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Food Deserts: USDA Report Review

Abstract

The purpose of this Capstone will be to provide city, county, and eventually state, entities with the knowledge to better identify those areas which would fall under the auspice of the Healthy Food Financing Initiative, as laid out in a report by the United States Department of Agriculture's Economic Research Council on "Food Deserts." Food deserts are those areas in which access to nutritious foods is limited by distance, by lack of transportation, or both. Food deserts have also been linked to obesity in children and adults, with the attendant health problems. With this knowledge, starting at the local level, it is hoped that people in areas needing assistance can be better identified.

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Food Deserts: USDA Report Review

Capstone

By

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University of Denver

Fall Quarter 2015

Professor: Steven Hick

Abstract

The purpose of this Capstone will be to provide city, county, and eventually state, entities with the knowledge to better identify those areas which would fall under the auspice of the Healthy Food Financing Initiative, as laid out in a report by the United States Department of Agriculture's Economic Research Council on "Food Deserts." Food deserts are those areas in which access to nutritious foods is limited by distance, by lack of transportation, or both. Food deserts have also been linked to obesity in children and adults, with the attendant health problems. With this knowledge, starting at the local level, it is hoped that people in areas needing assistance can be better identified.

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Introduction

In 2010, First Lady of the United States, Michelle Obama, began a program with the lofty goal of reducing childhood obesity within a generation. A series of programs, from food programs in schools, helping children have access to healthy, affordable foods, to getting children to move, were implemented to help contain the national crisis; medical problems such as early heart disease and type 2 diabetes are being seen in younger and younger patients. The Centers for Disease Control (CDC) has had a long-ranging study on the effects of obesity in children; it's found that children born into families with parents who never finished high school, many living in food desert areas, have double the chance of being obese than those children born into families whose parents who graduated college. (CDC 1999-2015)

Prior to this, in 2009, the United States Department of Agriculture's Economic Research Service (USDA ERS) provided a report to Congress on the prevalence of 'food deserts' in the United States; hunger and obesity are two problems being addressed by the First Lady's "Let's Move" program. The report outlined the roughly 2.3 million (2.2 %) of US households which did not have ready access to quality sources of food, and pointed out a further 23.5 million people who live in areas where the median income is 200% lower than the standard poverty level. The study points out that not everyone who lives in these areas is in poverty, but an

estimated 11.5 million people live in these areas and are at, or below, the poverty level. (Ver Ploeg et al, 2009)

The other component of the study is how far away from quality sources of nutrition these people reside. The study concluded that one mile in an urban setting, and ten miles for a rural area, would be the measured limits for access; this has also been the distance utilized in most of the current literature, with the exception of reports out of Canada, which all use kilometers. It was determined that people in rural settings, who may not have access to transportation, tend to borrow transportation to attain food, but that it may take twenty minutes, or longer, to get to a larger store for food. In urban areas, the likelihood of a person not having access to a vehicle was much higher, and distances to public transportation could be prohibitive. Most people in the urban setting tended to live at least four miles away from a larger food store. (Van Ploeg et al, 2009)

There have also been some studies into the increased risk of obesity to those living in a food desert – those areas farther away from a quality source of nutrition with no way to get there – but it's unclear as to why obesity is higher in these groups. (Morris, 2014)

The USDA's report is extensive, but is it accurate? It seems relatively easy to map out a one- or ten-mile circle around a supermarket and see where the gaps lie. What if, though, because of geography and topography, those distances don't tell the whole story? What if the distances are wrong? Speaking with some of the researchers at Geisinger Medical Research Center in rural Pennsylvania, they

believe that this is but one glaring fault with the USDA's report. There are others, but they don't fall within the purview of this report.

Literature Review

In examining the literature, it must be remembered that much of it is anecdotal because of the ephemeral nature of the data –it changes as new data is uncovered, and sometimes is contradictory in nature; what can seem to be verified in one study is debunked in another. This has made it extremely confusing to the author and researcher alike, most seemingly reinventing the wheel each time a study is conducted.

New AMA, CDC Initiative Aims to "Prevent Diabetes STAT"

This is a short article on the American Medical Association's JAMA Network webpage. It calls on not only the medical community, but also the business community, to better serve their patient and employee health by allowing people to become better advocates for their own healthcare. There is a major push to help healthcare professionals and the communities which they serve to "create better linkages." (AMA, 2015)

With the increase of obesity in those regions identified as food deserts, there is also an identified increase in diseases linked primarily with obesity, namely heart disease and type 2 diabetes.

The case of Montréal's missing food deserts: Evaluation of accessibility to food supermarkets

An article in the International Journal for Health Geographics, the background cited a study from Great Britain which looked at the prevalence of people living in areas with limited access to retailers, most specifically food retailers. It stated that peoples' poor choices in foods are perhaps linked to the fact that they do not have access to other, more quality forms of nutrition; their dietary choices may be dependent on where they can buy food.

The researchers studied locations of food stores, as well as those residents living in areas of low income, and their access to those food stores. The team utilized GIS to map out these factors, and came to the conclusion that there wasn't a problem with food deserts in the Montreal area, but a problem of poor food choice; the authors recommended that resources would be better utilized for education on those food choices.

Prevalence of Obesity in the United States, 2011-2012

Under the CDC's Division of Nutrition, Physical Activity, and Obesity, in the data section, is information on obesity. According to their data, 17% of children in the US are obese, and 34%, roughly a third of all adults are obese. The study is broken down by age, race, sex, showing that lower income families show an increased prevalence toward obesity. The site goes on to state that obesity in preschoolers has actually been dropping slightly in the past ten years, from 15.2% to 14.78%.

The Urban Grocery Store Gap

This paper, published in early 1995, was one of the first comprehensive studies on what was then called "The Grocery Store Gap," what would later become food

deserts. The study was initiated partly in response to government cuts to Federally-funded food banks, which was negatively impacting those living in urban areas.

Cotterill and Franklin, the paper's authors, took zip code data from 21 metro areas, combined this data with local demographic data, broken out by how many households in an area were receiving assistance, and correlated this information to all of the grocery stores in that metro area.

Next they looked at how far away from quality sources of nutrition these people lived, and whether they had access to a privately-owned vehicle, or to public transportation. People who tend to live in the areas receiving more public assistance tend to lack access to privately-owned vehicles.

One of the things discovered in the course of the study was that, in the 31 zip codes which had the highest numbers on public assistance, the numbers of retail stores in those areas was less than in areas with fewer people on public assistance. Even in those areas where a major retail chain would have a location, it tended to be much smaller, with less diversity in choices of food, than in areas with higher socioeconomic status.

The study was concluded with the revelation that grocery store gaps did, indeed, exist, and that there was need for further study into the problem, in the hopes that better distribution methods might be discovered, thus providing for the more disenfranchised in our society.

Characteristics and Influential Factors of Food Deserts

This follow-on of the USDA ERS study had quite a number of the same researchers and authors from the original report to Congress. The purpose of this paper was to uncover the demographic and racial differences of food deserts, and to try and predict the location of food deserts.

Another motivation behind the study was to discover how low-income groups in one area are similar, or different, from low-income groups in other areas. By doing this compare-and-contrast, it was hoped that differences in the food desert characteristics themselves could be discovered, and it was hoped that this information would be helpful in allowing policymakers make better decisions relating to food and assistance distribution.

The authors went on to state that the study was systematically stymied by a lack of common land-measurement; there are grid coordinates in some parts of the country, others use state-plane, and some use UTM. Some states are using standard feet and miles, others are utilizing meters and kilometers. It was hoped that a more common nomenclature (grid coordinates) would also arise out of this study to further advance the research of follow-on studies. The researchers were utilizing census tracts, which are not uniformly the same size, making it harder to research across wider areas.

It was discovered that there is a racial component to food deserts, at least in urban areas, with minority areas tending to have fewer food markets in close proximity, as well as an economic component, with lower income areas showing a preponderance for fewer markets, and a larger chance of existing in a food desert.

Obesity, Prevention, and Health Care Costs

This short article from the Brookings Brief speaks to the health care problems which arise with obesity. As people living in food deserts seem to be more obese, the health risks need to be understood by health professionals and policymakers alike to make better decisions regarding these underserved areas, and the people who live within them.

Neighborhood characteristics associated with the location of food stores and food service places

This is an article in the American Journal of Preventive Medicine looking at the segregation of neighborhoods by race, looking at the locations of food markets, ready access to other sources of food (fast food), as well as other factors such as the locations of liquor stores in these neighborhoods.

There is four times more likely, according to the study, to be a supermarket in a white neighborhood as in a black neighborhood, and there are three times fewer local places to consume alcohol in wealthier neighborhoods.

It is a conclusion of the study that minorities and the poor living in the lower income neighborhoods have fewer choices for quality nutrition, and much less access to higher quality, more diverse types of food than those who live in higher income areas.

Mapping the evolution of 'food deserts' in a Canadian city: Supermarket accessibility in London, Ontario, 1961-2005

This Canadian study mapped the locations of supermarkets in London, Ontario, which is a smaller city. Utilizing a GIS, it was discovered that markets, which had

clustered more toward the center of the city in the early 1960s, had moved into the outskirts of the city, leaving a very visible gap in the center of 'downtown'. Forms of transportation were also investigated for the people living in this gap, and it was discovered that, while there are many bus routes throughout the urban core, a half kilometer walk to-and-from the bus stop to the store, and back was required; residents in that area had to walk farther to catch a bus, thus taking longer to travel to a supermarket.

Their conclusion, as in so many of these, is that more research needs to be done.

Access to Affordable and Nutritious Food—Measuring and Understanding Food Deserts and Their Consequences: Report to Congress

This was a response to a federal directive to study those areas with limited access to affordable and nutritious food. This study defined a food desert as a census tract in which a. at least one-third of the residents live farther than one mile from a grocery store in an urban setting or ten miles in a rural setting, and b. the poverty rate is 20% or higher and/or the median family income is 80% lower than the median income for the surrounding area. The study concluded that almost 60 percent of US counties contain at least one food desert. (Morris, 2014)

This is the report which was given to Congress in 2009. It comprehensively covers every county, socioeconomic status for those counties, and lays out the distance measurements of one mile walking distance in a city, and 10 mile driving distance to a quality source of nutrition as a reasonable distance in rural areas.

Starting with long-form census data on food buying habits, the researchers further looked at those areas where diversity of foodstuffs were not available, or were too far away from the participants in the survey. The study identified those areas which would be considered food deserts, and identified who was living in those areas: poor whites, minorities, and the elderly, and how they tended to get to market (type of transportation), and how long it took to get there. It also identified the locations of all larger sources of nutrition in which diversity of diet was available, and where they were located in relation to the identified food deserts.

This was a massive study, spanning several years from 1996 to 2009, gleaning data from the USDA's polling of market data to find out who was buying what at retailers, and where.

The researchers, as noted in earlier literature, lamented of not having a set form geographic nomenclature with which to work, and hoped that a uniform system could be implemented in the future.

An Analysis of the Relationship Between Food Deserts and Obesity Rates in the United States

A report published in 2014 which appeared, at first glance, to be a follow-up to the USDA's report to Congress. There are several differences. Because the report to Congress had both rural and urban data, Morris had to use dummy data for the urban measurements because the distances in an urban setting can be deceiving: straight line distance is not going to be the same as walking several blocks out of the way to get to the same location.

There are more obese people in rural locations than in urban settings; it's speculated that, as people tend to have to drive the longer distances to get anywhere in the rural settings, this could be a contributing factor. More minorities than whites live in areas considered to be food deserts, and minorities, by and large, tend to be on the lower end of the socioeconomic spectrum.

Because of the differing distance information in the original USDA study (rural vs. urban), there was no way to duplicate parts of the study; it was suggested that more study into standardized distance measurement be required, as well as creating a more uniform food desert identification system, especially across regions, to assist local policy makers and researchers in grants for further study and identification.

Finding Food Deserts: Methodology and Measurement of Food Access in Portland, Oregon

This report came out about the same time as the USDA ERS report, and some of this report provided input to the Congressional report.

The most interesting thing about this report is not that Portland, Oregon has food deserts; it's those areas where disadvantaged people live which don't fall into an area which, by definition of distance and socioeconomic status, would be labeled as food deserts. The people living in these areas are just as limited as those living in what would be considered traditional food deserts in regards to food choice, but would fall out of the purview of any study conducted strictly on the food desert model because they live nearer a market, or have more ready access to transportation.

Food Access Research Atlas

This is an online atlas which was built with the data from the USDA ERS report. It's been updated a couple of times as more data comes in from the American Community Survey. The measurements utilized in the original study are evident, but it doesn't appear that newer locations for supermarkets have been updated on the map.

'Food deserts' in British cities: Policy context and research priorities

This is a report which outlines how quality food, which is important to a healthy diet in a population, is very often not available in low-income families in poor neighborhoods across Britain. Since the late 1990s, debates about what are called the social exclusion and health inequalities regarding poorer populations cropped up, and policy was implemented by the British government. The problem was that the policies were implemented before proper study of the issue was fully carried out.

The UK research councils have funded research into 'food deserts', and it's hoped that the studies will eventually catch up to the policies.

Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit

This joint study by the American Public Health Association and the National Institutes for Health was conducted in 2005, looking at the overall health of people in different neighborhoods, their racial makeup, and the locations of the those neighborhoods in relation to supermarkets.

It was found that, irrespective of race, in those neighborhoods which were the least impoverished, that the distances were fairly uniform, markets being readily available. In those neighborhoods which were most impoverished, African Americans disproportionately were affected by distance from quality sources of nutrition.

Surprisingly, it was also discovered that, in those neighborhoods where supermarkets had been opened by whites before they fled the city center and had been taken over by African American managers, that remained open, the population of African Americans in the local area tended to stay at the middle class income range, so there is some speculation that economic development may occur to help sustain the neighborhood middle class demographic.

More markets are closing, however, than are opening. Seven markets have closed, and only one new one is opening, even though Detroit has a population of around 976,000 people.

The study closes with suggestions about the possibility of a metropolitan-wide food distribution system which could better serve the poverty-stricken populations, predominantly African American, in Detroit. Further improvements to mass transportation need to be implemented, and racial disparities need to be addressed.

Design and Implementation

What Constitutes a 'Food Desert'?

According to the USDA, a food desert is characterized by a lack of, or limited, access to quality healthy and affordable food within a census block. Access may or

may not depend on distance from a source of food, but may depend on financial ability to pay for food. There are several criteria which would appear in probable food desert areas, which are:

1. Lower income
2. Lower education level
3. Percentage of minority residents
4. Access to public transportation
5. Access to a privately-owned vehicle.
6. Distance from a supermarket
7. Numbers of abandoned buildings, and low-income housing

The USDA report also discovered that, irrespective of whether the desert was in an urban area or rural, the absence of a vehicle or other means of transportation, and distance to a source of available food, was a contributing factor to the association with food deserts. (Dutko, et al, 2012)

With the USDA's interactive map, it's possible to locate the various areas considered to be food deserts. This map, as was mentioned prior, was created in conjunction, or in answer to, the USDA report which was delivered to Congress; the map is interactive, allowing users to plot their location, and to evaluate their risk of being in a food desert. The map, because it has a fair amount of data resident on it (quite a few layers), tends to bog down because of bandwidth. Because there IS a fair amount of data, it's easy to get data overload; the layman looking at the map may assume that they live in an area in which they're fine, when in fact they don't live near enough to a supermarket to meet the cutoff. Or, another example would

be the largest borough in Montour County, Danville, Pennsylvania, which shows up as a medium risk area, because many of the people who would shop at the store live over ten miles away by vehicle, the shaded area, which is only about a mile across, actually has two supermarkets within walking distance. (Ver Ploeg, 2015)

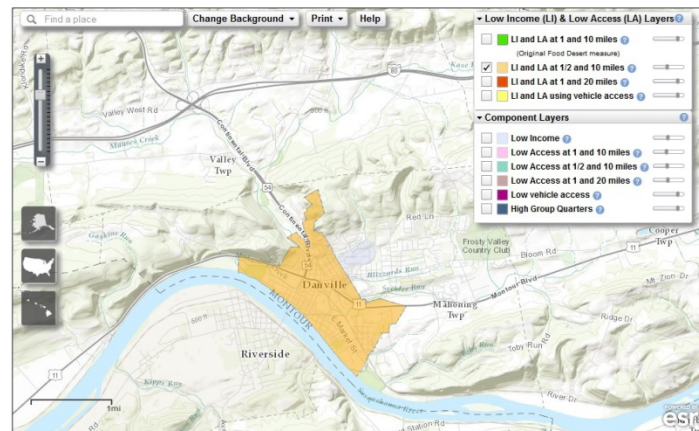


Fig. 1 USDA Website Picture of Food Desert in and around Danville, PA. (Ver Ploeg, 2015)

North American studies (Zenk et al. (2005), Larsen and Gilliland (2008), Apparicio et al. (2007)) have all come to common consensus that a reasonable distance to a food retailer is within walking distance. With this in mind, a food desert is a high poverty area (at 20% or higher) that has low or very low access to supermarkets.

The Problem

Obesity tends to cost a lot of money, not only to the individuals themselves, but also to the individual healthcare provider, to say nothing of the healthcare industry as a whole; according to a 2009 study, childhood obesity alone is responsible for over \$14.1 billion, and almost 21 percent of all current medical spending in the US is now obesity related. A large portion of this is paid for by Medicare/Medicaid, and it's estimated that the costs would be up to 12 percent lower if obesity wasn't

present. Increased costs and rates of disability are reported, which leads to reduced productivity. (Hammond, 2012)

Another problem with obesity is the increase in Type 2 diabetes. According to American Medical Association President Robert M. Wah, M.D., "Type 2 diabetes is one of our nation's leading causes of suffering and death— with one out of three people at risk of developing the disease in their lifetime." (AMA, 2015)

In a lot of urban areas, especially in the inner core of most cities, there is a singular lack of places in which the poorer citizens can buy quality food. It was first in the U.S. that the term 'grocery store gaps' was used to describe those poorer areas where retail grocery stores had moved out; this is termed "disinvestment." In the U.K., studies had been done which put the questions and research methods into sharper focus, namely lower socioeconomic status and walking distance to retail markets (Wrigley, 2002). In Canada, also, there has been growing concern, and newer studies on the subject of 'food deserts' (Smoyer-Tomic, 2006) and the growing cost of quality food. (Government of Canada, 2014)

Aside from the obvious health risks to the residents of these food deserts, there's also a toll on social services, the emergency services, to say nothing of the general well-being, mental and physical, of the neighborhoods themselves. There have been several studies on what makes a food desert, but there have been widely divergent inferences and methodologies in researching food access in various cities. One study showed a statistically significant and negative relationship between income, public assistance, car ownership (or lack thereof), access to public transportation, and the size of the supermarkets in individual zip code areas in 21

cities. The report states, in its conclusion, that, "... local market analysis of the grocery gap certainly is important and will provide needed more (sic) detailed information for local initiatives." This, after stating that, "... the percent of households with at least one vehicle for the rural poor is 87.16% for those with higher levels of public assistance and 92.42% for those in the lowest per capita income percentile. The averages are much higher than the 60.11% and 53.62% for the urban population on public assistance and lower income respectively." (Cotterill, 1995)

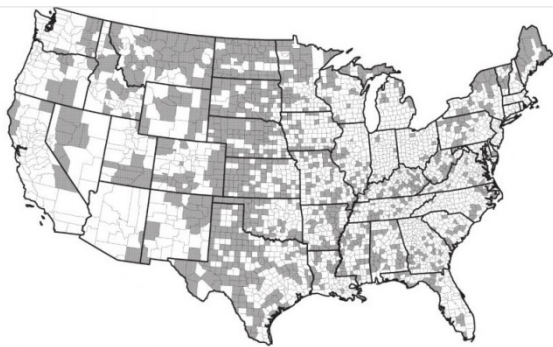


Fig. 2 Nonmetropolitan food deserts by county, 2000 (Hinrichs, 2007)

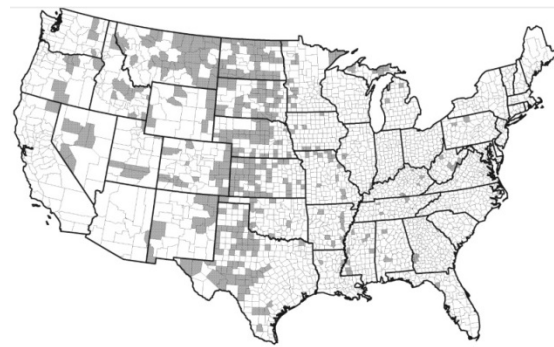


Fig. 3 Nonmetropolitan severe food deserts by county, 2000 (Hinrichs, 2007)

Because the distances listed, at least in the urban areas, are so widely varied – the USDA ERS did two different measures, one at ½ mile for urban and 10 miles for rural, another for a mile distance from markets in urban settings and 20 miles for rural areas, but then measured the all of the distances to the markets utilizing a half-kilometer grid system – my study looked at the distances in regard to how the USDA measured them ; it also looks at data on a county level to see how the USDA data, at least regarding the distances, stacks up

Even how the USDA ERS measured whether a county was considered to be rural or urban was different for the latest 2010 study. According to the USDA ERS website,

the centroid of counties was measured according to population on the earlier studies; if the majority of the population lived in a rural area, that's where the centroid appeared, thus the entire county was listed as rural. "For the 2010 analysis," the website continues, "the population-weighted centroid was used to designate a census tract as urban or rural. This should improve estimates of low-access tracts in areas with rural and urban overlap because it more accurately applies the urban 1-mile marker to urban areas and the 10-mile marker to rural areas. However, this change likely results in changes in the low-income and low-access status of some census tracts." (Ver Ploeg, 2015)

The USDA, in their original study, geocoded the locations of all sources of food in a county, in this case supermarkets. The USDA study broke down the distances into half-kilometer grids because they felt that this was a better measure of distance. In a marked difference, though, the researchers increased the size of the rural areas to 20 miles rather than 10 ten miles, indicating a willingness by some residents to travel farther than others. Because some of the studies utilized miles, I opted to utilize miles, but kept in mind the 10 kilometer distance, roughly 6.1 miles, as a secondary measure for the purpose of the study, and this is reflected in the maps.

Food Desert Study In Montour County, PA

Montour County is in north-central Pennsylvania; its northern edge is bounded by a spur of the Appalachian Mountains, and most of its southern border is the Susquehanna River. It has several small villages and towns, the largest being Danville, with a population just over 4,000 people. Unlike most towns in the region, which have been hit hard by the moratorium on coal mining and coal-fired electrical

plants, Montour county in general, and Danville in particular are hanging on, mostly due to Geisinger Medical Center, the major hospital for the central region; Montour county's economy is based on the hospital, a small women's prison, a state hospital, and farming. Roughly 65% of Montour county is arable land, the other 35% being rugged hills and mountains, and thick forests.

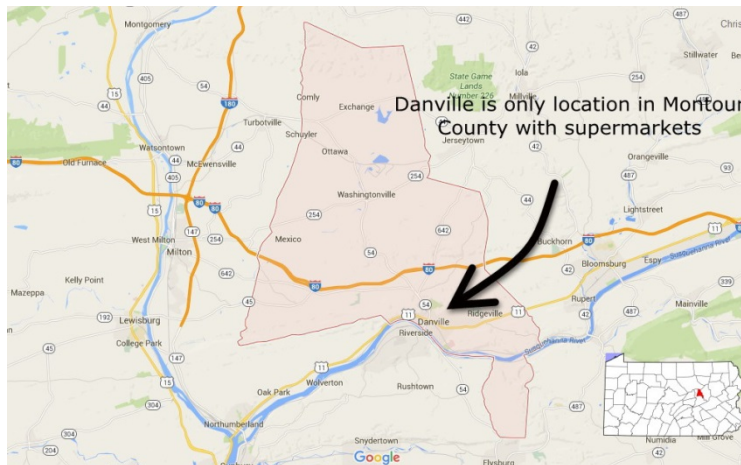


Fig 4 Montour County, PA (Source: Google Maps Inset source: Wikipedia)

There is an Amish population in the northern part of the county, but it's unclear how their presence affects how the government lists income and poverty because, while they pay taxes, their tax-base is relatively low, but they're not considered to be poor, or in need of quality sources of food; the areas in which they reside, however, are listed as lower income areas in Montour county.

Median Income

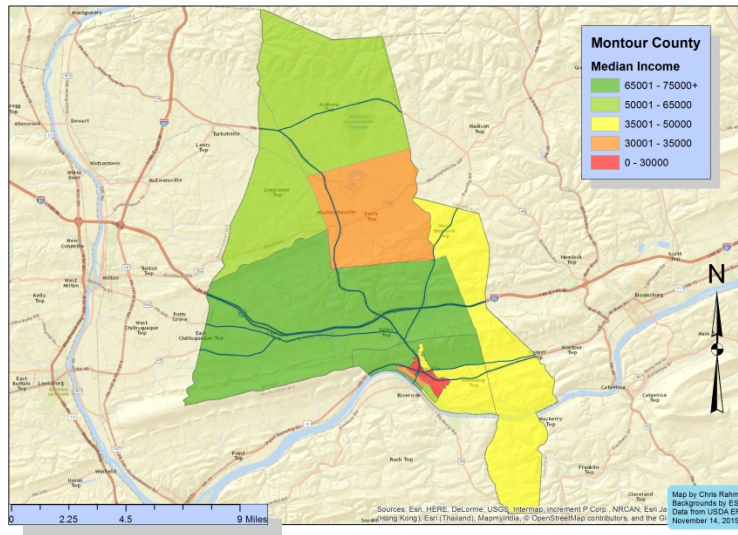


Fig 5 Montour County Median Income

The USDA ERS Measurements

The next maps represent those which were obtained from the USDA ERS website.

The first map, Figure 6, shows the low-income census tracts where people are more than a ½ mile (for the urban figure), and more than 10 miles (rural) from the nearest supermarket. None of the rural measures are in Montour County.

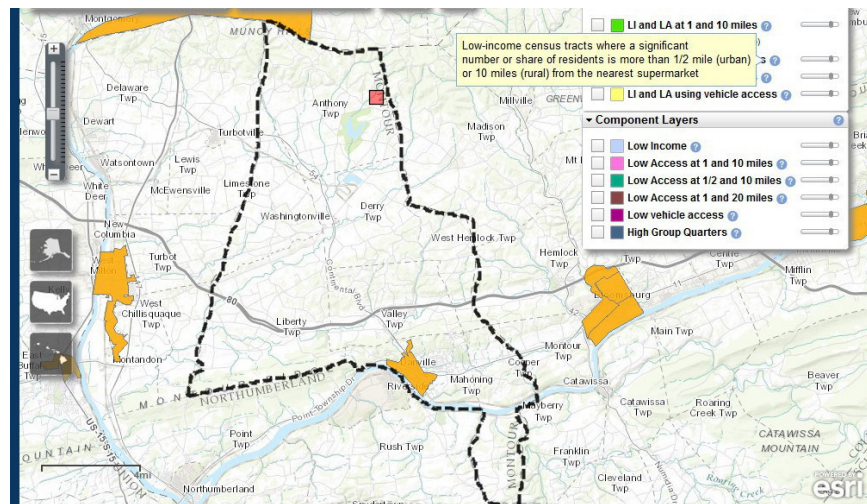


Fig 6 Census tracts where people are ½ mile or 10 miles away from supermarket. Source: ers.usda.gov

Figure 7 shows a slightly different parameter, with the closer census tracts being a mile away from a supermarket in the urban figure, while the rural mileage has increased to 20 miles to the nearest supermarket. It still shows those areas with lower incomes that are within ½ mile of a supermarket. The red square at the top of the county shows the rural centroid for the county. Again, none of the measurements show in Montour County.

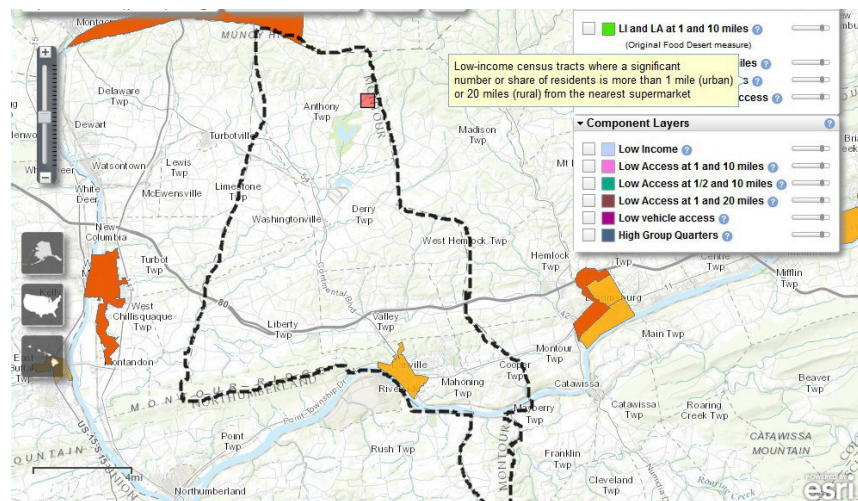


Fig 7 1 mile and 20 miles from supermarkets. Source: ers.usda.gov

Figure 8 shows those areas where a large number of households have little or no access to vehicles, or the residents live more than 20 miles away from supermarkets, and have low income. By the measurement here, anyone living in the yellow area would be listed as living in a potential food desert. It should be noted that only the area around the West Hemlock Township, not highlighted on the USDA map, does fall into a low-income area based on Census socioeconomic data, and will be shown to be outside the ten-mile road distance to a market.

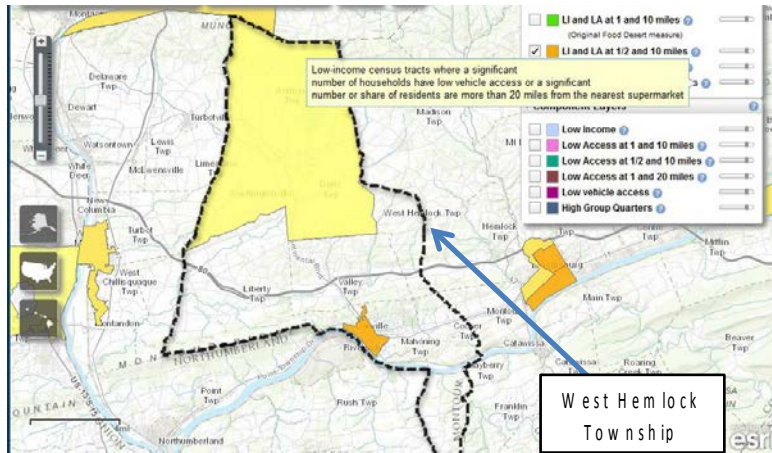


Fig 7 Low vehicle access, low income, residents 20 miles or more from supermarkets. Source: ers.usda.gov

Methodology

There are two supermarkets in the southern part of Montour County, and several in the surrounding counties: two in Columbia County to the east, one in Lycoming County to the north, and there are three in Northumberland County, which is to the west and wraps around Montour County to the south; Figure 8 shows the locations of the markets in their respective counties.

Market Locations

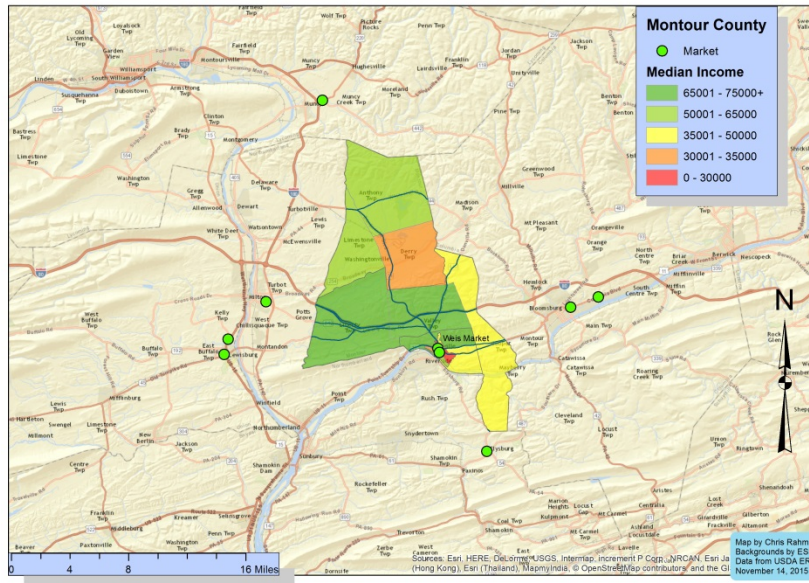


Fig 8 Distribution of Markets in Montour and Surrounding Counties

Because most of the county is measured as a rural area, 10 mile range circles are added to each market center, showing the distance inside of which a person could be expected to drive to a supermarket. As can be seen in Figure 9, some part of Montour County falls within the 10 mile range ring of at least one market.

Market Locations Ten Mile Ring

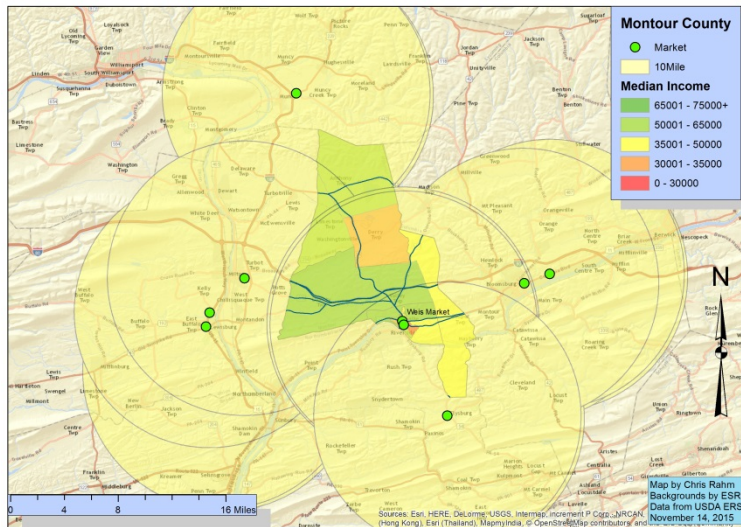


Fig 9 10 mile range rings around markets.

Because some of the studies from Canada and Europe mention a 10 kilometer distance, and because the USDA ERS study utilized a kilometer measurement for the rural measurements, that distance has also been factored as well in a separate set of range rings, as can be seen in Figure 10.

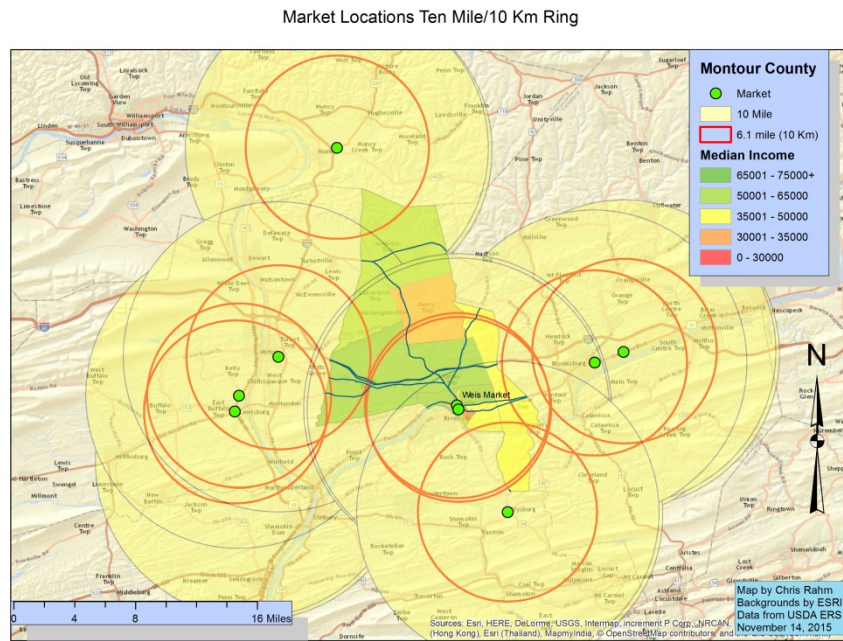


Fig 10 10 mile and 10 kilometer rings from supermarket centers

The distances for 10 kilometers do leave a gap in northern Montour County as is seen in the USDA ERS website data. However, neither the 10 mile nor the 10 kilometer distances are the true road distance which a resident would be traveling to get to a supermarket. "As the crow flies" distances don't tend to translate to line-of-sight in the mountains; ten miles apart on a map could very easily be twenty, thirty, or more miles apart by road. Utilizing the distance measurement tool, it's very easy to show how far 10 miles is by road. Figure 11 shows the 10-mile distance by road in north Montour County.

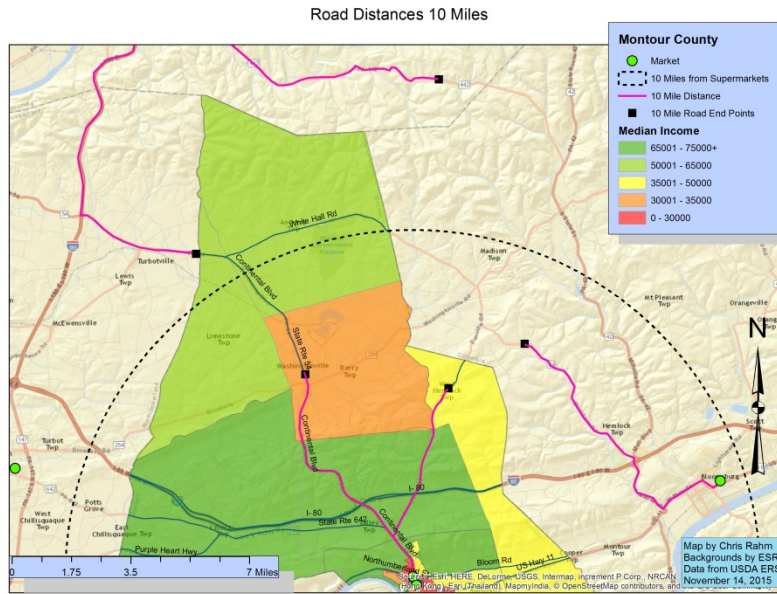


Fig. 11 10-mile road distances from super markets

As Figure 11 shows, the distances, in most cases, don't actually enter Montour County. In the case of the markets in southern Montour County, the road distances from those markets are far short of the edge of the 10 mile ring. This difference in distance could fundamentally change how and where food deserts are measured. Utilizing the 10 Mile Road End Points, it's possible to build a polygon which encompasses parts of northern and central Montour County, some of which matches the polygon on the USDA ERS website map, some of which doesn't match the USDA ERS map.

Results

Figure 12 is the built polygon, utilizing the end points at 10 miles in and around Montour County. Note that the area covered does not cover the entirety of northern Montour County as in the USDA ERS data map.

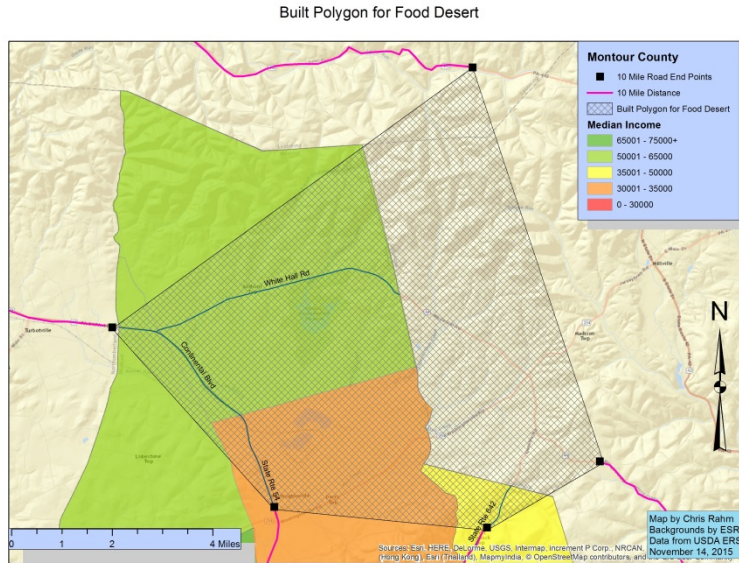


Fig. 12 Area built from 10 mile endpoints.

The stipulations of what make up a food desert in a rural area, according to the literature, is that it must have low income, must be more than ten miles from a source of quality nutrition, and/or the residents of the area in question must have limited or no access to either public transportation, or a privately-owned vehicle (POV). Utilizing those parameters, with the modified distances, and just using the Montour County lines, the modified polygon which now appears is much farther south than the USDA ERS data, and covers a much smaller area. For comparison, both maps are side-by-side in Figures 13 and 14.

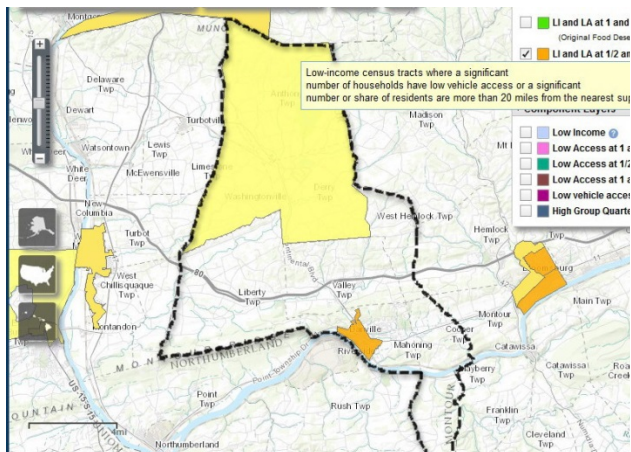


Fig 13 USDA ERS Data based on Census data and distance from markets

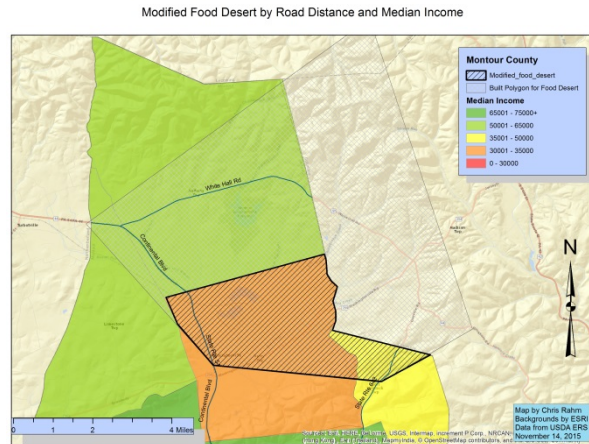


Fig 14 Modified Food Desert Data based on actual road distance

Discussion

As can be seen in the Montour County map, there may be vast differences in how the USDA ERS measures label an area as a food desert, when the reality of actual driving distance is something else entirely. In several of the studies, it's stated that governance needs to be done to standardize the measurements and nomenclatures are to be used, as well as units of distance. (Morris (2014), Sparks, et al, (2009), Dutko, et al, (2012))

While distances in Danville, PA, weren't observed, one study had much to say about methodology on possible best practices for delineating distances in urban areas: "... the computation of street network distances and the use of thousands of pieces of geographically detailed data can still be prohibitively expensive, either in terms of hardware or software purchasing costs, or in terms of staff time or expertise. We conclude that for the purposes of considering food access across urban areas as measured by distances to nearest stores, that the use of Euclidean distances and the use of relatively more aggregated census tract level inputs is likely to yield the same substantive conclusions as more resource-intensive methodologies." (Sparks, et al, 2009)

Areas for Further Research

Further research also needs to be conducted with other counties to observe whether the results are duplicable.

Geisinger Medical Center's Obesity Research Center has a massive store of data, most of it geocoded, which could be applied to conduct further research, perhaps with geostatistical analysis to discover where hotspots exist in relation to food deserts. Armed with this data, it might be possible to discover if there are other factors at work in areas identified as food deserts such as genetic differences in the population, environmental causes, variety of foods, or some other unknown agent.

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