# Redefining the Food Deserts in America

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## Abstract

In this paper, I seek to analyze current existing literature and USDA tools to identify gaps or overlaps in the identification of food desert areas based upon the trends regarding certain variables that could potentially have influence upon food security. This paper will then examine what further measures must be taken by academia and the USDA to properly address gaps in identifying areas in the United States currently experiencing food insecurity or possibly introduce new variables for future consideration.


*Keywords:* Food Desert, Food Insecurity, Food Environment, USDA.

**Introduction**

According to the Center for Disease Control, a food environment is "[t]he physical presence of food that affects a person's diet, ... proximity to food store locations, … distribution of food stores, foodservice...any physical entity by which food may be obtained, or [a] connected system that allows access to food." This means that the food environment a person resides in has direct effects upon their health. Food environments are also dependent on various socioeconomic and geographic factors such as car accessibility, a family's income level, and location. As a result, the identification of food environments that negatively impact residents have become priority in public health and policy-making as a way to address rising obesity rates and food insecurity levels.

The term "Food desert" was coined in Scotland during the 1990s as a description for food environments that do not have adequate access to affordable, healthy food (Beaulac, 2009). From that point on , it has become a buzzword in American public health initiatives and has spurred national campaigns such as Michelle Obama's "Let's Move!" and the Healthy Food Financing Initiative (Let's Move!). These programs have sought to reduce and or eliminate areas considered food deserts. The United States Department of Agriculture defines food deserts to be "at least 500 people and/or at least 33 percent of the census tract's population must reside more than one mile from a supermarket or large grocery store (for rural census tracts, the distance is more than 10 miles)." This definition focuses only upon distance factors and is different from the host of definitions used by academia. As a result, what may be classified as a food desert by the USDA may not be under a researcher's classification standards and the difference in definitions amongst researchers results in conflicting conclusions about the impacts of food deserts upon

health, etc. as findings are often "inconsistent" as Budzynska et al. note in their paper regarding Detroit food deserts and health issues such as obesity. To address this divergence of opinions regarding the classification of food deserts, I seek to combine a multitude of factors beyond distance to create a definition that is representative of academia.

## Literature Review

### Food Desert

In recent years, several terms have been developed to classify portions of the food environment, such as food deserts, and more recently food swamps in an effort to understand the correlations these environments have upon one's health, socioeconomic status, and other sociological measures. This research is based upon the idea that the environment has an effect upon behaviors related to health and consumption (Farley et al., 2010). As previously stated, the use of "food deserts" as a classification term stems from research done by Cummins and Macintyre during the 90s (Wright, 2016) and since then has evolved into a powerful tool to label areas that are lacking in access to food and proper nutrition. Research, especially in the United States, within the past decade has mainly focused upon properly identifying these food deserts and analyzing the prevalence of conditions such as obesity or the area's proximity to fast food restaurants. Even though current research indicates a correlation between residence in a food desert and obesity, causation cannot be properly determined due to many influences present in these environments. Dr. Diez Roux, an epidemiology expert who has written extensively on this topic, asserts that this is a result of a focus on cross-sectional data, which does not consider temporal differences (Whitacre et al., 2009). This is especially seen in the dearth of longitudinal research available on the long term effects of living in a food desert.

The Food Environment

Although the focus of my research is upon food deserts, it is important to understand the bigger picture –the food environment. This is especially important because research in this field is turning towards addressing the issues associated with the environment and addresses complex influences upon food consumption. Research has begun to focus on the multi-dimensional method of analyzing food environments because of the need to address singular factors outside of geography and other traditional measures (Rose et al., 2010). Factors such as shelf space for healthy foods, where consumers are most likely to shop, the variety of foods available, access to a car, time constraints, etc are also considered. The food desert is just one of several terms used to classify the food environment; other terms have also been identified as a result of food environment research. These other food environment descriptors can also use these factors that could potentially affect future food desert research. Additionally, a comprehensive study found that twenty-one out of the twenty-six papers they analyzed after a stringent screening process showed "at least one positive association between the food environment exposure and diet outcome (Engler-Stringer, 2014)."

Aside from food deserts, there is growing concern over the existence of food swamps. Food swamps are areas defined as having a high amount of unhealthy energy dense foods available as opposed to a food desert, which measures the lack of access to fresh, healthy food in general. Some research has shown that access to such high energy dense foods is at least triple that of healthy food options such as confections or chips (Rose et al 2010). Additional efforts to measure and account such influences have been made with the development of the Nutrition Environment Measures Survey. The food environment is multi-dimensional because it looks at

"community nutrition environment (e.g., location and accessibility of food outlets), consumer nutrition environment (e.g., price, promotion community nutrition environment (e.g., location and accessibility of food outlets), organizational nutrition environment (access to food in other settings...), and information environment (marketing, media, advertising)" (Engler-Stringer et al. 2014). Additionally, a comprehensive study found that twenty-one of twenty-six papers demonstrated "at least one positive correlation" between the food environment and diet (Engler-Stringer et al. 2014).

Accounting for these influences and food swamps will be important for future research in mitigating and identifying food deserts. If you look at one of the definitions of food deserts used by the USDA, "[t]o qualify as a "low-access community," at least 500 people and/or at least 33 percent of the census tract's population must reside more than one mile from a supermarket or large grocery store (for rural census tracts, the distance is more than 10 miles)," the definition addresses distance and wealth as these areas are low income census tracts. This interpretation of what constitutes a food desert does not address issues such as areas that have access to a supermarket within said distance but does not account for the cost of healthy food, at risk age groups, or the abundance of unhealthy food sources such as fast food. This failure to address such factors is remarked upon by Sparks et al regarding the issue, "[i]f the ... elderly or those lacking automobiles are vulnerable... but are spatially dispersed in higher income areas" the definitions used academia would fail to identify these people as living in a low access area. It is important to note that the "higher income levels" are those whose census tract has less than twenty percent of their tract labeled as poor.

Identification of Food Deserts

Sparks et al. identifies food deserts in the Portland area by using several methodologies. One such methodology uses the Euclidian distance, which is measuring the distance from the supermarket to the census tract. An additional measure could be the Network distance, which measures using the shortest path of travel, is used as an alternative to the Euclidian distance (D' Acosta, 2015). Accessibility is another factor that differs in existing literature; accessibility can be measured by proximity used in several studies by Mari Gallagher in 2008 and Apparicio in 2007, whereas, density is used in studies done by Charreire et al. in 2010. Other factors that impact the identification of food deserts include "acceptable travel distances, grocery store size and quality of food" as identified by Jenora as some of the indicators used by other prominent researchers in the field. Although these factors have been identified as influences, the variance across identification methodologies occurs due to the varying ways to measure them i.e.1 km buffer zones versus 5 km buffer zones or allowing a convenience store to count as a grocery store. As a result, the way one researcher defines a food desert is different from another's definition. This issue is best exemplified by a study done by Diego Rose, a professor at Tulane University. In his study he shows that based upon the inclusion of convenience stores as part of the grocery store availability factor areas previously designated as food deserts would not qualify as a food desert using the new data set (Rose, 2009). Therefore "controversy and criticism… [regarding a] lack of definitional and methodological consistency" has made it difficult to address the existence food deserts (Bedore, 2013).

After learning about food insecurity and the role the food environment in our decisions, food choices, health, etc., it became important to me to research negative food environments, especially food deserts, in order to address food insecurity. Food insecurity does not discriminate

against the urban or rural populace, insecurity is contributing to a growing obesity and diabetes epidemic and reinforcing socio-economic disparities in each of these areas (Hung, 2004). Several papers I have read have mentioned that there is a lack of a defined and consistent definition or methodology for identification. If in academia there is no standard procedure, how can policies be effectively applied to these areas if identification is conflicting amongst researchers? While the solution does not entirely rest upon the elimination of food deserts, beginning to create or identify portions of a rigorous definition will at least allow consensus and reflection on the multivariate nature of the field. Once trends are identified and comparisons between academia and the USDA are made, it will become more clear what should be analyzed when it comes to food insecurity and the influences the food environment has upon it. This leads me to ask three questions: 1) Is the USDA definition for the identification of food deserts adequate? 2)How does this definition compare to the definition used by academia? 3) What changes should be made to more accurately identify food desert areas?

**Methodology**

The issue of food insecurity is one that falls upon federal, state, and municipal governments which imposes a responsibility to identify areas that are at the most risk for experiencing food insecurity or already are classified as highly insecure. While the federal government has developed tools that identify such areas, there remains a lack of consistency in research regarding how these areas should be identified as food insecure as previously established in my literature review. Currently the United States Department of Agriculture's Economic Research Service has created the Food Access Research and the Food Environment Atlas to address and identify areas of low income. While the Food Access Atlas only focuses on

access based upon income, proximity, and transportation, the Food Environment Atlas also looks at other variables that will be discussed in my results and analysis section. The degree to which certain parameters used in these tools compare to what parameters various studies in the field have used or have yet to analyze in food desert identification methodologies. Additionally, there remains the issue of what exact socioeconomic, demographic, health/diet, and food related variables should be used to identify areas with low access.

In order to answer these questions, I have chosen to conduct a percentage analysis of socioeconomic, demographic, and other variables used by my sample set of papers to determine what trends are visible in academia and a comparison analysis to determine how well the USDA utilizes variables. The use of percent distribution to analyze prevalent socioeconomic and other variables is similar to the methodology used by Charriere et al. which analyzed other trends in food desert studies field using this method of analysis to determine which GIS technologies and proximity or distances were more prevalent in academia.

These variables were chosen for analysis as it has already been noted in various literature that there are trends in the methods of GIS (geographic information system) distance analysis. For example, Charreire et al. identified that a buffer, a defined zone, was most commonly used in GIS approaches in their own study. To my knowledge, a trend that has yet to be analyzed in depth amongst food desert and food environment literature is regarding the previously identified covariates in existing literature and how it compares to the USDA's measurements of low access areas. Using the identified trends amongst academia will allow me to ascertain if the USDA is addressing variables that have been used by at least a certain number of the obtained academic papers (around ten percent) which is at least four papers. I use this percentage as a threshold to

indicate significance as a result of my small sample size so as to not minimize the importance of these variables. I have chosen to approach the process of determining such trends amongst the literature, by using specific papers previously identified by two sources, written by D'Acosta and Charriere et al respectively. The reason I have chosen to use papers previously identified by two other sources is because they have already conducted extensive literature reviews whose purpose was to identify papers that explicitly reference food deserts and methodologies used to identify associations with certain variables. Another reason for combining their respective lists was to create, to the best of my ability, a list of papers that is representative of current and past literature regarding the topics of food deserts, food environments, and food insecurity. These papers have been identified through specific databases that collect peer reviewed papers and scholarly articles such as PubMed, PsychInfo, etc. which ensures the papers obtained from my own search and those from the sources mentioned previously are related to my field of inquiry.

Further modifications will be made to these data sets to examine variables that not been analyzed, for example, only looking at the covariates rather than what type of GIS model was used in each paper. I have also set a criterion that papers in my data set obtained from D'Acosta and Charriere do not focus on the United States in their studies will be excluded from the sample. The rationale for this exclusion criterion is based upon the nature of my inquiry regarding food security identification in the United States. Literature that identifies food deserts in other countries should be excluded in this case as a result of inherent differences such as data aggregation census tracts in the United States versus the census meshblocks in New Zealand, a unit of data aggregation unique to that area. To add to the previously identified data, I have obtained nineteen papers through my initial search for literature regarding this topic that will be

added to the current pool provided they are similar to the other papers. Exclusions from this set of papers will be based upon duplicate papers, whether they pertain to the United States, or if they do not pertain to the actual identification or analysis of food deserts and the environment.

When I complete my data analysis and have calculated the percent distributions for each parameter that has been identified, I will then create a list of the most common variables used. A small section of the papers I have analyzed is available in Table A which demonstrates what variables I have obtained from this review. Using this list, I will compare it to variables used by the USDA Food Access and Food Environment Atlases to determine how well they align. Once the alignment has been established, I will then analyze what factors need to be addressed by the USDA and/or academia and provide a rationale for more focus on underrepresented variables.

**Results**

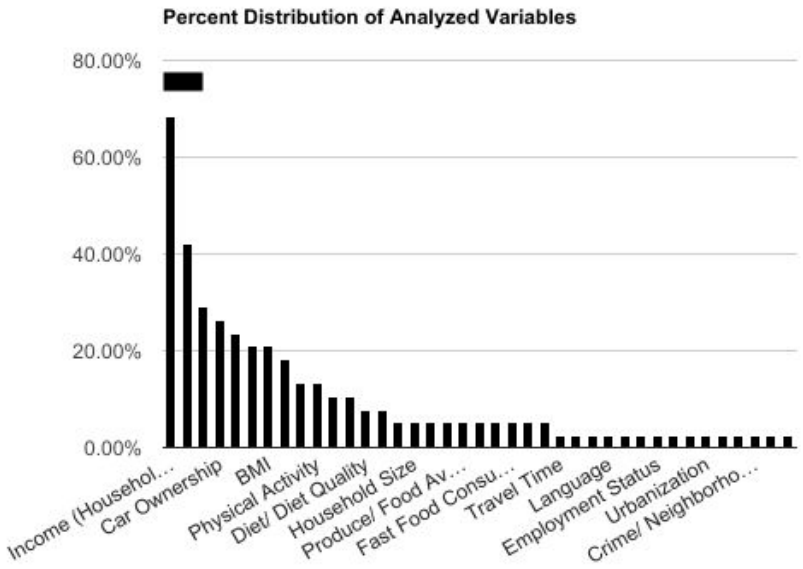
Once the exclusion criterion was applied to the set of papers obtained from the two sources written by D' Acosta and Charriere et al, the data set was reduced from an initial sample of seventy-two academic papers to forty-five papers. Then the lists were compared to remove duplicate papers from the combined list, and as a result, 30 unique papers were identified for my analysis of the various socioeconomic and demographic variables used to identify food deserts and other related food environments. From the set of nineteen papers identified during my initial literature review process, eight papers were identified as unique from the papers identified from D'Acosta and Charriere et al. and followed the exclusion criteria.

The Food Access Research Atlas and Food Environment Atlas Interactive Maps were used to identify variables used by the United States government as identification factors for "food deserts" or areas of low access. The variables obtained from these two atlases will serve as

representatives for comparison as to my knowledge these two atlases are the only sources that detail which variables are currently analyzed as indicators of low access areas. The variables observed from the government sources are as followed: low income, car access, minimum population threshold (five hundred people or a significant percentage), food sources (grocery stores, supercenters, convenience, specialized, SNAP and WIC authorized, fast food and full service restaurant expenditures and prevalence, other local food sources), ethnicity, diabetes and obesity rates, food cost and sales tax rates of milk, soda, etc. and food assistance data. These are the categories identified by the USDA and amongst those categories are the variables that will be taken for a comparative analysis. It is important to note that these variables were not an inherent part of the definition the USDA used in identification but were looked at in conjunction in areas that were identified as low access, which does pose some limitations to the robusticity of the definition.

From the final data set of thirty-eight papers, thirty-nine variables were identified: income, race or ethnicity, car ownership, marital status and single parent homes, age, BMI, population and population density, gender or sex, education, poverty level, physical activity, food intake and consumption, health related, diet or diet quality, cost and quality of produce, occupation, household size,etc. A comprehensive list with all percentages can be found in Table B in Appendix I.From my analysis, it was observed that twenty-six papers out of the thirty-eight analyzed used income as a covariate in their studies. Other variables that were predominately used by academia were ethnicity and race, population, car ownership, age, gender, BMI (body mass index), education, poverty level, physical activity, food intake, and health related variables excluding BMI. These variables were identified as the most commonly used as more than ten

percent of papers used. Some papers used a predetermined index; these indexes such as the Deprivation Index uses a predetermined host of socioeconomic variables to characterize a possible food desert with a value that can determine whether it is low access.




Graph 1: Histogram of Variables Identified

Table A: Sample of Papers Analyzed

| Paper name | Location of Study | Socioeconomic and Demographic Variables |
|---|---|---|
| Anthony & Lee (2010) | Los Angeles | Income |
| Austin et al (2005) | Chicago | Income, |
| Baker et al (2006) | St. Louis | Income, Race |
| "Baltimore..." (2010) | Baltimore | Income, Car Ownership |

| | | |
|---|---|---|
| Block & Kouba (2006) | Chicago | Affordability and Quality of Produce, Car Ownership |
| Block et al (2004) | New Orleans | Income, Age, Food Intake, Education Level, Job |
| Bodor et al (2008) | New Orleans | Food Intake, SES( income, education, occupation, produce availability) |
| Burdette et al (2007) | Cincinnati | Age, Gender, Income, BMI, Household Size, Crime |
| Coombs et al (2010) | Madison | Income, Car Ownership, Race |
| Community... (2010) | Prince George's County | Income, Car Ownership, Population |
| Eisenburg & Silcott (2010) | Franklin County | Income, Car Ownership, Population |
| Frank et al (2006) | Atlanta | Walkability, Income, Food Quality and Cost |
| Gordon et al (2010) | New York City | Income, Ethnicity |
| Jago et al (2007) | Houston | Ethnicity, Education, Age, BMI, Produce Availability at home |

When comparing the variables identified in Table B to the variables analyzed by the two USDA Atlases previously mentioned, it was found that the variables used by these atlases were also used by academia. The Food Access Research Atlas determines low access areas as those

"[t]racts in which at least 500 people or 33% of the population lives farther than … mile (urban) or … miles (rural) from the nearest supermarket." Using this definition, the Food Access Research identifies low access areas with a significant population that are also low income, have low vehicle access, and high group quarters. As a result, two of the three variables used by this specific atlas are reflected in the variables used by academia,whereas, the base definition identifies distance and population as factors. From the Food Environment Atlas, the variables that are unique to this atlas include: store availability, expenditure at fast food and restaurants, food prices for certain items, sales taxes for certain items, health and physical activity, and race. Race, health, physical activity, store availability and food prices are variables that correlate with academia. Although to a certain extent, the food prices used by the USDA are limited compared to the food prices examined by other literature.

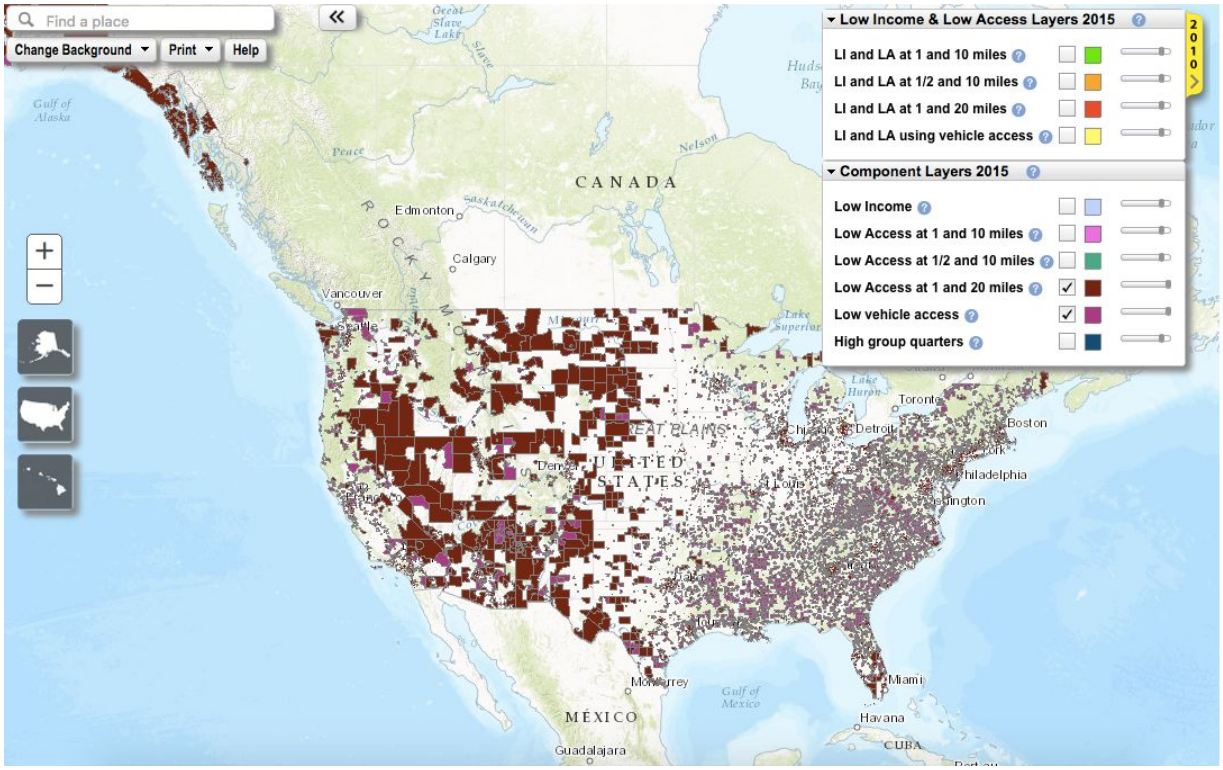



Image 1: Screenshot of Food Access Research Atlas

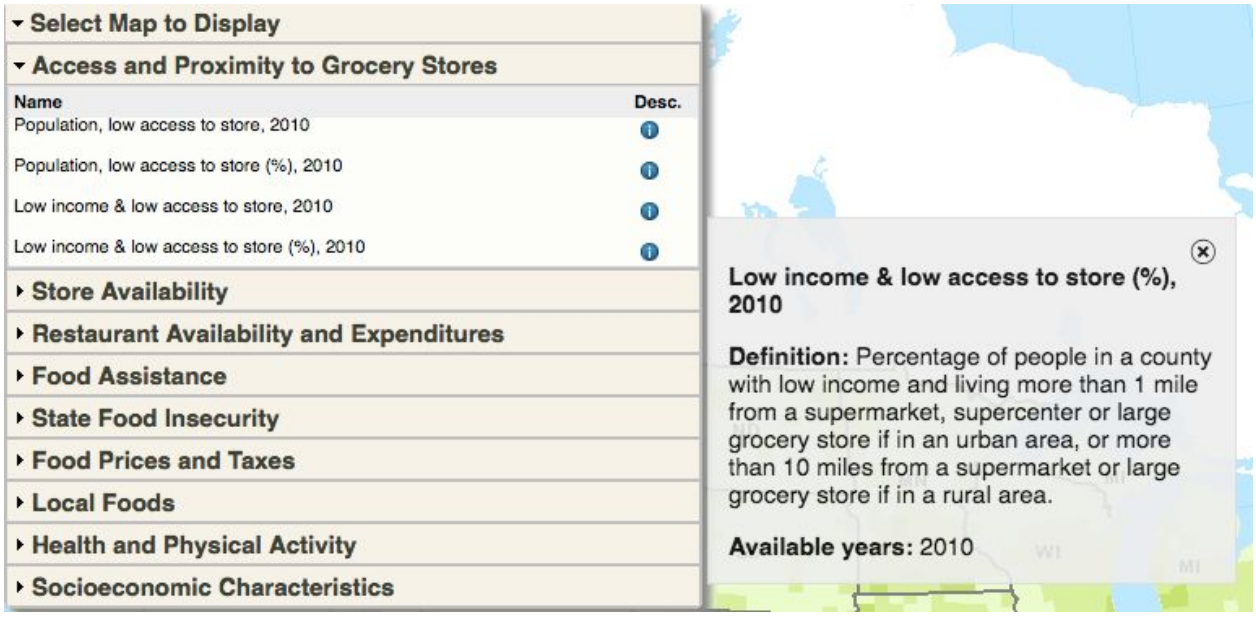



Image 2,3,4: Screenshots taken from the Food Environment Research Atlas

In comparison, only a few variables used by the Food Access Research Atlas and Food Environment Research Atlas were not amongst the most commonly used variables, for example, fast food and restaurant expenditures is a variable unique to the atlases as in academia expenditure is focused on how much is spent on certain foods or on the entire diet. Additionally, store availability, as in all possible food purchase points, is only used by 2.63 percent of papers in my analysis, whereas the USDA looks at several food purchase sources. Other variables such as income, race, population, and car ownership were the most common, respectively 68.42, 42.11, 28.95, and 26.32 percent of papers utilized those variables. Overall, combining all the variables analyzed by the USDA, seven of the ten unique variables used by the atlases match those of academia.

**Discussion of Results**

Out of thirty-eight papers, thirty-eight variables were extrapolated from my review excluding the one paper that used no variables. Out of these variables, ten unique variables were obtained from the combined atlases for further comparison. The USDA has done well in identifying and using the four most common variables in their identification process. This indicates that the USDA recognizes that these variables have some impact or at least a strong correlation with food access and the food environment. The USDA also uses different proximity distances in their atlases which echoes the different proximities used in academic papers which demonstrates that they are keeping up with trends in academia. Despite this it is important to note that while the USDA has collected and analyzed these variables, the actual definition of low access used by the atlases remains limited to just population, car access, and proximity to a supermarket. This exclusion of other variables from the definition creates possible limitations in identification as the atlases look s at these variables such as diabetes and obesity rates independent of their low access maps rather than as covariates as academia does. Other variables such as food costs and sales taxes are observed for only a small selection of items that show costs for products such as milk, sodas, and salty snacks do not necessarily display the impact these prices have upon areas with low access to healthier foods nor does it analyze the cost of healthier foods and impacts it has upon food expenditures in relation to household income levels. It is important that costs of healthier foods be analyzed as the basic definition identified in academic literature describes food deserts as areas of low access that do not have access to healthy foods or at least sources that will provide those foods. Additionally, in the Food Environment Atlas the maps of different variables cannot be overlaid with the map of low access to see possible overlaps. While it important that the USDA is looking at these variables, a more in depth

analysis of how these variables impact areas of low access would be beneficial. Also, the USDA could also stand to identify more variables for further analysis while including these variables to create a more nuanced definition.

Going back to academia, I was not surprised to discover that there was a significant amount of variables that have been analyzed as previously mentioned that there are significant methodological and definitional differences from paper to paper. Although, my results demonstrate how certain variables have a significantly higher amount of representation than other variables that potentially have equal importance as the most commonly used variables. This is exemplified by how fourteen of the thirty-eight variables have only been used by 2.63 percent of papers and only ten variables have been used by 5.26 percent of papers. Of those variables there are some that should be considered for future inclusion in a food desert definition or methodology for academia and the USDA. For example, variables that should be considered in identification of low access areas are walkability and travel times, especially, in urban areas and areas where transportation via car is more difficult. From their paper published in 2012, Jiao et al. explains how travel time restrictions of ten minutes "more than 89% of low-income individuals were beyond the distance of low-cost supermarkets." Walkability is another variable that has potential implications for at-risk age groups, the elderly and children, and those whose mobility is limited due to health issues who do not have adequate access to public transportation. Rather than measuring distances using the Euclidian method, it would be more practical to measure distances based upon average travel times. Another variable that merits consideration is the use of a price or market basket, this means that food expenditures for groups of products can be analyzed using the Consumer Price Index (Bureau of Labor Statistics). This could allow more

foods such as produce and other healthier items to be analyzed for continued impact upon consumer spending and whether the costs of such foods exceed the ability for someone to pay for it. Using a market basket as determined by the Consumer Price Index would also augment the food prices already used by the USDA. Using this variable would also allow researchers to compare the prices in local stores to determine how much more expensive healthier foods are as was done by Chambers and Grauel in their Oregon food desert study.

**Conclusion**

While creating a consistent definition for food deserts will remain difficult due to its multivariate nature, a determination can be made as to what should be done by the USDA and what variables should be given further consideration. First a definition must include the following variables: Income, Ethnicity/Race, Population, and Car Ownership. These variables were the four most commonly used in academia and the USDA has analyzed these variables, therefore, it would be prudent that a definition should include these variables within it. I also suggest variables that should be included within a definition and they are BMI, Poverty Levels, Physical Activity, and other variables present more than ten percent of the time. I would recommend the USDA take further steps to redefine what it means to be low access. Rather than limit the actual definition to only a few variables such as population, consider other variables such as cost and quality of produce which influence consumer spending. Unconventional Variables such as crime and neighborhood stability can also potentially affect access to grocery stores. For example, if there is a neighborhood of high crime rates the times in which someone could go to a local supermarket would be restricted in areas of instability. Overall a more nuanced definition is required, one that at least reflects ethnicity or race (in terms of

disproportionate lack of access), population, car ownership, age, gender, BMI, education, poverty level, food intake/ consumption, and health related variables as these are the more dominant variables present. These suggestions should also apply to academia as the collection of variables used is different from study to study and as a result creates confusion and adds to the vagueness in the field. Additional variables should be added as further research is done to determine further implications, whereas, the other variables identified by my analysis should be given further consideration to make the definition more practical and useful in identifying low access areas. The more nuanced of a definition the more precisely such areas can be identified for future policy and funding decisions.

**Further Research**

The future of food desert research lies in creating a definition that can meet the consensus of the academic community. Research needs to be done to determine exactly what variables can be used to accurately determine areas of low access and which ones do not really have much correlation. Additional work by the USDA to create more nuanced overlay maps can also aid in this endeavor to create a more clear image of where these areas of low access are located. While my work has introduced a list of potential variables to draw upon for a more coherent definition, there remains more work to be done in properly defining what specific characteristics these variables need to adopt and types of data will need to be collected for future research. As long as research continues to focus on identifying more variables and confirming their impacts upon the existence of food deserts through additional case studies, definitions will be able to more accurately set consistent criterion, therefore, more work can be done towards more effective

policy decisions. Policy decisions will then be able to target specific issues such as improving access to affordable and regular transportation.

**Limitations**

As with any research conducted, I have encountered various limitations. Initially, my research question was oriented towards the implementation of a combined definition in a case study in order to compare the efficacies of an academic definition versus that of the USDA. As my research process began, I discovered that literature has begun to identify trends in certain GIS methodologies used in identifying food deserts. As a result, I had to shift my research to identify trends in a niche area of food desert identification: the specific variables used as covariates. In order to determine this, I would have to do a literature review to properly analyze trends. Due to the lack of access to research databases, I had to use my initial literature review and the literature review lists from other credible sources to create as comprehensive a data set as possible. Additionally, I experienced time limitations in which if given more time I would create various test methodologies and apply them to various food desert cities to determine sensitivity and compare them to the sensitivity of a definition created from my suggestions. Further research in this field would allow for this to occur and with increased knowledge about the various covariates used researchers can determine exactly which definitions are adequate for inclusion in a more cohesive definition.

Appendix I

Table B: Percentage Distribution of All Analyzed Variables (n= 38):

| | |
|---|---|
| Income (Household/no qualifier) | 68.42 % |
| Ethnicity/ Race | 42.11 % |
| Population/ Population Density | 28.95 % |
| Car Ownership | 26.32 % |
| Age | 23.68 % |
| Gender/Sex | 21.05 % |
| BMI | 21.05 % |
| Education | 18.42 % |

| | |
|---|---|
| Poverty Level | 13.16 % |
| Physical Activity | 13.16 % |
| Food Intake/ Consumption | 10.53 % |
| Health Related | 10.53 % |
| Diet/ Diet Quality | 7.89% |
| Cost &/ Quality of Produce | 7.89% |
| Occupation | 5.26% |
| Household Size | 5.26% |
| Walkability | 5.26% |
| Price/Market Basket | 5.26% |
| Produce/ Food Availability | 5.26% |
| Marital Status/ Single Parent | 5.26% |

| | |
|---|---|
| Deprivation Index/ Neighborhood Socioeconomic Environment Index | 5.26% |
| Fast Food Consumption Frequency | 5.26% |
| Proximity to Highways/ Roads | 5.26% |
| Modes of Transportation | 5.26% |
| Travel Time | 2.63% |
| Food Purchasing Habits | 2.63% |
| Access to Food Storage/ Cooking Areas | 2.63% |
| Language | 2.63% |
| Migrant Workers | 2.63% |
| Shelf Length | 2.63% |
| Employment Status | 2.63% |
| Food Expenditure Index | 2.63% |
| Student Body Size | 2.63% |
| Store Availability | 2.63% |
| Urbanization | 2.63% |

| | |
|---|---|
| Perception of Food Availability | 2.63% |
| TV watching time | 2.63% |
| Crime/ Neighborhood Stability | 2.63% |
| Median House Value | 2.63% |
| None | 2.63% |

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