

**Data Science Final Paper: Research Proposal Regarding Food Insecurity and Hampton  
Roads**

Courtney Maynard

Department of Data Science, College of William and Mary

DATA 150: Evolving Solutions

Professor Brewer

December 14th, 2021

Word Count: 2007

## Introduction

Since the 2008 economic recession, food insecurity in the United States has not lessened in severity, even though the economy has bounced back (Fleischer et al., 2017). Food insecurity is one of the most pressing issues under the broad category of human development. Food insecurity is defined by the United States Department of Agriculture (USDA) as “a house-hold level economic and social condition of limited or uncertain access to adequate food,” while Feeding America defines food insecurity as “a household’s inability to provide enough food for every person to live an active and healthy life” (Dragas Center, 2020)(Gundersen et al., 2021). These two definitions demonstrate that having food security contributes to an individual’s ability to have a life full of freedoms. Thus, it is important that we determine how to measure food insecurity as well as possible solutions to solving the problem of food insecurity.

One of the biggest challenges to combatting food insecurity is that there are many different ways of measuring food insecurity. Without an accurate and consistent way of measuring food insecurity, there is the possibility that relevant groups are excluded from the data, and decisions made from the data might not benefit those in need to the fullest extent.

There is a lack of studies examining access to food sources as a measure of food insecurity. There is also a need for a better way to measure accessibility using GIS, but also without GIS because data is oftentimes removed from the humanity of situations, such as in identifying what constitutes a neighborhood (Caspi et al., 2010). The data might show a collection of streets, while the people living there might consider a neighborhood by some other factor, such as those who visit the same public park. This can lead to a mismatch between GIS data and evaluative survey data.

The gap of studies relating to accessibility can be further narrowed by looking at a gap identified by a study done by the University of New Hampshire: a lack of data regarding transportation between towns and food sources, which could be a potential problem or solution to rural food insecurity (Wauchope and Ward, 2012). The region chosen for further studies is Hampton Roads, in Virginia. Thus far, there is only one study done regarding food insecurity in the region, and it was an overview of food insecurity statistics in the region and efforts made to address food insecurity via public food programs and not actually a measurement of food insecurity in the region (Dragas Center, 2010). Thus, we arrive at the research question: how does the accessibility of food contribute to food insecurity in the Hampton Roads region of Virginia?

### **Proposed Plan**

In answering the question of how we can measure and solve food insecurity in the Hampton Roads region of Virginia, I propose a three-part plan. This plan will seek to see if there is a correlation between the accessibility of food sources and food insecurity in the Hampton Roads region of Virginia.

Firstly, I will use the method used in a study done by the University of New Hampshire to divide the Hampton Roads region into further block groups based upon the risk of food insecurity. This risk will be calculated on a scale using population density data and data regarding the percentage of families below the poverty line. The scale uses two measures taken from already existing data sets: population density and percent of families below the poverty line, and labels counties and towns in nine increments ranging from highest risk to lowest risk. Those labeled as highest risk are those with the largest population density and most percentage of

people in poverty (relative to the other areas in the state), those labeled high risk were either moderate population density and a large percent of people in poverty, or moderate percent of people in poverty and smallest population. This ranking system continues down to the lowest risk, with poverty being considered as a stronger risk factor than population density (Wauchope and Ward, 2012). The counties and towns in Hampton Roads will be ranked this way.

Then, I will have people on my research team use an evaluative survey developed by researchers at Virginia Tech, and applied to the city of Roanoke, Virginia, to determine the nutritional quality and availability of food sources in each of the towns and counties. In this study, graduate students used a checklist of food quality and nutritional quality modified from the “Nutrition Environment Measures Study in Restaurants and Nutrition Environment Measures Surveys in Stores” in order to record data on food and beverages in each location within a half-mile buffer around the geographic center of the census block group area. The students noted nutritional quality and availability in categories such as availability of protein, or percentage of sugar-sweetened beverages. The graduate students repeated this testing over a 12 month period to ensure averages of data (Parece et al., 2016). This method will be carried out in this proposed study, however, the geographic areas covered will instead be one-mile buffers around the most populous centers of each of the counties and towns. Lastly, I will measure travel times by car, walking, biking, and public transportation from the most populous neighborhoods in each block group to each food source. The neighborhoods will be defined using both data regarding housing development as well as survey responses from locals regarding what they consider to be their neighborhood. This will provide a more consistent evaluation of a neighborhood than is available currently using GIS, which will fill a research gap. Measuring the transportation times will also

fill a research gap regarding the impact of transportation accessibility to food sources on food insecurity.

Measuring the transportation times will take the most time and comprise the largest part of the budget; for accuracy, each transportation method will be assessed four times a year: once each during the different seasons. This study will hopefully identify if there is a correlation between transportation and food insecurity as well as a correlation between food quality and food insecurity in the Hampton Roads region and provide a basis for what kind of changes can be made to decrease food insecurity.

## **Hypothesis**

I hypothesize that there will be a correlation between transportation and food insecurity as well as between food insecurity and nutritional quality and availability of food. I hypothesize that if travel times increase in areas, so will food insecurity predictions and that if there is a low nutritional quality of food in food sources and low availability of nutritious food in an area, then predicted food insecurity in the area will be high.

## **Objectives, Obstacles, and Objections**

The purpose of conducting this research is to determine if there is a correlation between accessibility and food insecurity in the coastal region of Hampton Roads, Virginia. Two ways of measuring food insecurity using accessibility are measuring transportation ability to food sources and nutritional quality and quantity of food offered in food sources. Both of these will be measured in this study to determine if there are correlations between those factors and food insecurity. If it is determined that there are these correlations, then legislation can be created to

improve transportation systems to decrease food insecurity and/or increase the nutritional quality and quantity of healthy food at sources in the region.

The main obstacle that I anticipate arising during the research process is the difficulty of measuring the transportation times between population centers and food sources. I anticipate that there are inconsistencies in the paces of people walking and biking and so an alternative would be to use estimates for the times, such as looking at the number of miles between two different points and taking an average pace of a walker and biker and then calculating the time between two points. This method can be seen when using map features such as Google Maps or Apple Maps and determining travel times between places. However, ideally, I want the data to be as pure as possible and not estimates based on possible routes because sometimes map apps don't demonstrate the fastest way to get to a place. To overcome this obstacle, if it should arise, I will provide a pace to the people tracking walking and biking time, such as biking at a steady 10 miles per hour and walking at a steady 16 miles per hour.

Future research ideas that could possibly arise from this research would be to focus on transportation costs if it is determined that transportation times are a significant factor affecting food insecurity. If it is determined that transportation times are a significant factor affecting an individual's food insecurity, then results can be implemented to increase public transportation options and opportunities, such as increasing the number of bike lanes or bike-share programs in areas and increasing bus routes and stops offered. If nutritional quality and quantity of food have an impact on food security in Hampton Roads, then the local governments can create initiatives for increased fresh food sources, such as farmers' markets and superstores rather than convenience stores. Additionally, the research can determine in which areas superstores and increased fresh food sources would be the most effective across Hampton Roads.

Possible objections to this research plan include the costs of implementing this research and the large scale of the project. To begin with, this research would require a large number of people to help collect the transportation travel time data as well as the nutritional data. This would lead to a large cost of the study. However, the benefit of this research and the capability of implementing the research to greatly improve the quality of life of people in Virginia makes the cost of the project worth it. In addition, the scope of the project means that a large number of college and university students can get involved, giving them meaningful research opportunities. The second anticipated objection is regarding the size of the study. Hampton Roads is a huge area to tackle for this kind of research because of the in-depth nature of all of the factors being measured. By tackling all of the sectors and focusing on the geographic center of each of the areas or the most populous areas, it would be leaving out large portions of the sectors and possibly lead to discrepancies between the data and which people are actually suffering most from food insecurity. However, it is important to look at the entire Hampton Roads area and thus the method can be modified to increase the geographic areas covered and assemble large teams of people. By involving college students, and possibly high school students as well, it will be possible to increase data collection and make it easier, thus allowing us to cover the entire area. If the project begins and truly becomes too large of an area to cover in-depth, then the research can shift to focus on a particular county or town in Hampton Roads that is most at risk for food insecurity, according to the calculated risk level, and then the study can be scaled down to only cover that area.

Overall, this proposal should be considered because determining possible causes of food insecurity in the Hampton Roads region is the first step to combatting food insecurity in this area and improving the quality of life for Hampton Roads residents. The methods that are being

combined and utilized in this proposed study are reliable, valid, and peer-reviewed, and have led to meaningful results in the studies from which they originated. Additionally, they are feasibly applicable to Hampton Roads. Thus, supporting this proposal would greatly benefit the residents of Hampton Roads and provide meaningful results. Should this proposal be accepted, a possible budget is outlined below.

### **Budget Costs and Justification**

<b>Use</b>	<b>Justification</b>	<b>Cost</b>
Faculty Salary	One faculty overseerer part-time cost	\$40,000
Research Stipends	Research stipends of \$3000 for researchers who will perform data collection across Hampton Roads; 17 sections across Hampton Roads with five researchers in each section (one for each transportation method and one for nutritional quality information)	\$255,000
Transportation Costs	Esitimated costs for bus passes as well as gas for researchers measuring transportation methods	\$2000

Total Costs: \$297,000



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