Food Insecurity: An In-depth Look on How Food Deserts Affect Minority Communities in Louisiana

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Recommendations

- State officials should provide economic or financial incentives to support development of supermarkets in food deserts
- Ensure that public transportation routes and schedules maximize access to supermarkets
- Motivate more supermarkets & farmers markets to accept electronic benefits from food assistance programs
- Use zoning regulations to help supermarkets locate in underserved communities

Source: Harvard

Background

Food insecurity is big issue globally, specifically in U.S., food deserts, is a major issue that negatively affects the U.S population. These are regions where residents, specifically those living in low-income communities, lack access to fresh, nutritious food. USDA report shows that over 39.5 million Americans live in food deserts. Out of the residents living in food deserts:

Feeding America research report on "Identifying racism in food insecurity", attests that 67% of the residents that are affected by food insecurity are racial or ethnic minorities. so we decided to investigate this in a Post Katrina LA.

The purpose of this research is to delve deeply into food insecurity, particularly as it applies to underprivileged minorities living in food deserts.

Hypothesis

Racial and ethnic minorities are disproportionately affected by food insecurity among individuals who live in food deserts.

Data

The main datasets were sourced from USDA and U.S. Census Bureau either through downloading the csv via Kaggle or extracting via API from U.S. Census Bureau.

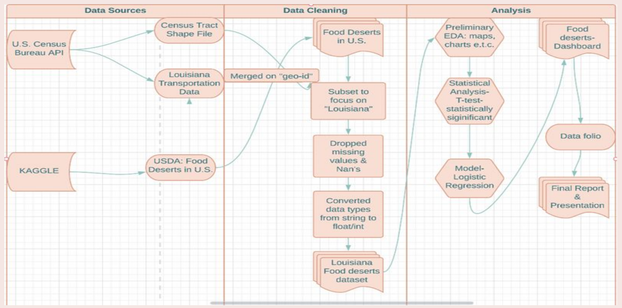


Fig 1: Flowchart of our Data Analysis process

Limitations:

- Food deserts in U.S.A is from, 2019 due to USDA limitations, reports are released every five years.
- Census Bureau releases information every 10 years however, due to time restrictions, our team decided to use 2010 census so it's fair to assume that population information has changed
- Model limit

Preliminary EDA

Two important criteria for defining food deserts:

- Poverty rate greater than 20%
- Distance to Supermarket: residents live 1 mile away in Urban & 10 miles away in Rural parishes

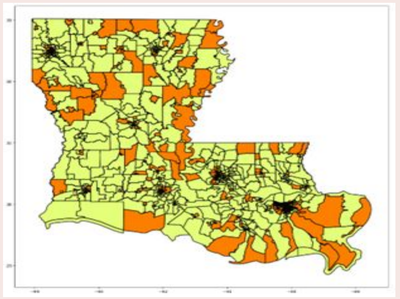
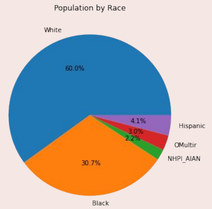


Fig 2: Map of Louisiana highlighting the food deserts regions



This chart shows the population distribution by race in Louisiana

- White population is the largest representing 60% of the LA residents
- Black population is the largest of the minority (31%)

Fig 3 :Pie chart of population living in Louisiana by race

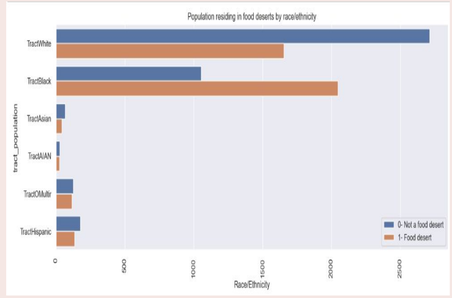


Fig 4 :Bar graph of population residing in food deserts by race

Key findings from the bar graph:

- In general, more white LA residents live in non-food desert regions than any other ethnic group
- The black community, the largest minority population in Louisiana, is most impacted by food deserts, i.e., has the most residents living in food deserts
- Although the other minority groups have a small population, for the most part, the number of people living in food desserts are similar (almost equal) to those not living in food desert areas
- Ultimately, people of colour are mostly negatively affected by poor access to healthy

Logistic Regression Model Highlights

- **Increase in vehicle ownership reduces log-odds of food desert by 1.6149.**
- **An increase in vehicle ownership is associated with a decrease in food deserts.**
- **People of color and lower income tracts are highly correlated with food desert indicators**
- **Interaction between vehicle ownership and geographic location was significant.**
- **Final model shows vehicle ownership, poverty rate, and geographic location play a role in food desert probabilities**

Statistical Analysis, Modeling & Results

Our team ran a hypothesis(t-test) on the distance to supermarkets for the minority population versus the majority population (white) for both urban and rural parishes in Louisiana (i.e., either 1 or 10 miles away from the supermarket.)

	T	dof	alternative	p-val	CI95%	cohen-d	BF10	power
T-test	23.475684	1159.688409	two-sided	5.059997e-100	[1155.73, 1366.53]	1.631793	9.409e+113	1.0

Fig 5: T-test results on distance to supermarkets in urban areas between white & non-white population

	T	dof	alternative	p-val	CI95%	cohen-d	BF10	power
T-test	7.959933	1150.592803	two-sided	4.100997e-15	[79.25, 131.1]	0.585902	1.621e+12	1.0

Fig 6: T-test results on distance to supermarkets in rural areas between white & non-white population

P-value < 0.05, i.e., statistically significant which means:

- **For both rural and urban regions, there are statistically significant differences in the distance to supermarkets for the white and minority populations living in Louisiana.**
- **We can reject the null hypothesis and assume that minority communities have less access to healthy food sources in either urban or rural regions.**

Logistic Regression- Model Selection

The flag for food desert regions is the "LILATracts_1And10" variable means low income and low access tracts whose distance to supermarkets are measured at 1 mile for urban areas and 10 miles for rural areas. This flag was converted to integers: 0- not a food desert and 1- food desert. A logistic regression model was the best for this binary variable

	Model Coefficient in Log Odds	Model Coefficient in Odds	P-Value	95% Confidence Interval (Odds)
Intercept	-1.761	0.172	0.070	[0.026, 1.154]
LILATracts_Vehicle	-1.615	0.200	0.257	[0.012, 3.239]
PovertyRate	0.041	1.042	0.004	[1.013, 1.071]
County_East Baton Rouge	-2.056	0.128	0.034	[0.019, 0.855]
County_Orleans	-3.094	0.045	0.001	[0.007, 0.303]
NonWhite	0.001	1.001	0.001	[1.000, 1.001]
Vehicle*Orleans	4.006	54.927	0.007	[2.922, 1031.944]
Vehicle*Baton	2.630	13.874	0.079	[0.737, 261.204]

Fig 7: Logistic Regression Model Results