hagan & Rubin, 2013). This continued education for those who are in low-income communities increases the likelihood of healthier diets and ensures nutrition information is passed on to residents in food desert communities.

Additionally, a couple of IEFD interviewees placed a large emphasis on the importance of education in changing dietary habits. One interviewee believed education was no longer just parent to child process, but now child to parent process. She noted a current interest in the younger generation in gardening and believed that it was essential to promote farming and self-sustainability at home as well as in the school curriculum. Education can help the community residents see the wealth in land around them. Another interviewee reiterating the idea, stated that there is a need to learn how to "survive off the land" and she expressed interest in increasing trees in the community so that there would more fruit trees. These trees would serve as an avenue of healthy, low or no cost, foods. She also stated that education should be improved, especially for parents, who should be informed about the consequences of their food choices on their children.

Conclusion

The IEFD appears to suffer from many common conditions noted by various scholars as food desert identifiers. Yet, its situation still remains unique. Though there is a prevalence of minority populations, low-income households, and low-education attainment levels, there are also factors of low-access, poor food options within the limited food outlets in the neighborhoods, and poor eating habits which shape the situation of the community.

As illustrated by an analysis of surveys and interviews of IEFD residents, many of the coalition's conditions reflect the previously listed identifiers: 25.03% of IEFD households make between \$10,000 and \$24,000 a year; 23.77% of the populations lives in poverty; 21.61% of the IEFD population has no high school diploma; 6.2% of surveyed individuals (under the age of 31 years old) eat the recommended number of fruit and vegetable servings; and only 8% of the total surveyed population eats the recommended servings of fruits and vegetables a day.

It is also important to emphasize the role that choice plays in the food purchasing decisions of food desert residents. Living situation aside, cultural and social conditions as well as time constraints lead to many of the unhealthy food consumption trends typical of food desert areas. Therefore, when forging solutions for the IEFD coalition, community responses to the communities' current conditions as well as individual preferences should be taken into consideration.

The most important thing to consider in choosing a solution(s) is the viability and the efficiency of its implementation within the communities that are in dire need of immediate alleviation of their healthy and affordable food deficiency. There is no single

cure-all for the ailments. One interviewee states "teaching people and telling them to eat healthy when it is unavailable to them, makes it hard for them to change eating habits." This suggests that education without access is useless, while access without education is equally futile. However, food desert areas that are suffering prolonged lack of access and affordability need solutions that bring the quickest relief. Though long-term solutions must be employed, short-term solutions are necessary in order to allow longer-term options to become grounded.

In order to ensure improvement in deprived communities, such as the IEFD, one of the most essential pieces to the solution puzzle is the use of an educating figure. It is important to note that a single solution may not be adequate. However, knowledge is power. By empowering community residents to utilize benefits they are qualified for, the income access limitation can be reduced. Furthermore, as residents learn to improve their eating habits and pursue more fresh produce, farmers will become more willing to operate in the low-income, low-access areas as profit margins increase with an increase in patrons. However, an increase in awareness and education will not improve the eating habits of food desert citizens if there isn't a simultaneous improvement in access.

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Appendices

Appendix A: Grocery List Inventory

Item	Type/ Quantity	Marsh	BP/Rickers	Los Compadres	Trader Joe's	Whole Foods
Dairy						
Milk	Skim/Low-fat	2.99	4.09	3.99	1.89	3.49
Eggs	Dozen	2.09	1.89	1.49	2.29	2.99
Cheese	Cheddar, Shredded/Sliced	3.19/ 3.29	1.29 (single slice)	3.99	3.99/ 3.99	3.99/ 5.99
Sour Cream	16 oz	1.65	-	2.49	1.79	2.99
Yogurt	6 oz	0.50	2.39	.99 (7 oz)	0.79	0.89
Vegetables						
Carrots	1 lb, whole	0.99	-	0.59	0.89	0.99
Celery	1 lb, whole	1.67	-	1.69	2.29	1.99
Onions	White, per lb	1.49	-	0.79	.79 (each)	2.49
Cucumber	per lb	0.99	-	1.49	1.69	2.69
Cabbage	per head	0.59	-	0.69	-	1.49
Lettuce	per head	1.29	-	1.79	1.29	2.49
Spinach	bag	2.49 (9 oz)	-	-	1.99 (6 oz)	2.49 (16 oz)
Tomatoes	Grape/ Cherry	2.50	-	-	2.49	3.00
Tomatoes	Roma, per lb.	1.69	-	0.89	1.99 (18 oz)	1.99
Bell Peoper	Red, per lb.	1.99	-	1.59	1.19	3.99
Bell Pepper	Yellow, per lb.	1.99	-	1.99	1.19	3.99
Bell Pepper	Green, per lb.	0.99	-	1.29	0.79	1.99
Broccoli	per lb.	2.19	-	1.39	1.99	2.99
Frozen Mix	bag, 16 oz	1.79 (12oz)	-	1.69 (14 oz)	2.49	2.69
Fruit						
Apples	Red Delicious, per lb.	1.99	0.99	1.19	2.29 (Gala, 2 lbs)	1.99
Bananas	per lb.	0.59	0.99	0.79	.19 (each)	0.99
Oranges	per orange	0.67	0.99	0.20	0.69	1.99 (per lb.)
Grapes	Red, per lb.	2.49	-	2.49	3.49	3.99
Mango	per mango	1.67	-	1.39	1.49	1.50
Meat						
Chicken	per lb.	2.79	-	-	6.99	3.99
Beef	per lb.	3.39	-	3.29	5.99	5.99
Ham	16 oz	4.89	-	2.79 (12 oz)	3.99 (7 oz)	4.39 (6 oz)
Turkey	16 oz	4.89	-	-	4.99 (8 oz)	6.39 (6 oz)
Bread & Grains						
Cereal	Standard size package	2.49	1.39 (2 oz)	3.99	3.99	2.99
Bagels	Standard size package	1.99	-	-	2.49	3.99
Bread	Standard size package	2.29	1.79	2.99	2.49	3.99
Oatmeal	Instant, 10 pack	2.15	-	-	3.49 (8 count)	3.49 (8 count)
Rice	White	2.15 (14oz)	-	3.99 (16 oz)	2.99 (32 oz)	3.99 (32 oz)
Rice	Brown	2.59 (14oz)	-	-	2.99 (32 oz)	5.39 (32 oz)
Pasta	Spaghetti, 16 oz	1.19	-	.59 (7 oz)	0.99	2.99
Pasta	Macaroni, 16 oz	1.19	-	0.89 (7 oz.)	0.99	0.99
Pasta	Fettuchini, 16 oz.	1.19	-	0.89 (7 oz.)	0.99	1.99
Snacks and Nuts						
Walnuts	16 oz	6.99 (12 oz)	-	-	7.49	8.99
Almonds	16 oz	4.99 (12 oz)	4.39 (4.5 oz)	-	4.49	5.99
Peanuts	16 oz	4.25	2.99 (9 oz)	.99 (3.17 oz)	3.29	2.99
Crackers	Package	3.49	.59 (sleeve)	2.59	1.69	3.99
Tortilla Chips	Average size bag	3	4.29	1.50	1.99	3.39
Other Chips	Average size bag	2.18	4.29	3.69	2.99	2.69

Appendix B: Survey

East Indianapolis Food Survey

This survey is sponsored by the Forest Manor Multi-Service Center, Community Alliance of the Far Eastside, United Northeast Community Development Corporation and Butler University's Center for Urban Ecology. We appreciated your help. Please check the box next to your answer.

ZIP CODE: _____

I. Transportation and Shopping Choices

1. Which of the following modes of transportation do you usually use to buy food that you eat away from home: (Check all that apply.)

- | | |
|-------------------------------|--|
| <input type="checkbox"/> Bus | <input type="checkbox"/> Personal Automobile |
| <input type="checkbox"/> Walk | <input type="checkbox"/> Other (Please Explain): |
| <input type="checkbox"/> Taxi | |

2a. How often do you eat at a fast food (quick service) restaurant for breakfast, lunch, or dinner?

- | | |
|---|---|
| <input type="checkbox"/> At least 10 times a week | <input type="checkbox"/> At least two times a month |
| <input type="checkbox"/> At least 5 times a week | <input type="checkbox"/> At least one time a month |
| <input type="checkbox"/> At least 3 times a week | <input type="checkbox"/> Less than one time a month |
| <input type="checkbox"/> At least 1 time a week | |

2b. Do you have fast food restaurants where you often eat?

- Yes No

2c. If you answered yes, please provide the name and location of those fast food restaurants:

2d. How long does it usually take you to get to your fast food restaurants (Distance one-way)?

- | | |
|--|---|
| <input type="checkbox"/> 0-5 minutes | <input type="checkbox"/> 20-30 minutes |
| <input type="checkbox"/> 5-10 minutes | <input type="checkbox"/> 30-45 minutes |
| <input type="checkbox"/> 10-20 minutes | <input type="checkbox"/> More than 45 minutes |

2e. What are the reasons you eat at a fast food restaurant: (Check all that apply.)

- | | |
|---|--|
| <input type="checkbox"/> It tastes good | <input type="checkbox"/> It's on my way to my employment/ school |
| <input type="checkbox"/> I dislike cooking | <input type="checkbox"/> I don't have time to cook |
| <input type="checkbox"/> I'm busy and it's fast | <input type="checkbox"/> It's healthy |
| <input type="checkbox"/> It's cheap | <input type="checkbox"/> Other (Please Explain): |

3a. How often do you purchase food to eat at a gas station or convenience store like Walgreens, CVS, or the Dollar Store?

- | | |
|---|---|
| <input type="checkbox"/> At least 10 times a week | <input type="checkbox"/> At least two times a month |
|---|---|

5c. How long does it take you to get to your food pantry/ bank (Distance one-way)?

- | | |
|--|---|
| <input type="checkbox"/> 0-5 minutes | <input type="checkbox"/> 20-30 minutes |
| <input type="checkbox"/> 5-10 minutes | <input type="checkbox"/> 30-45 minutes |
| <input type="checkbox"/> 10-20 minutes | <input type="checkbox"/> More than 45 minutes |

5d. What would you like to most see change in your food bank/pantry? (Choose up to three).

- | | |
|--|--|
| <input type="checkbox"/> Closer to home | <input type="checkbox"/> More fresh fruits and vegetables |
| <input type="checkbox"/> More meat | <input type="checkbox"/> More dairy |
| <input type="checkbox"/> Greater variety | <input type="checkbox"/> Better service |
| <input type="checkbox"/> Longer hours | <input type="checkbox"/> More cooking/ nutrition education |

II. Cooking and Eating

1a. Which of the following best describe your eating habits:

- | | |
|---|---|
| <input type="checkbox"/> I eat healthy | <input type="checkbox"/> I try to eat healthy, but often can't |
| <input type="checkbox"/> I try to eat healthy, but sometimes can't | <input type="checkbox"/> I don't really care about eating healthy |
| <input type="checkbox"/> I eat what tastes best and what's provided | |

1b. If you answered "I try to eat healthy, but sometimes/often can't," what are the main reasons you can't: (Choose up to three.)

- | | |
|---|---|
| <input type="checkbox"/> Too expensive | <input type="checkbox"/> Not enough time to cook |
| <input type="checkbox"/> Don't like to cook | <input type="checkbox"/> Don't know how to cook healthy foods |
| <input type="checkbox"/> Distance to grocery store | <input type="checkbox"/> Quality of food at the grocery store |
| <input type="checkbox"/> I like eating unhealthy food | <input type="checkbox"/> Other (please explain): |

1c. What does healthy food mean to you?

2. How often do you cook or make food at home?

- | | |
|---|---|
| <input type="checkbox"/> At least 10 times a week | <input type="checkbox"/> At least 1 time a week |
| <input type="checkbox"/> At least 5 times a week | <input type="checkbox"/> Less than once a week |
| <input type="checkbox"/> At least 3 times a week | |

3. How often do you eat fresh fruits or vegetables?

- | | |
|--|---|
| <input type="checkbox"/> 0-1 time a week | <input type="checkbox"/> 2-4 times a week |
| <input type="checkbox"/> Once a day | <input type="checkbox"/> 2-4 times a day |
| <input type="checkbox"/> 5 or more times a day | |

4. What are the main food problems in getting the foods you need?

- | | |
|--|--|
| <input type="checkbox"/> Cost of food | <input type="checkbox"/> Time for shopping |
| <input type="checkbox"/> Distance to the store | <input type="checkbox"/> Quality of food |
| <input type="checkbox"/> Safety | <input type="checkbox"/> Other (please explain): |

5. What would you like to see change about food in your community? (Choose up to three.)

- | | |
|---|---|
| <input type="checkbox"/> Grocery Store in the Neighborhood | <input type="checkbox"/> More Farmers Markets |
| <input type="checkbox"/> More Community Gardens | <input type="checkbox"/> Better Health Education |
| <input type="checkbox"/> Workshops for Personal Gardening | <input type="checkbox"/> Better Produce at Grocery Stores |
| <input type="checkbox"/> More Emergency Food Distribution | <input type="checkbox"/> Less Fast Food |
| <input type="checkbox"/> Healthier Food at Convenience Stores | <input type="checkbox"/> Healthier Food at Food Pantries/ Banks |
| <input type="checkbox"/> Other (please explain): | |

6. Please provide us your impression of the overall health of your neighborhood's food situation:

7. Is there anything else you'd like to add?

III. Demographic Information

1. How long have you lived in your community (not necessarily address)?

- 1-2 years
- 2-5 years
- 5-10 years
- 10-20 years
- 20-30 years
- More than 30 years

2. Are you Male or Female?

- Male
- Female

3. What is your age?

- 18-20
- 21-24
- 25-29
- 30-34
- 35-45
- 46-54
- 55-64
- 65-74

75- Older

4. Including yourself, how many people live in your household?

1-2

3-4

4-5

6-7

8 or more

5. What is your total household income:

Less than \$10,000

\$10,000-\$19,999

\$20,000-\$29,999

\$30,000-\$39,999

\$40,000-\$49,999

\$50,000-\$74,999

More than \$75,000

6. Do you receive benefits from Food Stamps/EBT or WIC?

Yes

No

7. If you answered yes, please estimate your monthly benefit:

For a chance to win a \$50,00 gift card to a local food retailer and to stay involved in bringing healthier food to your neighborhood, please provide the following information:

Name:

Address:

Phone number:

E-mail:

Appendix C: Interview Questions

East Indianapolis Interview: Analysis of Food Sources

This interview is sponsored by the Forest Manor Multi-Service Center, Community Alliance of the Far Eastside, United Northeast Community Development Corporation and Butler University's Center for Urban Ecology. This interview will take about an hour and it will help put emotional characteristics to numerical data. (Please read the Recorded Interview Informed Consent—attached)

1. Tell me about yourself; how long have you lived around the [insert sponsorship location]?
2. What do you like about the community?
3. Is there anything you would change about it?
4. How do you get your food?
5. Currently there are a limited number of food outlets that provide affordable and nutritious food, how would you describe the food situation of your community?
6. What are some reasons why you choose the food you eat? (ex. lack of variety, lack of availability, price, convenience of location, lack of food preparation time). Do you have any concerns with food?
7. Do you describe your eating habits as healthy? If not, what are some reasons preventing you from eating healthier?
8. What do you see as your main food problems—is it the access to food in the community or do you have a problem with the food available?
9. What would you like to see improve in terms of food availability in your community?

Recorded Interview Informed Consent

Dear Participant,

Thank you for responding to the interview section of the Indy East Food Desert. This is part of a project conducted by the Center of Urban Ecology at Butler University and its partner the Indy East Food Desert Coalition. Professor Nic Mink is the project supervisor and may be contacted at 815-409-0979 if you have any further questions.

There is no monetary compensation for your participation; however your feelings and input are valuable for the project. This interview will be recorded for the purpose of transcription and analysis. You will be asked to discuss your opinions on the current food provision conditions in your area. There are no anticipated benefits or risks associated with your participation in this interview.

Before we begin, please be assured of your rights as a respondent:

- Your participation is voluntary.
- You are free to refuse to answer any question at any time.
- You are free to withdraw from the interview at any time.
- The interview will be kept confidential and will only be available to members of the project team.
- Excerpts from this interview may be made a part of the final report, but under no circumstances will your name or any information that may personally identify you be included in the report.
- Recordings and transcriptions of the interview will not bear your name or personal identity characteristics other than a subject number.
- Upon transcription, all recordings will be erased and destroyed.

Thank you again for your participation. I would be grateful if you would sign this form to show that I have provided you with this information.

I agree to have this interview audio recorded.

YES

NO

NAME _____

SIGNATURE _____

DATE _____

Appendix D: Limitations and Future Research Needs

Similar to many other food desert studies, a limitation of this study lies in the accuracy and currency of the secondary data (Raja et. al., 2008). In relation to access, though many of the residents living in the Indy East Food Coalition boundaries live and work within the coalition area, true access may not be fully observed if school and work routes are not taken into account. "True food availability" may be skewed if individuals work or attend school outside the community and have adequate access to grocery stores along their routes to these places (Besharov et. al, 2011). Even though in this study, work and school routes were considered, physical access may not reflect the financial access. Even with the utilization of en route food outlets, it is possible that the purchased quantity differs based on price changes. Therefore, in addition to studying access to food outlets along work and school routes, research should be done to reflect the impact of price along these routes on food desert citizens.

Another limitation pertains to the analysis of travel limitations. While driving is the main mode of transportation used to analyze the degree to which food desert access is limited, more research needs to be done to understand walking, biking, and public transportation through studies such as a neighborhood walkability study. In a study of King County in Seattle, Washington, the calculation of transit and driving distances didn't take into account the time spent on the road nor the time spent walking and waiting on bus stops (Jiao et. al., 2012). This skews the analysis of time spent to get groceries. Furthermore, when considering biking and walking distances, street infrastructure of neighborhoods need to be considered because maneuverability of streets will influence travel. Finally, census data on automobile ownership is nonexistent, and in order to

properly analyze the true limitations of transportation restrictions on food access and grocery shopping behaviors surveys should be created (Larsen and Gilliland, 2008).

The final element that could provide more support in grocery store inventory is the use of standardized data collected by grocers. In Detroit, the community of Piety Hill collected data from the grocery store, Peaches & Greens, and national scanner data from Nielsen representing fruit and vegetable purchasing habits to complement the collection of community survey data (Weatherspoon et. al., 2012). It is noted that standardized data via Nielsen can be misleading, since it only documents the price and quantity of purchases, but doesn't identify whether food choices are based on preference or limitation to access. But when this information is coupled with a study of local food patterns, data on food availability can become more comprehensive. Also a restraint to the current study is the limited surveying of grocery stores. Only three of the over 100 food outlets within the IEFD boundaries were surveyed. A more all-inclusive approach would be to compile a list of retail outlets and drive the streets to verify accuracy and confirm store presence, as done in a New Orleans study (Besharov et. al., 2011). Confirming store existence would increase accuracy of reported access limitations and it would also allow for a larger comparison pool of price and availability of the grocery list items.