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Analysis of Links Between Food Accessibility and Walkability in Boston, Massachusetts and Three Surrounding Suburbs

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Analysis of Links Between Food Accessibility and Walkability in Boston, Massachusetts, and Surrounding Suburbs

by

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ABSTRACT

What are the connections between food insecurity and walkability? Food insecurity remains one of the most concerning policy issues in the United States today. As a car-dependent nation, it begs the question of how members of the population without personal vehicle access suffer from food insecurity because of that lack of access. 14 million Americans reside in areas considered by the USDA as “food deserts,” or further than one square-kilometer from a supermarket in urban areas and further than 10 square kilometers in rural areas. I argue that walkability contributes to food security by reducing barriers to access healthy grocery outlets. I will test the hypothesis that in areas with a more concentrated population and higher walkability, it is easier and faster to obtain groceries compared to areas with lower walkability.

INDEX WORDS: Walkability, Food insecurity, Food desert, Urban design, Census tract, Infrastructure

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DEDICATION

Dedicated to my father, Greg Anderson, for his unwavering support and propensity to read every word.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

What are the connections between food insecurity and walkability? Food insecurity remains one of the most concerning policy issues in the United States today. As a car-dependent nation, United States policymakers must ask themselves how many members of the population without personal vehicle access suffer from food insecurity as a result. 14 million Americans reside in areas considered by the USDA as “food deserts”, or further than one square-kilometer from a supermarket in urban areas and further than 10 square kilometers in rural areas. I argue that walkability contributes to food security by reducing barriers to access healthy grocery outlets. I find that in areas with a more concentrated population and higher walkability, it is easier and faster to obtain groceries compared to areas with lower walkability. I provide evidence comparing the walkability of Boston, Massachusetts and three of its surrounding suburbs: Braintree, Stoughton, and Randolph, Massachusetts. Through the analysis of these areas, I then used those findings to test my hypothesis and interpret the data for use in future policymaking.

1.1 Background

To date, the United States Department of Agriculture's Economic Research Service (ESR) determined that approximately 6,500 census tracts in the United States are characterized as food deserts. (Dutko et al., 2012) A "food desert," as defined by the USDA, is characterized by large proportions of the population with low access to transportation to centers with affordable, fresh, healthy food. Access to quality food has massive ramifications on the quality of life for Americans, including decreased chances of obesity and weight-related illnesses. (Dutko et al., 2012) Areas with higher concentrations of poverty are more likely to experience food insecurity issues and the underlying causes that exacerbate the problem (Dutko et al., 2012). These lower-

income areas also often lack walkable access to other services, such as banks and healthcare centers.

Public transportation, or lack thereof, is one such condition that can influence a population's access to adequate groceries. Many food deserts can be found in census tracts of low walkability and limited public transit options, requiring residents to rely on personal vehicles to get to grocery stores. In addition, infrastructure in cities, suburbs, and rural communities is often not conducive to pedestrians and active transport, instead relying upon cars to reach a destination. For the percentage of Americans who need car access, this transportation issue poses a challenge when grocery shopping.

1.2 Defining Terms and Concepts

This study utilizes several concepts and definitions in preparing and analyzing data. To ensure clarity and understanding while reading this paper, some key definitions are listed below:

Walkability: Ability and capability of the physical built environment to safely access destinations on foot or with a mobility device within a reasonable distance. When defining walkability, safety, comfort, distance, and convenience are four factors to consider. For this study, "reasonable distance" refers to ¼ mile or 30-minute or less walking distance. Walking times may vary by person or environment, but generally, 30 minutes is an acceptable timespan.

Built environment: A place's physical infrastructure, such as planned roads, sidewalks, budlings, bicycle lanes, parking lots, road signs, and other aspects of city structure.

Food accessibility: For this study, food accessibility refers to the ease and capability of accessing fresh, healthy, affordable, and culturally sensitive food within a reasonable distance and time from their residence.

Food mirage: A phenomenon in which a neighborhood or other residential area appears to not be in a food desert due to food retailers nearby but lacks options for fresh, affordable groceries in favor of stores with prepackaged convenience items and limited produce options.

Social Explorer: An online demographic database system updated each year by the American Community Survey (ACS) responses, a survey sent out annually by the U.S. Census Bureau to obtain current demographic information. ACS data is available in one-year, three-year, and five-year estimates. This study used Social Explorer five-year estimate tables in conjunction with ArcGIS Pro for data visualization and analysis to draw the most accurate conclusions.

Census tract: A statistical boundary determined by the United States Census Bureau that contains anywhere between 1,000 and 8,000 people but is ideally around 4,000 for measuring demographics in an area. Census tracts are redrawn each census year to reflect the updated population from the previous year.

1.3 Literature Review

An essential distinction in some research recognizes the difference between a food desert and a food mirage. Food mirages may take the form of a census tract containing a physical supermarket or grocery store that lacks affordable price options for lower-income residents, or may contain only convenience stores, gas stations, dollar stores, and fast-food restaurants for meal options. Additionally, the store may be outside of a walkable area, and residents face obstacles when traveling to the store. As a result, members of the population without reliable car access tend to have greater reliance upon alternate, often slower, forms of transportation such as public transit or walking. (Clifton, 2004)

In addition to the accessibility and affordability of food, another factor to consider is the acceptability of food; that is, the presence of grocery stores and supermarkets selling fresh,

healthful, culturally sensitive food in lower-income areas. Lower-income areas tend to have few options for stores that sell this type of food. Corporate supermarkets that offer affordable prices and a wider variety of food tend to refrain from building new stores in an area of lower-income and higher crime, leading to a higher likelihood of residents having limited grocery shopping options (Bastian & Napieralski, 2016).

A study done in 2004 indicated that recent immigrants living in the urban environment of Austin, Texas, found walking to and from the grocery store to be complex, tiresome, and unwieldy (Clifton, 2004). To add to the unpleasant experience, those who rely upon walking as a primary mode of transportation must be more cognizant of budget constraints and make more frequent trips to the store, as purchases are dependent upon how much they can carry, which may be further compounded by the presence of small children and mobility issues. For those lacking reliable transportation, daily life is usually organized around what is available. For example, one mother in the study was forced to rent an apartment with her children in a crime-ridden apartment complex due to its proximity to local grocery retailers (Clifton, 2004).

Another study examined how walkability affected food access in two suburbs of Detroit, Michigan (Bastian & Napieralski, 2016). The two suburbs, Warren and Inkster, were significantly different regarding economic and social standing. The researchers found that Warren had a much higher income rate, lower crime rate, and greater rates of vehicle ownership. The study utilized researcher-generated walksheds made with ArcGIS to visually interpret where residents lived in relation to several types of businesses that sell food. For the study's purposes, convenience stores and gas stations were included as retailers that sell food rather than just looking at major supermarkets and grocery stores. The walksheds were constructed with half-

mile and one-mile buffers in both towns and analyzed to determine what percentage of the population in each town lived in a food desert.

Bastian and Napieralski found conclusive evidence that food deserts are technically not present in the two suburbs studied. However, their analysis included convenience stores, gas stations, and dollar stores. While these retailers provide food, the options are often outside of a healthy diet as the USDA recommends. My study includes only data for establishments classified by the USDA as grocery stores, markets, and supermarkets and exclude other food establishments. I did this for two reasons: First, my study is focused on the availability of fresh ingredients in walking proximity. Secondly, the availability of convenience items and fast-food restaurants provide residents with limited meal options with less nutritional value and are not counted for this study.

Recent studies show a need for more specific connections between walkability and food insecurity. The physical built environment of many American cities and suburbs contributes to insufficient walkable infrastructure, particularly in lower-income neighborhoods (Hamidi, 2020). Neighborhoods severed by interstate highways provide little to no walkability to any grocery outlet (Bradley & Vitous, 2021). Most research focuses on public transportation options and personal vehicle use rather than walkability as a measure of access to grocery stores. If an article does mention walkability, it is usually an afterthought and only mentioned briefly.

For many Americans, walking is the primary mode of transportation in areas that lack sufficient public transit. This can be challenging as much of the current United States infrastructure could be more conducive to pedestrians, patricularly pedestrians carrying bags of groceries. This study sought to find the connections between walkability and rates of food insecurity and make suggestions for solutions.

2 RESEARCH DESIGN AND METHODOLOGY

The literature surrounding food insecurity varies in terms of defining exactly what a food desert is and how policymakers attempt to solve the issues. Most of the literature uses the USDA definition of a food desert, in which the physical distance between households and grocery stores is measured in census tracts. (Goyanes and Hoch, 2021) The census tracts use 1-square-kilometer grids as the baseline for measuring geographical boundaries. A *census tract* is a statistical boundary determined by the United States Census Bureau that contains anywhere between 1,000 and 8,000 people but is ideally around 4,000 for measuring demographics in an area. Food deserts are then measured by calculating the relative price of fresh produce and the cost of transportation required to obtain it. Forms of transportation may include walking, biking, driving, public transit, or any other form required to reach a grocery outlet. (Goyanes and Hoch, 2021)

For an area to be considered a food desert, the tract must be low-income AND have low access to adequate healthy food. (Hamidi, 2020) Low income can be measured by one of three criteria:

- if more than 20% of residents live below the poverty line
- if the tract's median family income is less than or equal to 80% of the statewide median family income
- if the tract has a median family income less than or equal to 80% of the metropolitan statistical area's (MSA) median family income

For a tract to be low access, at least one-third of the population must reside more than one square kilometer away from a grocery outlet in an urban area. (Hamidi, 2020) Combining these criteria serve as the official USDA equation for determining food deserts.

2.1 Selection Process and Demographic Information

For this paper, I examined the connections between walkability and grocery access in Boston, Massachusetts, and three suburban towns of the Boston Metropolitan Statistical Area (MSA). Braintree, Randolph, and Stoughton, Massachusetts all reside less than 20 miles from Boston's city limits. As seen in Table 1, the three cities are similar in population, population density, median income, and median rent. The methodology behind choosing these cities is twofold. Firstly, all three are in the same MSA and have similar populations and distances from Boston proper. Secondly, the three towns are more affordable communities than Boston, with lower income levels, and more limited modes of public transportation. Choosing towns with similar characteristics helps control for confounding factors from the overall analysis.

As seen in Table 2, Boston is a considerably younger city than the three suburban towns. The starkest contrast can be seen in the median age of Stoughton, which has a median age of 45.7 compared to Boston's 33.8. The disparities are most likely due to Boston's hub as a place for young professionals beginning new careers, while the suburbs have residents that have been living there for generations. Table 3 provides the racial composition of Boston and the three towns. Most are majority white, with the noted exception of Randolph.

Education rates are relatively steady throughout all municipalities. Table 4 indicates that all have similar rates of residents possessing a bachelor's degree or higher, as well as similar rates of only high school completion. Braintree has the lowest rates of less than a high school

education, while Randolph has the highest. This may explain the higher income levels in Braintree as compared to the other municipalities. (Table 1).

Table 1: Demographic Characteristics of Boston, MA, and Suburbs (2021)

Municipality	Boston	Braintree
Population	672,814	38,712
Population Density per Square Mile	13,918.3	2,812.90
Median Household Income	$81,744	$114,916
Median Rent	$1,783	$1,602
Family Households	128,147	9,671
Non-family Households	143,803	4713

Municipality	Randolph	Stoughton
Population	34,661	29,028
Population Density per Square Mile	3,526.40	1,804.60
Median Household Income	$87,869	$94,823
Median Rent	$1,768	$1,722
Family Households	8,879	7,763
Non-family Households	3,271	3,514

Source: Social Explorer Tables: ACS 2021 (5-Year Estimates)

Table 2: Age Disparity by Sex in Boston, MA, and Suburbs (2021)

	Boston	Braintree	Randolph	Stoughton
Median age	33.8	40.5	41.3	45.7
Male	33.1	38.2	38.8	43.7
Female	34.2	42.9	43.2	47.0

Sources: Social Explorer Tables: ACS 2021 (5-Year Estimates). Author's calculations.

Table 3: Racial Composition of Boston, MA, and Suburbs (2021)

	Boston		Braintree	
	Frequency	Percentage	Frequency	Percentage
White	337,100	50.1%	28,022	72.4%
Black	158,008	23.5%	1,262	3.3%
Asian	65,259	9.7%	7,624	19.7%
Other	112,447	17.0%	1,804	5.0%
Total	672,814	100%	38,712	100%

	Randolph		Stoughton	
	Frequency	Percentage	Frequency	Percentage
White	10,603	30.6%	19,375	66.8%
Back	14,698	42.4%	4,904	16.9%
Asian	5,031	14.5%	1,804	6.2%
Other	4,329	12.0%	2,945	10.0%
Total	34,661	100%	29,028	100%

Sources: Social Explorer Tables: ACS 2021 (5-Year Estimates). Author's calculations.

Table 4: Educational Attainment in Boston, MA, and Suburbs (2021)

	Boston		Braintree	
	Frequency	Percentage	Frequency	Percentage
Less than high school	55,289	11.8%	1,881	6.9%
High school	168,221	36.0%	12,810	46.9%
Bachelor's or higher	243,449	52.2%	12,647	46.4%
Total	466,959	100%	27,338	100%

	Randolph		Stoughton	
	Frequency	Percentage	Frequency	Percentage
Less than high school	3,653	14.8%	1,923	8.9%
High school	13,532	54.8%	10,745	49.9%
Bachelor's or higher	7,536	30.5%	8,892	41%
Total	24,721	100%	21,560	100%

Sources: Social Explorer Tables: ACS 2021 (5-Year Estimates). Author's calculations.

Table 5. Percentage of Vehicle Access per Housing Unit in Boston, MA, and Suburbs (2021)

Municipality	Boston, Massachusetts		Braintree, Massachusetts	
	Population	Percentage	Population	Percentage
No vehicle	91,697	33.7%	1,029	7.2%
1 vehicle	115,278	42.4%	4,486	31.2%
2 or more vehicles	64,975	23.8%	8,869	61.7%
Housing Units	271,950	100%	14,384	100.0%

Municipality	Randolph, Massachusetts		Stoughton, Massachusetts	
	Population	Percentage	Population	Percentage
No vehicle	1,047	8.6%	720	6.4%
1 vehicle	4,169	34.3%	3,377	30.0%
2 or more vehicles	6,934	57.1%	7,180	63.6%
Housing Units	12,150	100.0%	11,277	100.0%

Sources: Social Explorer Tables: ACS 2021 (5-Year Estimates). Author's calculations.

2.3 Finding Connections

I configured four maps to find the connections between walkability and food access. One will show the walkability of Boston overlaid with data showing where the food deserts are located, and three will show the same with the suburban towns. The goal of each map is to see how the maps differ in terms of walkability and ease of safely accessing food.

I used datasets from the Massachusetts Food Systems Database, available via the Metropolitan Area Planning Council (MAPC). Established in 1963, MAPC is a regional planning agency that recruits local government officials from Metropolitan Boston to encourage collaborative efforts between cities and towns to foster smart growth and development in Massachusetts. MAPC strives to assist municipalities with planning, smart growth, and urban sprawl through a variety of programs and initiatives. Using the Massachusetts Food Systems Database data extrapolated from the MAPC website, I created maps portraying how different food systems interact in Boston and three of its surrounding suburbs.

This project utilized ArcGIS Pro and its multiple capabilities to illustrate the findings via maps. ArcGIS Pro is a geospatial analytical tool used in many fields, from geography to public policy. It is managed by Esri, a geographical information systems company. Using the software and its online database catalog, this study will use geospatial analysis to determine practical solutions for public policy for food deserts and walkability. All ArcGIS Pro data is stored in files known as shapefiles, which can be translated onto a map via different layers. The layers are customizable and used as a base to add more geographical information.

Additionally, I used data from Social Explorer, an online database prepared by the American Community Survey, an annual survey formulated by the United States Census Bureau to gain demographic data on a particular area. Combining information from each software allowed me to create a comprehensive map detailing my findings on walkability and grocery store access. I then analyzed the data and see connections and patterns using the same process for all four areas.

Using American Community Survey 2017-2021 5-year estimates, I configured tables illustrating personal vehicle access in Boston, Braintree, Randolph, and Stoughton. As shown in Table 5, the rate of not owning a vehicle in a suburban town is between 6% and 8%. These numbers contrast with the City of Boston as indicated in Table 5. The rate for no vehicle is 33.7%, a difference of more than 25 percentage points.

The differences in vehicle ownership can be attributed to fewer public transit options in the suburbs than in Boston proper. Most MBTA (Massachusetts Bay Transit Authority) train lines in the suburbs are direct commuter routes to Boston, with few intra-city lines. Also, while there are bus stops in all three suburban cities, they are at the center of the city only, with no stops in specific neighborhoods or residential streets. The MBTA bus lines are limited to two

lines in Braintree and Randolph and none in Stoughton- a different transit authority serves Stoughton, the Brockton Area Transit, with several stops throughout Stoughton. I hypothesize that it is easier to obtain groceries using walking as a form of transportation in larger cities than in smaller suburbs. I also hypothesize that more grocery outlets in Boston have a larger selection of fresh produce and ingredients than in Braintree, Randolph, and Stoughton.

2.3 Creating Maps

To build the maps on ArcGIS Pro, I had to find the correct databases to gain relevant information. The layer entitled "Food Retailers 2017," accessed from MAPC's Food Systems Map website, is used to pinpoint where food retailers are located and what type they are. I placed a point symbol for each food retailer located within the city boundaries of each city. I narrowed down the food retailer types to the following parameters using a Definition Query Search in ArcGIS Pro to differentiate between retailers that primarily sell prepackaged and convenience items and fresh ingredients and produce:

- Fruit and Vegetable Markets
- Seafood Markets
- Meat Markets
- Supermarkets and other grocery stores (excluding convenience stores)
- Warehouse wholesale stores (Costco, Sam's Club, BJ's Wholesale, etc.)

I then constructed buffers of ¼ mile around each food retailer to illustrate the presence of housing and residential streets inside the buffer. ¼ mile distances are used as the standard for planning committees and agencies when designing walksheds, as most able-bodied individuals can complete ¼ in ten minutes. Ten minutes is the approximate standard most planners use for the duration of how long people are willing to walk to reach their destinations (Tufts University).

The region inside the buffer indicates ¼ mile distance or less from the closest food retailer, while those outside the buffer represent a longer distance than ¼ mile.

3 RESULTS AND ANALYSIS

3.1 Mapping Results and Analysis

After configuring the maps of the four municipalities, it became exceedingly clear that Boston has a much more robust and accessible number of food retailers that overlap with one another, indicating a wide variety of options for food. As seen in Figure 1, Boston contains many food retailers analyzed in this study. The most abundant are supermarkets and other grocery stores, followed by farmer's markets. Boston's wide variety of food shopping options and dense housing result in a remarkably high likelihood of walking access to these stores.

In contrast, the three suburban cities have much fewer options, and most are concentrated in a main area along bus lines. While none of the suburbs can be labeled food deserts by USDA definitions (one-mile radius) due to the prevalence of convenience stores and gas stations within the mile, the cities' walking accessibility to stores with fresh ingredients is limited. Most grocery options in all three cities are centrally located with little to no residential foot access from all directions (Figure 2, Figure 3, Figure 4), with the exception of Stoughton. Unlike the other two suburbs, Stoughton has a larger number of stores with ¼ buffers that contain residential streets. Local fruit and vegetable markets, seafood markets, and grocery stores can be found within the parameters.

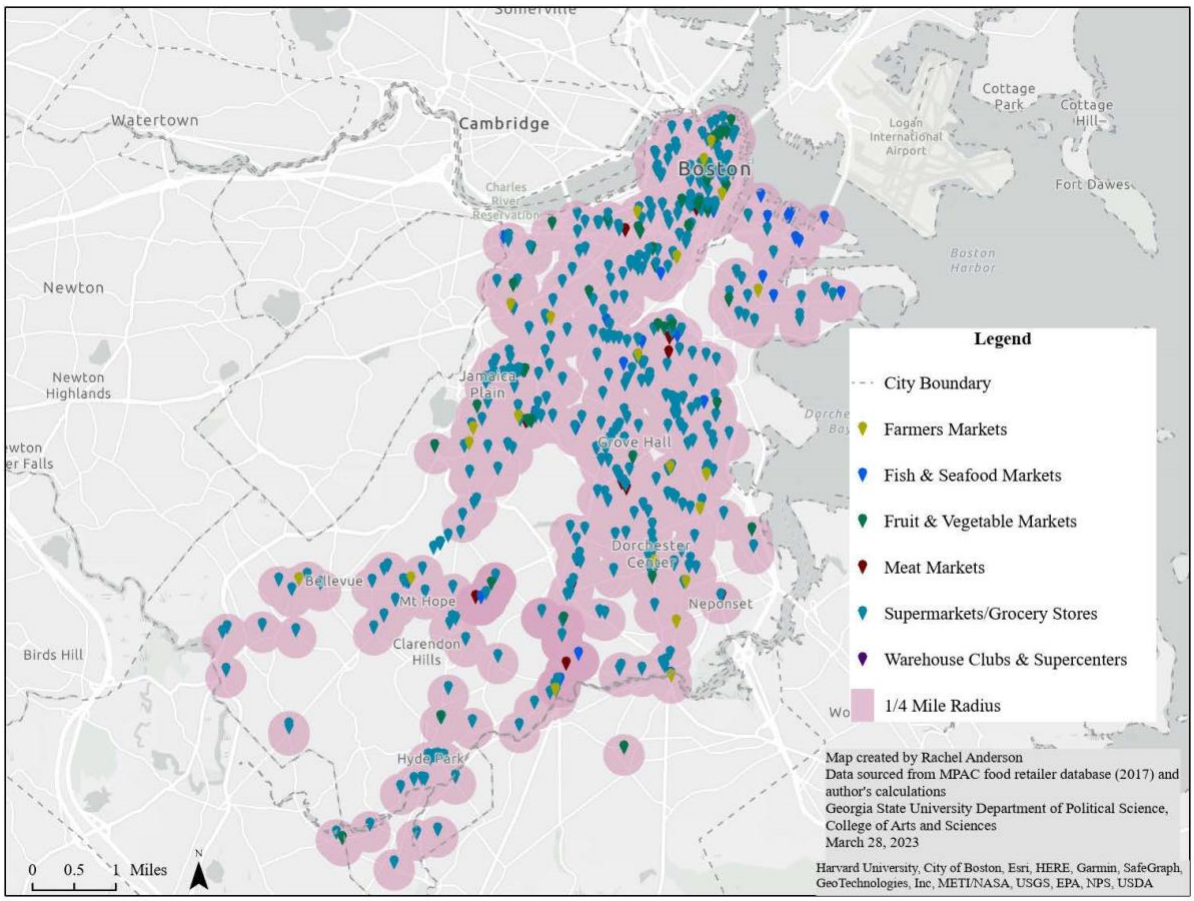

Figure 1: Grocery stores with 1/4-mile walking radius: Boston, Massachusetts
Source: Metropolitan Area Planning Council, Food System Map and Datasets, retrieved on 03/04/2023. Datasets retrieved: Food Retailers 2017, Reference USA, MassGIS, Tufts University, 2017. Author's calculations.

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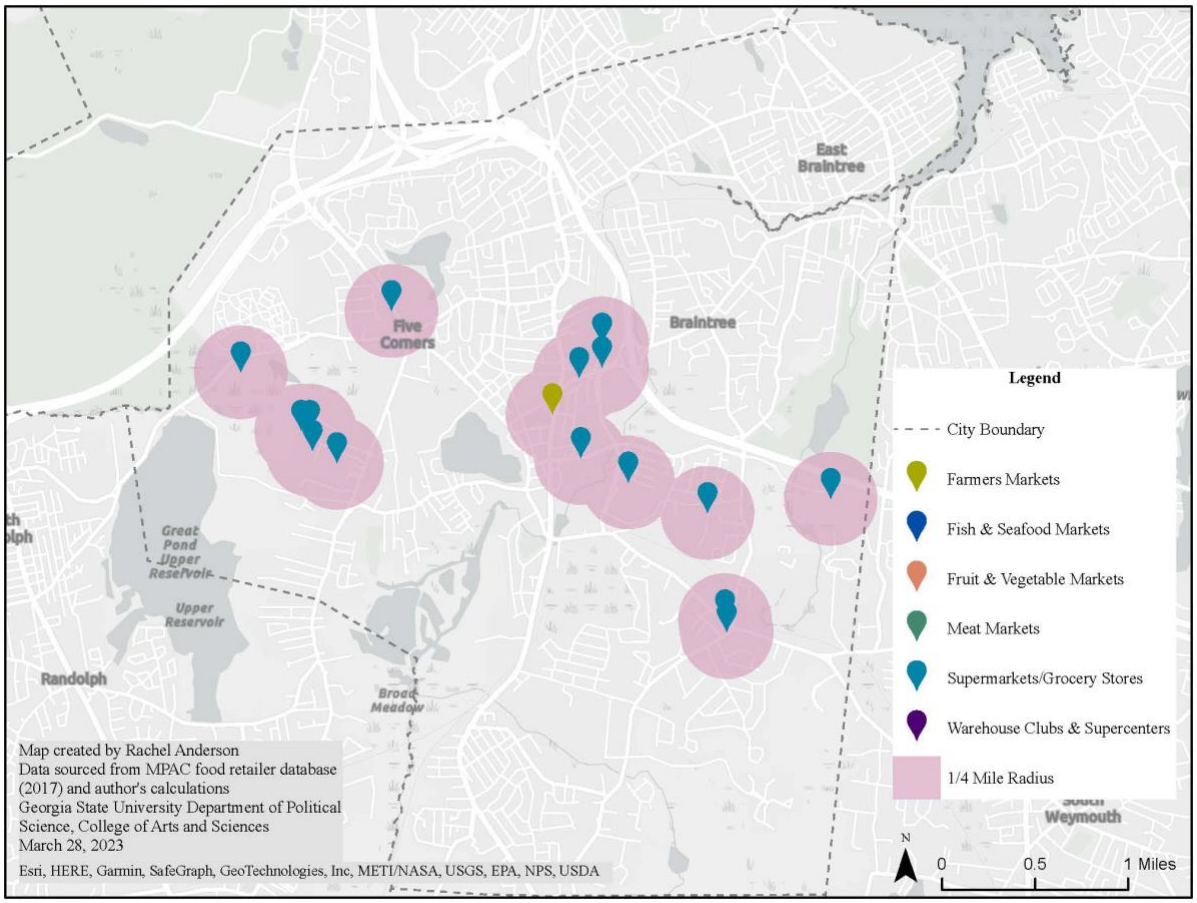

Figure 2: Grocery stores with 1/4-mile walking radius: Braintree, Massachusetts
Source: Metropolitan Area Planning Council, Food System Map and Datasets, retrieved on 03/04/2023. Datasets retrieved: Food Retailers 2017, Reference USA, MassGIS, Tufts University, 2017. Author's calculations.

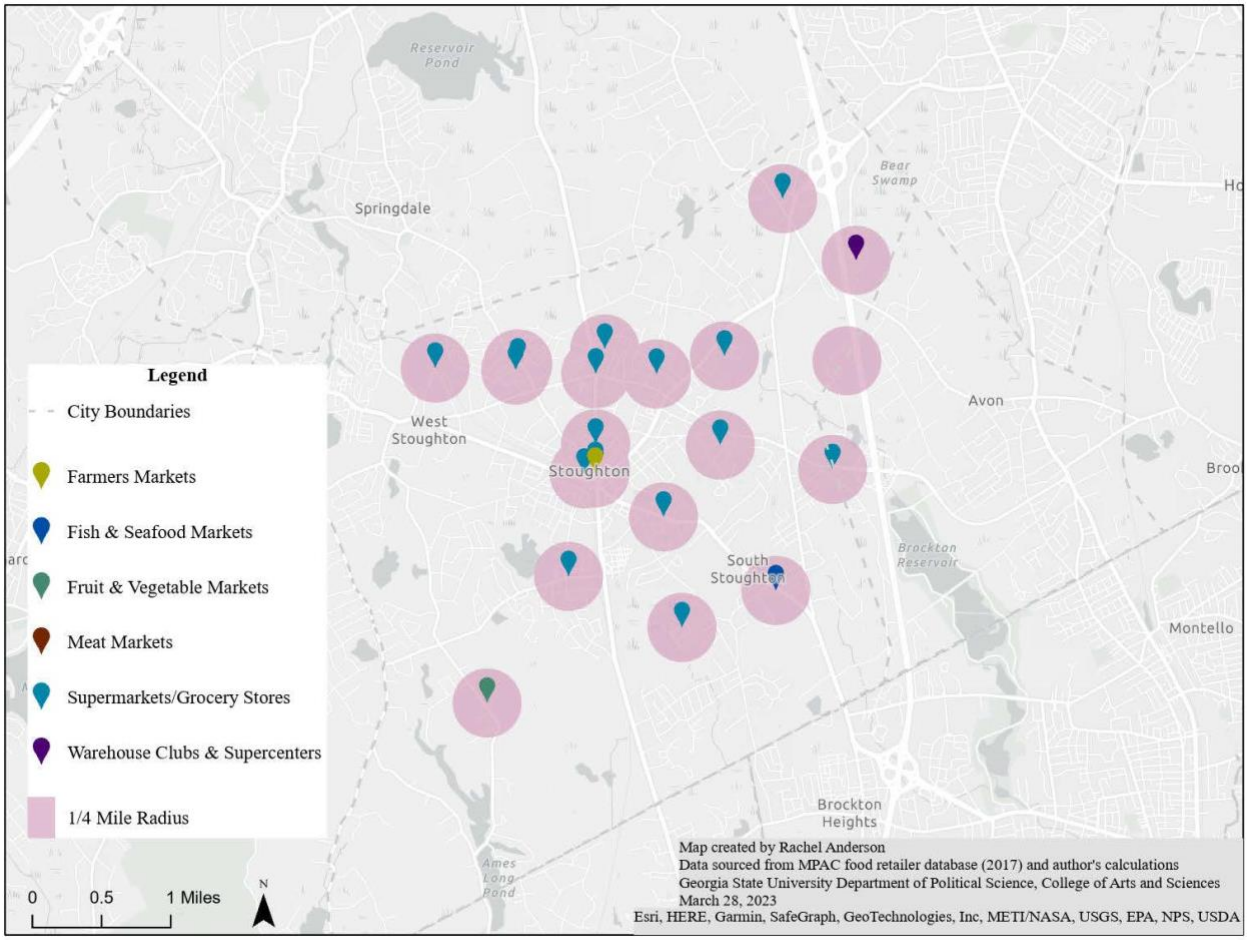

Figure 3: Grocery stores with 1/4-mile walking radius: Stoughton, Massachusetts
Source: Metropolitan Area Planning Council, Food System Map and Datasets, retrieved on 03/04/2023. Datasets retrieved: Food Retailers 2017, Reference USA, MassGIS, Tufts University, 2017. Author's calculations.

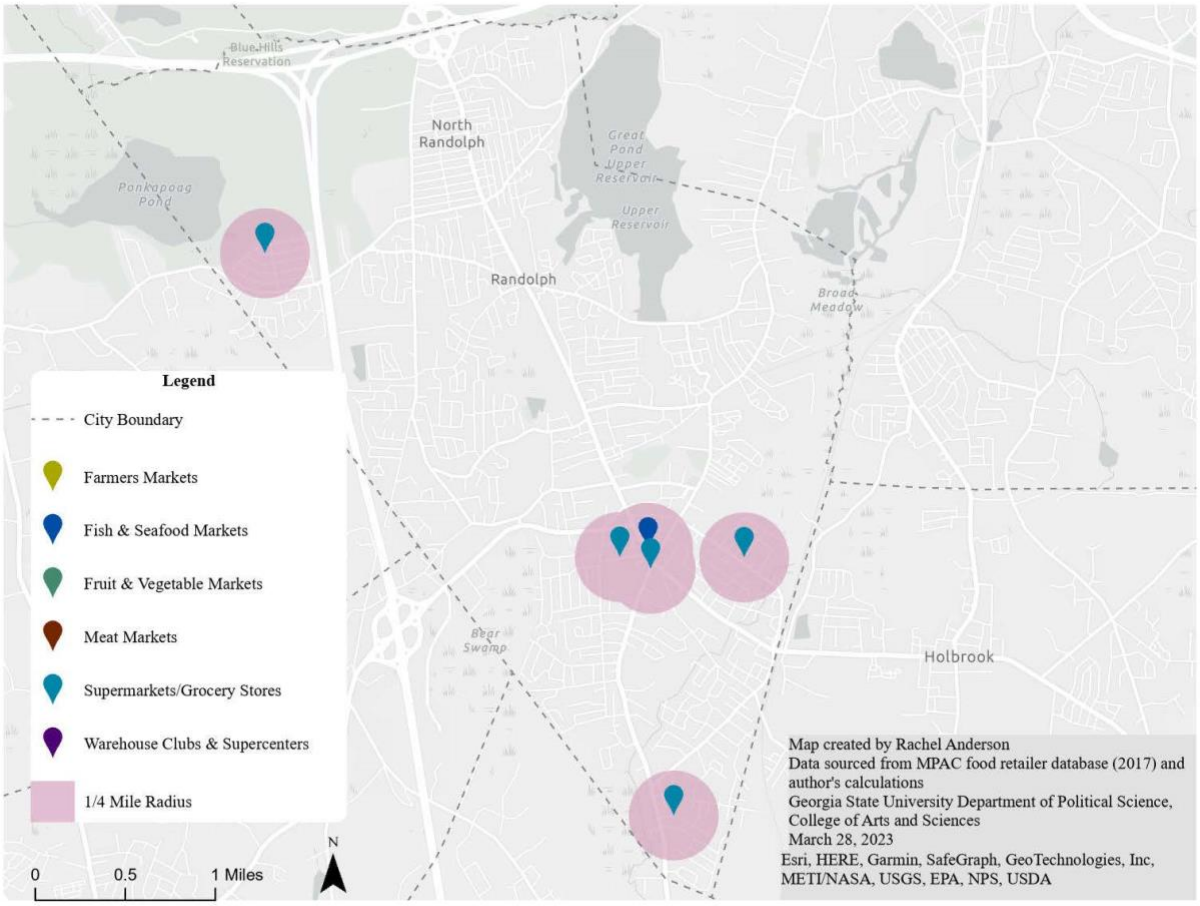

Figure 4: Grocery stores with 1/4-mile walking radius: Randolph, Massachusetts
Source: Metropolitan Area Planning Council, Food System Map and Datasets, retrieved on 03/04/2023. Datasets retrieved: Food Retailers 2017, Reference USA, MassGIS, Tufts University, 2017. Author's calculations.

In addition to less foot access, what little walkability exists is mostly along main commercial roads that are not conducive to pedestrians. For example, to access a cluster of stores in Randolph (see Figure 4), one must navigate a busy, traffic-congested state highway. Similar road infrastructure carries over to Braintree, in which nearly all food stores clustered in a single stretch of road. There are also fewer stores overall per suburban town when compared to Boston, leaving the population of the suburban cities with less options and therefore, less walkability.

4 CONCLUSION AND IMPLICATIONS

4.1 Conclusions

The study answers my three research questions and hypothesis conclusively. In my hypothesis, I stated that areas with a more concentrated population and higher walkability can more easily and quickly obtain groceries than those with lower walkability. This proves correct when examining the map of Boston proper (Figure 1) and its high walkability and number of adequate food retailers. In Boston, walking down the street and finding a grocery store is much easier than in the suburban cities.

The maps illustrating grocery store presence and walkability in the towns also give merit to my hypothesis. The cities have bus stops close to commercial areas but little ¼ mile walksheds from residential neighborhoods to commercial sections of town. While Braintree, Randolph, and Stoughton have food retailers with residential areas within the ¼ mile buffer, much of the population lives outside these buffers. The walkable access to grocery stores and other food retailers proved low, particularly stores with fresh, affordable food. While there are multiple convenience stores near residential neighborhoods, those store types were not used in this study due to a lack of fresh produce, meat, and seafood and a tendency to only sell prepackaged convenience items. Using these findings and my definitions of food accessibility, I can confidently label certain areas within the three cities as food mirages in terms of walkability.

Several implications may be made from the results of this study. Firstly, it became apparent that there are limited public transit options outside Boston city proper. Those who take public transit are limited to direct bus routes or commuter lines that rarely make stops in specific neighborhoods. During my research, I found that in each suburban city, only one or two bus lines

service the entire city. While it is very possible to catch a bus to a food store, some complications may attribute to it not being a viable solution. Many people find the bus cumbersome and time-consuming and prefer walking down the street to a corner store and taking only what they need.

Secondly, policymakers, city planners, and government officials in Braintree, Randolph, and Stoughton did not consider walkability and pedestrian-friendly design at the start of these places as industrialized factory towns (O'Connell, 2013). These suburbs began as shoe-factory towns on the outskirts of Boston that were later connected by the expansion of highways after WWII (O'Connell, 2013). As the metropolitan area was extended to South Boston in the 1940 Census and onward, the former factory towns saw robust suburbanization with favor to the automobile that could connect it to Boston. As a result, the built environment is pedestrian-unfriendly, resulting in a lower walkability rate and less options than Boston. In present day, the towns have less dense housing and a higher percentage of vehicle ownership than Boston (see Table 1), rendering the development of commercial areas car dependent. More vulnerable groups with little vehicle access remain disadvantaged for collecting necessities.

Lastly, I believe there is a need for more grocery stores, markets, and supermarkets in suburban towns with adequate, affordable options. The less dense urban environment of the suburbs restricts commercial and residential zoning to specific areas, leading to many neighborhoods without walkable access to grocery stores. Opening more corner markets and smaller stores closer to where people live will alleviate the need for a vehicle altogether. While none of the cities in this study are technically food deserts as defined by the USDA, there is still limited access to healthy food options for a portion of the population as defined by this study.

4.2 Possible Solutions

Massachusetts has implemented several programs designed to assist those with lower access to groceries. According to the MAPC, one such strategy is the enactment of the Massachusetts Community Systems Plans. The program highlights a city's specific needs and assets relating to food access and strives to provide an equitable food system to its residents. Equity is the foundation for which all goals and strategies must be analyzed. Without the equity lens, a city cannot ensure its efforts are adequate in reaching every part of the community. Examples may include increased urban agriculture, SNAP (Supplemental Nutrition Assistance Program) and WIC benefits, community food banks, community gardens, and government-sponsored food programs in public schools.

Along with food systems plans, Massachusetts continues to utilize food delivery apps such as Instacart and pick-up services at major grocery outlets to reach immobile and disabled portions of the population. For example, the Malden, Massachusetts Community Food Assessment (CFA) states that one of its key goals for bettering food access in the city is to coordinate with local markets to establish pickup or delivery times for residents who live further away from a grocery store. Similarly, the CFA reiterates its goal of modifying and promoting infrastructure suitable for walking and biking, particularly regarding routes that service food retailers.

Finally, this study shows the need for more stores in suburban towns. People with mobility restrictions, the elderly, people with small children, and those without a personal vehicle all deserve the same access to fresh, affordable, culturally sensitive food as other groups. If the state of Massachusetts is serious about its dedication to a more equitable food system, keeping in mind the needs of the fringes of the population is pertinent.

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