

**Food Insecurity in the Bay Area: An Analysis of Disparities of Food Access**

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**ABSTRACT**

Food insecurity is an increasingly pressing problem in the United States. Food security is defined as having “consistent access to enough food for active healthy living”. Those who are food insecure typically lack access to healthy food, especially fresh fruits and vegetables, facing increased risk of certain types of cancer, obesity, and cardiovascular disease. Food insecurity is traditionally attributed to a lack of financial resources. Recently though, studies have looked to the migration of grocery stores out of low-income and urban communities as the cause of possible disparities in physical food access. Therefore I sought to determine if disparities in physical access of fresh produce, as measured in terms of access to quality vendors and walking access/proximity, existed between either urban and suburban or low-income and high-income neighborhoods in the San Francisco Bay Area. I hypothesized suburban and high-income neighborhoods would have greater walking access as well as possess higher quality vendors compared to urban and low-income neighborhoods respectfully. I conducted walking tours of four neighborhoods – classified in terms of median household income and relative population density – to identify all vendors selling fresh fruits and vegetables and assess the quality of these retailers. Finally I compared these neighborhoods based on the quality of available fresh produce vendors and in terms of proportion of households with access to at least one of these vendors. The findings of the study are incongruent with the first half of my hypothesis but support the second half. While high-income and urban neighborhoods possessed the higher quality fresh produce vendors they also possessed inferior walking access, alluding to the complexities of the issue of food insecurity.

## **INTRODUCTION**

Food security, which is defined as having “consistent access to enough food for active healthy living” (USDA 2009) is an increasingly pressing problem in the United States. Most narrowly tend to think hunger and food insecurity are completely synonymous with one another, and although hunger is a possible outcome it is not inevitable. Those who are food insecure in the United States often severely lack access to healthy food, especially fresh fruits and vegetables. These important food groups are crucial for an active healthy life and can prevent chronic diseases, including several types of cancer, cardiovascular diseases, and obesity – which accounts for the second leading cause of death in the United States (U.S Dept. of Health and Human Services 2000; Jansen etc. 2007; Drewnowski & Specter 2004). Hunger and food insecurity contribute to poor health, rising health care costs, and are also associated with poor education and behavioral problems in children (Center of Hunger and Poverty 2000). In 2008 over 49 million people suffered from food insecurity, which is about 15% of the nation (USDA 2009). From 2007 to 2008 the number of people living in an insecure food situation grew by almost 15 million (USDA, 2009). Much of this is attributed to the recent economic crisis, making this issue even more relevant today (USDA, 2009).

Traditionally the U.S government defined food security as a condition that results from a lack of money (Nord & Prell 2007). The Department of Health of Human Services in the 1960s actually adopted a new a definition of poverty that was centrally tied to the economy food plan – a nutritionally adequate food plan designed by the USDA (USDA, 2009) Studies do confirm a strong negative correlation between low food security and income (Nord & Prell 2007; Rose et al. 1998). Specifically, 30% of households with poverty-level incomes were food insecure, while just 15% of households with income levels twice the poverty threshold, and only 7.5% of households with income levels three times the poverty line experienced food insecurity (Nord & Prell 2007). Additionally households below the poverty line were more than 3.5 times more likely to experience food insecurity than those above the poverty threshold (Rose et al. 1998). Yet while a lack of financial resources are a key barrier to food access this should not be the only factor considered, for instance 20% of U.S households classified as food insecure had midrange or high incomes (USDA, 2002).

The disappearance of grocery stores in urban and poor communities has recently been cited as another contributor to food insecurity in the United States (Ohls et al. 1999; Bolen &

Hecht, 2003). Across the nation, supermarkets have fled the inner cities following their wealthier customers to the suburbs, creating what are now popularly termed “food deserts” (Mari Gallagher Group, 2004). This trend began in the 1960s and 70s and has continued, cutting off easy access to nutritious and competitively priced food for urban shoppers (Rosenberg & Barrett 1992). For example, since the 1970s, Boston has witnessed 34 of their 50 big chain supermarkets shut down (Rosenberg & Barrett 1992). Additionally the majority of the grocery stores lost to the suburbs were originally located in low-income neighborhoods. One study conducted by the University of Connecticut found that in 19 cities low income areas had 30% fewer grocery stores per capita than high income areas (Cotterill & Franklin 1995) These migratory trends suggest possible disparities in food access between both urban and suburban communities and low-income and high-income areas.

The purpose of this study is to examine these suggested disparities of food access between both urban and suburban and low-income and high-income neighborhoods. For this study I defined access in terms of physical attainment of fresh produce. Due to the migration of super markets into the rich suburbs and out of the poor inner cities these areas may lack a large selection of fresh produce, posing a considerable barrier to physical access for the neighboring households. For instance in Philadelphia the small corner stores, making up the majority of food retailers, lacked 50% of the items from the USDA Food Plan – a nutritious diet plan comprised of 104 essential food items compiled by the U.S government for families on a budget (Thayer et al. 2007). Another significant barrier to physical access that has gone largely unstudied is transportation access. When residents of ‘food deserts’ own a car, they have the option of driving to a mainstream grocery store. Although if they lack a car they are forced to rely on their immediate environment, which could largely be comprised of fast food restaurants and gas stations, for nourishment. In 2004 about 1 out of every 10 U.S households did not own a car (EIA 2005). For these zero-car households, walking is the second most common method used to reach grocery stores; it is only superseded by obtaining a ride from a friend (Ohls et al. 1999). A survey of food stamp participants found that transportation barriers put considerable limits on where these consumers shop and was one of the main reasons they only make one big trip to a grocery store a month, resulting in fewer perishables like fresh fruits and vegetables in their homes (Ohls et al. 1999).

The body of current literature and the majority of political solutions are mainly focused on income barriers while physical access has until recently largely gone unnoticed. Although, while there does exist some studies on physical access, this limited literature that does concentrate on physical access barriers to food security only analyze these barriers in low-income and urban communities, however as mentioned earlier 20% of food insecure households had moderate to high-incomes (USDA, 2002). As a result I wanted to know how do disparities in food security, measured in terms of physical access to fresh produce vendors – walking access of and the quality of these available vendors – vary between high-income and low-income neighborhoods and also between urban and suburban neighborhoods in the San Francisco Bay Area? In this study walking access is defined as one's household located within a quarter-mile radius of at least one fresh produce vendor. A quarter-mile is cited as the acceptable walking distance in the current literature for the average able-bodied individual (Institution of Highways and Transportation 2000). I hypothesize that there will be a higher percentage of households within an acceptable proximity (i.e. possess walking access) of at least one fresh produce vendor in high-income and suburban neighborhoods compared to low-income and urban neighborhoods respectively. Additionally I also hypothesize that these available vendors in high-income and suburban neighborhoods will be of higher quality compared to low-income and urban neighborhoods.

## METHODS

**Neighborhoods Under Study** I studied four neighborhoods in the San Francisco Bay Area – Pacific Heights and the Tenderloin in San Francisco and Serramonte and Mission Street in Daly City. These four neighborhoods were not chosen randomly but because they met stringent criteria. Using information from the U.S Census and city-data.com, a private Illinois-based website known for its comprehensive profiling of U.S cities, I delineated each neighborhood based on the following criteria. Each neighborhood was classified as urban if its city was on the “urban areas” list from the U.S Census or suburban if the neighborhood's city is not on this list. Each neighborhood was also classified as either low-income or high-income according to where the household median income of each neighborhood fell in relation to California's median income of \$64, 563 (California Department of Finance, 2009). Finally the two cities – San Francisco and Daly City – which the four neighborhoods in this study are apart of have a higher

percentage of zero-car households compared to the U.S average of 8% (EIA 2005). Ultimately Pacific Heights is the high-income urban neighborhood, the Tenderloin is the low-income urban neighborhood, Serramonte is the high-income suburban neighborhood, and finally Mission Street is the low-income suburban neighborhood.

**Data Collection** After delineating each neighborhood I conducted extensive walking tours locating every vendor within each neighborhood who sold any fresh produce, this includes the typical supermarkets and corner grocery stores, as well as the atypical vendors such as farmers markets, roadside produce stands, gas stations, etc. Conducting a walking tour reduced the probability of missing a merchant and also allowed for qualitative data collection. At each fresh produce vendor I noted their address and then rated the quality of each store using a rating system, which will be described in detail at the end of the methods section.

**Data Analysis: Walking Access** Using ARC GIS, a popular Geographic imaging systems software, and the addresses of all the fresh produce vendors within each neighborhood, I conducted spatial analysis to determine the walking accessibility of fresh produce for each neighborhood. First using batchgeo.com I converted the addresses of each fresh produce vendor into GPS points and then plotted them on a map of the appropriate neighborhood. Next I delineated a quarter-mile radius, the acceptable walking distance, around each merchant to signify the households that are within an acceptable walking distance. A sample map can be seen below (Figure 1). With these maps I determined the percentage of each neighborhood that cannot successfully access fresh produce by walking – lies outside the quarter mile radius of all vendors. Finally I compared the percentage of households lacking walking access between high-income and low-income neighborhoods and also between the urban and suburban neighborhoods. This spatial method of data analysis is the most straightforward way of measuring when taking into consideration my limited resources, such as access to maps detailing the actual location and size of households, and it is very similar to the method used by other peer-reviewed studies (Hobson et al., 2002).

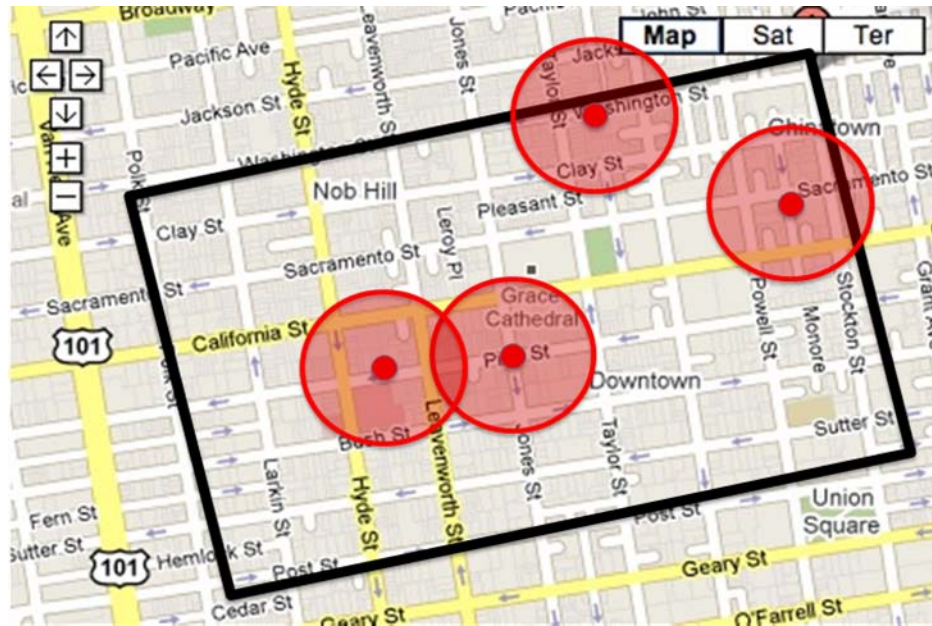


Figure 1. A sample of the neighborhood spatial analysis maps created in ARC GIS

**Data Analysis: Quality Access** Finally I analyzed the disparities in quality of the fresh produce vendors between both urban and suburban neighborhoods and low-income and high-income neighborhoods, using the rating system below. I rated the quality of each vendor based on three variables: price, variety, and quality of the available fresh produce. For each of these variables they were rated on a scale of 1 to 4, with 1 being the worst and 4 the best.

#### Price

**1:** +\$5.00/lb., **2:** \$4.99 – \$3.50/lb., **3:** \$3.49 - \$2.00/lb., **4:** \$1.99 - \$0.01/lb

#### Variety

**1:** 1 – 10, **2:** 11 – 30, **3:** 31 – 50, **4:** 51 – +100

**Add 5** for potatoes , **Add 5** for onions, **Add 10** for other vegetables

#### Quality of Produce

- 1** Rotten food present and majority of selection has visible bruises
- 2** No rotten food present and some have visible bruises (overly ripe)
- 3** No rotten food, very few have visible bruises (overly ripe)
- 4** No rotten food and no visible bruises. All perfect ripeness

## RESULTS

**Characteristics of Study Sites** Amongst the four neighborhoods analyzed in this study the vast majority of all fresh produce retailers in urban neighborhoods were small corner stores, while the majority in suburban neighborhoods were mainstream grocery stores (Table 1).

Table 1. The percentage breakdown of store types and total number of stores by neighborhood

<b>Types of Store</b>	<b>Neighborhoods</b>			
	Serramonte High-Inc. Suburb	Mission Street Low-Inc. Suburb	Pacific Heights High-Inc. Urban	the Tenderloin Low-Inc. Urban
Liquor Store	--	--	5.3%	7.8%
Bakery	--	--	5.3%	3.1%
Convenience Store	--	--	--	3.1%
Corner Store	--	--	52.6%	65.7%
Market	--	42.8%	21.2%	15.6%
Produce Market	--	42.8%	--	3.1%
Farmer's Market	50%	--	--	1.6%
Mainstream Grocery Store	50%	14.4%	10.5%	--
<b>TOTAL No. of STORES</b>	2	7	18	64

Additionally the greatest number of fresh produce vendors was available in the low-income neighborhoods and in the urban neighborhoods (Table 2).

Table 2. Total number of stores by neighborhood type.

	Urban	Suburban	TOTAL
High-Income	18	2	20
Low-Income	64	7	<b>71</b>
TOTAL	<b>82</b>	9	

**Walking Accessibility** Figures 1 through 4 below display the spatial maps used to analyze walking access in each neighborhood.



Figure 1. Spatial analysis map of Mission Street neighborhood.



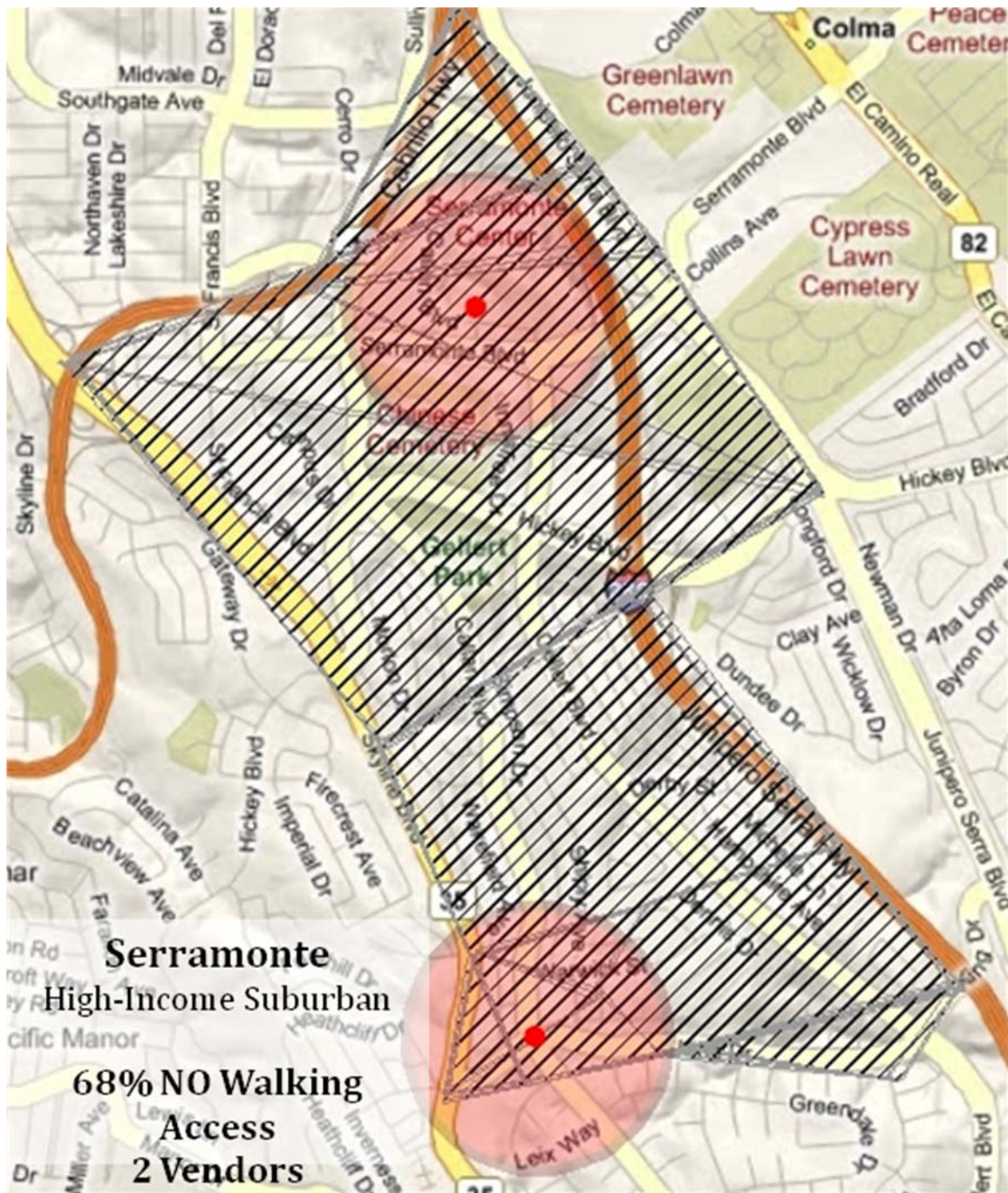


Figure 2. Spatial analysis map of Serramonte neighborhood.



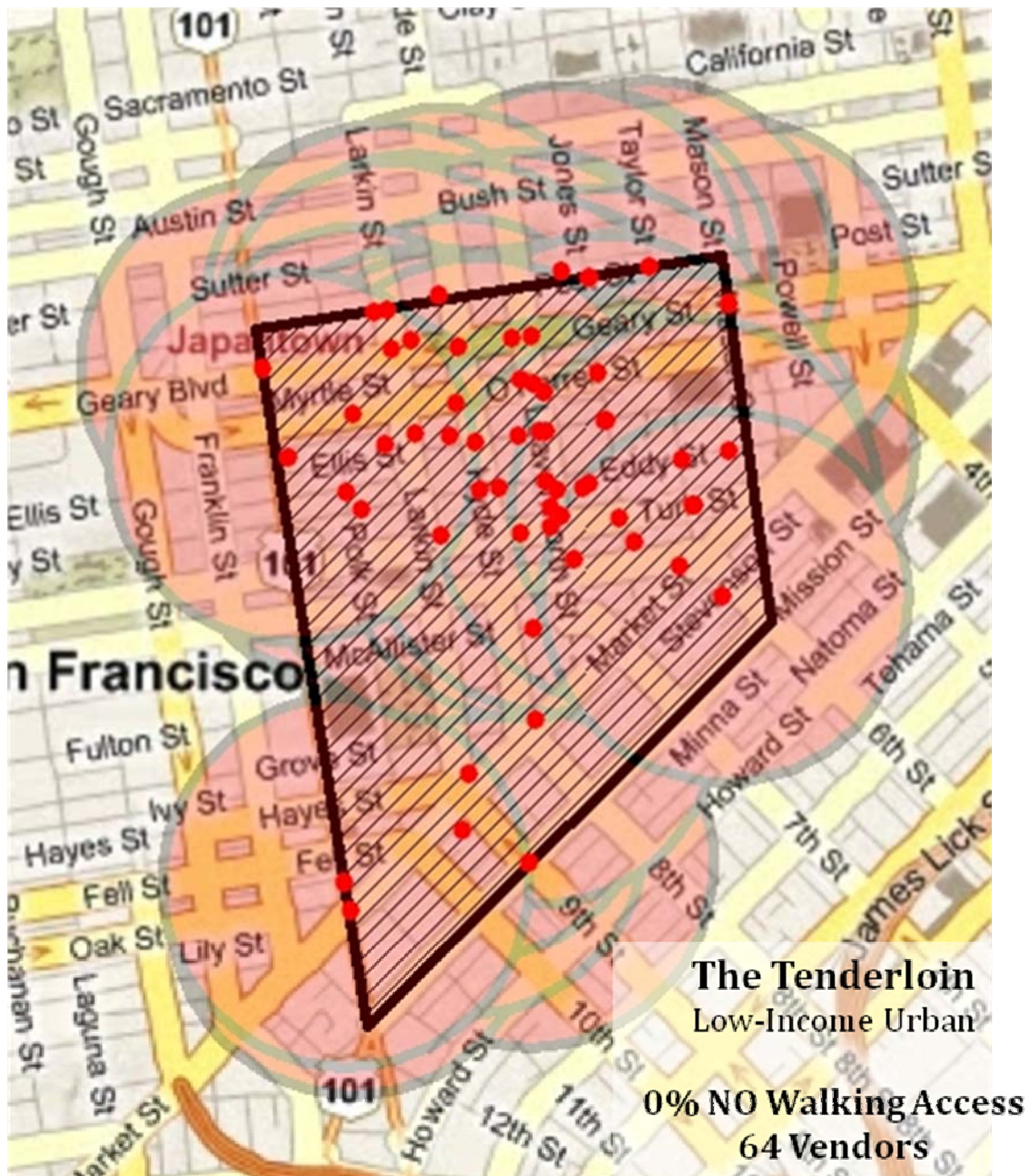


Figure 3. Spatial analysis map of the Tenderloin neighborhood.



Figure 4. Spatial analysis map of Pacific Heights neighborhood.

Low-Income neighborhoods and urban neighborhoods possessed the greatest walking access in this study– a greater percentage of households in low-income neighborhoods and urban neighborhoods were within a  $\frac{1}{4}$  radius of at least one fresh produce vendor. The Tenderloin, the low-income urban neighborhood, is the most walking accessible neighborhood in the study with 100% of households possessing walking access to fresh produce. Whereas, Serramonte, the high-income suburban neighborhood, is the least walking accessible neighborhood with only 32% of households within an acceptable proximity of a fresh produce vendor (Table 3).



Table 3. The percentage of households with NO walking access and the total number of vendors by neighborhood type

	Urban		Suburban	
	% No Walking Access	Total No. Vendors	% No Walking Access	Total No. Vendors
<b>High-Income</b>	<b>26%</b>	<b>18</b>	<b>68%</b>	<b>2</b>
<b>Low-Income</b>	<b>0%</b>	<b>64</b>	<b>16%</b>	<b>7</b>

**Quality Analysis of Available Fresh Produce Vendors** After analyzing the price, variety, and quality of the available fresh produce vendors and then comparing the average ratings amongst the four neighborhoods I found Serramonte – the high-income suburban neighborhood – had not only the highest quality and the least expensive fresh produce, it also tied with the low-income suburban neighborhood (Mission Street) for the greatest variety too (Figure 5 through 7).

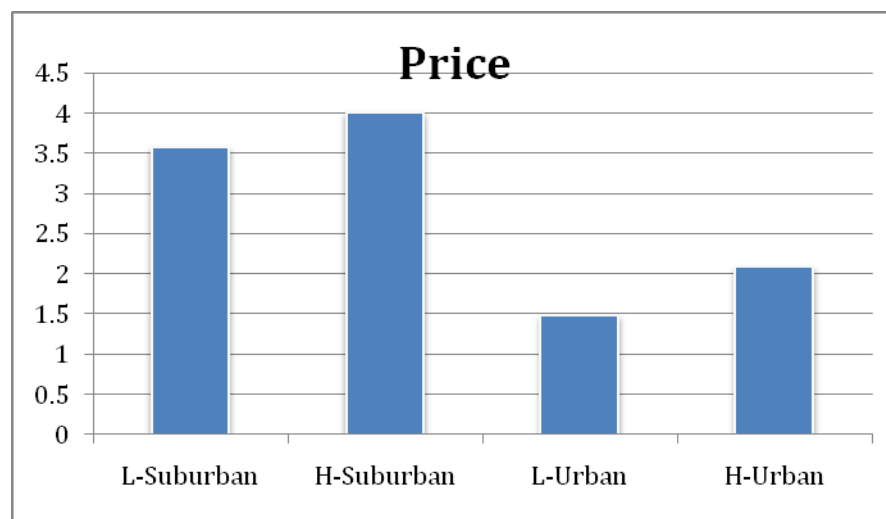


Figure 5. The average price rating of fresh produce vendors by neighborhood.

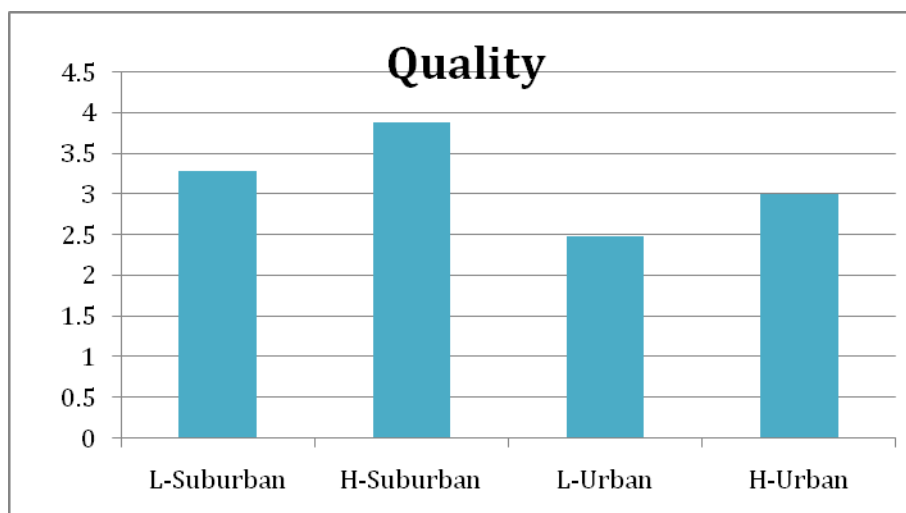


Figure 6. The average quality rating of fresh produce vendors by neighborhood

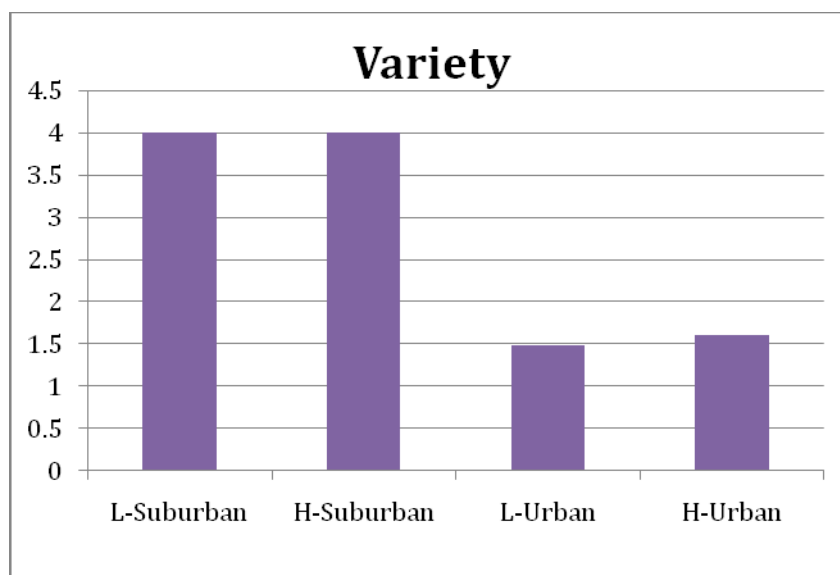


Figure 7. The average rating of the variety of fresh produce by neighborhood

In all three categories – variety, quality, and price – the high-income suburban neighborhood had the highest average rating. While the low-income urban neighborhood had the lowest average rating (Figure 8).

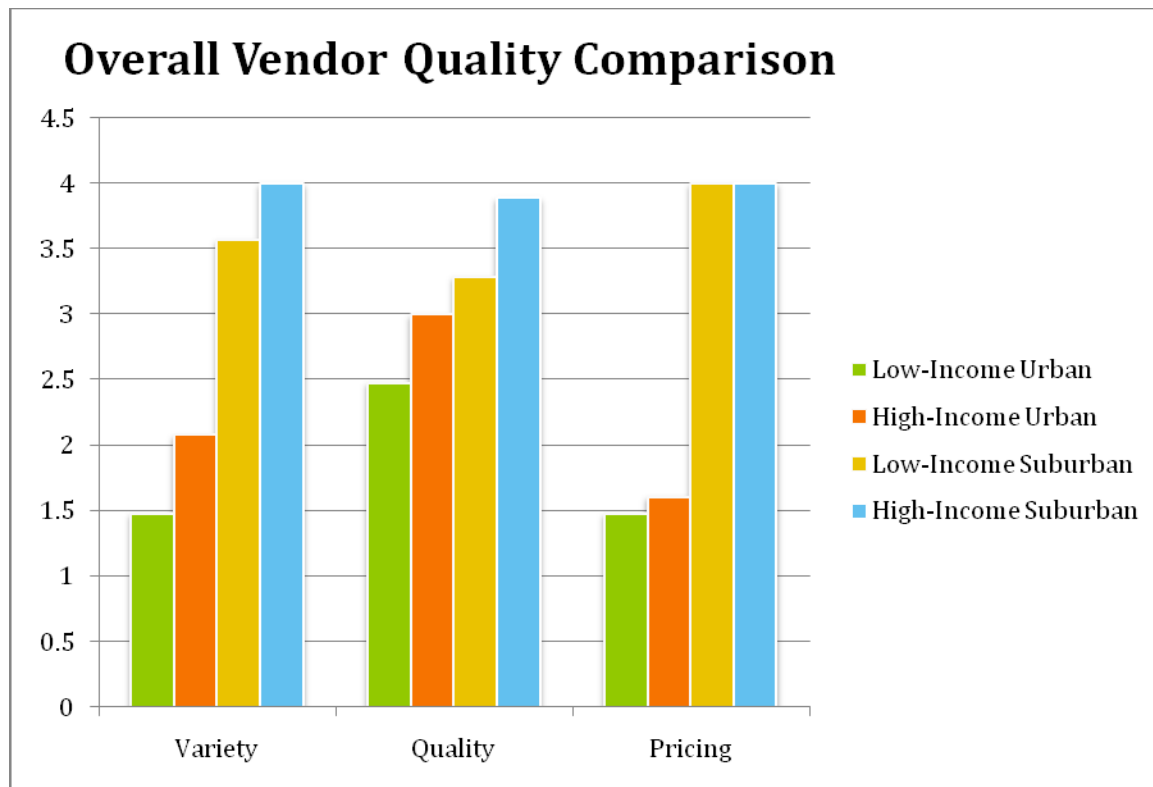


Figure 8. Compilation of the average ratings for all three variables for each neighborhood.

## DISCUSSION

This study attempted to measure food insecurity – disparities in physical food access – among both urban and suburban neighborhoods and low-income and high-income neighborhoods in the San Francisco Bay Area. Results of this study revealed only part of my original inclination were correct. Urban and low-income neighborhoods maintained greater walking access to fresh produce vendors compared to suburban and high-income neighborhoods. Although, while walking accessibility of these neighborhoods was inferior, indicating my first hypothesis was false, the quality assessment analysis revealed my second hypothesis was correct. These same neighborhoods contained higher quality fresh produce vendors, exposing the complexities of food security and the multi-faceted nature of access, ultimately pointing to the fact that food insecurity is not simply a symptom of income.

**Walking Accessibility** Spatial walking analysis surprisingly confirmed both parts of my first hypothesis were incorrect. In both the urban and suburban cities, a far greater percentage of low-income households possessed walking access to fresh produce vendors than high-income

households (table 3). In contrast the vast majority of the current literature on food security proclaims urban cities severely lack access to fresh produce. In a twenty-one-city study, zip codes containing the greatest number of persons on public assistance had 20% fewer supermarkets than zip codes with a low percentage of persons receiving public assistance (Public Voice for Food and Health Policy, 1996). Another study analyzed eight cities, including San Francisco, reaffirming the consensus; on average low-income communities had 32.7% fewer supermarkets than the high-income areas within the same city limits. (Brunett, 2002). Additionally across both the high-income and low-income neighborhoods, a far greater percentage of the urban households possessed walking access to fresh produce vendors than suburban households (table 3), again this finding is incongruent with the current literature. Los Angeles lost 13 of their 44 full service grocery stores in less than twenty years, a decline of 30% within the Los Angeles city limits (Ashman et al, 1993). What remains, on average, is 1 full-service grocery store for every 26,400 residents (Ashman et al, 1993). Moreover in 1970 over 1000 supermarkets could be found in Chicago, today less than 500 remain (Turque et al. 1992).

I expect that I found greater walking access to fresh produce vendors than previous studies because my analysis included atypical fresh produce providers such as gas stations, corner stores, and small neighborhood markets, while the vast majority of current studies solely examined grocery stores. A-typical fresh produce vendors make up the vast majority of retailers in the low-income and urban neighborhoods, while mainstream grocery stores comprise only a small portion of fresh food retailers (Table 1). Inner-city residents tend to shop at independently owned stores. For instance only 18.9% of stores in San Fernando Valley, an area largely comprised of wealthy suburban cities, were independently-owned, compared to 32.8% of stores in Los Angeles (Ashman et al, 1993). The customer-base of neighborhood corner stores and markets is much smaller compared to large grocery stores (Gottlieb, 1996) resulting in a relatively high prevalence of similar vendors within a small area.

The large presence of small independently owned fresh produce vendors in urban and low-income communities is further compounded by the historical transformation and present nature of the retail food industry in the United States. Throughout the 20<sup>th</sup> century major chains started to take advantage of massive economies of scale ultimately increasing the size of their stores – typical supermarkets in 1930 were 10,000 square feet whereas today the median store size is 46,775 square feet (Ashman et al, 1993; Food Marketing Institute, 2008). The relatively

expensive cost of land, labor, and utilities coupled with large tax breaks motivated gigantic super stores to migrate to suburban communities and wealthy areas, leaving the urban cities and low-income communities uncaptialized and open to independent store development (Ashman et al, 1993). Conversely due to the high entry barriers in the supermarket industry –a new store in 1991 collectively cost \$3.8 million to construct – the major food retailers currently dominate the affluent and suburban communities (Gottlieb, 1996), leaving these areas with relatively large but very few fresh produce providers.

**Quality Access Analysis** Quality access analysis revealed higher quality fresh produce vendors across all three variables – price, variety, and quality of available fresh produce – in both the suburban and high-income neighborhoods compared to the urban and low-income neighborhoods, supporting my second hypothesis and the current literature. As stated above, many low-income and urban neighborhoods lack large supermarkets, leaving small corner stores and markets to provide nutrition for residents (Ashman et al, 1993). A study of Philadelphia, found small corners stores lacked 50% of the items from the USDA Food Plan – a nutritious diet plan comprised of 104 essential food items, compiled by the U.S government for families on a budget (Thayer et al. 2007). Additionally studies found inner city stores tended to have fewer items and lower quality food compared to their suburban counterparts due to inferior size (Ashman et al, 1993). Even when healthier foods like fresh produce is available, shoppers in these underserved areas often face higher prices as well as expired or poorer quality products (Public Voice for Food and Health Policy, 1996). Residents of South Central Los Angeles spending 36% of their household income on food, averaged \$275 more per year, than residents in selected suburban areas spending only 12% of income on food (Gottlieb, 1996).

While the historical supermarket migration may not have compromised the walking access of low-income and urban communities it may have affected the quality of the food retailers in these areas. The vast majority of the fresh produce vendors left in low-income and urban communities are neighborhood corner stores and markets (Winne, 2002). These small stores are unable to take advantage of the amenities of large grocery store chains such as established distribution systems. They must buy products at near retail value and as a result charge the consumer more than their wealthy suburban counterparts (Gottlieb, 1996). In addition to being smaller, corner stores and markets obtain less profits on a product by product basis – the costs of labor, land, utilities, and security (shoplifting robbery, vandalism) are higher within a poor urban metropolitan area than



in the prosperous suburbs – further discouraging major high quality retailers from entering poor inner city neighborhoods (Ashman et al, 1993). Facing a financial loss, neighborhood stores opt for goods with high profit margins. These tend to be liquor, cigarettes, and packaged food with a long shelf life (Gottlieb, 1996). Limited shelf and cooler space, combined with the costs of spoilage also prevent these small stores from carrying more healthy food and fresh produce (Gottlieb, 1996).

**Limitations** While this study conclusively determined the urban and low-income neighborhoods in this study had greater walking access and conversely the suburban and high-income neighborhoods possessed higher quality vendors, these results may not be fully applicable to the issue of food security in United States. Studies confirm food insecurity is most prevalent in the Midwest and the South confirming regional disparities within the United States (Public Voice for Food and Health Policy, 1996) therefore the focus of this study on the San Francisco Bay Area may prove inappropriate for other areas. Additionally the results of this study may not even be fully applicable to the Bay Area. My small sample size poses possible questions of accidental results or the influence of confounding factors. Recently the ‘Good Neighborhood Program’ – a incentive based approach aimed at getting local merchants to increase fruit and vegetables– was launched in San Francisco (Good Neighbor Program, 2007). Additionally I conducted my walking tours – data collection – only once. Not repeating my walking tours during different hours of the day, days of the week, and months of the year to confirm I had not missed vendors could have resulted in a conservative analysis of both walking access and quality access.

**Future Research and Broader Implications** Future research may broaden the scope of my study. It would be beneficial to address some of the limitations of this study by including more neighborhoods and look past the San Francisco Bay Area in order to gain a better picture of food insecurity within the United States. Walking access is highly influenced by walk-ability of a neighborhood, therefore examining how walk-able an area is – prevalence of sidewalks, etc. – and its relation to food security may be note worthy. It may also be fruitful to examine consumer behavior – despite fresh produce being offered at establishments such as liquor stores, it is inconclusive whether or not customers would actually purchase healthy food from these store types. Additionally it would be interesting to see if the appearance of these establishments plays a role in consumer activity. These expansions on my study may shed even more light on the

greater complexities of food security and the multi-dimensional approach that is required to tackle this issue.

My findings, although restricted by constraints and limitations, suggest the issue of food security in the San Francisco Bay Area is caused by a composite of several access-related factors. Systems theory tells us that a single intervention designed to address a specific problem, is not likely to produce satisfactory results in the long term (Senge, 1994). Currently the primary anti-hunger/food insecurity strategies in the United States are aimed at only one part of the problem – income (Nord & Prell 2007). Food assistance programs such as food banks and food stamps may have mitigated the worst cases of food insecurity but the problem still persists. This study demonstrates how walking inaccessibility and quality inaccessibility may play significant roles in the persistence of food insecurity. The solution must be tackled on multiple fronts. Additionally the burden of solving food insecurity has largely been placed on the federal and state governments, while the community remains largely inactive which inadvertently bypasses a large range of untapped solutions (Winne, 2002). Consequently the issue of food insecurity must also be addressed by multiple actors. The more we understand about food insecurity, the greater chance we have of finally eradicating it in the United States.

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