Project Proposal

due October 11, 2021 by 11:59 PM

Team E.T.: Elaijah Lapay and Tahmara Ouedraogo

October 11, 2021

Load Packages

Load Data

```
STAT_198_Food_Security_Dataset <-
  read_excel("~/R/Team-E-T/data/STAT 198 Food Security Dataset.xlsx", sheet = " County Projections")
```

Introduction and Data, including Research Questions

The persistent issue of food insecurity is a complex but important factor in a person's well-being and nutrition, and is an important social determinant of health. It's defined by the Food and Agriculture Organization of the United Nations as lack of "regular access to enough safe and nutritious food for normal growth and development and for an active and healthy life."

There are a variety of factors that have the potential to impact food security. Our project aims to determine the extent to which other variables have the ability to predict the state of food insecurity among North Carolinian counties using a number of related variables that address employment, meal price, education level, and urbanization. We furthermore hope to explore the true impact that COVID-19 has had on North Carolina's state of food insecurity and childhood food security across North Carolina's counties.

Our data directly related to food insecurity and employment, as well as employment, in 2019 (pre-COVID-19) and 2021 (post-COVID-19) was sourced from Feeding America, the United States' largest hunger relief organization, that compiles national, state, and local data on food insecurity as a part of the organization's "Map the Meal Gap" and "Coronavirus and Food Security" Research Initiatives.

Our data related to education level and urbanization in North Carolinian counties was sourced from the USDA's Economic Research Service and the results of the American Community Survey from 2015 to 2019. The results for these variables for each North Carolinian county were combined into one Excel sheet and programmed for use in R.

Feeding America Data was sourced from here: https://www.feedingamerica.org/research/map-the-meal-gap/by-county USDA Economic Research Service Data was sourced from here: https://www.ers.usda.gov/data-products/county-level-data-sets/download-data/

STAT 198 Food Security Dataset

Variables Description:

`County` is which North Carolina County each row refers to. `2019 FI Percent` is the percent of County Residents Identified as Food Insecure in 2019 `2019 Child FI Percent` is the percent of County Residents under 18 years old Identified as Food Insecure in 2019 `2021 FI Percentage` is the percent of County Residents Identified as Food Insecure in 2021 `2019-2021 FI Percent Change` is the change in Percent of County Residents Identified as Food Insecure from 2019 to 2021 `2019-2021 Unemployment Change` is the change in Percent of County Residents Identified as Unemployed from 2019 to 2021 `2021 Child FI Percent` is the percent of County Residents under 18 years old Identified as Food Insecure in 2021 `2019-2021 Child FI Percent Change` is the change in Percent of County Residents under 18 years old Identified as Food Insecure from 2019 to 2021 `2019 Cost per Meal` is the estimated Cost per County of the Cost of a Meal from 2019 to 2021 `2013 Rural-urban Continuum Code` is the 2013 Country Designation of Degree of Urbanization and Adjacency to a Metro Area `2013 Urban Influence Code` is the 2013 Country Designation of Size of Largest City/Town and Adjacency to a Metro Area `Less than HS Diploma, 2015-9, Percent` is the 2015-9 Estimate of County Residents with Less than a High School Diploma in Education `Only HS Diploma, 2015-9, Percent` is the 2015-9 Estimate of County Residents with only a High School Diploma in Education `Some College Education Completed, 2015-9, Percent` is the 2015-9 Estimate of County Residents with Some College Education Completed `College Degree Obtained, 2015-9, Percent` is the 2015-9 Estimate of County Residents with an Associates, Bachelor's, or other Degree Obtained

Glimpse

```
glimpse(STAT_198_Food_Security_Dataset)
```

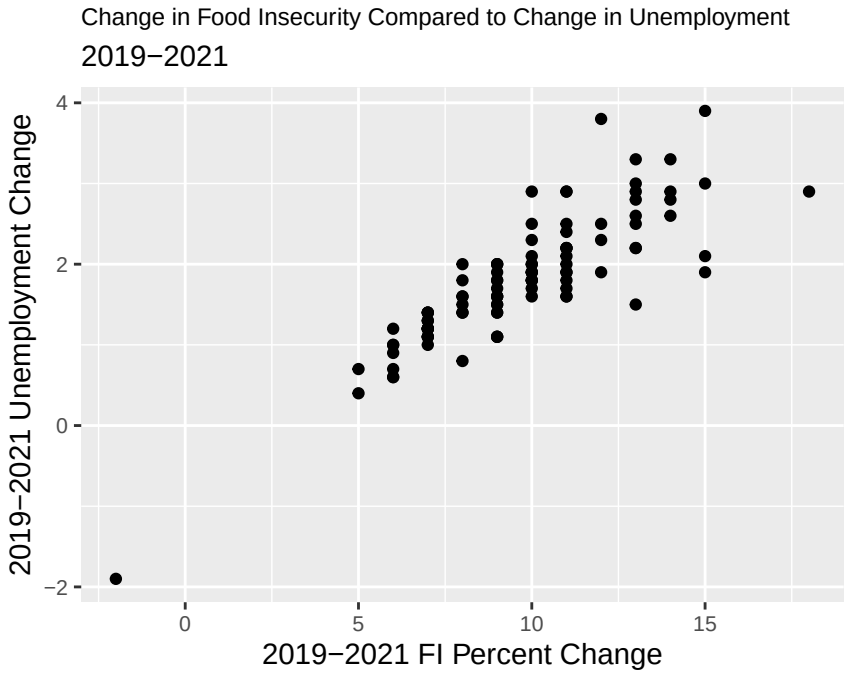
```
## Rows: 100
## Columns: 15
## $ County                                          <chr> "Alamance", "Alexa~
## $ `2019 FI Percent`                               <dbl> 0.137, 0.143, 0.18~
## $ `2019 Child FI Percent`                         <dbl> 0.192, 0.195, 0.26~
## $ `2021 FI Percentage`                            <dbl> 0.153, 0.160, 0.19~
## $ `2019-2021 FI Percent Change`                   <dbl> 11, 12, 5, 14, 7, ~
## $ `2019-2021 Unemployment Change`                 <dbl> 2.1, 2.3, 0.7, 2.9~
## $ `2021 Child FI Percent`                         <dbl> 0.217, 0.222, 0.28~
## $ `2019-2021 Child FI Percent Change`             <dbl> 13, 14, 4, 13, 8, ~
## $ `2019 Cost per Meal`                            <dbl> 3.15, 2.92, 2.83, ~
## $ `2013 Rural-urban Continuum Code`               <dbl> 3, 2, 9, 6, 7, 8, ~
## $ `2013 Urban Influence Code`                     <dbl> 2, 2, 10, 4, 10, 7~
## $ `Less than HS Diploma, 2015-9, Percent`         <dbl> 13.694117, 17.6091~
## $ `Only HS Diploma, 2015-9, Percent`              <dbl> 27.65582, 38.65881~
## $ `Some College Education Completed, 2015-9, Percent` <dbl> 33.81207, 29.52250~
## $ `College Degree Obtained, 2015-9, Percent`      <dbl> 24.83799, 14.20957~
```

Data Analysis Plan

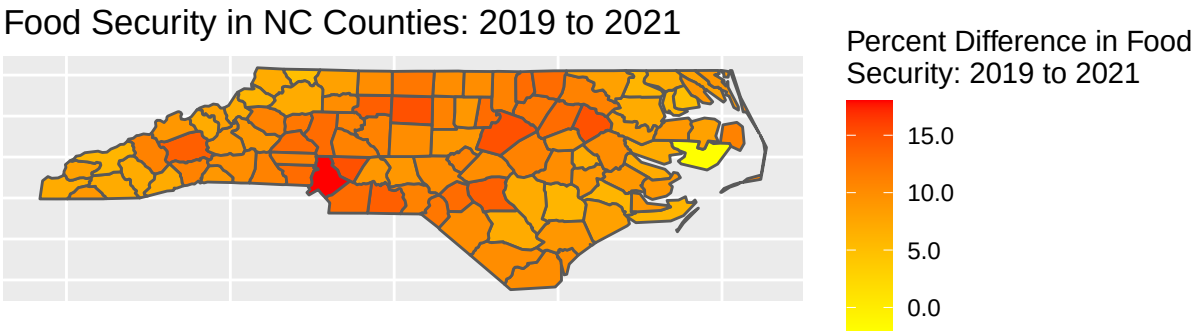
We intend to use readings of Food Insecurity and Child Food Insecurity by county as determined by Feeding America as the outcome or response Y, while using other variables in our dataset related to one's social determinants of health, particularly employment, meal price, education level, and urbanization, as potential explanatory variables for the final response, Y. We also hope to conduct a similar analysis comparing 2019 Food Security by County to 2021 Food Security by County and determining whether or not particular variables serve as predictors not only in food insecurity, but changes to food security from pre to post-COVID.

We aim to use regression analysis to determine the extent to which the different variables in our dataset serve as a strong predictor of food insecurity and child food insecurity among North Carolinian counties. We will determine the correlation coefficient for each of the variables in relation to food insecurity and child food insecurity in 2019, 2021, and the percent difference in food insecurity and child food insecurity from 2019 to 2021 to reflect the impact of COVID on these measures.

We hypothesize that a higher level of unemployment, higher meal prices, lower levels of education, and a greater degree of ruralness on the Urban-Rural Continuum at the county level have a strong association with a higher level of food insecurity for both the general population and for children. Results to support this conclusion would involve a correlation coefficient with an absolute value close to 1, and a regression line with a strongly positive or negative slope relative for the variables we are observing.



The purpose of this scatterplot is to give a clear sense of the possible correlation between higher unemployment levels and higher food insecurity levels. The plot seems to indicate a strong positive correlation between those two variables, in accordance with our hypothesis.



Note: NC Map Data sourced from https://r-spatial.github.io/spdep/articles/sids.html

The purpose of this spatial map visualization is to explore the rural and urban impact of food security in North Carolina counties. Being able to explore the percent change in food security for the counties in and around the Charlotte and Raleigh-Durham area as opposed to the more rural Eastern and Western portions of the state reveal interesting results. For example, there was a documented rise in food security in the urban areas surrounding Charlotte, but not in rural Eastern North Carolina, and there was, in fact, a county that decreased in food insecurity in the pandemic, complicating our hypothesis.