Analysis and Policy Proposal to Address Food Security in the USA

Overview of Food Security Issues: Food security in the USA has been a persistent issue, leading to substantial costs to the nation's healthcare and social welfare systems. According to the USDA **[1]**, food security is defined as "a lack of consistent access to food for an active, healthy life". This primarily revolves around a lack of "financial resources" and negative economic situations which drive such food insecurity **[1]**. However, food insecurity is driven by a multitude of factors beyond those economic: not only are race and age relevant **[2],** but food security also differs substantially between states **[2]**.

The following analysis will present two overarching analytical components: initially, the report will break down and analyze existing data on food security by demographics, states, poverty rates, and median income. Subsequently, the report will develop an actionable policy to combat food security as driven by the analysis.

Analysis of Food Access Demographics:

To begin with, one needs to understand the contemporary status of food insecurity in the USA. This is necessary to frame both the magnitude and scope of individuals suffering from food insecurity. This analysis is best achieved by developing a quantitative grasp of the number of individuals classified as Food Insecure. This report defines food insecure individuals and those without food access as those who reside beyond 1 mile from a supermarket. This definition is appropriate: approximately 90% of the tracts in the dataset contains accurate information for the population share which resides beyond 1 mile from a supermarket. By applying this criterion to the aggregate population across the USA, the analysis in **Figure 1 determines** that **39.8% of individuals** overall in the country **are food insecure**. Conversely, **60.2% of individuals are** determined to be **food secure**. While the Figure 1 analysis conveys that food security in the USA remains a challenge, one needs to be cognizant of two elements. Firstly, given that this categorization reflects food insecurity for 90% of tracts, 10% of tracts are not fully accounted for. Secondly, supermarkets and home locations (for instance, the suburbs) may skew the quantity of food insecure individuals.

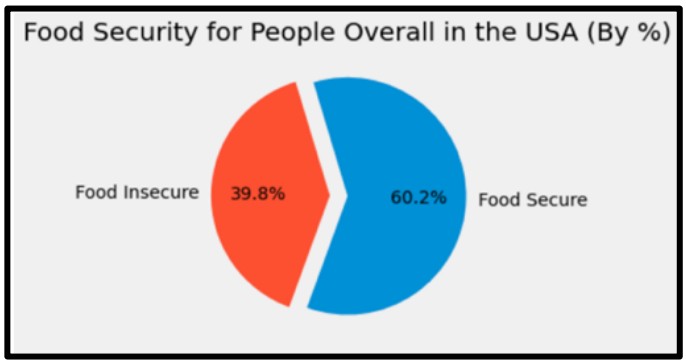

Figure 1: *A Pie Chart Displaying Food Insecurity in the USA. (An individual is "Food Insecure" if he/she resides beyond 1 mile from a supermarket).*

Citations: [1]: "What Is Food Insecurity in America?" *Hunger and Health*, 7 Oct. 2019, https://hungerandhealth.feedingamerica.org/understand-food-insecurity/.
[2]: Vaccaro, Joan A, and Fatma G Huffman. "Sex and Race/Ethnic Disparities in Food Security and Chronic Diseases in U.S. Older Adults." *Gerontology & Geriatric Medicine*, SAGE Publications, 30 June 2017, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5502940/.

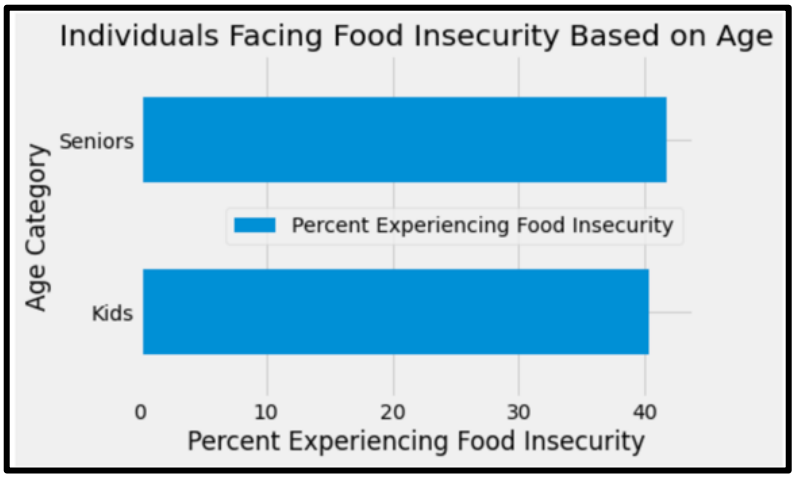

Figure 2: *A Bar Graph Displaying Food Insecurity in the USA based on age. (Computed out of all seniors and kids, 41.7% and 40.4% are food insecure, respectively. Children/Kids are defined as those between 0-17, and Seniors are defined as those 65+).*

Given this holistic understanding, the analysis now segments Figure 1's analysis into buckets. This is to grasp food security's impacts on specific groups. **This report will hone into age and race and the differences of food insecure individuals within them**. Such analysis begins by considering **how food security differs by age** between the young and elderly. Here, we define children/kids as those aged between 0 – 17, and we define seniors/elderly as those aged 65+. A description of the computation will illustrate the results displayed in **Figure 2**. Here, with the existing dataset, while one may find the total quantity of food insecure individuals by race and age in the US, this information on its own will not be informative. Thus, the analysis for age and race employ the larger dataset to account for the total number of individuals as quantified by both age and race so that the analysis compares specific categories. The percentage of food-insecure children/seniors in Figure 2 is based upon (divided by) the sum total count of children/seniors in all tracts, respectively. As **exhibited in Figure 2**, the analysis deduces that the **share of food-insecure children out of all children is 40.4%** and the **share of food-insecure seniors out of all seniors is 41.7%**. Again, while this number may be relatively high due to one's living preferences, it does indicate that any policy addressing food insecurity must not ignore the concentrated populations of kids and elderly who are food insecure.

Of equal significance, this report exhibits differences in food security based on race. Akin to the age analysis above, rather than analyzing (dividing by) the total population of food insecure individuals, this analysis considers each group of food insecure individuals within their own race. For instance, white food insecure people are compared against the total population of white individuals measured in the larger dataset. The analysis will not be relevant otherwise. There are seven races considered:

Percentage of People Facing Food Insecurity (Based on Race)

	Race Categories	Percentage Facing Food Insecurity
0	Native	49.258017
1	White	44.771462
2	Black	29.486656
3	Pacific	28.054058
4	Other	23.583894
5	Latino	22.467918
6	Asian	20.734547

Table 1: *A Table Displaying the % of People in Each Race Facing Food Insecurity.*

White, Black/African American (Black), Asian, Latino, Hawaiian/Pacific Islander (Pacific), American Indian /Alaska Native (Native), and Other Race (Other). **Table 1 displays** a **table of the percentage of food-insecure individuals by race.** Based on this analysis, as referenced in descending percentages in Table 1, Native and White people hold the highest percentage of food insecure individuals at 49.3% and 44.8%, respectively. The remaining races reside between 20.7% (Asian) to 29.5% (Black) food insecure individuals in their populations.

Bar graphs in **Figure 3** offer a visualization of the races facing the greatest and least food insecurity within their specific group. Again, this graph confirms that while Native and White's populations face the highest food insecurity, the remaining (Black, Asian, Latino, Pacific, and Other) races cluster more tightly together. It is necessary to address the potential shortfalls of the analysis here. One finding that warrants further attention is the number of White individuals who face food insecurity (standing at approximately 44.8%). There is one primary factor that may have contributed to this result. One must recall the definition of a food-insecure individual: someone who resides more than one mile from a supermarket. As evidenced by the Brookings Institute, despite growing diversity in the USA, **white populations still dominate 80% of the share of the population residing in areas such as suburbs in 2010 [3]**. Given that suburbs tend to be more geographically distant from supermarkets, this element may contribute to the analysis in Figure 3. Possible elements that may be integrated into an expanded analysis include procuring data **by race** of whether one's living distance from a supermarket is a result of strained economic conditions or personal choice.

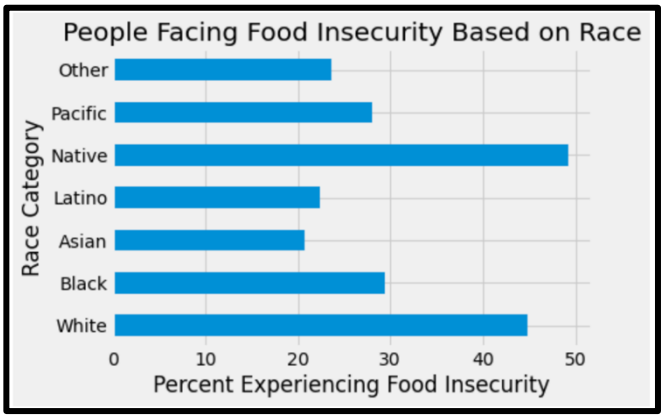

Figure 3: *A Bar Graph Illustrating Food Insecurity in the USA based on Race. (As explicated in the text, rather than dividing by the total number of food secure individuals, we segment and divide by the total population of each race to offer a more meaningful analysis).*

Analysis of Food Access (State Geography): The data analysis has now produced findings of individuals facing food insecurity across the overall population, and how this computation differs by race and age. However, analysis thus far has been on the national level. To develop policy, one must develop a metric that determines which states have the greatest and lowest food security levels. To rank states by food security, we need to generate an effective metric. The subsequent analysis employs two unique weighted

Citations: [3]: Frey, William. "Melting Pot Cities and Suburbs - Brookings." *Melting Pot Cities and Suburbs: Racial and Ethnic Change in Metro America in the 2000s*, May 2011, https://www.brookings.edu/wp-content/uploads/2016/06/0504_census_ethnicity_frey.pdf.

metrics. **The first metric** (titled "One Mile + Low Income One Mile") aggregates data from two categories: 1) individuals who live at least one mile from a supermarket and b) low-income individuals who live one mile beyond. **The second metric** (titled "Low Income One Mile + Low Income Ten Miles") aggregates data from two categories: 1) low-income individuals who live one mile beyond a supermarket and 2) low-income individuals who live ten miles beyond. The computations are discussed below, and the graphs may be found in the attached Excel file.

To begin with, the analysis applies two metrics for two reasons. The first metric offers equal (50/50) weight to both categories to ensure that food insecure, and additionally low-income individuals who are vulnerable, at the one-mile distance are fully considered. This is done by solely focusing on data points centered at the one-mile benchmark given that we define individuals who are food insecure as those who reside at this distance from a grocery store. The second metric centers on low-income individuals living at both one mile and ten-mile distances (offering 50/50 weight to each). The purpose of this is to assess/confirm our state's rankings from the first metric by observing if there are any significant deviations in state classification. Additionally, those who suffer the greatest from food security issues (at a ten-mile distance) are emphasized and stressed under this metric, complementing our first metric weights.

The **first metric** weighs both food insecure individuals (one mile) and low-income food insecure individuals (one mile) equally. These categories offer the most comprehensive insight into food insecurity. However, not all segments of food insecure individuals are equally impacted. Thus, the first metric's analysis places particular weight on individuals who are economically disadvantaged and food insecure. Here, the metric produces its state rankings by assigning a cumulative score to each state based on the percentage of its population who classify as food insecure and low income/food insecure. This score was determined by aggregating the total number of food insecure individuals (both total and low-income at the one mile

Top 5 States with Worst Food Security Based on First Metric Computation

State	Weighted Metric
Mississippi	48.730820
West Virginia	45.659592
Arkansas	42.158898
Alabama	41.934559
South Carolina	41.733874

Table 2: *Displays the five states with the* ***worst*** *food security based on the first metric.*

Top 5 States with Best Food Security Based on First Metric Computation

State	Weighted Metric
Nevada	17.546012
New Jersey	17.309505
New York	14.365894
California	11.667714
District of Columbia	3.100580

Table 3: *Displays the five states with the* ***best*** *food security based on the first weighted metric.*

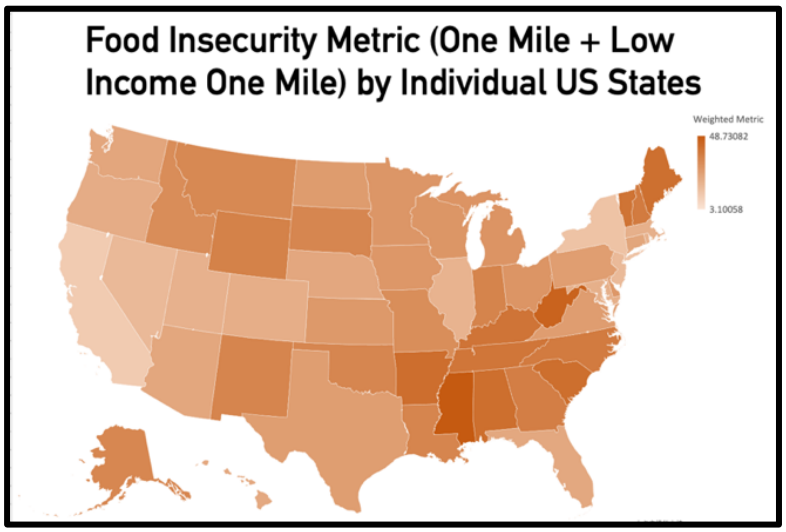

Figure 4: *An Excel GeoGraph Illustrating Food Insecurity in states based on the first weighted metric of food insecure people living 1+ miles from a supermarket and low-income people living 1+ mile from a supermarket. (Darker colors indicate worse food security, while lighter colors indicate greater food security).*

benchmark). States range in scores from 49.6 to 16.3. Figure 4 supplements these tables by offering a visual representation of this first metric. As generated in Excel Geographs, states with worse food security have darker shades, while states with stronger food security have lighter shades. Here, **Table 2 displays the five states with the worst food security**, and **Table 3 displays the five states with the strongest food security**. More food insecure states have higher scores, and stronger food security states have lower scores. Particularly, Mississippi ranks as the state with the worst food security, and DC ranks as the region with the best food security.

The **second metric** weighs low income and food insecure individuals equally at one and ten miles distances. Based upon our classifications, this metric offers insight into low-income individuals and how they face food insecurity as grouped by state. Since low-income individuals tend to face greater issues with food security, this metric complements the first by placing greater weight on ones more vulnerable. While one may observe the full dataset in the Jupyter Notebook, by examining **Tables 4 and 5**, there are slight adjustments between state rankings. However, the scores and state rankings remain generally the same. State scores range from 16.01 to 0.80 with higher scores indicating worse food security and lower scores indicating stronger food security. **Figure 6** generates and presents a visual representation of this second metric by way of Excel Geographs. Indeed, Figure 6 matches the

Top 5 States with Worst Food Security Based on Second Metric Computation

State	Weighted Metric
Mississippi	16.012249
West Virginia	13.321294
Arkansas	13.033095
New Mexico	12.100416
Alabama	11.822368

Table 3: *Displays the five states with **worst** food security based on the second weighted metric.*

Top 5 States with Best Food Security Based on Second Metric Computation

State	Weighted Metric
New York	2.714998
Massachusetts	2.562299
California	2.534027
New Jersey	2.296211
District of Columbia	0.803051

Table 4: *Displays the five states with **best** food security based on the second weighted metric.*

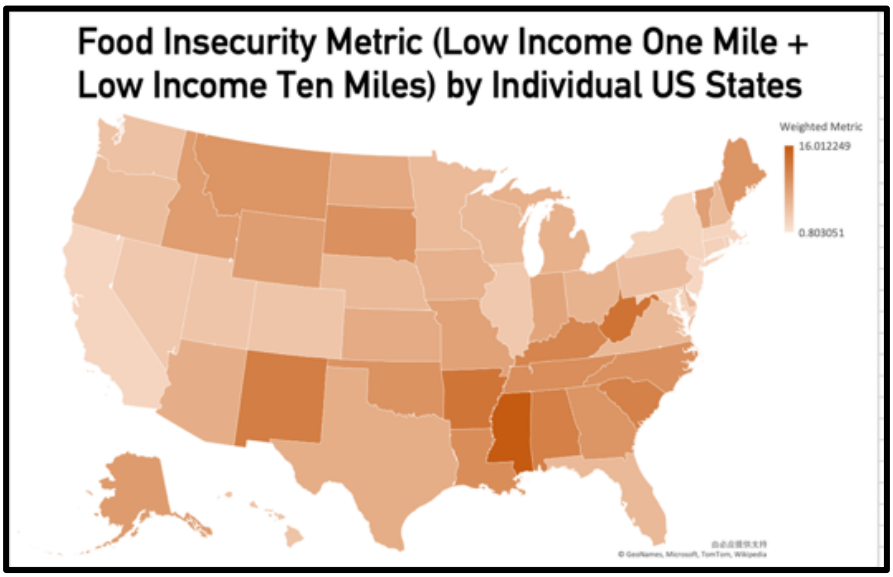

Figure 5: *A GeoGraph Illustrating Food Insecurity in individual states based on the second weighted metric described above.*

representation in Figure 5, reflecting the lack of any major adjustments in the state rankings. Indeed, states such as Mississippi, West Virginia, and Arkansas continue to reflect poor food security, and states such as DC, New York, and California reflect strong food security. In Figure 6, states with worse food security have darker shades, while states with stronger food security have lighter shades. Here, due to a lack of data in 90% of rows for ten-mile categories, **the report analyzes low-income categories in both the one and ten miles equally**. Indeed, after cleaning the dataset, only approximately 10% (7000 rows) contain valid entries for low-income individuals living more than ten miles from a supermarket. This data was likely primarily collected for states with existing poor levels of food security, which augmented their measured levels by the metric. Thus, we witness greater clustering of states by food security scores.

Analysis of Poverty/Income: The last step of the analysis accounts for correlations between poverty rates and median family income with food security. After analyzing the correlations generated between poverty and income with both low-access individuals and low-access/low-income individuals at one-mile distances, the latter group presents a stronger correlation. Thus, food-insecure people in the "Percentage of Individuals who are Food Insecure" in Figures 6 and 7 are defined as low-access, low-income individuals at one-mile distances. **Figure 6** examines the correlation between median family income and food security, and **Figure 7** examines the

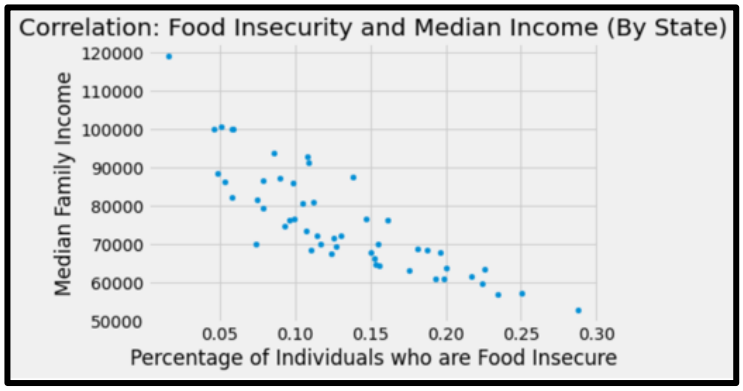

Figure 6: *A Scatterplot displaying the correlation between median family income and food security. There is a strong, linear, negative relationship.*

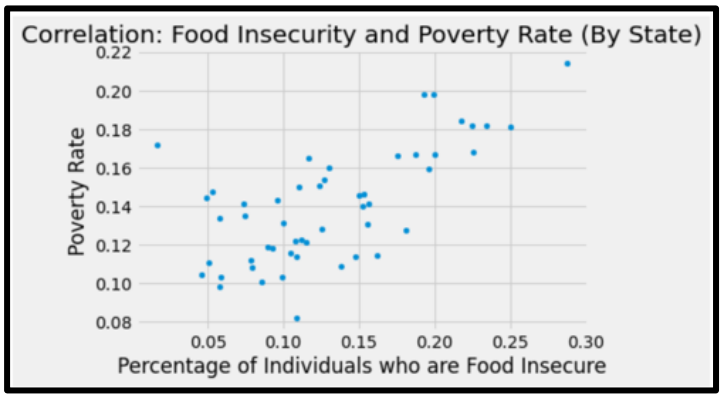

Figure 7: *A Scatterplot displaying the correlation between poverty rates and food security. There is a moderately strong, linear, positive relationship.*

correlation between poverty and food security. After grouping by states for clarity, scatterplots demonstrates the relationship. In Figure 6, the analysis notes a strong, positive, linear relationship between median family income and food insecurity: as median family income drops, so does food insecurity. In Figure 7, the analysis notes a strong, negative, linear relationship between poverty rate and food insecurity: as poverty rates rise, so does food insecurity. We can make a conclusion: with lower-income/greater poverty, food security **becomes greater.** With lower socioeconomic status, food security is a greater issue.

Policy Conclusions: Based on the analysis above, **three conclusions are clear**: food security remains a challenging issue that prevails across race/age group, food security particularly affects the Southern States, and food security is strongly tied to income/poverty. There are three components to effective policy. **The first policy component will ensure that all age groups/races are positively impacted**: we need to improve **the balance between local food production and distribution such that all individuals have adequate access**. Particularly, this can be achieved by "encouraging food producers to utilize community-based markets" and "promoting global value chains" **[4]**. As we learned in the demographics analysis, all races/age groups are profoundly impacted by food insecurity, so this process will be crucial for all. The **second component will ensure that states who are struggling in providing food security are assisted**. Primarily, such policies may mirror those currently applied in developing countries by focusing on "structural changes in relative prices and targeted food subsidies" **[5]** in the Southern States and others that struggle with food security. This will ensure that long-term measures to better agricultural placement and increase food production can be generated. This is critical to bring greater balance across states for food security, an issue displayed in the geography analysis. **The third component will ensure that we integrate policies that combat poverty/income disparity.** Particularly, targeted poverty alleviation ensures that "essential social services" to "create financial and social safety nets" **[6] with supportive food subsidies** will be critical to avoid individuals from falling into the poverty cycle and exacerbating the issues of food security over time. All in all, only with equally distributed, targeted food security and policy alleviation programs may we generate effective policy.