Assessing Supermarket Quality in Relation to Town-Health Outcomes

Summer McTigue[1] and Patricia Hans[#]

[1]Ridgewood High School, USA
[#]Advisor

ABSTRACT

Obesity, diabetes, and other heart-related illnesses are major problems in the United States. It has been revealed that this is mainly due to one's diet, as a healthier diet would lead to positive health outcomes. Problems with diet and negative health outcomes correlate strongly with a lessened accessibility to supermarkets selling nutritious food, and a wider influx in fast food restaurants affect the decisions those in low income communities can make about food and accessing nutritious food. In order to determine why there is a higher risk for obesity and diet-related illnesses in lower income areas, an ethnographic mixed method (QUAL+QUAN) study was utilized. This was achieved through going to three towns - West, East, and South Orange, New Jersey - with varying income levels to assess different aspects of each grocery store in the area. This study adds to the existing understanding of food accessibility through a localized and enriched view of the quality of supermarkets, and how this quality differs depending on the average income level of an area. The income and supermarket quality of an area also directly correlate to the health of a town, especially with regard to obesity and heart-related diseases. The findings of this study suggest that higher income towns have greater access to nutritious foods, leading to positive health outcomes, while lower income towns have limited accessibility to nutritious food and therefore face negative health outcomes.

Introduction

A San Francisco man bleeds into his muscles. As a low-wage worker, he can only afford very few meals, and finds that tacos and other cheap meals are more filling than fruit. This man suffers from scurvy, a disease that stems from a lack of vitamin C in the diet, and is very rare. Dr. Lindsay Ryan (2024), an associate physician at the University of California, San Francisco, had previously only seen this disease in refugee camps. Another man faces a bone infection in one arm, and the only way to remove it is through amputation. However, this man lives on the streets of San Francisco, and claims that death would be a better route than having to live his life with a disability if he does not have proper housing. His amputated arm would leave him vulnerable, and although social workers work to find him housing, the attempt is futile. Eventually, the man is transferred to hospice, where he dies soon after.

Dr. Ryan works at a medical safety net, which is a hospital that disproportionately aids individuals on Medicaid or do not have insurance. These hospitals cater toward those with very low incomes, and many immigrants or people of color. However, most of the illnesses people have do not stem from genetics or other issues, but from environmental factors due to their lifestyle. The term end-stage poverty, coined by Dr. Lindsay Ryan, refers to patients who face "the manifestation of social inequality in people's bodies" (2024). In these instances, consideration on income level and one's health go hand in hand, as the medical safety nets reveal that the illnesses many people struggling with poverty have can be traced back to their income (Woolf et al., 2015). Scurvy is an extremely rare disease, however the San Francisco man had little to spend on healthy food, and had no choice but to defer to a diet that led to major health problems.

Americans grow up surrounded by media and advertisements concerning a multitude of different foods and brands, and this marketing usually affects their perceptions of this food. Although many of these foods could be

nutritious and beneficial to one's well being, other foods, mainly fast food or processed food brands, can incur long lasting harm onto individuals. A vast amount of Americans do not have sufficient access to nutritious foods, turning instead to fast food or other harmful options. This leads to a higher rate of obesity in America (Freeman, 2007).

It has also been determined that better accessibility to supermarkets and a strengthened presence of them leads to healthier individual decisions (Gould et al., 2012). The sources discussed speak to the relationship between supermarkets and access to healthy foods, and how the prevalence of different types of foods affect an individuals health. This research reveals that although healthy eating can improve one's health and reduce risk of chronic disease, many communities, notably low-income communities, have less accessibility to supermarkets that can provide healthier foods. Further, the research conducted in this study presents a new understanding of the quality of the supermarkets in areas with major income differences, as each town analyzed consisted of a diverse array of food stores.

Literature Review

In this literature review, many pieces of work discuss how access to nutritious foods can result in major health effects for different groups, however they reach this conclusion in diverse ways. According to the 2020-2025 Dietary Guidelines for Americans (DGA), a healthy diet is defined by consuming nutrient dense foods, such as a variety of fruits and vegetables, grains (especially whole grains), low fat dairy products, and foods high in protein, while limiting intake on sugars, saturated fat, and sodium (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). This definition is important in order to consider how healthy food may be a challenge for many people to achieve, and how many would revert to eating cheaper foods consisting of overwhelming amounts of saturated fat and sodium.

Andrea Williams looks considerably at the role of fast food restaurants in the diets of low income communities (places that take part in substantial amounts of fat and sodium in their food), and argues that this is a result of targeted marketing, prevalence in schools, and government subsidies (Freeman, 2007). In low income cities, such as West Oakland, there is only one supermarket and 36 liquor and convenience stores, and fast food restaurants on every corner. Freeman also believes that communities of color suffer the most harmful effects from these practices, as many do not have sufficient access to adequate healthcare and nutrition. She claims that "while the growth of fast food in poor urban neighborhoods has increased steadily, supermarkets stocking fresh, high-quality food have simultaneously relocated to the more spacious and affluent suburbs" (Freeman, 2007). This suggests that lower income areas face problems pertaining to reaching these supermarkets, and further research deepens this insight.

The article "Classifying Neighborhoods by Level of Access to Stores Selling Fresh Fruit and Vegetables and Groceries: Identifying Problematic Areas in the City of Gatineau, Quebec", is a case study that examined different aspects of supermarkets in a city in Canada, and emphasizes how different income levels access nutritious food. Researchers created a local deprivation index to measure the different levels of social and material deprivation the population faces, and the population was divided into four different quartiles, each with differing deprivation indexes. They also measured an individual's distance to a supermarket and the variety of fruits and vegetables in the stores, and found that people with high levels of social deprivation and poor accessibility to food stores are more likely to develop unhealthy eating patterns. This research fits into the further conversation because of the focus on geographic access to nutritional foods, revealing greater information about inequalities based on income differences. It is important to note the geographic access to supermarkets (as well as what is in the supermarkets themselves) as there is a correlation between that and socioeconomic status.

Additionally, in the article "Perceived and Geographic Food Access and Food Security Status Among Households with Children", Ma et al. sought to examine the association between perceived and geographic food access to one's socioeconomic access. Researchers classified participants into three categories: food secure (FS), food insecure (FI), and very low food security among children (VLFS-C). The overall food environment was characterized by geographic information system based measurements - using geographic data on the presence of grocery stores and distance to those stores - as well as self reported perceptions on the food environment. The results of this study revealed that

people who were food insecure or very low food security among children commonly reported lower quality of fruits and vegetables, as well as lower odds of easy access to healthy foods. However, the results contrast slightly as the distance to the nearest supermarket was shorter for VLFS-C households compared to FS households. FI households also reported more opportunities to purchase fast food, indicating a greater perception of unhealthy foods in their respective areas. This study is similar to Gould et al. as they also collect data on accessibility depending on one's income level, however expands this idea by incorporating how individuals perceive their food access. It is important to understand how people consider their food situations, as it can differ from what the situation actually is.

An additional article, titled "The Link Between Local Food Environments and Obesity and Diabetes," also utilizes geographic information systems (GIS) in order to determine one's proximity to nearby supermarkets, and reports on the correlation between food environments and related diseases, such as obesity and diabetes (2008). Researchers used GIS in order to create a retail food environment index, where a higher number on the index would mean a person lives near more fast food or convenience stores compared to grocery stores. With this method, they found that California residents with an abundance of fast food or convenience stores were more likely to suffer from obesity or diabetes. These findings relate back to Freeman's article, as both determine the connection between fast food restaurants and diet-related illnesses, however this study does not reflect upon low income areas specifically. Freeman believes that low income areas and people of color specifically face problems relating to food access, reverting to cheaper meal options, while the California study furthers this information by comparing access to fast food and one's health. This research is limited, however, as it only determines that fast food and convenience stores lead to greater health related disease in California, and not in other areas.

A U.S department of agriculture study (2009) looks at the United States overall to collect data on accessibility. The study found a small percentage of consumers are unable to access nutritious food due to a lack of transportation, meaning most Americans do have sufficient access to supermarkets with regard to traveling there. The study provides important information pertaining to food pricing, as it stated that "Results from these analyses show that when consumers shop at convenience stores, prices paid for similar goods are, on average, higher than at supermarkets" (Ver Ploeg et al., 2009). Lower income families that only live near convenience stores, therefore, are forced to pay more for their produce unless they were to travel to a supermarket.

There are many gaps in the current research, most notably that most studies do not take a localized viewpoint into limited accessibility to nutritious food. Most of the studies looked at measured accessibility to food stores through geographic information systems, as this program provides clear information on access to supermarkets. However, most of these studies fail to determine what each food store consists of, and how that can affect one's diet. The Department of Agriculture study (2009) looked into accessibility throughout the country, therefore gathering information on all particular types of towns, and the Regents of the University of California et al. study (2008) looked specifically at California. It is important for some studies to minimize their viewpoint on where they are gathering information from, however those that have done so are in different countries, so can diverge from the US to some respect (Gould et al., 2012). Additionally, few studies have looked closely at the supermarkets in different income areas in order to determine accessibility, with regard to stepping into these communities through an ethnographic study and analyzing their supermarkets and how it relates to their health. This gap led me to my research question: why is there a higher risk for obesity and diet-related illnesses in low-income areas compared to high-income areas?

Assumptions

Based on past research in different areas, it was assumed that lower quality supermarkets would correlate with the amount of related diseases such as heart disease, heart attacks, or diabetes. This quality would be revealed through the freshness of fruits and vegetables in the store, the variety of them, the pricing of the foods, and the area of the store allotted for fruits and vegetables, among other aspects. I also hypothesized that there would be a greater amount of stores in higher income areas in comparison to lower income areas.

Definitions

For the context of this study healthy food was defined as fruits and vegetables. Healthy food can mean many things, however past research utilized this definition as well and it is far easier to measure than other aspects of healthy food.

Methodology

With this research, I utilized an ethnographic mixed method (QUAL+QUAN) study in order to determine my results. First, it was necessary to determine which areas to research, as it was preferred to analyze towns with vastly different income areas but still were in close proximity to each other. This led me to research West Orange, South Orange, and East Orange, in Essex County, New Jersey. South Orange exhibits the highest income level, and East Orange has the lowest, with West Orange slightly lower than South Orange.

This ethnographic study was achieved through going to the specified areas (West, East, and South Orange), in order to gather specific information about the stores people in the areas shopped at. The main aspects of the grocery stores that were considered pertained to the fruits and vegetables in the store, as past research has determined that to be a suitable way to measure the health of a population. The categories were variety, freshness, pricing, area of the store reserved for fruits and vegetables, and the pricing for frozen fruits and vegetables. The variety and freshness of the fruits and vegetables were determined through a 1-3 scale, however the scale was different with both categories. A variety score of 3 means that there are at least four different types of a fruit or vegetable, while a freshness score of 3 means there are zero blemishes, bruises, or rotting of the fruit or vegetable. A variety score of 1 means there is no variety between foods, or only one type in the first place. Scoring a 1 for freshness would mean the majority of fruits and vegetables are rotten or bruised. The pricing for frozen fruits and vegetables were determined through a sample of frozen mixed vegetables and frozen mixed berries, however the brand changed depending on what was available at the store.

For the pricing of the fruits and vegetables, the best method found was to use a sample of three popular foods, instead of gathering the prices for all of them. Apples, bananas, and tomatoes were considered as the most viable, as most stores (even small convenience stores) had them.

After visiting each store in order to gather information, I then looked at the health records of each town to see if their income level and supermarket quality would correlate with how healthy each town is. This information was gathered through the Census Bureau and the NJ Healthy Community Planning Report, which was developed by the NJ Departments of Health (NJDOH) and the NJ Department of Environmental Protection (NJDEP). The three aspects of health I gathered information on was the heart attack rate, heart disease deaths, and the obesity rate. Another way to measure health would have been through a diabetes rate, however this information was not available online or in the Healthy Community Planning Report. However, the CDC (2022) states that the main risk factors for heart attack or stroke are high blood pressure, high cholesterol, diabetes, smoking and secondhand smoke exposure, obesity, unhealthy diet, and physical inactivity. Therefore, diabetes is one of the factors that leads to heart-related illnesses later on.

Limitations

One main limitation faced in this study was using fruits and vegetables as the only means to measure healthy food. This was the most optimal way to do so, as it could be more easily measured and quantified, however healthy food encompasses far more foods than solely fruits and vegetables. Other aspects, such as low-fat foods, organic or minimally processed snacks, and forms of protein would likely be signs of a healthy diet, however this data is much harder to determine. Many convenience stores or bodegas with an already limited food supply would not contain these particular foods, therefore most of the results would be challenging to collect.

Results

When deciding which towns to research, it was determined that West, East, and South Orange would be the most viable. The three areas have vastly different incomes (see Figure 1), as South Orange has an average median household income of $174,795, West Orange has an average of $127,931, and East Orange is $58,659 (US Census). An additional preliminary consideration on the population and area of the town was necessary, as these factors might alter the results of the collection of data.

	West Orange	East Orange	South Orange
Average Median Household Income (2018-2022)	$127,931	$58,659	$174,795
Population (2020)	48,482	69,620	18,489
Area of town	12.13 mi	3.927 mi	2.85 mi
Poverty Rate	6.6%	18.4%	5.9%
Amount of Large Supermarkets	3	2	2
Amount of convenience stores	10	16	0

Figure 1. Initial research on towns chosen for study

After collecting information on each of the stores in the towns, it was necessary to define what kind of store it was. For example, West Orange had three larger supermarkets while also having nine convenience stores. Convenience stores are commonly smaller, independently owned, and have a much lower presence of fruits and vegetables throughout the store. Once I determined which stores were larger and which were convenience stores or bodegas, I compared the number of fast food restaurants to the number of large grocery stores per mile. I did this because I assumed lower income areas would have a greater presence of fast food and fewer large grocery stores, and chose not to include bodegas because those stores do not provide a sufficient source of nutrition for the people who shop there and are much different than larger grocery stores. The results revealed that East Orange experiences a vast difference with the amount of fast food restaurants in the city compared to the amount of large grocery stores, while South Orange is the only town with a greater presence of supermarkets per mile than fast food. Although West Orange appears to have much fewer large stores per mile, it is important to consider the fact that West Orange is 12.13 square miles, while South and East Orange are both under four square miles. This means that West Orange will naturally have fewer stores per mile, as there is also a larger presence of parks and reservations compared to the other towns.

**Figure 2.** Fast Food Vs. Large Grocery Stores Per Mile
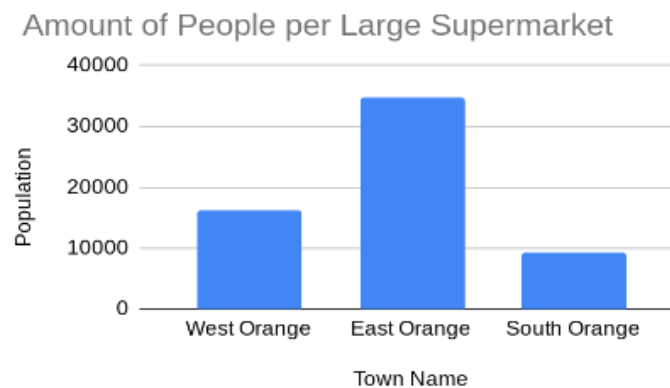
Figure 3. Amount of People per Large Supermarket

Another look into accessibility stems from comparing the population of each town to the amount of large supermarkets. As stated in Figure 1, the population of each town is fairly different, ranging from 18,489 to 69,620 people. South Orange, the town with the smallest population, has the same amount of large supermarkets as East Orange, the town with the largest population. This reflects a clear disconnect between the two towns, as a greater number of East Orange residents have access to fewer stores (see figure 2).

Pricing

Another important aspect of the grocery stores was the pricing of fruits and vegetables, and past research has revealed that smaller stores typically have higher prices (US Department of Agriculture, 2009; White, 2007). Overall, that research was mostly affirmed, as convenience stores had higher pricing for most stores, and vice versa for large grocery stores. West Orange had the highest pricing for apples and tomatoes, however this is likely because there are far more convenience stores in West Orange than large grocery stores, and this data was gathered through an average pricing. South Orange had the lowest prices for apples and bananas, but slightly higher prices for tomatoes. As data was collected in convenience stores, it was found that for many of them prices were not listed for many of the fruits

and vegetables, which necessitated me to ask someone for the price of a certain fruit or vegetable. This is interesting as it is very likely that people would not go through the process of asking for the price of an item and would prefer prices listed. Additionally, a common practice for many bodegas that I gathered during my study was that instead of a price given per pound of a fruit or vegetable, stores instead sold them per item. This reveals that people may be less likely to purchase more than one of a certain item in a convenience store, in contrast to larger grocery stores.
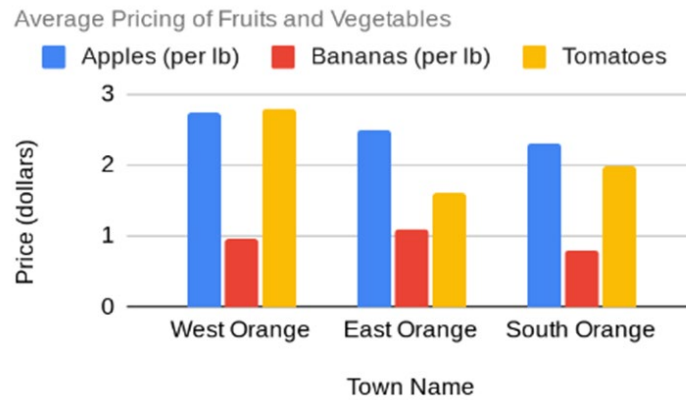
Figure 4. Average Pricing of Fruits and Vegetables

Variety and Freshness

Overall, both the variety and freshness of these fruits and vegetables correlated with the income levels of each town. For the variety of the stores, South Orange scored perfectly because the two supermarkets in the town are both large and contain a wide variety of produce throughout the score. The main reason why West Orange did not score as high was because of the presence of smaller convenience stores in the town, since South Orange contains none of them.
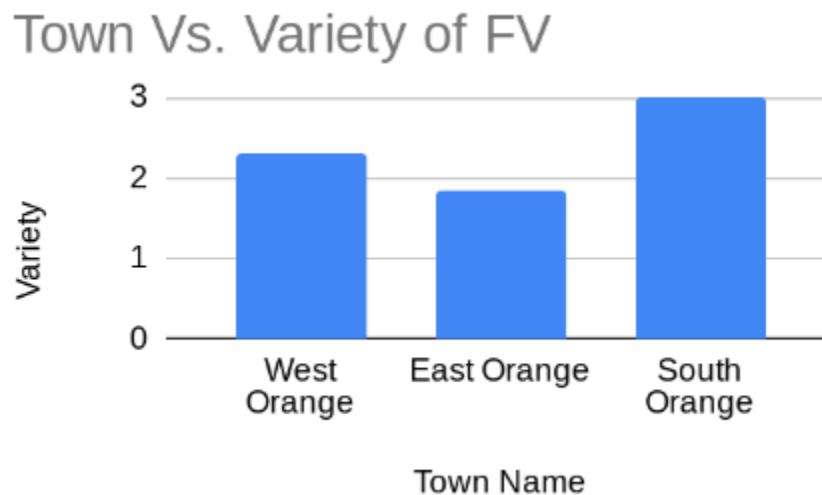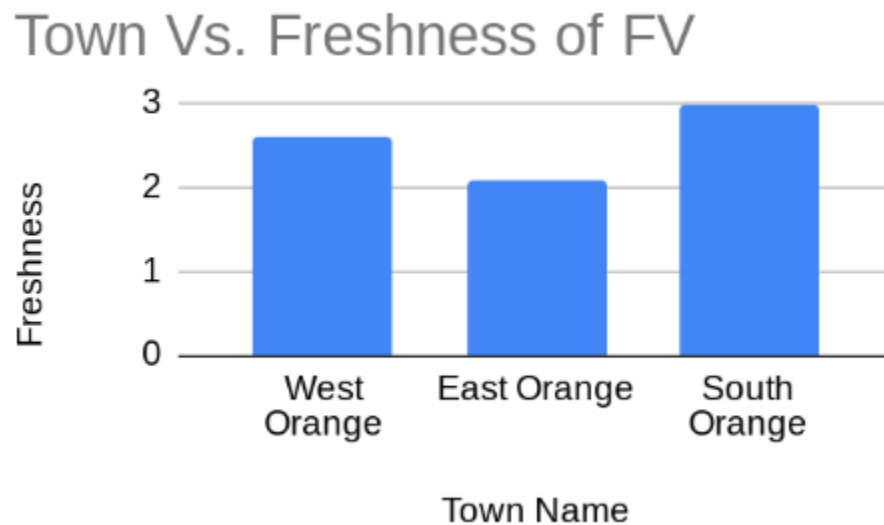

Figure 5. Town Vs. Variety of Fruits and Vegetables

       With regard to freshness, the towns scored similarly as variety, mainly because if a store is larger it will have more variety and a better quality of their food. Some stores in East Orange specifically contained fruits and vegetables

which almost all contained blemishes or were rotten, which calls into question the amount of people who are purchasing the rotten produce. Larger supermarkets, however, mostly maintained a high freshness scale.


Figure 6. Town Vs. Freshness of Fruits and Vegetables

Area of Store Devoted to Fruits and Vegetables

Overall, South Orange was determined to have the highest average area of the store specified for fruits and vegetables, while East Orange had the smallest. Even the largest grocery stores in East Orange were much smaller overall than South or West Orange stores, and this also relates directly to the variety of fruits and vegetables at each store.
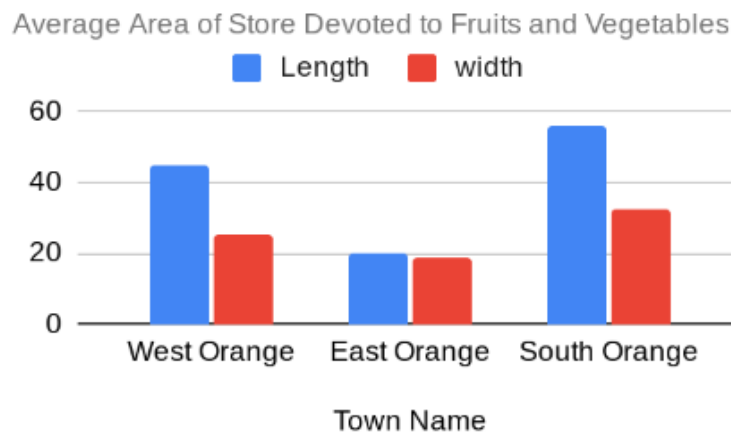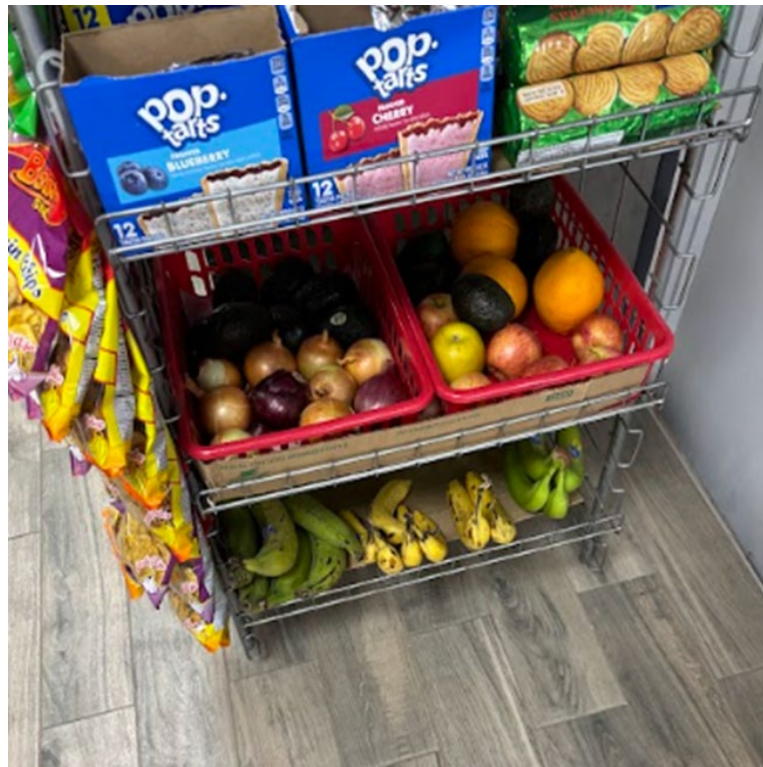
Figure 7. Average Area of Store Devoted to Fruits and Vegetables

Presentation of Fruits and Vegetables

The presentation of the fruits and vegetables in the store is very important to determine how customers will likely be attracted to the product or what products specifically they may prefer. For example, one convenience store in West Orange depicts most of their fruits and vegetables thrown together and combined into one group, placing avocados, onions, apples, and oranges, in one place. Bananas are separate, which can likely mean they are sold more commonly or cheaper than the other products. This depiction of fruits and vegetables differs greatly from larger grocery stores, where much larger varieties of fruits and vegetables are organized and commonly separate from each other. This would very likely impact a consumer's ability to buy a product, as they would be less inclined to buy products that

are badly presented. This is especially true when products are hidden from view, because if customers cannot see most of the fruits and vegetables they are incapable of buying them.

Both of the stores in South Orange were presented well, as they were both larger supermarkets. In West Orange, a town with a decent mix of both convenience stores and larger supermarkets, and East Orange, a town with a very limited number of large supermarkets, many of the smaller convenience stores face issues with the presentation of their produce (see appendix).

A store in South Orange was the only store (out of all visited) with a specific organic section. Because of the wide range of food stores analyzed in this study, organic food was not heavily considered, as smaller bodegas rarely contain organic fruits and vegetables. However, an organic section or organic produce in a store reveals strong access to healthy food overall, especially because the presence of organic food is extremely limited in East Orange and more prevalent in South Orange.

Health of Towns

When collecting data on the health records of these towns, it was evident that East Orange, the town that also has the lowest income rate, is also the unhealthiest with regard to heart-related illnesses and obesity. East Orange is above average for the state of New Jersey with both the heart attack rate and heart disease-related deaths. It is clear that the income of a town impacts their health, because South Orange has the best health out of the three towns, receiving fairly similar results to that of West Orange. This is especially seen in the obesity rate of the towns, as the East Orange average percentage is above the New Jersey average (28.2%) while South Orange and West Orange are both below the average.

	New Jersey	West Orange	East Orange	South Orange
Heart attack: age adjusted rate per 100,000 (2016-2019)	16.3	9.9	20.1	8

Heart disease deaths: age adjusted rate per 100,000 (2016-2019)	163.7	136.7	231.9	164.8
Obesity % of adults (2018)	28.2%	24.9%	36.8%	24.2%

Figure 8. Health information

Conclusions

After stepping into each town and observing the food situations in each area, it can be concluded that East Orange faces the most negative experiences and outcomes with regard to food access and quality. The town has about 2 medium-large grocery stores, with decent variety and freshness, but mainly contains small convenience stores which consist of very little fruits and vegetables in the first place. Additional information on the health of East Orange residents suggests a correlation with the quality of supermarkets because it also has the worst health outcomes compared to the other two towns. Residents in East Orange lack access to the quality fruits and vegetables that are common in high-income areas, suggesting later problems with health because of this.

In contrast, South Orange holds the best food situation, even though the town only has two large supermarkets. South Orange has the highest variety and freshness of their fruits and vegetables compared to the other two towns, especially because the town does not have any smaller convenience stores - in contrast to West and East Orange - which usually have very little variety.

Further research would be necessary to better determine the health of lower income and higher income towns through additionally measuring other forms of wellness such as gyms, parks, and other means for physical activity. Besides diet, physical activity is one of the most important ways to minimize negative health outcomes, so measuring that and nutrition would provide a concise means to measure an area's health. A consideration of how wellness culture has impacted those in higher income areas could inform this research, as modern society has fallen into overconsumption of an array of products which claim to help with physical wellbeing or health (Blei, 2017).

It is important to recognize that negative health outcomes are not solely due to individual health choices, as it was revealed through this study that the location of a person and their income level clearly reflects their access to nutritious food. People in East Orange face a clear issue in accessing proper nutrition, as most of the stores in their areas consist of bodegas with very little variety or an extremely low quality of fruits and vegetables. The issue of obesity, diabetes, and heart-related diseases in America can be solved only through recognizing that this is a systemic issue, and continuing to research this topic is the only way to further understand it.

Acknowledgments

References

Adrian C. Gould, Philippe Apparicio, & Marie-Soleil Cloutier. (2012). Classifying Neighborhoods by Level of Access to Stores Selling Fresh Fruit and Vegetables and Groceries: Identifying Problematic Areas in the City of

Gatineau, Quebec. *Canadian Journal of Public Health / Revue Canadienne de Santé Publique*, *103*(6), e433–e437. https://www.jstor.org/stable/canajpublheal.103.6.e433

Ahern, M., Brown, C., & Dukas, S. (2011). A national study of the association between food environments and county-level health outcomes. *The Journal of Rural Health*, 27(4), 367-379. https://onlinelibrary.wiley.com/doi/10.1111/j.1748-0361.2011.00378.x

Azétsop, J., & Joy, T. R. (2013). Access to nutritious food, socioeconomic individualism and public health ethics in the USA: a common good approach. *Philosophy, ethics, and humanities in medicine : PEHM*, 8, 16. https://doi.org/10.1186/1747-5341-8-16

Blei, D. (2017, January 4). *The false promises of wellness culture*. JSTOR Daily https://daily.jstor.org/the-false-promises-of-wellness-culture/

California Center for Public Health Advocacy, PolicyLink, & UCLA Center for Health Policy Research. (2008, April). *Designed for disease: The link between local food environments and obesity and diabetes.* Regents of the University of California, PolicyLink, and the California Center for Public Health Advocacy. https://healthpolicy.ucla.edu/publications/Documents/PDF/Designed%20for%20Disease%20The%20Link%20Between%20Local%20Food%20Environments%20and%20Obesity%20and%20Diabetes.pdf

Freeman, A. (2007). Fast Food: Oppression through Poor Nutrition. *California Law Review*, 95(6), 2221–2259. http://www.jstor.org/stable/20439143

Heart disease and stroke. (2022, September 8). Centers for Disease Control and Prevention. https://www.cdc.gov/chronicdisease/resources/publications/factsheets/heart-disease-stroke.htm#:~:text=The%20Nation's%20Risk%20Factors%20and,unhealthy%20diet%2C%20and%20physical%20inactivity.

Houghtaling, B., Greene, M., Parab, K. V., & Singleton, C. R. (2022). Improving Fruit and Vegetable Accessibility, Purchasing, and Consumption to Advance Nutrition Security and Health Equity in the United States. *International journal of environmental research and public health*, 19(18), 11220. https://doi.org/10.3390/ijerph191811220

Lee, R. M., Rothstein, J. D., Gergen, J., Zachary, D. A., Smith, J. C., Palmer, A. M., Gittelsohn, J., & Surkan, P. J. (2015). Process Evaluation of a Comprehensive Supermarket Intervention in a Low-Income Baltimore Community. *Health Promotion Practice*, 16(6), 849–858. http://www.jstor.org/stable/26741248

Ma, X., Liese, A. D., Bell, B. A., Martini, L., Hibbert, J., Draper, C., Burke, M. P., & Jones, S. J. (2016). Perceived and geographic food access and food security status among households with children. *Public health nutrition*, 19(15), 2781–2788. https://doi.org/10.1017/S1368980016000859

Penney, T. L., Brown, H. E., Maguire, E. R., Kuhn, I., & Monsivais, P. (2015, May 3). *Local food environment interventions to improve healthy food choice in adults: A systematic review and realist synthesis protocol.* BMJ Journals. https://bmjopen.bmj.com/content/5/4/e007161.info

Ryan, L. (2024, April 11). *Many patients don't survive end-stage poverty*. New York Times. https://www.nytimes.com/2024/04/11/opinion/doctor-safety-net-hospital.html

Sadler, R. C., Gilliland, J. A., & Arku, G. (2013). *A food retail-based intervention on food security and consumption.* International journal of environmental research and public health, 10(8), 3325–3346. https://doi.org/10.3390/ijerph10083325

Union of Concerned Scientists. (2016). *The Devastating Consequences of Unequal Food Access: The Role of Race and Income in Diabetes*. Union of Concerned Scientists. http://www.jstor.org/stable/resrep17305

U.S. Department of Agriculture. (2009). *Access to affordable and nutritious food: Measuring and understanding food deserts and their consequences: Report to congress* (M. Ver Ploeg, V. Breneman, T. Farrigan, K. Hamrick, D.Hopkins, P. Kaufman, . . . E. Tuckermanty, Authors). https://ageconsearch.umn.edu/record/292130

U.S. Department of Agriculture, & U.S. Department of Health and Human Services. (2020, December). *Dietary Guidelines for Americans, 2020-2025* https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf

U.S Department of Health and Human Services. (n.d.). Access to foods that support healthy dietary patterns. https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/access-foods-support-healthy-dietary-patterns

White, M. (2007). Food access and obesity. *Obesity Reviews*, 8(s1), 99-107. https://onlinelibrary.wiley.com/doi/10.1111/j.1467-789X.2007.00327.x

Wight, V., Kaushal, N., Waldfogel, J., & Garfinkel, I. (2014). Understanding the Link between Poverty and Food Insecurity among Children: Does the Definition of Poverty Matter?. *Journal of children & poverty*, 20(1), 1–20. https://doi.org/10.1080/10796126.2014.891973

Woolf, S. H., Aron, L., Dubay, L., Simon, S. M., Zimmerman, E., & Luk, K. X. (2015, April). *How are income and wealth linked to health and longevity.* https://www.urban.org/sites/default/files/publication/49116/2000178-How-are-Income-and-Wealth-Linked-to-Health-and-Longevity.pdf