Food Insecurity In America

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Abstract

The United States Department of Agriculture produces an annual Food Environmental Atlas dataset that records more than 275 variables related to food insecurity in the United States at the county level. With an interest in food insecurity as a measurement of population health, we investigated the links between socioeconomic status, age, and location nationally and in Washington state at the county level to assess differential access to food in the United States. In our analysis we find that there is no one socio economic factor that we can use as the major cause of obesity, that counties in Eastern Washington state face the least amount of access to healthy food, and that adults suffer a statistically larger impact than children and seniors as independents responsible for their own meal intake and financial income.

Introduction

According to Feeding America in 2017, 1 in 8 Americans were food insecure, which equates to about 40 million people including 12 million children. Being food insecure is defined by the US Department of Agriculture as "lacking reliable access to a sufficient quantity of affordable, nutritious food" [4]. Food insecurity does not only affect those who are homeless or low-income, but it impacts many other populations like seniors, children, people who live in rural communities, African Americans, and Latinos. There are also many people who live above the poverty line who still experience food insecurity too. With some basic knowledge and understanding of food insecurity, we wanted to analyze a few specific variables to understand this issue more. This analysis will be guided by these three questions: is adult obesity rate linked to socioeconomic status,
does food insecurity vary by age, and
in Washington what counties have the least amount of access to healthy food?
To answer these questions we used data from the United States Department of Agriculture that looks at food insecurity and different variables such as socioeconomic characteristics, store and restaurant availability, food insecure population by age and more. This set provides data about these variables for each state in America and also within each county.
To help those who are impacted by food insecurity, the government created programs like the Supplemental Nutrition Assistance Program (SNAP), the Women, Infant, and Children Supplemental Nutrition Program (WIC), and the Senior Farmers

Market Supplemental Nutrition Program (SFMNP) which provide grocery or cash vouchers to those who qualify. About 13% of the US population participates in these government programs and the research conducted in this report can help define that demographic more in detail. Analyzing the groups of people who are most impacted will provide evidence to government officials and policymakers make future decisions about the efforts to decrease the population impacted by food insecurity.

Related Work

In the realm of food insecurity in America, we are in no way the first to analyze available data. Companies and institutions like The State of Obesity, the Centers for Disease Control and Prevention, and Frontiers in Medicine are among some of the leading institutions performing research in this area, many of which have already provided great insights on food insecurity in America. Frontiers in Medicine, for example, published a paper in 2018 reporting that “among older adults [individuals ≥65 years of age], 23% were living in a food-insecure household,” and that “the odds of having a chronic disease were also greater among individuals living in food-insecure households” [1]. Related to this work, the Journal of the American Geriatrics Society published a paper in 2018 reporting that “8.3 percent of American households with a family member aged 65 or older and 9.2 percent of all older adults experienced food insecurity,” [2]. We find the analysis from these two papers intriguing and wonder what this relationship looks like at the Washington state level.
The final related work we consulted before beginning our analysis was from the Centers for Disease Control and Prevention. In 2010 they published a paper analyzing key findings from 2005-2007 dataset they released, observing a few notable trends. The finding we wanted to dig deeper into was that “among men, there is no significant trend between education level and obesity prevalence, and among women, obesity prevalence increases as education decreases,” [3]. We were again curious if this trend is true within Washington state and analyzed this within our report.
From the previous research we were able to narrow our scope into the aspects we find interesting. Through our analysis we wanted to answer the questions: is adult obesity rate linked to socioeconomic status, does food insecurity vary by age, and in Washington what counties have the least amount of access to healthy food?

Methods

The data used in the analysis was collected through the United States Department of Agriculture as a part of their *Food Environment Atlas.* The data was collected from U.S. Census Bureau as a part of the 2010 census, Centers for Disease Control and Prevention as a part of the Behavioral Risk Factor Surveillance System (BRFSS) for 2008-2010, ERS estimates using 6 years of data from the Current Population Survey Food Security Supplement, and the USDA's Food and Nutrition Service, Supplemental Food Programs Division.
To analyze the link between socioeconomic factors and obesity, we calculated correlation coefficients to see the linear dependence of obesity and various socio-economic factors, then plotted linear regressions to see how strongly states, and counties would follow the trends. Due to data constraints the data for obesity rates,

and the various socio-economic factors were collected two years apart, however, we decided to still compare the data sets against each other due to rates and proportions of various indicators staying fairly stagnant when comparing their data across the years.

To analyze food insecurity by age we broke down levels of poverty by age groups and then cross analyzed that data with data on the number of individuals, families, and children that experience food insecurity. To get a general analysis of food insecurity on the national level we averaged the amount of people with low access. However, to get a more detailed and insightful analysis we approached the data through ratios of the national averages in comparison to view the trend and correlation of accessibility between the groups of adults, children, and seniors.

To approach the question of what counties in Washington state have the least access to healthy food we compared the ratio of fast food restaurants to full service restaurants to see which is more accessible for the population, and analyzed the number of people that are served by farmers markets that accept vouchers for Special Supplemental Nutrition Programs such as SNAP/WIC/WICCASH/SFMNP. Looking at these to aspects of food allowed us to see what types of food are most accessible in terms of cost and frequency of location, and if those foods are healthy in general.

Results

Link Between Socioeconomic Status and Obesity

Driving our research by asking; "Is adult obesity rate linked to socioeconomic status?". We analyzed the strength of the correlation between the poverty rates and adult obesity rates, along with the correlation between median household income and adult obesity rates at both the county and state level, to see if there is any real connection between socioeconomic status and adult obesity rates. When calculating the correlation coefficient between adult poverty rates, and obesity rates at the state level we found the relationship to have a coefficient of ≈0.47, which proves to be a moderate positive correlation, which means that there is some relationship between poverty and obesity at the state level.

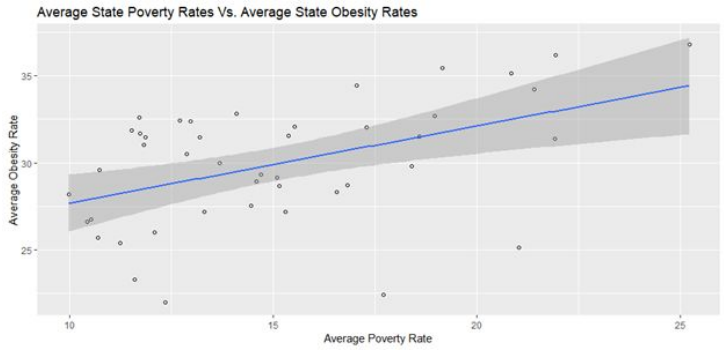

Figure 1: Average Poverty Rates vs State Obesity Rates

After looking at the strength of the correlation at the state level, we zoomed in another level to look at the correlation at the county level. The coefficient revealed to be ≈0.39, while not as strong as it is when looking at the data zoomed out is still moderately positive, with clear trends and relationships. Such as there are no counties

with an adult poverty rate less than 10% with a obesity rate greater than 40%, and there are no counties with an adult poverty rate greater than 40% with an obesity rate less than 30%.

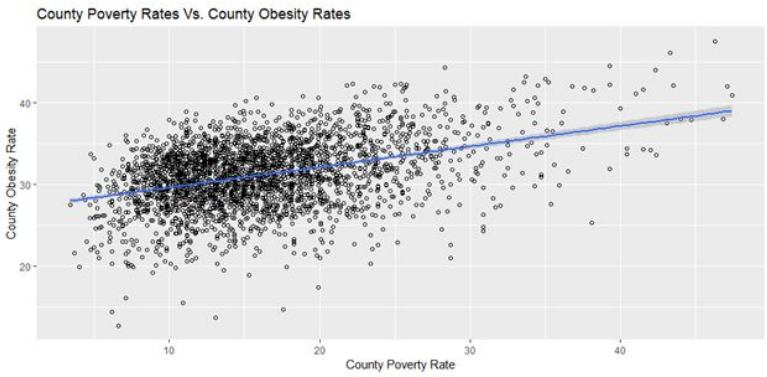

Figure 2: County Poverty Rates vs County Obesity Rates

Considering other possible factors contributing to obesity we decided to look at the correlation between median household income and obesity. We found that the correlation coefficient was ≈-0.44, which shows that the lower the income the greater the rates of obesity, and vice versa.

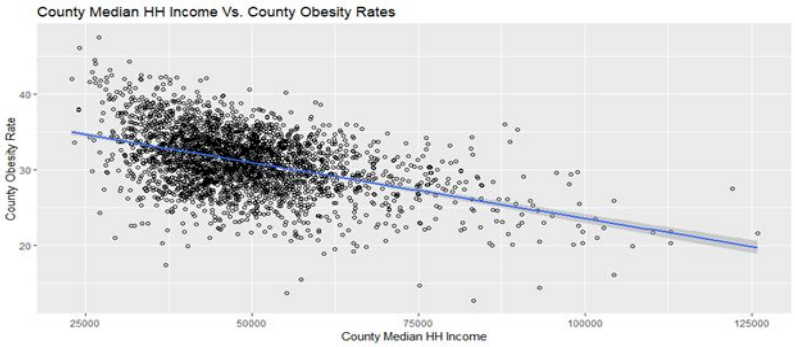

Figure 3: County Median Household Income vs County Obesity Rates

After looking at this data in various ways, there is no one socio economic factor that we can use as the major cause of obesity. However, we can acknowledge the boundaries that people of lower socioeconomic status/economic status face when it comes to staying healthy. Poorer families and people often face the problems of choosing high-fat foods dense with energy due to their affordability, living in food deserts where healthy foods are hard to find, economic insecurity, activities being unavailable or unaffordable, which all can contribute to obesity. Which means that there is definitely some link, however with all types of confounding variables from location, climate, safety, and many other things that vary from area to area its hard to say what exactly is the cause of obesity across the united states, or even at the county level.

Does food insecurity vary by age?

In this report, we also examined food insecurity by age groups to answer the question if food security varies by age? We defined three different age groups by separating the data into those under the age of 18 to be considered children, those over 64 to be seniors, and between 18 and 64 to be adults. By categorizing the ages into children, adults, and seniors we could analyze which ages are affected by food insecurity more or less. It is important to note that children are unable to provide for themselves and often rely on other family members or adult care takers to feed them, so if a family/adult is unable to feed themselves they will also have trouble providing for their youth too.
We calculated the correlation between the adult population with low access to the store against the population of children who have low access to stores with nutritious foods in

each county in the country.

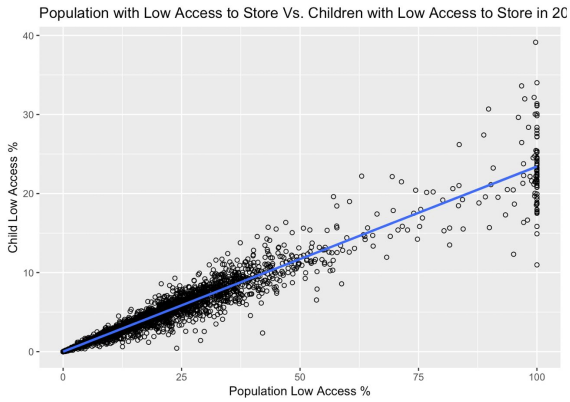

Figure 4: Population with Low Access to Stores vs Child Population with Low Access to Stores

There is an overall positive relationship between the adult population and the child population in the counties.

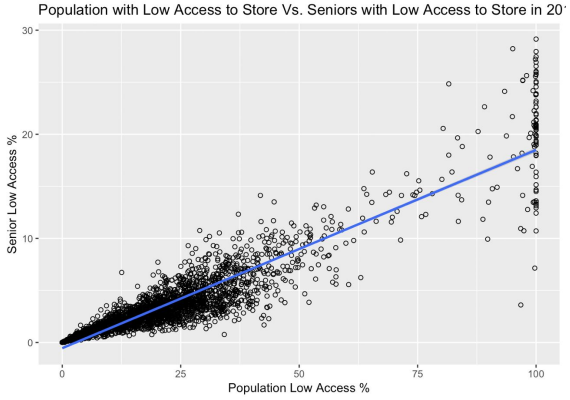

Figure 5: Population with Low Access to Stores vs Senior Population with Low Access to Stores

The adult population with low access to stores and the senior population with low access were also analyzed by counties. It shows similar results to our results for the previous graph, though the percent is slightly smaller for seniors. It seems that adults suffer a statistically greater impact than children and seniors maybe because they are independent and responsible for their own meal intake and financial income. Or maybe because children are required to attend schools where there are government programs like Free and Reduced Lunch where they can get food.

In Washington, what counties have the least amount of access to healthy food?

Lastly, the questions of what counties have the least amount of access to healthy food? One way we answered this question is finding the ratio of fast food restaurants to full service restaurants in each county in Washington. Lincoln, Adams, Whitman, Franklin and Grant county were found to be the top 5 counties with the least access to healthy foods based on this ratio.

County	Fast Food to Full Service Proportion
Lincoln	1.8
Adams	1.44
Whitman	1.37
Franklin	1.23
Grant	1.16

Table 1: Top 5 Counties with the Highest Fast Food to Full Service Restaurants Ratio

These ratios could be higher for these countries because are more rural areas with less access to fresh foods, or because average income of the residents there is a demand for more affordable food options. Taken from the interactive map from our online report, it can be observed that the counties with the highest fast food ratio, are all located in the south east part of Washington.

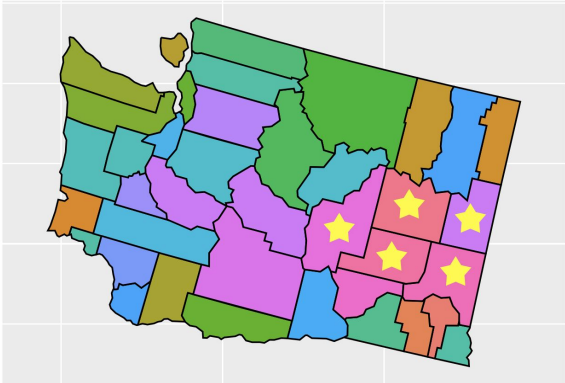

Figure 6: Top 5 Counties with the Highest Fast Food to Full Service Restaurants Ratio. Stars on the map represent the top 5 counties with the highest ratio.

Another way we wanted to answer this question of what counties have the least amount of access, we looked into another variable in the data set and computed the number of residents per farmers market that accepting SNAP.

County	Number of Residents per Market accepting SNAP
Benton	95168.5
Pierce	93630.6666666667
Grant	93124
Franklin	88825
Spokane	81754.3333333333

Table 2: Top 5 Counties with the Highest Number of Residents Per Farmers Market that Accept SNAP

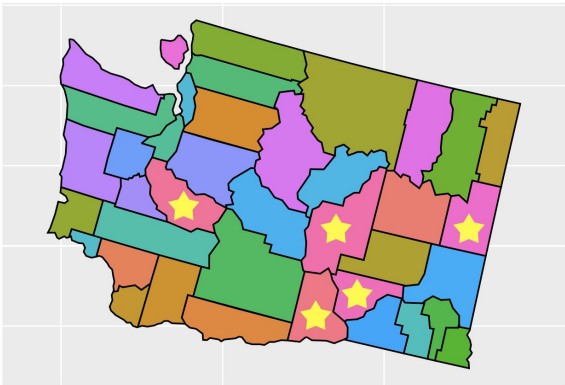

Figure 7: Top 5 Counties with the Highest Number of Residents Per Farmers Market that Accept SNAP. Stars represent the top 5 counties with the highest value.

The stars above show the geographic location of the counties that have the least access to healthy foods based on the highest proportion. This shows that the same trend from the fast food to full service restaurant proportion, that the more food insecure counties are located in the south east. Though it is important to note Pierce County, which is considered a more urban area is ranked 2nd in the table. So we cannot say that only rural areas suffer from food insecurity.

Discussion

Our project focus fell within the topic of food insecurity and access as an investigation on population health. By breaking the .gov dataset down socioeconomic status, age, and location components, we were able to gauge the varying accessibility to healthy eating lifestyles in the United States. The findings of the cross between socioeconomic status and obesity rates did not indicate that poverty was a significant cause of obesity (based on correlation strength), but the negative direction of the correlation does suggest that people on the lower end of the socioeconomic factor face more obstacles in accessing organic or generally healthier foods. Assuming possible causation, legislation and organizations looking to alleviate poverty and/or improve American health standards should aim to open more markets within critical areas that enable affordable, healthy food options. From looking at the impact of food security on different age groups, we found that adults face more problems than children and seniors as independents in charge of their own food consumption and dietary stability. Something to work on

would be to battle this crisis from the roots; alongside federally assisted meal programs in school cafeterias, our nation's youth should receive teaching in home economics or health courses on how to look for or prepare sustainable, budget meals. In the state of Washington, our analysis concluded that counties in Eastern Washington endure the least amount of access to healthy food, and that more rural areas seem to utilize more government resources for food support due to lack of food security. Necessary action should be taken on income concerns in those areas, as most of the insecure counties should not have issue with access to fresh food as they are the top in agriculturalists per capita (i.e. they produce most of the state produce).

Future Work

In the future, the type of analysis we performed could easily be extended onto other food insecurity datasets - hopefully ones with more depth. A combination of unique datasets with concurrent timeframes would allow for more detailed/specific analyses, since picking from many would allow us to single out the strengths of a given collection. We found in certain cases that there wasn't enough data for us to work with (for example, data on individual cities to dive deeper into potential gentrification questions), and look forward to seeing future analysis on datasets with more granular data.

At a larger scale, moving forward we would like to see more organizations and policymakers supporting the acceptance of food access programs like SNAP, WIC, and SFMNP, especially in communities where we found low access to healthy foods. We believe that everyone should have equal access to food that will improve their quality of life, and urge policymakers to draft actionable regulations that create the infrastructure to support these rural counties.

Citations

1. Fernandes, Simone G et al. "Food Insecurity in Older Adults: Results From the Epidemiology of Chronic Diseases Cohort Study 3." Frontiers in medicine vol. 5 203. 12 Jul. 2018, doi:10.3389/fmed.2018.00203
2. "How Common Is Food Insecurity Among Older Adults?" Health in Aging, 8 Mar. 2018, www.healthinaging.org/blog/how-common-is-food-insecurity-among-older-adults/.
3. Cdc.gov. (2010). Products - Data Briefs - Number 50 - December 2010. [online] Available at: https://www.cdc.gov/nchs/products/databriefs/db50.htm [Accessed 4 Jun. 2019].

4. “What Is Food Insecurity in America?” Feeding America, hungerandhealth.feedingamerica.org/understand-food-insecurity/ https://hungerandhealth.feedingamerica.org/understand-food-insecurity/.