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A Farmers' Market in a Food Desert: Evaluating walkability and streetscape as factors of farmers' market effectiveness in food accessibility: The case of Farmers' Market East in Austin, Texas

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A Farmers' Market in a Food Desert: Evaluating walkability and streetscape as factors of farmers' market effectiveness in food accessibility: The case of Farmers' Market East in Austin, Texas

by

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Dedication

Many people have helped me in writing this research. This report is dedicated to them.

A special feeling of gratitude to my parents and family who have supported me throughout the process. I will always appreciate all they have done, especially my grandmother, Emilia for her love and incite my passion for cities and transportation.

I also dedicate this dissertation to many friends, CRP colleagues, and give special thanks to Juan Sanchez for being there for me with his beautiful words of encouragement and affection through the entire program and my life.

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Abstract

A Farmers' Market in a Food Desert: Evaluating walkability and streetscape as factors of farmers' market effectiveness in food accessibility: The case of Farmers' Market East in Austin, Texas

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The University of Texas at Austin, 2015

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Food deserts are defined by absence of large grocery stores to access affordable food that constitute a healthy diet resulting in high levels of obesity, diabetes and cardiovascular diseases in the community. Farmers' markets have resulted as an approach to improving food accessibility in food deserts, however the lack of public transportation, incomplete sidewalks, and dilapidated streetscape in many American neighborhoods, can really affect farmers markets' usage. To answer this question, this research uses the Sustainable Food Center (SFC) Farmers Market East Austin as a case study area to investigate how built environment around the market affect its usage.

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INTRODUCTION

Food deserts can be described as "geographic areas where residents' access to affordable, healthy food options is restricted or nonexistent due to the absence of grocery stores within convenient travelling distance" (USAD, 2014). This can contribute to increasing levels of obesity and diet-related diseases in many urban areas (Jilcott et al., 2011). Farmers' markets have developed as an approach to improving food accessibility in food deserts, but little research has been done on their effectiveness in addressing food insecurity in food deserts (Boos, 2012). Most of these farmers' markets run incentive programs called Special Supplemental Nutrition Programs as mechanisms to increase access to healthy food for low-income consumers and also channel dollars into the local food economy (Donovan et al, 2013).

However, studies across the US found that Special Supplemental Nutrition Programs vouchers often went unused due to different transportation barriers (NCGA, 2013). To solve food access problems, researchers argue that we should go beyond increasing individual family budgets and focus on more structural gaps within neighborhoods e.g. the lack of public transportation, sidewalks, and streetscapes (SFC, 2000). However, little is known about how the built environment really affects the population's usage of farmers' markets. To answer this question, this research used the Sustainable Food Center (SFC) Farmers' Market East Austin as a case study area to investigate how the neighborhood's built environment affected farmers' market usage.

The SFC Farmers' Market East is located in the Chestnut neighborhood in Central Austin; this community traditionally has been characterized by food scarcity and demographic segregation, despite it being located in one of the most advanced mass transit areas of the city. East Market is open March through November on every Tuesday from 3-7 pm and receives 600 customers per week (SFC, 2014), which is less visitors compared to other farmers' markets run by the Sustainable Food Center in Austin.

To understand the built environment around this market, I used GIS to measure within a half-mile buffer around the location, the spatial distribution and density of different land-uses and the availability of transportation facilities (e.g. bus stops, bus frequencies, bike facilities, sidewalks, intersections, and crosswalks). Meanwhile, the streetscape, which is defined by the character of the buildings, the space between them, ground surfaces, vegetation, walls, fences and furnishings that enrich the urban space, was divided into edges and regions based on architectural theory and were evaluated through computer imaging software quantity and quality of neighborhood's streetscape elements.

The market usage data was collected by customer surveys, which included their food purchase spending, and overall satisfaction with the market. Results showed that the sidewalk length and bus stop density were positively correlated with the market usage. The appearance of graffiti and fences on streets was negatively correlated with the market usage.

LITERATURE REVIEW

Food deserts have typically been defined as urban areas where people do not have access to an affordable and healthy diet (Cummins & Macintyre 2002) due to the absence of grocery stores within a convenient travelling distance. According to a report prepared for Congress by the Economic Research Service of the US Department of Agriculture (USDAERS), about 2.3 million people (or 2.2 percent of all US households) live more than one mile away from a supermarket and do not own a car (USDAERS, 2009).

Recently, food deserts have received substantial attention due to the increase of obesity and diabetes rates within the United States (Morland, Diez-Roux, & Wing, 2002; Ford & Dzewaltoski, 2008; Moore, Diez-Roux, Nettleton, & Jacobs, 2008; Jilcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011; Alviola et. al, 2013). Researches agree that understanding the features of food deserts may be advantageous in the development of policies that promote access to healthy foods and could thus improve obesity and health outcomes (Alviola et. al, 2013). Considerable research indicates neighborhood socioeconomic conditions and built environment characteristics are related to obesity, physical activity, and other health-related behaviors (Roux et. al, 2001; Schmid et.al, 2003; Evenson, et al., 2003; LD, et al., 2004).

Earlier studies have shown the association between low-income minority groups and access to healthy foods, particularly fresh fruits and vegetables where people usually do not own cars as much as wealthy communities. Researchers found that neighborhoods that are predominantly African American have fewer supermarkets comparative to white

neighborhoods (Powell et al. 2007; Berg & Murdoch 2008; Dutko, Ver Ploeg, & Farrigan 2012). According to this, white neighborhoods have an average of four times as many supermarkets as predominantly black neighborhoods do, and grocery stores in African-American communities are usually smaller with less selection (Powell et al. 2007;Berg & Murdoch 2008; Dutko, Ver Ploeg & Farrigan, 2012).

Regarding food deserts, people's choices about what to eat are severely limited by the options available and how affordable these options are (Morland, 2002). However, many food deserts offer an oversupply of fast food chains selling cheap meat and dairy-based foods that are high in fat, sugar, and salt and processed foods such as snacks, chips and carbonated drinks typically sold by corner stores, convenience stores, and liquor stores.

On the other hand, regarding the association between food deserts and the built environment, scholars concur about the impact of the built environment on indoor and outdoor physical and social environments, and subsequently on health and quality of life (Rao et. al, 2007). Researchers define the built environment as encompassing all buildings, spaces, and products that are created or modified by people (Rao et.al, 2007). By one definition, the built environment consists of the following elements: land use patterns, the distribution across space of activities and the buildings that house them; the transportation system, the physical infrastructure of roads, sidewalk, bike paths, etc., as well as the service this system provides; and urban design, the arrangement and appearance of the physical elements in a community (Saelens & Handy, 2010).

The past decade has seen a dramatic increase in studies on the relationship between built environmental and health. Evidence suggests built environment factors play a major role in physical activity and other obesity-related behaviors (Gordon-Larsen et. al, 2006). The expansion of suburbs; low-density patterns; extensive roads; decentralization of the population; and the separation between residential and business areas have determined the neighborhood and street landscapes that result in automobile usage. Prior conditions can be counted as relevant factors that might explain existing gaps in the allocation of food retailers in residential districts (Perdue, 2003) and subsequently food deserts.

Experts focus on neighborhood built environment, have determined urban form and urban design as key indicators that determine people's travel behavior and travel choice (Cervero & Gorham, 1995; Cervero & Kockelman, 1997; Frank, 2000; Saelens et al., 2003; Zhang, 2007). Several studies argue that "spread-out development trends curvilinear street patterns and cul-de-sacs, huge express roads passing through the city, lack of public transportation systems, and inferior walking/biking environments with a shortage of sidewalks/bike roads have fostered people's dependency on automobiles and discouraged non-automobile modes" (Holtzclaw, 1994; Cervero & Gorham, 1995; Frank, 2000;). Some research indicates that other factors, such as the socio-economic characteristics of individuals and neighborhoods, have more influence on people's travel choices than urban form does (Krizek, 2003; Cao et al., 2006).

Current literature suggests that proximity and location to farmers' markets influences the redemption rate of supplemental WIC coupons that are provided to buy fresh fruits and

vegetables (Brown, 2002; Colasanti et al., 2010; Grace et al., 2007; Racine et al., 2010). Several municipal studies across the US have reported FMIP's vouchers allocated in farmers' markets often are unused due to transportation barriers (NCGA, 2013).

However few studies have investigated the effects of structural gaps of the built environment (e.g. low density, availability of public transportation, availability of sidewalks, streetscape) on farmers' market access usage (Colasanti et al., 2010; Grace et al., 2007; Herman et al., 2006). In this sense, farmers' markets in food deserts "must go beyond increasing the family budget" (SFC, 2000) to identify these structural gaps that exist in neighborhoods, and address them in ways that make sense for the people who live there.

Research on transportation modal choice and food outlets has focused on driving as the default transportation mode. During the last few decades academic research has primarily focused on understanding and designing space for automobiles (Lo, 2009). Although some studies have investigated access to a supermarket by walking or taking public transit (Jiao, 2012), pedestrian transportation is still addressed with 'far less intensity, seriousness and funding" (Lo, 2009). During the 1970s some pedestrian research was conducted by applying automobile traffic modeling technology and concepts to pedestrian behavior research (Strangl, 2008). Nowadays, it is commonly accepted that pedestrians experience their environment differently than automobiles: the slower speeds of walking means that pedestrians are able to observe their surroundings in more detail; climate conditions such as sun and rain demand special protection for pedestrians and

other possible dangers become important factors when it comes to designing and planning a pedestrian environment.

Walkability refers to "the quality of walking conditions including safety, comfort, and convenience" (Litman, 2003). Despite the recent interest in walkability, there is a developing field of research indicating that specific elements of the built environment affect the quality of the pedestrian environment and have an impact on the willingness of people to walk (Litman, 2003). Street connectivity, sidewalk width, roadway width, presence of benches, and building articulation among others, are examples of some of the physical features that influence the walkability of a street and neighborhood (Saelens & Handy, 2008). Other perceptual features of the streetscape are considered to be significant in pedestrian behavior such as safety, cleanliness, and aesthetics.

On this subject, walkability and streetscape can facilitate food accessibility in a food desert. Walkability and streetscape should support neighborhood connectivity (Speck, 2012) and therefore better access to food sources. Scholars have demonstrated that customers who live closer to the farmers' market are more likely to use the market (Boos, 2012). Furthermore, costumers' surveys have shown that farmers' market shoppers cited walking by the market as one of the top ways they first learned about the market (Project for Public Spaces, 2012). In this regard, walkability and streetscape can facilitate food accessibility in a food desert.

Chapter 1: Food Deserts: the scarcity of healthy food in American neighborhoods

The definition of a food desert emerges from rural areas with no grocery stores for miles around, however many food deserts have been identified in areas located in the center of cities and surrounded by abundant food retailers. The U.S. Department of Agriculture (USDA) defines a food desert as "a census tract in which one-third of the population lives more than one mile from the nearest large supermarket or grocery store in an urban area, and more than 10 miles in a rural area" (USDA, 2014). Simultaneously, the USDA describes a "large retailer" as a store that has more than $2 million in sales annually (USDA, 2009).

By 2009 the Economic Research Service affiliated with the USDA estimates that 23.5 million people live in food deserts in the United States and more than 13.5 million people are low-income (USDA, 2014) and many of them are in 418 rural food deserts where all residents live more than 10 miles from a large grocery store (USDA, 2014).

Currently food desert studies have been addressed to solve the equation of food access, affordability, and equity (Alviola et al., 2013). Results from a USDA report supports this approach indicating that residents of these areas are constrained in their ability to access affordable nutritious food because they live far from a supermarket or large grocery store and do not have easy access to transportation; people in these areas have income at or below 200 percent of federal poverty thresholds (USDA, 2009); and a prevalence of fast food chains and convenience stores with processed meals in numerous urban low-income

communities of color. All of these factors have led to the increase in obesity and diabetes rates across the country (Alviola et al., 2013).

In several urban and suburban areas across the United States, low-income people often pay more for food than their wealthier neighbors (SFC, 1995). In cities like New York City, Los Angeles, Hartford, Knoxville and Minneapolis, low- income residents pay 10 to 40 percent more for food than higher income residents of the same cities (Community Food Resource Center, 1993). Within these food-underserved areas, residents pay more due to lack of efficient, well-stocked supermarkets located in their neighborhoods (SFC, 1995)

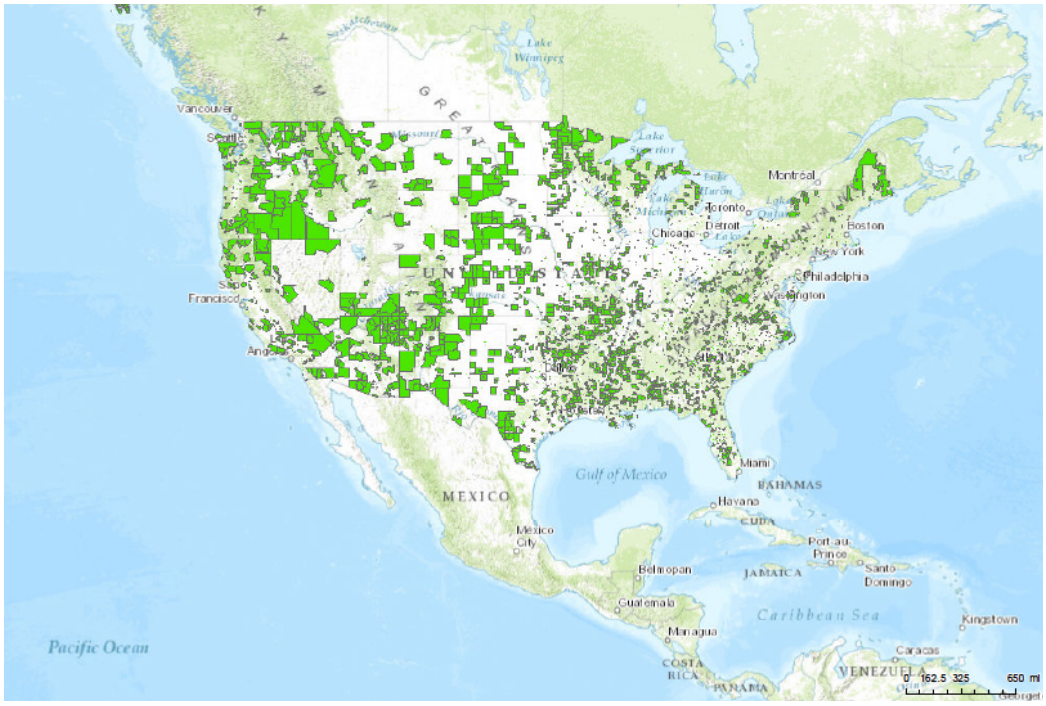


Figure 1: Low income census tracks and low food accessibility at 1 and 10 miles in the US. Source: USDA Economics Research Service, Food Access Research Atlas, 2014.

The grocery gap can be explained historically as a contemporary urban phenomenon. After the Great Depression, supermarkets located in the suburbs gradually replaced public markets in central urban cores. This left many inner-city communities without a major food supplier and the food gap was rapidly filled by fast food, convenience and corner stores (The Food Trust, 2012).

Food environment studies suggest food deserts in urban settings are characterized by food availability that is closely constricted in relation to factors as distance, race, income, and age (Adams et al., 2010). Within urban food deserts, higher levels of racial segregation and greater income inequality prevail, while in rural areas with limited food access, the lack of transportation infrastructure is the most defining characteristic. Additionally, rural communities have to tackle low percentages of individuals with lower levels of literacy and a large elderly population (The Food Trust, 2012).

Improving access to healthy food is a critical component of the nationwide agenda to build an equitable and sustainable food system. In this regard, policy makers, advocates and researchers have begun to address their findings to acknowledge how access to food environments may impact food shopping habits and thereby nutritional behavior (Adams et al., 2010). Understanding the characteristics of food deserts may benefit in the development of policies that promote access to healthy foods and therefore achieve improvements to overcome health issues and contribute to community economic development (Alviola et al., 2013).

Despite Federal Food and Nutrition Programs Assistance efforts, municipal government agencies should implement public policies and strategies to solve the issue of inequitable food access in low-income in underserved communities replicating good practices and innovations. By attracting and bringing more grocery stores and other fresh food retail outlets to neighborhoods such as farmers' markets, public markets, cooperatives, farm stands, community-supported agriculture programs, and mobile vendors (The Food Trust, 2012); increasing the stock of fruits, vegetables, and other healthy foods at neighborhood corner stores or small groceries (The Food Trust, 2012); growing food locally through backyard and community gardens and larger-scale urban agriculture (The Food Trust, 2012); and improving transportation to grocery stores and farmers' markets (The Food Trust, 2012).

Food Deserts in Austin

According to a report by The Food Trust in 2012, Texas is the state with the largest grocery gap and also the existing food retailers are unevenly distributed among low-income and food underserved neighborhoods (The Food Trust, 2012). By 2000, 67 of 254 counties in Texas were classified as food deserts with the vast majority located in West Texas and the Panhandle area (The Food Trust, 2012).

By 2010, Texas was identified as the state with the thirteenth highest adult obesity rate and the seventh highest obesity rate for children; this is directly correlated with a high incidence and risk for Type II Diabetes, high blood pressure, heart disease, and cancer

(The Food Trust, 2012). Over time, incidents of diet-related diseases have increased in communities classified as food deserts where groups are more likely to have less access to healthy food sources. These issues affect the state economy, making people less productive and competitive, but also causing higher costs to the health system. A 2011 report by The Texas Comptroller of Public Accounts found that obesity cost Texas businesses $9.5 billion in 2009, while future projections estimate that by 2030 obesity will cost Texas $32.5 billion per year if no action is taken (The Food Trust, 2012).

Central Texas is one of the fastest growing regions in the US. Rapid population growth and increases in the cost of living mainly in the Austin metropolitan area, forces its inhabitants to spend a big portion of their family budget paying for rent instead of buying food. Food insecurity is one of the top concerns when it comes to assessing the capacity of the Central Texas region to meet food needs. A report released by the Feeding American and the Capital Area Food Bank, stated that between 200,900 to 368,800 people required food assistance in form of supplemental nutrition vouchers or food stamps (SFC, 2011) indicating that Central Texans families are struggling to meet their food necessities.

This can be explained by the sky rocketing population of the Austin-Round Rock MSA that affected property values in the most vulnerable area of Austin such as the eastside where the taxable value of the properties increased by 80% (SFC, 2011) forcing residents to seek alternative financial sources to cover other household expenses such as food and utilities.

Supplemental Nutrition Assistance Program cases: Travis County, TX, 2007-2010

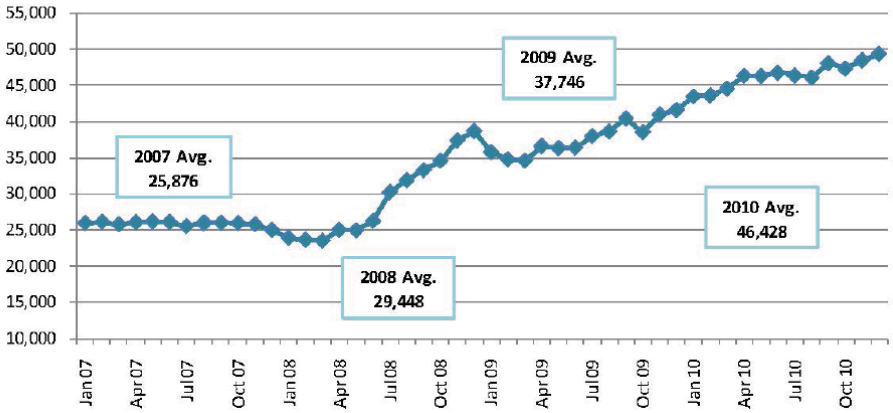


Figure 2: Supplemental Nutrition Assistance Program cases Travis County, TX, 2007-2010. Source: Central Texas Foodshed assessment, Sustainable Food Center, 2011.

Additionally, the redemption of food stamps and FMNP and WIC vouchers is highly attributed to the increase in the consumer price index for food, which is 6.4 percent more than it was in 2010 (SFC, 2011). However, the lack of adequate food outlets in a large number of neighborhoods is also another a major issue.

In Austin, there are vast areas in the east and south of the municipality that the USDA defines as 'food deserts'. According to the USDA, in Austin 40 out of 218 census areas are classified as food deserts, in other words, about 18 percent of census areas in Austin are considered low-income communities and located more than a mile away from a healthy food source (USDA, 2014).

This trend of there being a lack of available fresh produce and meat for unrepresented communities dates back to the early 1960s when middle class households began to move from urban city centers to the suburbs, taking the food retailers with them. Currently,

food outlets are still concentrated in wealthy neighborhoods rather than those urban communities in East Austin, where food stores are generally smaller and have a smaller selection (SFC, 1995).

Food accessibility in East Austin

East Austin is comprised within a six square-mile area between Manor Road to the north, the Colorado River to the south, Interstate 35 to the west and Airport Boulevard to the east. Recent research conducted by the SFC has shown that despite the accelerating population and economic growth of Austin- Round Rock MSA, the eastside still remains the area that has a major concentration of minority populations and low-income households.

	Total Population	White	Black	Hispanic	Asian	% below poverty level
Texas	20,851,820	71.0%	11.5%	32.0%	2.7%	15.4%
Travis County	812,280	68.2	9.3	28.2	4.5	12.5
78617	15,222	59.3	12.1	48.5	1.5	11.0
78653	4,715	70.2	11.7	30.1	0.2	7.8
78702	22,534	30.0	23.7	67.7	0.4	28.8
78721	10,124	23.5	45.2	50.8	0.1	25.7
78723	30,110	40.8	31.8	42.3	1.2	19.6
78724	15,428	29.1	41.4	43.4	0.3	16.3
78725	1,836	49.3	27.9	34.5	2.4	12.0
78741	40,661	49.5	8.8	51.6	5.9	32.9
78744	33,706	46.3	11.7	64.8	1.4	17.6
78745	53,044	66.4	5.9	40.3	1.6	9.5
78753	44,210	48.5	18.7	38.5	6.3	13.7

Figure 3: Race, ethnicity and poverty rates in selected zip code areas. Source: Sustainable Food Center, 2011.

The socio-demographic profile of the chosen area is constituted by 271,590 residents, in

which Hispanics make up 46.59% of the total and African Americans, 21.7% (SFC, 2011).

In order to present a general overview regarding the state of food accessibility in East Austin, results extracted from the SFC 2011 Central Texas Foodshed Assessment Report will be presented. The study selected 11 zip code areas in East Austin (78617, 78653, 78702, 78721, 78723, 78724, 78725, 78741, 78744, 78745 and 7875), all of them located within an area of 285 square miles. These zip codes were selected based on the higher concentration of individuals below the poverty line and the lack of full service grocery stores within a reasonable distance (SFC, 2011).

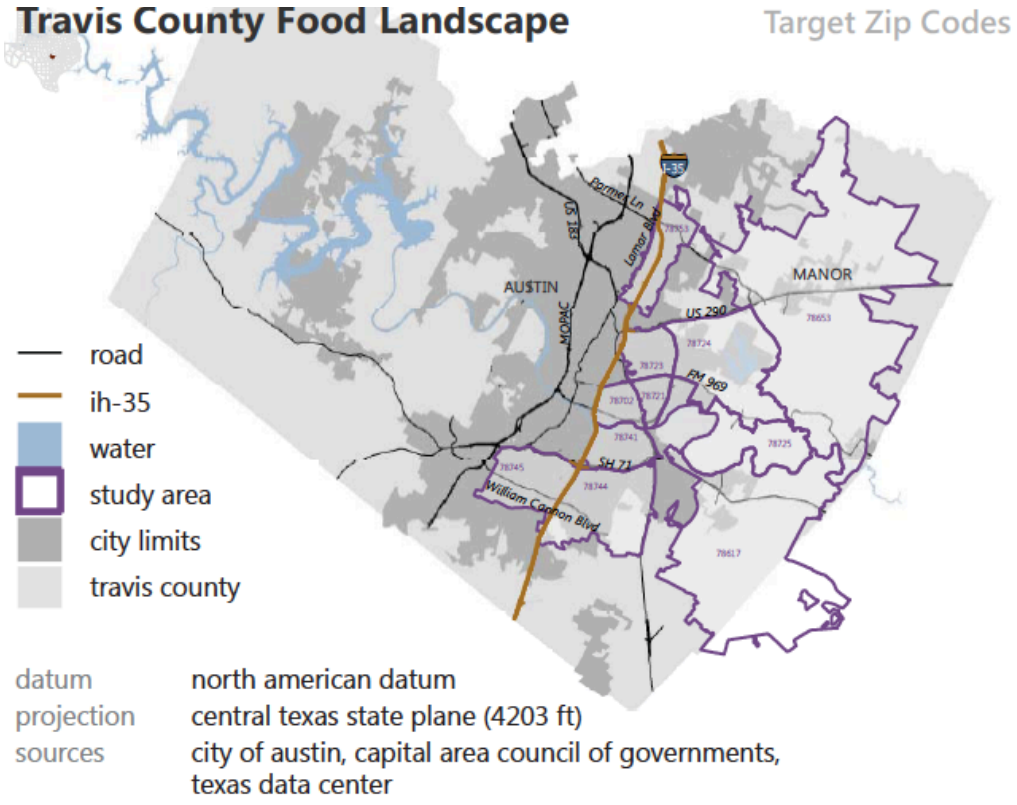


Figure 4: East Austin study area. Source: Sustainable Food Center, 2011.

The median income for the selected zip codes (except for 78653 and 78725) remain below the Travis County median income level (SFC, 2011) and six of them share rates of poverty below the median state level: 78702, 78712, 78723, 78724, 787412 and 78744, as is shown in Figure 4.

By 1995 nearly 2,300 East Austin families were re-enrolled in the Women, Infants and Children Special Supplemental Nutrition Program (WIC) that represented about 30% of the total amount of households of that area.

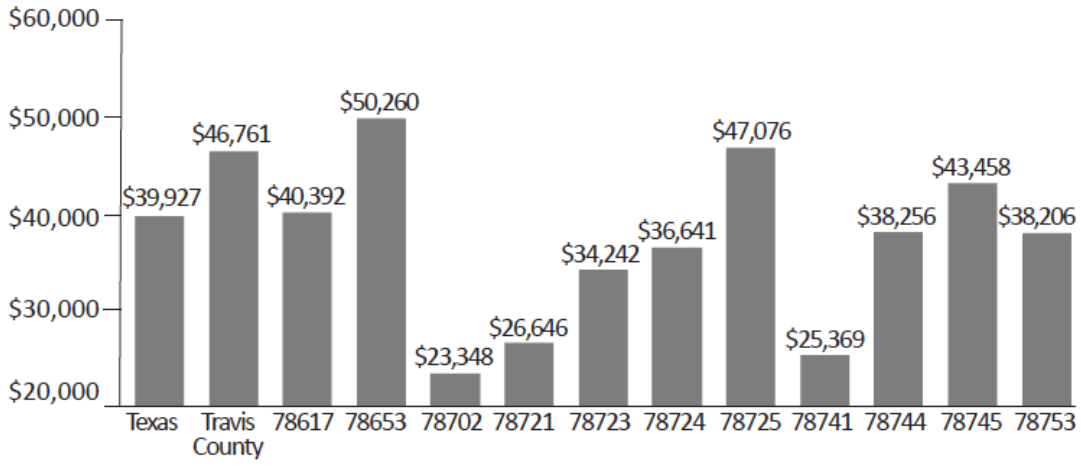


Figure 5: Median household incomes for selected zip codes areas (U.S. Census Bureau, 2000). Sustainable Food Center, 2011.

The report also includes an inventory of full-service grocery stores in each of the selected zip code areas. This factor is relevant since the report adopted the USDA's food desert definition that considers the lack of full service grocery stores as a determining factor when it comes to delineating an area as a food desert. Full-service stores are defined as a "retail outlet that specializes in selling a variety of food items from all food groups. It

may have an in-store deli or bakery, or carry household merchandise" (SFC, 2011). According to the results, areas under zip codes 78712 and 78724 just have five convenience stores and two food pantries but neither area has a full-service grocery store.

The remaining areas have more food outlet options but still not enough to supply the community with its needs and residents usually drive out of the area in order to get food. However, other factors such as store quality, availability price and proximity affect residents' food options.

	Total Population	Food Retailer	Full Service Store	Food Pantry	Discount Store
Travis County	812,280	325	85	93	38
78702	22,534	22	3	17	2
78741	40,661	18	2	5	3
78721	10,124	5	-	2	-
78723	30,110	10	4	7	2
78724	15,428	12	-	3	-
78753	44,210	36	8	2	5
78744	33,706	5	1	2	1
78617	15,222	14	-	2	1
78745	53,044	21	7	7	6
78725	1,836	-	-	-	-
78653	4,715	10	-	2	1

Figure 6: Number and type of food outlet for each selected zip code. Source: Sustainable Food Center, 2011.

Another major concern found in this area was many low-income consumers rely on expensive corner convenience stores for buying food when they do not have access to a grocery store. These smaller stores generally offer higher prices and limited options due to grocery companies rarely serving these stores (SFC, 1995).

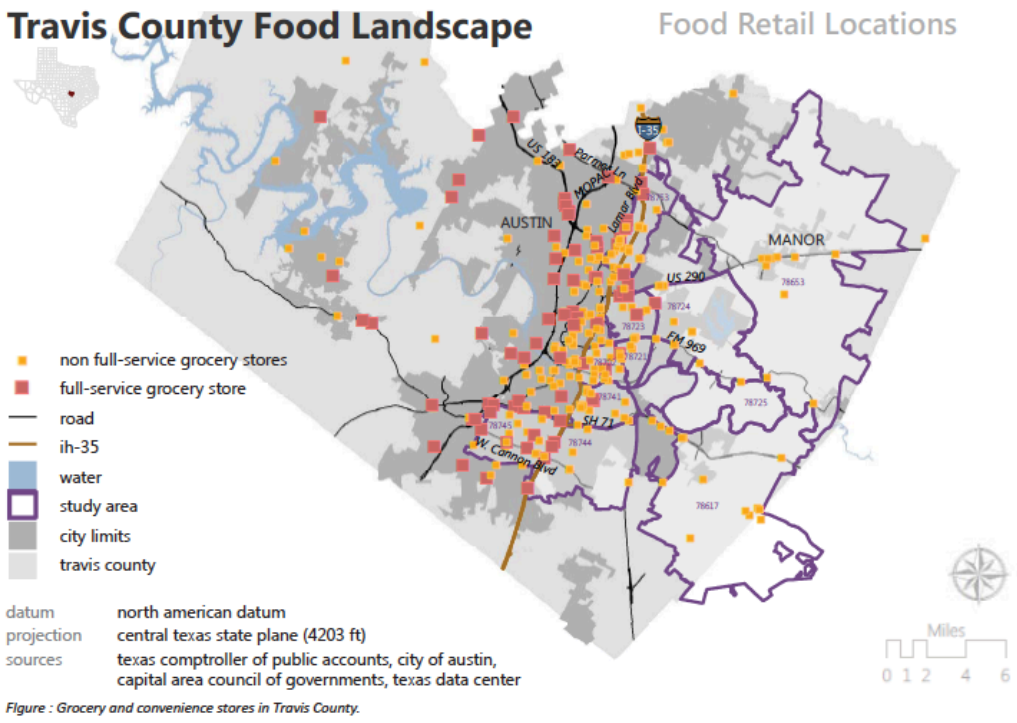


Figure : Grocery and convenience stores in Travis County.

Compounding the need for families to seek food assistance is the lack of easily accessible, full service grocery stores. There are 325 food retail stores in Travis County. These include full service stores like HEB; wholesale stores like Sam's Club; convenience stores like Diamond Shamrock; and ethnic stores like Hong Kong Market.

Figure 7: Travis County Food Landscape. Source: Sustainable Food Center, 2011.

Food desert areas in East Austin also experience a lack of reliable public transportation, thus the vast majority of residents of these underserved areas depend on cars to reach the nearest supermarket to buy their groceries and many residents must take taxis to buy food at the supermarket (SFC, 1995). On this subject, those without access to cars or public transportation to travel to the closest grocery store area are forced to purchase food from the limited selection in local convenience stores or fast food restaurants. Data extracted from the 2009 USDA report reveals that people living in food deserts spend significantly more time (19.5 minutes) traveling to a grocery store than the national average (15

minutes) (USDA 2009).

Recent studies such as Jiao et al. (2015) case study explores food deserts in the Austin area. It identifies good food sources as supermarkets, large grocery stores, community markets, and farmers markets, while convenient stores, fast food retailers, and corner stores were catalogued as poor food sources. These food sources were contrasted with physical access using geographic information systems network analysis to determine 10 minute service areas for users of different modes of transportation: automobile, bicycle, walking, and transit (Jiao et al., 2015). Economic access was another variable considered in this case study. There were four different vulnerable population groups identified in the census block group level by applying one of the four conditions:

- At least 20% of the population fell below the poverty line (Jiao et al., 2015),
- At least 40% of the population fell below double the poverty level (Jiao et al., 2015),
- At least 30% of households had no vehicle (Jiao et al., 2015), or
- The median family income (MFI) for the block group was 80% or lower than Travis County's Median Family Income (Jiao et al., 2015).

Study results draw the conclusion that, on average, 98% of underserved communities can access a good food source within a 10-minute drive, while the levels of access for other modes of transportation are significantly lower. Walking provides the lowest level of access to good food; on average only about 24% of vulnerable populations have access to good food via walking (Jiao et al., 2015).

By adding food outlets to an urban neighborhood or rural area, healthy nutrition will be improved, therefore rates of obesity and diabetes will decrease among East Austin residents. Yet these changes will not be sufficient enough, enhancements in the built environment will be needed to transform food-underserved areas. In this regard, significant legislation to improve nutrition, increase opportunities for safe exercise and access to adequate urban public space and recreational area will create stronger and healthy communities.

The importance of supporting comprehensive efforts to promote healthy diet and food security in Austin

Municipal Comprehensive plans provide a roadmap for the future growth of a community (Raja et al., 2008). Incorporating food issues within a comprehensive plan ensures that a community will have a well–functioning sustainable food system in the future that provides adequate access to healthy and affordable food.

Imagine Austin Comprehensive Plan and Community Health Improvement Plan includes policies to promote healthy eating and a community food component while paying significant attention to community urban agriculture enacting the Ordinance No. 20110210-017 in which urban agriculture and community gardens are regulated and supported by the city. However, neighborhood relations, zoning, and the lack of clarity in city regulations are still barriers towards the consolidation of a sustainable food system in

Austin. Specifically, the city needs flexibility in zoning regulations and to juxtapose it with other community needs such as securing public transportation and an adequate environment for walking and safety.

It is true the contemporary application of zoning has been largely driven by considerations other than health, although the "concerns noted pertain to sanitation, cleanliness, and contamination, perhaps reflecting the concerns of a past era when these were most pressing public concerns" (Raja et al., 2008). According Raja et al., recent concerns over food deserts and health related issues have caused debate regarding the use of zoning to facility public health, especially by regulating the presence of particular types of food destinations in a neighborhood, such as fast food chain establishments.

In order to accomplish positive impacts using zoning as a vehicle to facilitate the construction of a sustainable and healthy food system accessible to all residents, it is essential that zoning will be part of a comprehensive food assessment and food planning process adjusted to the specific neighborhood environment and socioeconomic characteristics of its residents.

In the case of Austin, the Community Health assessment and Community Health Improvement Plan identified food access as being one of its four priorities. Strategic actions such as the promotion of programs of nutrition education and counseling, breastfeeding support, healthy foods and facilitating access to health care and food

benefits to low-income communities through the WIC program (City of Austin, 2015) the plan is seeking to:

- Decrease the percentage of low-income residents who are not living within one mile of a grocery store (City of Austin, 2015).
- Increase the prevalence of people who eat more servings of fruits and vegetables each day (City of Austin, 2015).
- Promote the availability of healthy foods and beverages in retail settings (City of Austin, 2015).

Food insecurity significantly impacts children, the elderly, and minorities among who the recommended serving of fruits and vegetables is extremely limited. Despite policy efforts to improve accessibility to healthy foods, it is also essential reinforce education about healthy eating and enroll more communities to participate in nutrition assistance programs.

Sustainable Food System for Austin

A sustainable food system in Austin would mean an integrated and interconnected network that includes production, processing, distribution, consumption, and waste management (City of Austin, 2015). It is also a system in which sustainability matters and it is defined as finding a balance among three sets of goals:

- Prosperity and jobs (City of Austin, 2015).
- Conservation and the environment (City of Austin, 2015).
- Community health, equity and cultural vitality (City of Austin, 2015).

The sustainable food system for Austin would be local in order to preserve urban farmland, support the local economy, be self-reliant, and provide fresh, healthy and affordable food for the community, which helps to reduce health-related issues (City of Austin, 2015).

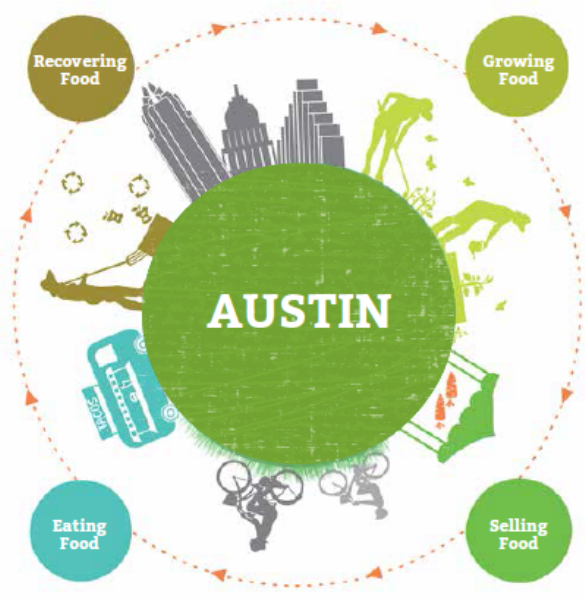


Figure 8: Sustainable Food System model for Austin, TX. Source: State of the Food System Report, Office of Sustainability, City of Austin, 2015.

Despite the significant efforts of local authorities and communities to overcome food-related issues by generating a robust food system able to include all stakeholders and create opportunities for all, critical factors still exist that threaten local food production and consumption in Austin. The following illustration highlights areas with critical access to fresh and nutritious food in the Austin metropolitan area.

Figure 9: Areas of Austin with limited access to fresh food, TX. Source: State of the Food System Report, Office of Sustainability, City of Austin, 2015.

Regarding the fast pace of population growth in Austin, local food production is unable to attend to the needs of some consumers who have little access to or cannot afford fresh and healthy food. Although, partnerships of governments, local agencies and non-governmental organizations have oriented a new path for improving local food systems and neighborhood food environments enhancing local food security among communities.

Collective efforts, of these partnerships have resulted in tangible progress in the Austin food environment. Some of these improvements are highlighted in the following illustration:

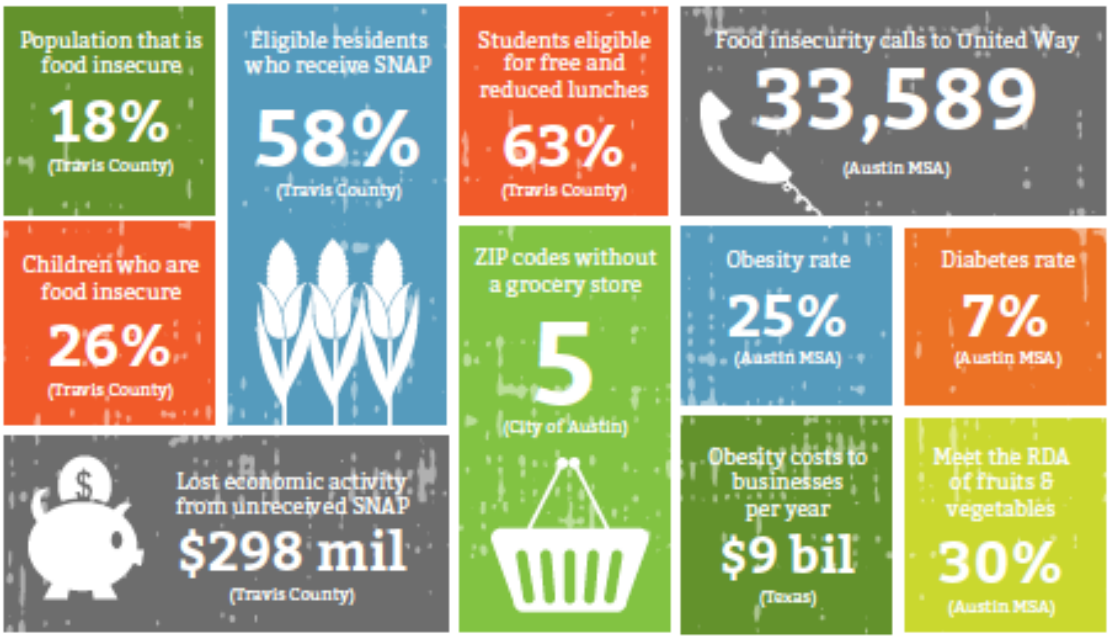


Figure 10: City of Austin Food policy indicators by 2014 . Source: State of the Food System Report, Office of Sustainability, City of Austin, 2015.

The Sustainable Food Policy Board

In 2008 the City of Austin passed the ordinance #20081120-058 establishing the Travis County Sustainable Food Policy Board (SFPB) to serve as the entity for advising primary policymakers for the City of Austin and Travis County in order to "improve availability of safe, nutritious, locally and sustainable grown food a reasonable prices for all residents" (SFPB, 2011).

The scope of the SFPB is to advise policymakers on two levels: local food systems and food access and wellness. Local food systems include strengthening "locally-based, self –

reliance food economies; distribution and consumption; and enhancing the economic, environmental and overall health of Austin and Travis County" (SFBP, 2011). Regarding, food access and wellness includes "supporting the tenant that good food is a human right; ensuring that nutritious and affordable food can be easily accessed in a respectful manner; and acknowledging that there is no excuse for hunger in Austin and Travis County" (SFBP, 2011).

The SFBP along with the Austin City Council, City of Austin and Travis County worked together in order to bolster the local food economy and enhance access to nutritious food through food policies that support the city and county food system (SFBP, 2011).

Enacted resolutions and ordinances by municipal authorities in Austin facilitate strategies to accomplish the construction of a robust local food system:

- Use of public/private lands for community gardens and family farms (SFBP, 2011).
- Make access to water more affordable for responsible urban agriculture (SFBP, 2011).
- Ensure vibrant farmers' markets through permits that encourage growth and resiliency in the local food sector (SFBP, 2011).

Ordinance	Date	Objective
Affordable Access to Water for Responsible Urban Agriculture: Resolution 20091015-023	**10/2009**	Resulted in a meter fee waiver process to allow urban farms to install separate meters for irrigation and avoid wastewater fees as well as the ability to work with food producers through other measures to help with affordable water for irrigation.
City Code Change to allow Sampling by Vendors at Farmers Markets: Ordinance No. 20100429-028	**04/2010**	Resulted in the ability of vendors at certified farmers markets to sample food products by an amendment to the city code.
Support for Sustainable and Organic Urban Farms and Community Gardens: Resolution 20091119-065	**02/2010**	Resulted in the identification of over 100 city-owned sites that could potentially be made available for sustainable food production.
City Code Changes: Community Gardens and Sustainable Farming: Ordinances 20110210- 017, 20110210-018 and 20110210-019	**02/2010**	Resulted in necessary amendments to City Code to help accomplish the goals in Resolution 20091119-065 and Resolution 20091015-023 to support sustainable food production via community gardens and urban farms.
Support for Farmers Markets: Resolution No. 20100325-054	**03/2010**	Resulted in Council request for city manager to review city code to find a solution that would facilitate the preparation and selling of hot food at farmer's markets. The SFPB worked diligently with city staff and council to find a solution resulting in an amendment to code via Ordinance No. 20101028-046

Table 1 continued

City Code Amendment to Allow Food Enterprises to Sell "Hot Foods" at Farmers Markets: Ordinance No. 20101028-046	**10/10**	Resulted in allowing certified farmers' markets to have temporary food permits for 14 consecutive weekends, so that vendors with appropriate permits can prepare food regularly.
Waived Certain Application and Permit Fees for Vendors and Demonstrations at Farmers Markets: Ordinance No. 20110407-064	**04/11**	Waived certain new application fees (created for booming food trailers who use the same mobile vending permits) for vendors at city certified farmers markets. Made explicit waivers for egg vendors and farmer's market chef's demonstration booths.

Table 1: Regulation and ordinances for food policies enacted by the Travis County and City of Austin. Source: SFBP, 2011.

Despite local officials focusing on building an affordable local food system, several advocates have raised issues regarding food accessibility within the Austin metro area. According to Delia Garza, recently elected to the Austin City Council, several Austinites on the city's southeastern fringe have to drive to the next county to find the closest grocery store. Garza said: "Families in Del Valle, who are City of Austin residents, have to drive to Bastrop to go to the closest grocery store" (Austin American Statesman, 2014).

These activists have made an effort to collect signatures for petitions that call for the City to provide adequate food outlets to these underserved areas. In 2014, activist Patricia

King collected over 1,300 signatures for a petition to bring a big grocery to Del Valle. Unfortunately many of these initiatives are not carried out because neighborhood conditions such as population and density are important criteria for big food businesses when deciding where to build their next store. Furthermore, big supermarket chains are unwilling to expand inside of the food desert because doing so will decrease revenue at the locations that the residents already go to buy their groceries.

Food access non-profits based in Austin, TX

Community and regional food planning is closely related to improving the community's food system (Raja et al., 2008) in order to achieve a sustainable food system, federal and local governments are not the only actors that play a significant role providing economic support to run nutrition programs, food advocates and non-governmental organizations (NGOs) contribute to creating stronger links among producers, processors, distributors, and consumers of foods.

According to the Center of Non Profit studies there are more than 6000 registered non-profit organizations in the Austin Community College District Service Area and more than 22,000 people working in the Central Texas non-profit sector. Austin has about 60 non-profits that are concentrate on the construction of a sustainable food system, all of them working from different perspectives of health, agriculture, housing, activism or public policy (Southwestern University Office of Civic Engagement, 2013)

Sustainable Food Center

The Sustainable Food Center (SFC) is an organization that is dedicated "to helping East Austin residents cultivate a healthy community by strengthening local access to fresh food" from the farmers to the households to the schools" (SFC, 2014). It was founded as the Austin Community Gardens in 1975. The SFC actually opened its first physical location on E. 17th Street in September 2013. This non-profit hosts farmers' markets in four different Austin locations, where they provide incentive programs for customers who receive federal food benefits. They work with almost fifty local schools to educate children about the importance of having access to healthy, fresh foods. SFC also provides a free six-week healthy cooking class, "La Cocina Alegre" or The Happy Kitchen for English and Spanish speakers. Additionally, the Grow Local Program, incentivizes community members to grow their own food and share it with their neighbors by providing participants with free gardening resources like seeds and compost as well as free gardening classes.

SFC is very focused on food insecurity and obesity prevention in vulnerable families, neighborhoods and schools in Austin. In 2012, the SFC reported assisting approximately 150,000 Central Texans annually distributed:

- 70% are Hispanic/Latino, 20% African-American, 8% Caucasian, 2% Asian;
- 80% of the children attending partner schools are economically disadvantaged; and
- 75% are low-income families who are at risk for household food insecurity and/or diet-related illnesses.

Chapter 2: Farmers' markets in United States

Brown (2011) described farmers' markets as "recurrent markets at fixed locations where farm products are sold by farmers themselves." At these temporary facilities, customers do not just have access to fresh, local and healthy goods but also handicrafts, baked goods, and other products. Farmers' markets have the advantage of connecting consumers to producers (Raja et al., 2008). According to the USDA, between the period of 1994 to 2006 farmers' markets increased from 1,755 to 4,385 (USDA, 2007).

When farmers' markets are located in low-income urban neighborhoods, they facilitate access to nutritious and fresh produce. When it comes to opening a farmers' market, it is relatively simple and requires very little investment; it begins by inviting local farmers to sell their products in strategic sites where foot traffic is high and close to public transportation stops and stations. However one of the most important considerations is farmers' markets "respond to the costumers' economic realities in addition to their preferences' (Raja et al., 2008) Usually farmers' markets within low-income neighborhoods allocate food assistance in the form of vouchers such as food stamps, WIC, and Senior FMNP.

Additionally a successful farmers' market--especially those within minority communities--pursues education campaigns to increase demand by promoting the advantages of these food outlets over conventional food retailers as well increasing awareness of healthy eating through free cooking classes. Community engagement is also necessary to generate community values such as identity and cooperation around the market among farmers and customers. Specific cultural contexts and languages are also considerations that farmers' markets should anticipate to prevent from becoming barriers.

Barriers to Farmers' Market

Research on farmers' markets usage indicates that although federal nutrition assistance programs such as Farmers' Market Nutrition Program (FMNP) and WIC coupons are effective in increasing consumption of fruits and vegetables, the redemption of these coupons is still poor (Conrey et al., 2003; Grace et al., 2007; Racine et al., 2010). A study conducted (Grace et al., 2007) regarding the food stamp program in Portland, OR, investigated the barriers to using Urban Farmers' Markets for participants. It concluded that out of the 5,317 food stamps issued by Department of Health Services in Oregon over 17 days only 2,300 of food stamp dollars were spent (Grace et al. 2007). The survey conducted came up with issues that might explain the low redemption of coupons at farmers' markets in Portland.

Basic awareness about farmers' markets and the ability to use food stamps there seemed to be a major barrier to redemption rates. The second major barrier to farmers' market use

among the participants was price (Grace et al., 2007). The subjects believed that farmers' markets were more expensive than grocery stores and did not offer any incentives in the form of discounts or special offers.

A recent study released by the Project for Public Spaces conducted among eight different farmers' markets across the country revealed that almost 60% of farmers market customers in low-income neighborhoods believed their market offered better prices than grocery store nearby their area (PPS, 2012) this is because these low-income customers were buying more than half of their total produce at the farmers' markets.

The Importance of Farmers' Markets Location

The location of farmers' markets had the biggest influence on the participants. According to Brown's inventory of farmers' market research conducted from 1940-2000, the most important factor to the success of a farmers' market is location (Brown, 2002). The current literature suggests that proximity to farmers' market locations influences the redemption rate of WIC vouchers that are provided to buy fresh fruits and vegetables (Brown, 2002; Colasanti et al., 2010; Grace et al., 2007; Racine et al., 2010).

A study conducted by Herman et al. (2006) revealed that WIC centers selected for participation in the study based on proximity to a major supermarket store and a certified year-round farmers' market recorded higher rates of redemption. These results are substantially higher than the national average of redemption rates for WIC and FMNP

coupons. To be eligible, the center had to be within walking distance (not more than 1⁄2 a mile) to a supermarket or a year-round farmers' market (Herman et al., 2006).

Other commonly reported barriers were the lack of transportation to farmers' markets. One study conducted in Charlotte, North Carolina, (Herman et al., 2006) showed as many as 25% of farmers' market participants identified a lack of farmers' markets nearby to a transit stop as a barrier.

Another major barrier mentioned by the participants was the markets' limited hours. Most of the farmers' markets only operated one day per week and were only open for an average of 4-6 hours. Other minor barriers to using farmers' markets were the limited selection of food, the inconvenience of fresh produce, and the poor usability and lack of product promotion (Grace et al., 2007).

Sustainable Food Center Farmers' Markets

The SFC Farmers' Markets is one of the most relevant projects of the Sustainable Food Center. It began in 2003 with the founding of the "Austin Farmers' Market" at Republic Square Park. This project encompasses four of the largest weekly farmers' markets in the state of Texas and gathers more local farmers than anywhere else in the City of Austin with 117 local farmers and small businesses participating as vendors.

These four markets are the farmers' markets at Republic Square and Sunset Valley on Saturday mornings, the east location on Alexander and 17th street on Tuesdays, and The

Triangle on Wednesday afternoons. SFC Famers' Markets stands offer local fruit and vegetables; local cheeses, meats, and eggs; flowers, herbs, plants and soaps; delicious ready-to-eat jams, salsas and honey; cafe foods and drinks for breakfast and lunch from producers within a 150 mile radius from Travis County.

All SFC Farmers' Markets accept Supplemental Nutrition Assistance Program (SNAP) and Farmers' Market Nutrition Program (FMNP) vouchers, which are distributed among WIC recipients and Double Dollar Incentive Program eligible families for the purchase of fresh fruits and vegetables (SFC, 2014) safeguarding access to healthy and affordable local foods. Total sales in 2014 attributed to the Double Dollar Incentive Program were $109,968 and WIC eligible families, with a total value of $95,550 (SFC, 2014).

The most recent annual report launched by the SFC reported that 220,000 customers visited the four weekly SFC Farmers' markets between 2013-2014 with total sales for all four markets combined amounting in 2.64 million dollars (SFC, 2014) and 117 local farmers and small businesses participated in SFC Farmers' Markets as vendors (SFC, 2014) Additionally, farmers' markets outcomes indicate that Nutrition Assistance Program participants obtain 25% or more of their household fruits and vegetables from SFC Farmers' Markets (SFC, 2014)

SFC Farmers' Markets play a role beyond being food outlets offering food education programs and providing composting and recycling kiosks for farmers' market customers.

Moreover, they become an adequate space for gathering where families can also enjoy live music and other activities.

Chapter 3: Transit Oriented Development Overview

Transit-Oriented Development in United States

Improvements in accessibility recently have focused on developments around transit facilities, highlighting the powerful role that transit investments play in leading urban development (TCRP, 2004). Recently, several transit systems and communities across the United States have become interested in participating in Transit Oriented Development programs. The Institute for Transportation & Development Policy defines the Transit Oriented Development (TOD) as a compact, high density, mixed-use, walkable development that is within a half mile of a transit station. TOD generally includes residential, commercial, retail and recreational space, and is designed to create connections between transit, bicycles and pedestrians (ITDP, 2014)

Recently, TOD has drawn attention as a tool for promoting smart growth, boosting economic development, and supplying market demands and lifestyle preferences (TCRP, 2004) in several American urban cores. Benefits attributable to TOD initiatives include improvements in the air quality, preservation of open space, availability of pedestrian-friendly environments, the increase of ridership and revenue of public transit, reduction of urban sprawl, and reorientation of urban development patterns around both rail and bus

transit facilities. TOD projects expand mobility choices that reduce dependence on automobiles and transportation costs and free up household income for other purposes.

By 2011, there were more than 100 fascinating varieties of TOD across America indicating a growing tendency and interest in the upcoming years to increase the number. Most often, TOD projects are connected to rail stations and located in mixed-use buildings with offices and commercial businesses. But recently, several cases of public-private partnerships can be found among bus-only systems as well, usually as intermodal transfer and commercial-retail space at central-city bus terminals (TCRP, 2004).

Transit-Oriented Development in Austin

The City of Austin defines TOD and its goals by stating that:

"Transit Oriented Development (TOD) is as intentional mixing of land use and transit through the creation of compact, walkable, mixed-use communities within walking distance of a transit stop or station. The goal, of a TOD is to bring together people, jobs, and services designed in such a way to make it efficient, safe, and convenient to travel on foot or by bicycle, transit or car. TOD is an opportunity for Austin to carefully coordinate transit and development for the benefit of the entire City…The City of Austin is committed to creating transit-supportive communities by optimizing land use around high quality transit" (City of Austin, 2014)

In 2004 in anticipation of the Capital Metro MetroRail, the Austin City Council approved a resolution to begin the process of developing TOD regulations. The City of Austin's TOD ordinance regulates new development and redevelopment in areas where automobile usage can be reduced. Austin's TOD ordinance considers a two-phase implementation approach for introducing TOD in selected areas.

In the first phase, TOD district boundaries are recognized and TOD district zoning classification is defined. Simultaneously, Gateway, Midway, and Transition zones are designated and regulations for each zone are adopted to regulate density, height, and use.

The second phase is in the implementation of the station area plan, which involves specific design standards and development goals for each TOD district (City of Austin, 2008).

The ordinance establishes that the station area plan must have six subdistricts that regulate land use, density, building height, site and building design, and general standards (City of Austin, 2008). These districts are defined by density and use and are further divided into residential and mixed-use categories: low density residential; medium density residential; high density residential; live/work flex; mixed-use; and corridor mixed-use. The plans also include strategies to achieve affordable housing around transit stations. (City of Austin, 2008)

A TOD district can be classified according to its location (City of Austin, 2008). The following table shows TOD types in Austin:

TOD classification	Characteristics	Location
Neighborhood Center	It is located at the commercial center of a neighborhood. The average density is approximately 15 to 25 dwelling units for each acre. Typical building height is one to six stories. Uses include small lot single-family residential use, single-family residential use with an accessory dwelling unit, townhouse residential use, low-rise condominium residential use and multifamily residential use, neighborhood retail and office uses, and mixed-use buildings.	MLK Jr. Blvd Plaza Saltillo Lamar Blvd/Justin Lane
Town Center	It is located at a major commercial, employment, or civic center. The average density is approximately 25 to 50 dwelling units for each acre. Typical building height is two to eight stories Uses include townhouse residential use, low- and mid-rise condominium residential use and multifamily residential use, retail and office uses, and mixed-use buildings.	Northwest Park and Ride North IH-35 park and Ride Oak Hill Highland South IH-35 Park and Ride

Table 2 continued

Regional Center	It is located at the juncture of regional transportation lines or at a major commuter or employment center. The average density is more than 50 dwelling units for each acre. Typical building height is three to ten stories. Uses include mid-rise condominium residential use and multifamily residential use, major retail and office uses, and mixed-use buildings.	
Downtown	It is located in a highly urbanized area. The average density is more than 75 dwelling units for each acre. Typical building height is six stories or more. Uses include mid- and high-rise condominium residential use and multifamily residential use, large retail and office uses, and mixed use buildings.	Convention Center

Table 2: TOD classification for Austin, TX. Source: City of Austin, 2008.

Transit-Oriented Development and walkability

The benefits of walking daily are well known. Studies have determined that walking ten or more blocks per day is associated with a 33% decrease in the risk of cardiovascular disease (Frumkin 2001). In order to take advantage of the benefits of walking, the environment should have certain features that promote walkability.

Walkability can be defined as a physical environment that encourages pedestrian activity. It is also "the quality of walking conditions, including factors such as the existence of

walking facilities and the degree of walking safety, comfort, and convenience" (Litman, 2003). Other scholars widen the definition by emphasizing that walkable place are those in which destinations are close, physical barriers are non-existent, pedestrians feel safe from crime and motorized traffic, and the physical infrastructure supports walking (Forsyth & Southworth, 2008).

TOD encourages people to use non-motorized transportation modes, such as walking, biking, and public transit (Cervero & Kockelman, 1997). The TOD design concept focuses on building compact, pedestrian-friendly neighborhoods and is centered on high quality transit systems (TCRP report, 2004).

Excellent walkability, good connectivity in the transit system, diverse population, and well-designed open spaces are improvements that TOD tracks offer to ensure an adequate pedestrian environment. Therefore, walkability is one of the anticipated benefits from implementing TOD development.

In regard to walkability studies in TOD areas, travel type and distance should be considered based on function and location (O'Sullivan & Morrall, 1996). In TOD districts, factors such as the continuity of nodes in the street network and transfers among different transportation modes another key factor not just among transportation modes but also provide a friendly environment for pedestrians.

In the general literature, walkability has been a topic with different approaches; mainly it has been approached as a part of modal choices or as an independent subject.

Traditionally, walkability has been studied as a part of non-motorized modes of transportation along with bikes and public transit. In certain way few studies may be explained due to walk is not easy to test or excerpt variables that only correlate with walkability conventional modal choice (Handy, 1996). However, other studies attempted to develop a detailed list of the characteristics of urban form are likely to significantly correlate with travelers' behaviors and choices. Environments features such as density, mixed land uses, and street connectivity as well as block size, sidewalk width, and traffic volume are relevant factors of the walkability.

Chapter 4: Built environment and pedestrian behavior

The Center for Disease Control and Prevention (CDC) determines built environment includes all of the physical parts of where we live and work and it influences a person's level of physical activity (CDC, 2013). Insufficient and inaccessible pedestrian or bike infrastructure such as sidewalks or paths are factors that contribute to sedentary habits. Today, approximately two thirds of Americans are overweight (CDC, 20130) this can be explain by the existing correlation between a poor built environment and high rates of obesity, cardiovascular disease and diabetes.

The built environment is multidimensional concept that comprises urban design, land use, and the transportation system, and encompasses patterns of human activity within the physical environment and is constantly changing (Handy et al., 2002). Handy et al., suggested there are at least five interrelated and often correlated dimensions of the built environment at the neighborhood scale as it is shown in the table:

Dimension	Definition	Example
Density and intensity	Amount of activity in a given area	Persons per acre or jobs per square mile
Land use mix	Proximity of different land uses	Ratio of commercial floor space to land area Share of total land area for different uses Dissimilarity index
Street connectivity	Directness and availability of alternative routes through the network	Intersections per square of area Ratio of straight-line distance of network distance Average block length
Aesthetic qualities	Attractiveness and appeal of a place	Percent of ground in shade at noon
Regional structure	Distribution of activities and transportation facilities across the region	Rate of decline in density with density with distance from downtown Classification based on concentrations of activity and transportation network.

Table 3: Dimension of the built environment Source: Handy et al., 2002

Pedestrian- oriented neighborhoods comprise high densities of development, a mix of land uses, a street network with high connectivity, human-scale streets, and desired aesthetic qualities. On the contrary areas where walking, biking and public transportation are continuously are prevented or at least a significant challenge are marked as car-oriented.

Built environment and travel mode choice

An ample amount of previous research has examined various factors that are expected to influence people's modal choice. Most researchers support the idea that there are positive relationships between urban form-density, mix use and connectivity- and non- motorized travel and transit usage (Frank, 2000; Cervero and Kockelman, 1997; Cervero and Gorhma, 1995; Ewing and Cervero, 2002).

Cervero and Kockelman (1997) define three D's-density, diversity, and design as variables that shape urban form and subsequently have an impact on travel behavior (Saelens et al., 2003; Handy et al., 2002). They consider the three D's model to explain how built environment influences travel demand-specifically, trip rates and mode choice of residents. San Francisco's case study suggested that more compact, diverse, and pedestrian-oriented neighborhoods could significantly influence how people travel.

Simultaneously, the three D's model correlates with less driving or more use of public transit, more multiple-occupant automobile driving, and more non-motorized transport (Ewing & Cervero, 2002). Other scholars sustain that neighborhood characteristics and detailed urban design are more relevant to physical activity, such as walking/biking than socio-demographic attributes (Saelens et al., 2003).

Later studies re- interpreted the three D's model into other words and concepts such as physical proximity and connectivity within the neighborhood to transit or activity nodes

(Frank, 2000; Pikora et al., 2002; Saelens et al., 2003; Leslie et al., 2007;). Frank (2000) focused on proximity and connectivity between trip origins and destinations, which are expected to be significant elements affecting people's travel choice. Based on his research, fine-grid neighborhoods, pedestrian-oriented, and with complete and well-maintained sidewalks, give more positive opportunities for pedestrians than new, auto-oriented development neighborhoods.

Another one of his research findings was that the reduced travel distances and less vehicle miles traveled (VMT) were partially due to the positive association between connectivity and other land use attributes that affected proximity, including land use density and mix.

Hess et al. (1999) have been explored the relation between neighborhood design and pedestrian travel. His research comprised the study of 12 commercial centers in the central Puget Sound region, in the northwest coast of Washington. By using a 0.5 miles radius area to control variables of population density, land use type and mix, income, and size of study sites, they observed the effect of how urban form and design such as block size, existence of public sidewalk system, completeness of sidewalk, entry points, airline distance, route length, route directness, existence of on-street parking, street system induced pedestrians' walking distance per hour (Hess et al., 1999). The outcomes of the study suggested that there were significant differences in pedestrian travel patterns due to neighborhood design, and consequently there was a higher volume of pedestrians in well-

design, maintained and safer walking environments with better pedestrian facilities than in comparable neighborhoods (Hess et al., 1999).

Certain studies such as Cerin's et al. (2006) also sustain that greatly walkable neighborhoods are more like to concentrate population density, land use diversity, and better street connectivity, infrastructure and safety for walking. Whereas built environment settings that may cause people's willingness to walk, this also can play a role a surrogate for a set of socio-economic factors that affect travel behavior other overlooked factors, such as trip purpose or socio-demographic factors, may play a considerable role in people's modal choice (Handy, 1996; Frank & Pivo, 1994).

Neighborhood Characteristics

The definition of neighborhood characteristics varies among researchers, but in most cases, the concept embraces not only the physical features of the neighborhood (e.g., street design, street patterns) but also socio-demographic characteristics of the neighborhood (e.g., income level, prevalence of race or predominant land use of the area). Studies conducted in California by Cervero and Gorham, examined how two different suburban neighborhoods a transit neighborhood and car-oriented neighborhood shed lights on a pattern in modal choice and trip generation rates by measuring different variables such as residents' median income and public transportation offer.

The study reveled that the transit neighborhood "experienced lower drive-alone modal shares and trip generation rates than the auto neighborhood. The transit neighborhood also showed higher walking and bicycling modal shares and generation rates than its automobile counterparts" (Cervero & Gorham, 2000).

Krizek's (2003) study surveyed and tracked travel behaviors of similar households to determine whether neighborhood accessibility characteristics (density, land use mix and street pattern and block size) and socio-demographic factors (such as income, number of vehicles, number of adults, number of children, and number of employees) influenced those households' travel behaviors (such as vehicle miles traveled, person miles traveled, tour frequency, an tour complexity).

Socio-demographic Factors

First-hand studies on socio-demographic factors evidence the importance of these elements to be measured in people's choice to walk (Ewing & Cervero, 2001; Cerin et al., 2007). The built environment comprised a set of socio-economic factors that may impact travel behavior. In low-income communities travel people's choice usually socio-demographic factors are major causes rather than the built environment or urban form.

Other factors

Besides the variables mentioned above, a few researchers consider other factors, such as land use balance, travel costs, parking supply (Zhang, 2004), public spaces, bus rapid transit lanes, and green ways (Cervero, 2009) as important to influencing people's choice

to walk. Research conducted in the cities of Boston and Hong Kong (Zhang, 2004) analyzes the influence of land use on travel mode choice. In one hand, land use attributes were highly relevant in Boston when it comes to travel choice and travelers' socio-economic characteristics. On the other hand, Hong Kong's case study exposes its denser environment impacts mode choice that combined with varied land use explained the transit-dominated travel pattern. Ewing et al. (2006) focused on quantifying qualitative urban design.

He studied the perceptions of walkability that exist between objective measurements and subjective reactions by observation, rating and (by an expert panel), and analyzing the relationships between physical features and urban design quality settings. Among the nine urban design qualities, five of them (imageability, visual enclosure, human scale, transparency, and complexity) were confirmed as valid protocols for urban design qualities related to walkability

Chapter 5: Walkability in Austin

By 2013, Austin's population grew to nearly 1.9 million. Recent data from the U.S. Census Bureau suggested that in the past decade (2000-2010) Austin experienced a 37% increase in population, and growth was 2.6% for 2013. Future projections for 2050 estimates that the Austin MSA will reach 5,176,940 people. Despite the positive outcomes of population growth such as economic growth and high rates of employment,

other factors such as lack of affordable housing, insufficient services and infrastructure, environmental issues, and traffic congestion constitute challenges to shape a sustainable future for the city.

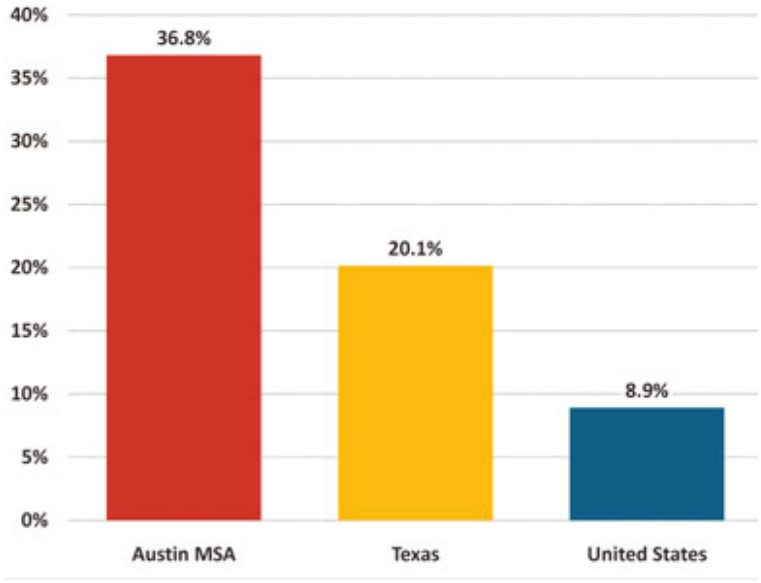


Figure 11: Population growth 2003-2013. Source: U.S Census Bureau, 2010

By 2013 the INRIX Traffic Scorecard Annual Report ranked Austin as one of the Top 10 Worst Cities for Traffic in America, based on an examination of 2012 driving. Austin has been one of the most auto-dependent cities in the United States due to its spread-out urban development; massive roads that pass through neighborhoods, and the lack of access to public transportation systems.

Local authorities recognize traffic congestion's negative impact on Austin urban development. The Traffic Congestion Action Plan of 2015 established as its main goal "Reduce congestion using a variety of tools (short term methods coupled with a mid-long term strategy)" (City of Austin, 2015). Among the main strategies for alleviating

congestion the City looks for improving in the roadway network, traffic signal system, remove impediments to traffic flow, additionally it the need of transportation alternatives as "tool in the tool box to address mobility challenges including reducing the number of vehicles on our roadways" (City of Austin, 2015) that especially address solutions for improving and increasing the practice of other mobility modes such as walking, biking and public transit.

Austin's ordinances and Comprehensive Plan emphasize the implementation of strategies that seek to provide a walkable urban environment. Mainly, the City's Urban Design Guidelines provide recommendations for new development that enhance walkability, citing a link between a project's economic viability and walkability (City of Austin, 2009). Design considerations such as streetscape and urban design elements include such amenities as benches, trash receptacles, planters, bike racks, sculptures, and water features, and a tree canopy to enhance the pedestrian experience.

According to the website Walkscore.com, Austin is the 34th most walkable large city in the United States. This score corresponds to the walkability of the address, with 0 being the least walkable (or car-dependent) and 100 being a "walker's paradise" (Clifton, 2013). The more destinations that are close to the address, the higher the score will be. Although Carr et al (2011) found Walk Score to be a valid indicator of access to walkable amenities; Walk Score does not "assess the physical built environment for pedestrians" (Clifton, 2013). In this regard it is possible that a neighborhood with a great number of

destinations is not walkable.

When pedestrian behavior in Austin has been studied, Cao et al. (2006) suggested trips were influenced by the quality of the built environment, such as mixed land uses, interconnected street networks, sidewalks, and other facilities. Further findings in this study advised that the impact of the built environment on pedestrian behavior may depend on the purpose of the trip, utilitarian or recreational purposes, and the relationship between the built environment and walkability may be a matter of residential location choice than of travel choice (Chung, 2009).

Additional, studies have documented the pedestrian environment in other areas of Austin. Chung (2009) measured accessibility to the MLK Jr. rail station from surrounding neighborhoods and found that many residential streets were missing sidewalks or were otherwise unsafe for pedestrians. Rodriguez (2010) recommended streetscape amenities to enhance the pedestrian experience in an area totally devoted to motor vehicles from I-35 and its surrounding areas.

In 2009, the city adopted the Sidewalk Master Plan to promulgate "policies that will encourage walking as a viable mode of transportation, improve pedestrian safety, and enable people to walk to and from transit stops" (City of Austin, 2009). The master plan includes an analysis of Austin's sidewalk system time. According to the diagnostic, by 2009 Austin had a deficit of roughly 3,500 miles of paving to create a complete system.

Based on the master plan results, Clifton (2013) reported that an average of $5.50 per square foot of sidewalks needed around $1,000 for each wheelchair accessible sidewalk, which came to roughly $824 million for new sidewalks, and another $120 million for upgrades to existing sidewalks. This became a major issue for the city when it comes to envisioning a more walkable city (Clifton, 2013)

The Great Streets Development Program is also another effort made by the city that seeks strategies to improve "the quality of downtown streets and sidewalks, aiming ultimately to transform the public right-of-ways into great public spaces" (City of Austin, 2009). This program also offers financial assistance to private developers with the cost of implementing streetscape standards that go above and beyond the city's minimum requirements (City of Austin, 2009). In this respect, urban planners and stakeholders should pay close attention to walkability as a key measure of urban vitality.

Chapter 6: Case study: SFC East Farmers' Market at Chestnut Neighborhood in Austin, Texas

The Chestnut neighborhood is located in East Austin. Its boundaries are Martin Luther King Boulevard to the north; East 12th street to the South; Chicon Avenue to the East; and Miriam Avenue. It is close to the major city landmarks such as the Capitol, the redeveloped site of the former Robert Mueller Airport, Hutson-Tillotson College, Austin Community College's new East Austin Campus, and the University of Texas.

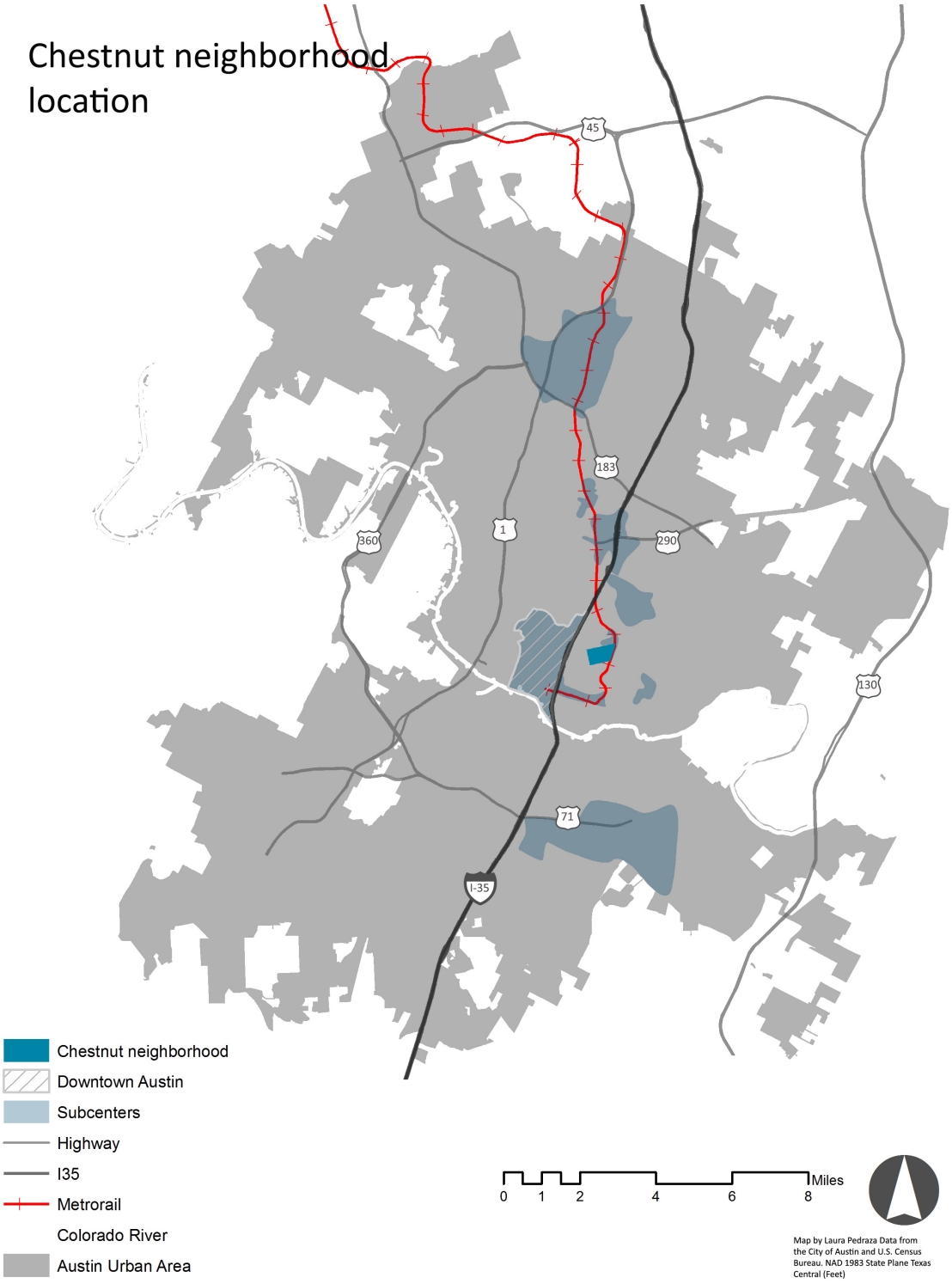


Figure 12: Chestnut neighborhood location map on the local context . Source: City of Austin, 2014

Figure 13: Chestnut neighborhood location map. Source: City of Austin, 2014

Approximately 1462 residents live in Chestnut's estimated five hundred households. Chestnut is about sixty square blocks or 180 acres. Approximately 77% of its residents are African-American, 19% are Hispanic, and 4% white.

Over 100 structures within the Chestnut neighborhood are listed in the city's East Austin Survey of Cultural Resources. Many houses within the neighborhood reflect design

features. However, because of their age, approximately 25% to 30% of these homes are in need of repair or rehabilitation.

Chestnut neighborhood

History

Prior the twentieth century, the Chestnut neighborhood used to be a rural community situated along the eastern edge of the urban and suburban extent of Austin. The majority of the Chestnut neighborhood was platted between 1890 and 1915 (Nixon et. al, 2013). By the 1920s, numerous African American church assemblies were located in the Chestnut neighborhood and by the end of the 1940s Chestnut was completely developed with almost exclusively single-family homes except the Hudspeth's Corner, a small, historic commercial strip located at the intersection of 14th Street and Cedar Avenue.

During the decades of 1940s and 1950s, most of the growth was concentrated between 17th Street and a commercial development and multi-family housing, especially along MLK Jr. Boulevard diversifying use within the neighborhood. In 1965, the area only contained a small number of vacant parcels the result of which was increased density. At that time Chestnut's residents were almost exclusively African American, accounting for 99% of the area's population in 1960 and 1965 (Austin Community Renewal Program, 1967). According to the Welsh (2007) study the neighborhood has (1) importance as a community with strong African American roots, (2) the central role played by Chestnut's predominantly black churches, and (3) the legally mandated segregation that shaped Austin (Walsh, 2007).

In 1967 the City of Austin suggested a "clearance and redevelopment" plan for Chestnut because more than half of the neighborhood's properties were considered dilapidated and half of its streets were unpaved (Dixon et. al, 2013). The I-35 project aimed to preserve the community's history (Austin Community Renewal Program, 1967).

The Chestnut Neighborhood Plan was completed in 1999. A neighborhood focus group was formed to discuss various planning topics such as housing, safety, health, youth development, land use, and transportation. The plan identified ten priorities to address strategies in order to overcome issues and turn them into opportunities for future neighborhood improvements (City of Austin, 1999):

1. Protect the historical and existing character of Chestnut: Protect the existing character of Chestnut by addressing long-standing land use and zoning issues, promoting quality new development, encouraging mixed use zoning and granting amnesty to smaller lots. (City of Austin, 1999).

2. Incorporate as a non-profit organization: Incorporate as a non-profit organization to promote new housing and business investment, and rehabilitation for older homes (City of Austin, 1999).

3. Make the neighborhood safer and easier to walk through: Clean up vacant lots and abandoned automobiles and other health and zoning code violations. Installation of sidewalks, improved street lighting and left turn signals to promote safety and make the neighborhood easier to walk through (City of Austin, 1999).

4. Establish a Chestnut Business Coalition (City of Austin, 1999).

5. Improve access to preventive health services and expand opportunities for the elderly in the neighborhood (City of Austin, 1999).

6. Develop a pocket park in Chestnut (City of Austin, 1999).

7. Form a strong police and neighborhood partnership. Rebuild a strong neighborhood watch and form a strong police and neighborhood partnership so that police visibility and presence can be enhanced. Ideally the neighborhood wants a police sub station located within the area (City of Austin, 1999).

8. Create more opportunities for youth to participate in Chestnut's future (City of Austin, 1999).

9. Reinforce the historic and cultural character of Chestnut. Reinforce the historic and cultural character of Chestnut by identifying and designating landmarks, researching historic district designation and requiring that new housing developments be compatible with the original wood frame and porch style of the neighborhood (City of Austin, 1999).

10.Establish Chestnut as a Community Block Development Grant (CBDG) area (City of Austin, 1999).

The plan envisioned a safer and more pedestrian friendly neighborhood, an adequate environment for pedestrians through intensive improvements to sidewalks, and street lighting and maintenance of vacant lots were established as key strategies that would enhance the residents' quality of life. Simultaneously the future Land Use Map identified the parcels designated with mixed use and parkland. Subsequently in 2009 the Neighborhood Plan association amended the ordinance to include the MLK Jr. TOD Station Area adopting the MLK Jr. Area Plan for the designated parcels including the zoning, site development and design regulations for those properties with TOD zoning. Finally in 2014, the ordinance 990715-113 amended to change the land use designation from civic use to single family use for the property located at 1805 and 1807 Ulit Avenue on the future land use map (City of Austin, 2014).

Martin Luther King Jr. Transit- Oriented Development

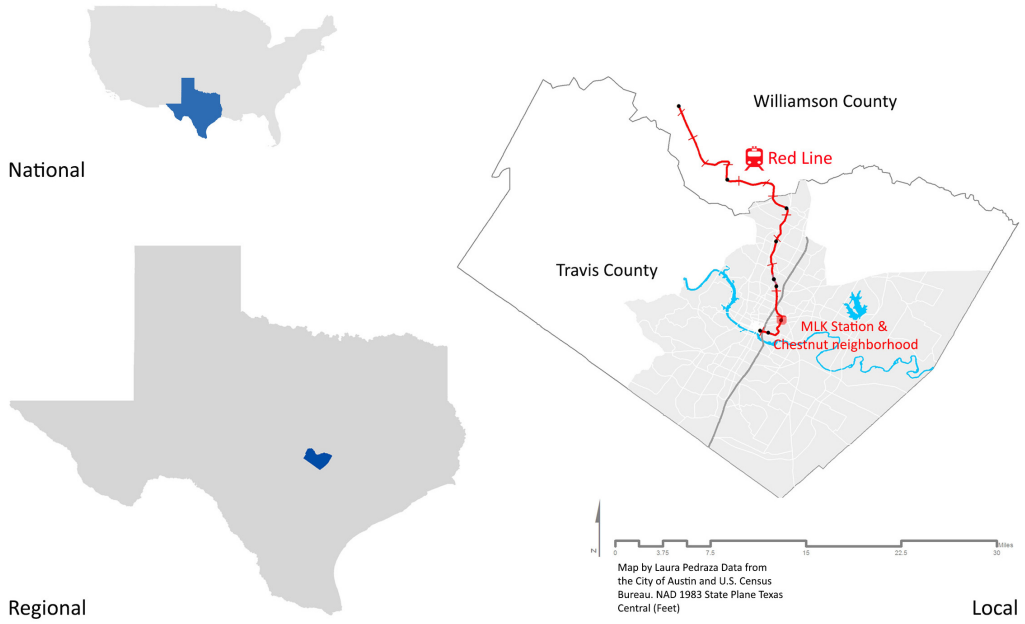


Figure 15: MLK Jr. TOD. Source: City of Austin, 2014

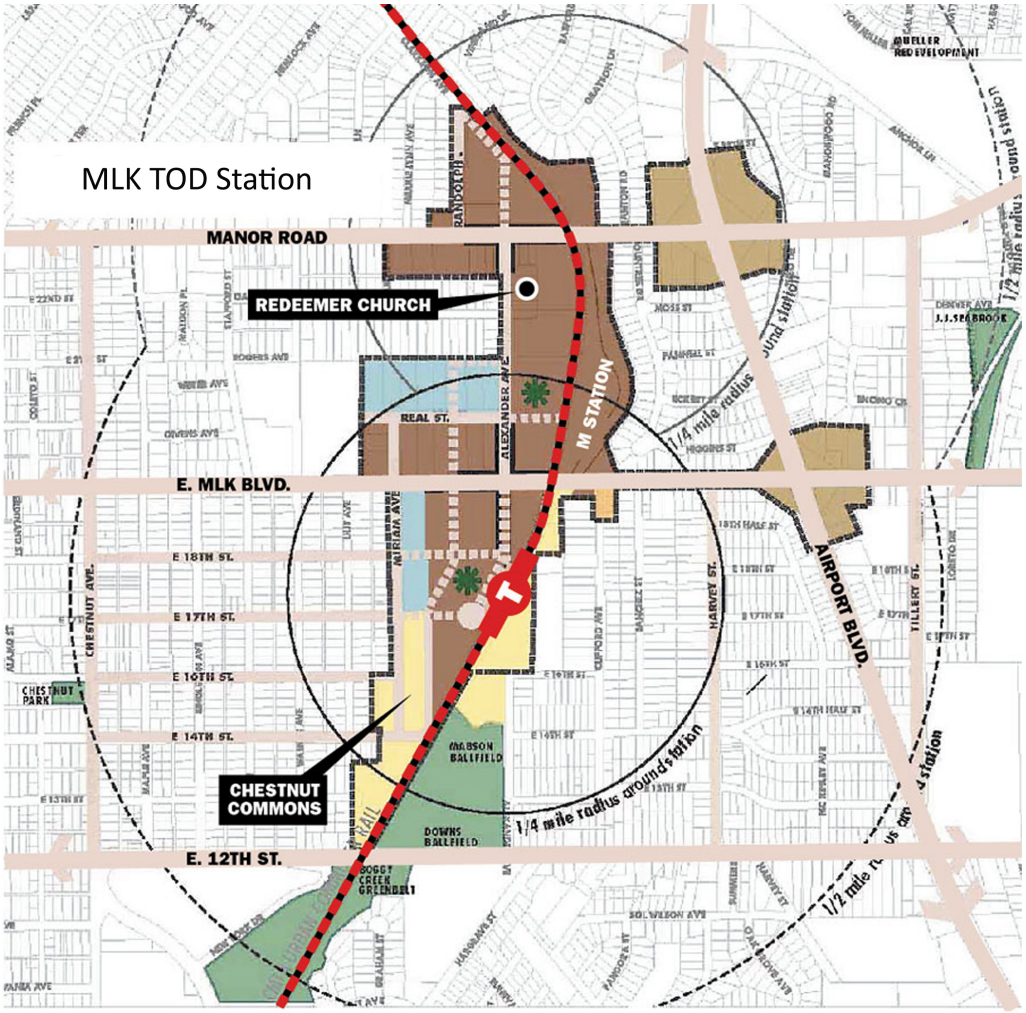
This TOD district is developed within the historically African-American Chestnut neighborhood located on Alexander Avenue at MLK Jr. Blvd. The Martin Luther King, Jr. Blvd. TOD district is a neighborhood center TOD district according the general classification established by the City of Austin TOD Ordinance. It is located on Alexander Avenue at MLK Jr. Blvd. The TOD site consists of 30 acres, the new residential complex, the Chestnut Commons, and three local nonprofit organizations that provide locally relevant community services. The TOD district also includes a substantial area of open space.

The land acquired for the TOD district was the former site of the Featherlite Concrete Factory, which was active during the 1940s. Subsequently, several actors came and

shaped the development of the site for predominately residential use. However, the TOD district was envisioned as a project that served the community or Social Profit Village. The MFI Real Estate leveraged ownership of the TOD land to support financially the MLK Jr. Station, the affordable rental housing development, and transitional housing for homeless youth (Dixon et al., 2013).

Future phases will add a senior care nursing facility, a community center, a mixed-use office, and retail and residential development (Dixon et al., 2013). Adjacent to these residential developments, three nonprofit organizations: Sustainable Food Center, People Fund and Creative Action, bringing new services to the neighborhood and facilitating collaboration between community members.

Regarding the MLK Jr. TOD station services and facilities, this station offers a ticket vending machine, ticket validators, and digital signs with real-time train arrival information, lighting, windscreens, accessible ramps and glass canopies. The North Boggy Creek Bikeway will cross this station. The MLK, Jr. MetroBike Shelter provides secure parking for up to 24 bikes on a first-come, first-served basis. A MetroBike card is required to gain access to the facility. Routes 464 MLK, Jr./Capitol and 465 MLK, Jr./University of Texas are timed to meet the trains and run on varying schedule. Two-hour MetroRail passes may be used on these connectors (CapMetro, 2014)



Source: Austin Chronicle, 2010

Figure 16: MLK Jr. station. Source: Austin Chronicle, 2010

The MLK Jr. TOD district embodies a new approach to TOD (Dixon et al., 2013). Research concerning TOD projects within low-income communities, suggests the common disconnect between existing communities and these new developments and the challenge that it poses to former residents when it comes the rising of housing costs (Dixon et al., 2013).

While the site and the development located in the Chestnut neighborhood was inscribed as a TOD district, within the neighborhood plan, rail transit was not recognized as a necessity. The MLK Jr. station serves a connector bus that transports riders to the south side of the University of Texas campus to the rail line, thus riders pass through the area more frequently than residents walking and boarding trains. In this context, transit oriented developments is more often seen by residents as about development than transit (Dixon et al., 2013).

Sustainable Food Center East Farmers' Market

In 2008 the report *The Enduring Challenge of Concentrated Poverty in America: Case Studies from Communities Across the U.S.* found East Austin was one of the sixteen communities with high levels of concentrated poverty, at least 40% and a substantial lack of grocery stores because of transportation and other issues (SFC, 2012) and the abundance of convenience stores, exacerbating the problem of diet-related health issues. Even though low-income families in Austin face barriers to access healthful food, they have also demonstrated a willingness to purchase and consume accessible, affordable nutritious food (SFC, 2012). In 2010 SFC Farmers' Market saw a 62% increase in Women, Infants, and Children (WIC) Farmers' Market Nutrition Program (FMNP) participation, and an 82% increase in Supplemental Nutrition Assistance Program (SNAP) usage (SFC, 2012).

In 2010 the SFC St. David's Foundation and Wholesome Wave proposed to implement an incentive program to increase the nutritious foods purchasing power of targeted low-income families (SFC, 2012), The proposal included a SFC Farmers' Market and Double Value Coupon Pilot increasing the number of low-income families East Austin that access and purchase fresh, healthy foods (SFC, 2012) within an area considered as a food desert, facilitating the performance and effectiveness of the Double Dollar Pilot Program and simultaneously ensuring funds from St. David's and USDA.

Figure 17: SFC Farmers' Market East location map 2012- 2015. Source: Pedraza, 2015.

In 2012 the market was located at 183 Highway and 51st Street in the YMCA East, 5315 Ed Bluestein facilities and ran every Tuesday from 10 am to 1 pm year -round. This site offered an adequate parking area, enough space for setting up farmers' stands, restrooms and additional features such as a playground and other areas for people gathering.

However, in an interview with Suzanne Santos, director of the SFC Farmers' Market program, in April 2015, it was mentioned that when they decided the YMCA East as desirable location accessibility to public transportation was not considered as a relevant factor. Unfortunately, one year later the market was moved to another location because lack of public transportation on the site negatively impacted on Farmers' Market usage and most of the clients relied on driving a car to reach the market.

In March 2013, the East Market was reopened at 2835 E Martin Luther King Jr. Blvd in a vacant parcel. It operated every Tuesday through 3 pm- 7 pm year-round 18, 21, 22 and 6 bus routes and the MetroRail service served this area. Additionally the Redeemer Presbyterian Church allowed East Market to use its parking area and restrooms for market costumers. Despite several parking limitations the market was operating on that site for two years. But in March the Market was moved one block south at Alexander and 17th Street 2015 due to a construction project on the parcel. The Market still operates in the same hours, is closer to MLK Jr. MetroRail station and offers free street parking and limited lot parking for costumers.

Chapter 7: Results

Throughout data collection, field observation and image analysis this document aims to analyze how the built environment of the Chestnut neighborhood impacts the SFC East Farmers' Market usage. During the period of February to April the information was compiled in the form of databases, images, sketches and surveys.

The result were organized and analyzed by three categories:

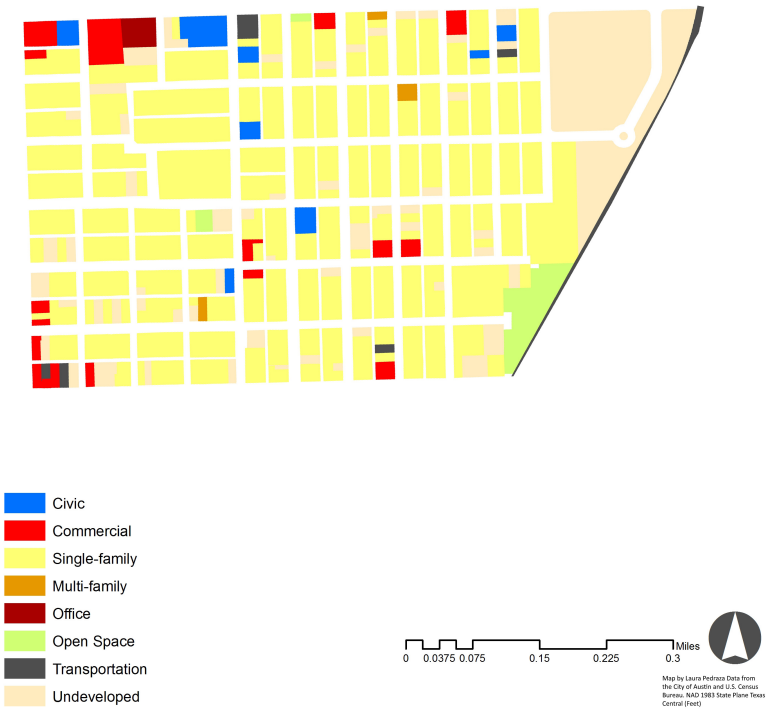
- Land use and density
- Connectivity
- Features of the built environment

Land Use and Density:

Mixed land use is defined as the relative proximity of different land uses within a given area. A mixed-use neighborhood would include not just homes but also stores, offices, parks, and perhaps other land uses.

Measurements of land use mix are not standardized. On one hand, studies assess the distance from each residential unit within a neighborhood to the nearest store, community facility or other land uses. On the other hand, studies have been based on a dissimilarity index that divides an area into grid cells and for each cell counts the number of neighboring cells occupied by different land uses. Additionally, a simple classification of the total land use within the site into shares of each type of land use is another way to measure land use diversity.

Chestnut's land use map suggests that predominantly land use is single-family homes making up 88.52 acres followed by undeveloped land with approximately 24 acres. Finally the MLK Jr. station comprises 2.7 acres.



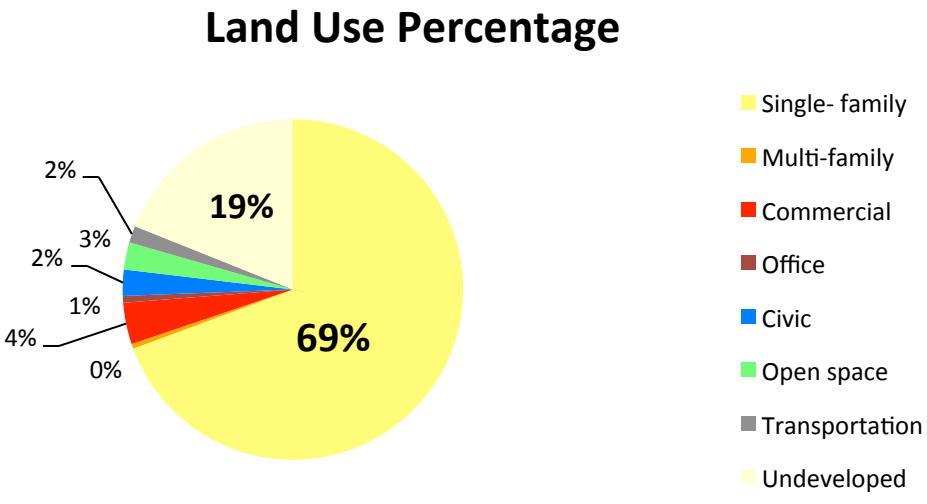


Figure 18: Chestnut neighborhood Land Use Map 2010. Source: City of Austin, 2014

Land Use	Area (acres)
Single- family (100)	88.52
Multifamily (200)	0.57
Commercial (300)	5
Office (400)	0.81
Industrial (700)	3.28
Civic (600)	15.16
Open Space (600)	12.51
Transportation (800)	4
Undeveloped (900)	24
Parking (800)	2
Total	155.85

Table 4: Chestnut neighborhood land use in 2010. Source: City of Austin, 2014

Literature regarding TOD sites and walkability suggests that low diversity in land use may negatively impact walkability. This is true for the Chestnut neighborhood that comprises the MLK Jr. TOD district that is primarily embedded in a residential cluster. Additionally, preliminary results from Chung's study (2009) were taken to confirm previous land use percentages. Chung calculated the dissimilarity index (Cervero & Kockelman, 1996) for the MLK Jr. Station and surrounding area within ¼ and ½ mile buffer that includes Chestnut neighborhood. He measured dissimilarity by calculating the

dominant land use in 13 columns and 18 rows (234 cells total) of a 100-by-100-meter grid cells covering the site (Chung, 2009). According to the literature, this measure is useful for finding the relationship of land use in the center cells to those of eight adjacent cells (Chung, 2009).

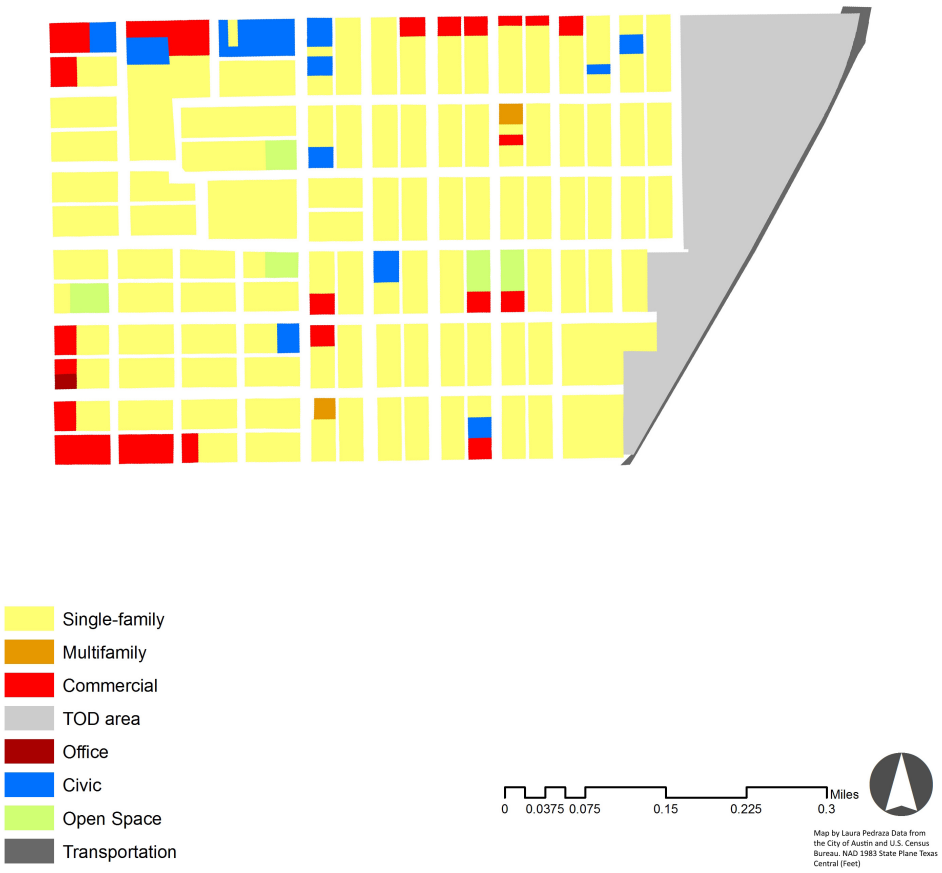


Figure 19: Chestnut neighborhood Future Land Use Map. Source: City of Austin, 2014

The process to calculate the dissimilarity index is based on overlaying a grid of 100-by-100 meter cells on the existing land use map. Later by estimating the predominant land use of each cell by the acres and later computing the percentage of heterogeneity of the center cell by comparing the cells adjacent to it (Chung, 2009).

The dissimilarity index values range from 0, which means low dissimilarity, or in other words where the dominant land use of the cell is identical to the land use of the adjacent cells. On the other hand, the higher dissimilarity value is 1, which means high dissimilarity, where the dominant land use of the cell is different from any of the land uses of the adjacent cells (Chung, 2009).

As it was expected, significant cells were residential or vacant parcels, while other land uses were not that significant or clustered. Results from Chung's study presented an overall dissimilarity index value in this area (with an average dissimilarity index of 234 cells) was 0.28, which means that this area has low heterogeneity, therefore a less friendly pedestrian environment (Chung, 2009).

Density is a measure of the amount of activity found in an area. It is usually defined as population, employment, or building square footage per unit of area and may be measured as people per acre or jobs per square mile. Density is perhaps the easiest characteristic of the built environment to measure and is thus widely used.

Density in the Chestnut neighborhood was measured by calculating the frequency of certain land use on the site.

Land Use	Frequency
Single- family (100)	584
Multifamily (200)	3
Commercial (300)	22
Office (400)	1
Industrial (700)	5
Civic (600)	11
Open Space (600)	1
Transportation (800)	7
Undeveloped (900)	72

Table 5: Chestnut neighborhood land use frequency in 2010. Source: City of Austin, 2014

Chung (2009) reported the intensity of densities by calculating the total number of jobs and residents per acre. Pulling out date from the census block data and LEHD data, the number of residents and jobs was added in each block and divided the sum by the acres. Results showed that the population density and job density were 16.39 and 180.27, respectively. The result of intensity of uses (population total divided by study area) was 9.71, which indicates a negative value for the walkability (Chung, 2009)

Connectivity:

Connectivity is defined by scholars as the directness and availability of alternative routes from one point to another within a street network. It can be measured through a variety of

ways. For example, by calculating the number of intersections per square mile, or by the ratio between the straight-line distance between two points and the distance along the network between these points. Additionally, the average block length is often used as a measure of connectivity.

More precisely, Daisa (1997) defines street connectivity as "a system of streets with multiple routes and connections serving the same origins and destinations. It is an area with high connectivity has multiple points of access around its perimeter as well as a dense system of parallel routes and cross-connections within an area" (Daisa, 1997).

Chestnut's street grid is rectangular and rectilinear and is typical of a neighborhood built after the middle of the nineteenth century. On the contrary, adjacent developments to the Chestnut area have curvilinear and disconnected streets dating from the period after World War II. Both patterns reflect the shift in the practice of planning and market demand during the last century.

The purpose of a street network is to connect spatially detached sites to enable people to reach one place from another. The street network depended on the design, and "it may provide one connection or many connections, direct connections or indirect connections fro all modes or for selected models of travel" (Handy et al., 2003).

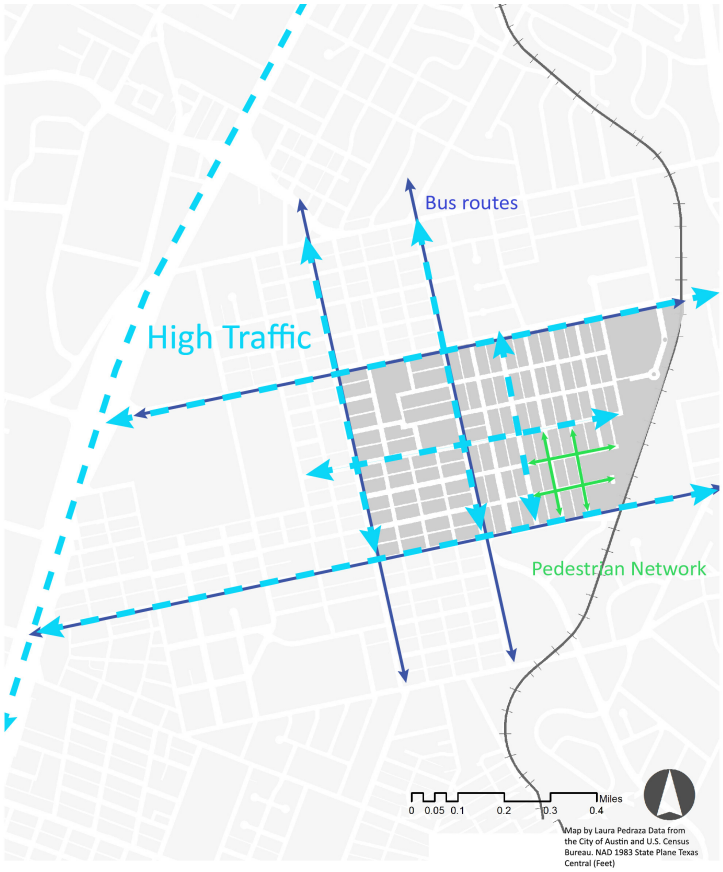


Figure 20: Chestnut neighborhood accessibility. Source: City of Austin, 2014

Another bullet point on connectivity is the quality of the street network and it definitely influences the accessibility of potential destinations within the neighborhood having significant implications on travel choices, emergency access, and in general, quality of life (Handy et al., 2003).

Handy et al., (2003) defined a connectivity index by calculating the number of streets links divided by the nodes or link ends. The higher number of links relative to nodes, the greater the connectivity. One example of these connectivity index is Cary, North Carolina where the town's ordinance requires an index value of at least 1.2 and connections to

compatible adjacent uses spaced no more than 1,250 to 1,500 feet apart for each direction, a requirement that ensures a minimum level of connectivity, but the wanted index value is 1.5. By implementing this index the City of Cary has improved its connectivity standards; increased efficiency in delivery of services and more interaction among residents specifically on the local street networks.

Other features of the built environment

There is substantial evidence for neighborhood characteristics correlating with walking. Neighborhood design supports walking and they describe neighborhood walkability by analyzing a set of physical features such as type of street patterns; hierarchy and scale of neighborhood; crosswalks; access to public transportation; safety and aesthetics values that may impact pedestrians' willingness to walk.

The grid, hierarchy and scale of the streets in Chestnut neighborhood

In the Chestnut neighborhood motorized traffic and residents shared the public space. The right of way in this site generally is 500 feet wide. Chestnut's grid is simple and efficient, typically each block measures xxx by xxx. These measurements maximize the number of houses facing the street, minimized legal boundaries and allowed for standardization of lot size. In the case of Chestnut, the average lot size is 40 ft. by 126 ft (Handy et al., 2003).

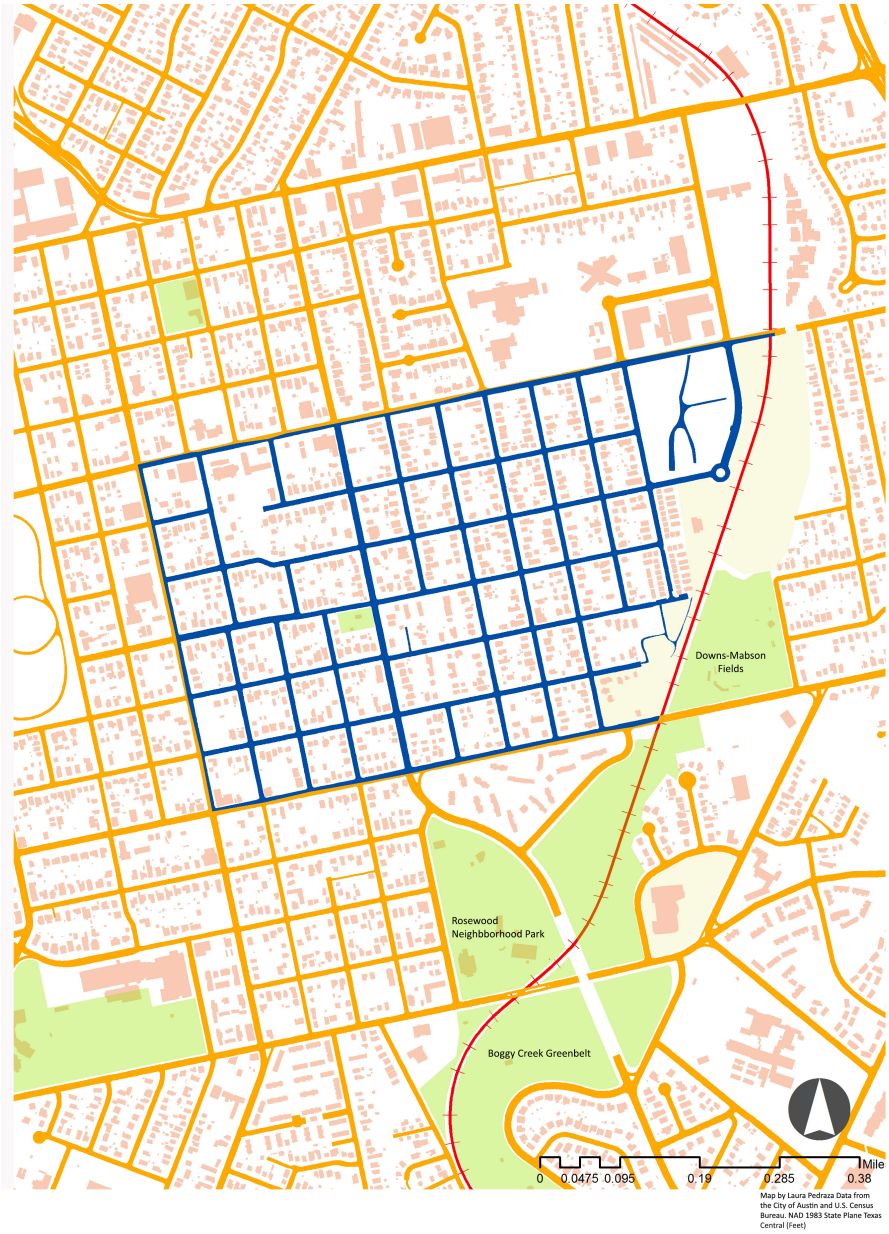


Figure 21: Chestnut neighborhood urban grid. Source: City of Austin, 2014

Chung's (2009) study reported the average block size of this zone scored a 4.1, which is close to the high standard for comfortable walkability. For the Chestnut neighborhood block size parameter was measured using Boer et. al. (2007) standards to measure neighborhood design and walking trips in ten U.S. metropolitan areas. The New

Urbanism theory suggests that the best scale for walking is the length between 300 to 600 feet. The categories for block length are: <400 feet: excellent; 400–500 feet: preferred; 500–600 feet: acceptable; and >600 feet: minimal. However, 96.2% of the sampled individuals lived in neighborhoods with average block lengths of >600 feet. Chestnut's typical block length is 310 ft. (Table 6)

Short block length (long-side)	**Score**
Less than 400 feet	Excellent
400 to 500 feet	Preferred
501 to 600 feet	Acceptable
Greater than 600 feet	Minimal

Table 6: Smart scorecard measures for walkability. Source: Boer et al. (2007)

Before the decade of the 1950s, American neighborhood streets had a few traffic lights and streets with two lanes for traffic, most of them with a single lane of opposing traffic, which facilitates easier left turns because there was often a "break" in the opposing traffic flow (MTS. Org, 2014). Simultaneously, there were more choices of routes that may make travel more interesting and efficient.

However, the standardization of the modern neighborhood street pattern mostly occurred with the Federal Housing Administration Act (FHA). The standards specified subdivision layout, the size of the block (600 to 1,000 ft. in length), the intensity for semi-detached residential units, among other requirements (Handy et al., 2003). According to Handy et

al. (2003), the FHA recommended that subdivision developers create a hierarchy of streets that sought to place major thoroughfares outside of the developments, eliminate wide intersections, discourage through traffic, and reject grid patterns (Handy et al., 2003) incentivizing the use of curvilinear streets, courts and cul-de-sacs.

However, the idea of a street hierarchy gained acceptance in the 1960s in the U.S. as a way to bring order to suburban streets. It is largely accepted that street hierarchy is deeply embedded in traffic engineering and transportation in which "streets are differentiated by the degree to which serve access or movement functions" (Handy et al., 2003).

The street hierarchy categorizes roads into local streets, collectors, arterials and highways. Local streets discourage cars and they are designed with intermittent street patterns. Collector streets carry traffic having a trip ending within the specific area. Sub-arterial roads allow connections between local areas and arterial roads. Arterial roads are high-capacity urban roads and the essential primary function of an arterial road is to deliver traffic from collector roads to freeways (See addendum for street hierarchy).

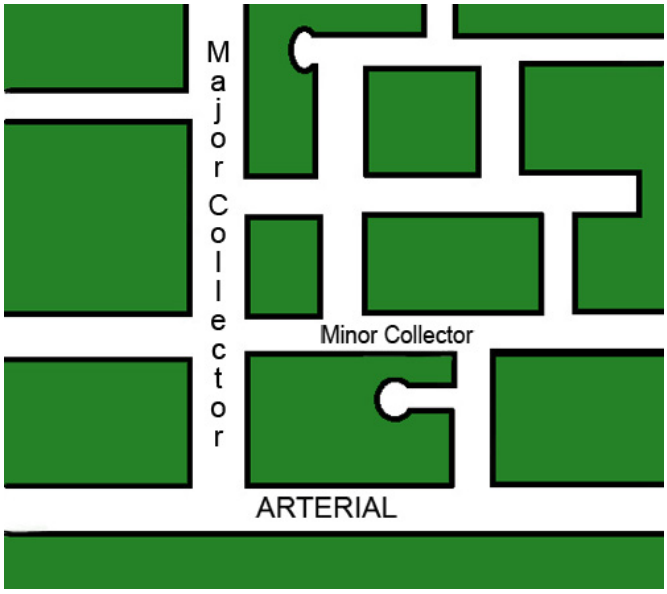


Figure 22: Street hierarchy diagram. Source: MTS. Org, 2014

As a consequence, residential areas across the U.S are frequently isolated from surroundings and have low connectivity between neighborhoods leading to inefficient and indirect routes from one site to another.

The Chestnut neighborhood was a medium-density residential area with relatively well-connected street networks. Moreover, its newly developed new urban style residential area, along with Miriam Ave., have excellent street conditions. The street conditions of the Rosewood neighborhood are in between the Upper Boggy Creek neighborhood and the Chestnut neighborhood. The street conditions of the Rosewood neighborhood, however, are very poor with missing sidewalks.

Sidewalks

Sidewalk conditions and cross walks within the study area were analyzed. The sidewalk conditions were sorted into the following three categories: excellent, good, and poor. The analysis did review existing vehicular street networks that included local and sub-arterial roads. To determine how to classify the sidewalk conditions, a GIS analysis was conducted by revising the street layers, speed limits, and the existence of sidewalks. MLK Blvd has a speed limit of 45 miles per hour (mph) and E. 12th St. is mph while the speed limit is 30 mph on most local roads and alleys. Additionally, streets with speed limits less than 30 mph were included even though they did not have sidewalks or crosswalks because of their low volume of traffic.

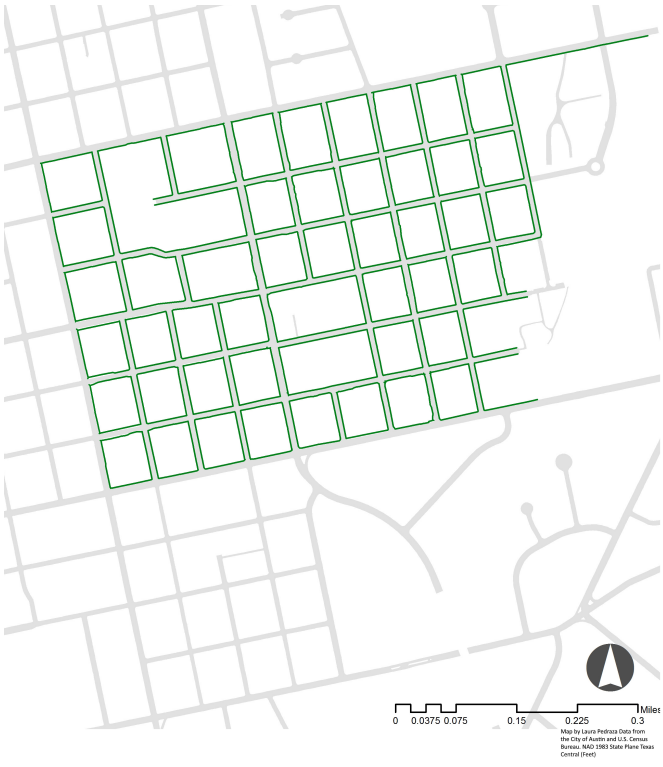


Figure 23: Chestnut neighborhood sidewalks. Source: City of Austin, 2014

To calculate intersection density at the site, I used the measurement implemented by Chung (2009), by collecting data from the City of Austin's sidewalk network where marked crossings and unmarked crossings are identified. The site comprises of a total area of 383.8 acres (= 0.6 square mile), and there were 11 marked crossings and 107 unmarked crossings (118 intersections total); that is, there were 197 intersections per square mile, which is a moderate number of intersections, but an extremely low value if we only consider the marked crossings (18 marked crossings per square mile).

Furthermore, looking at the ratio of marked crossings compared to all of the intersections at the site, the ratio was only 10.7, which is also a very low score. Additionally by using the GIS Network Analysis tool, walkability was measured from/to main neighborhood facilities such as the light rail station, the school, the Sustainable Food Center, and churches. The 10-minute service area was calculated by the Euclidian method. The total sidewalk length of the area is 5 miles. Within the 10 -minute walkable distance service area, single family (52.9% of the usage) and undeveloped land (23.5%) were the two predominant land uses pedestrians would encounter in the site.

Crosswalks

Based on the sidewalk data given from the City of Austin website, we calculated the proportions of each type of pedestrian built environment to see the overall picture of the site's pedestrian environment. When the data were collected in 2006, more than 65% of the streets had no sidewalks. Moreover, there were only 11 marked crossings out of 118

possible pedestrian crossings at the site. In other words, less than 10% of all intersections had pedestrian crossings.

Figure 24: Chestnut neighborhood pedestrian crossing at MLK Jr. Boulevard and Chestnut Avenue. Source: Pedraza, 2015

Figure 25 Chestnut neighborhood pedestrian crossings. Source: Pedraza, 2015

Those marked crossings were clustered in five intersections on the edge of the study boundary and next to arterial streets. The average distance (interval) between adjacent marked crossings was 653 meters in Euclidian distance, which is much farther than the general international guidelines of 100-meter intervals.

Figure 26: Chestnut neighborhood pedestrian crossing at MLK Jr. Boulevard and Chestnut Avenue. Source: Pedraza, 2015

Bus stop density, distance and frequency

It is broadly accepted that fairly dense urban development is an essential feature of a successful public transit system. The ridership is substantial when business and offices are concentrated within 1⁄4 mile of a station and housing within a half mile. Likewise,

high public transit density provides shorter, more walkable distances to alternative modes of transportation and the use of more accessible bus stops encourages walking between leisure, work, and home. Features such as stop spacing, network structure, travel time, reliability standards and frequency may determine how far customers will be willing to walk.

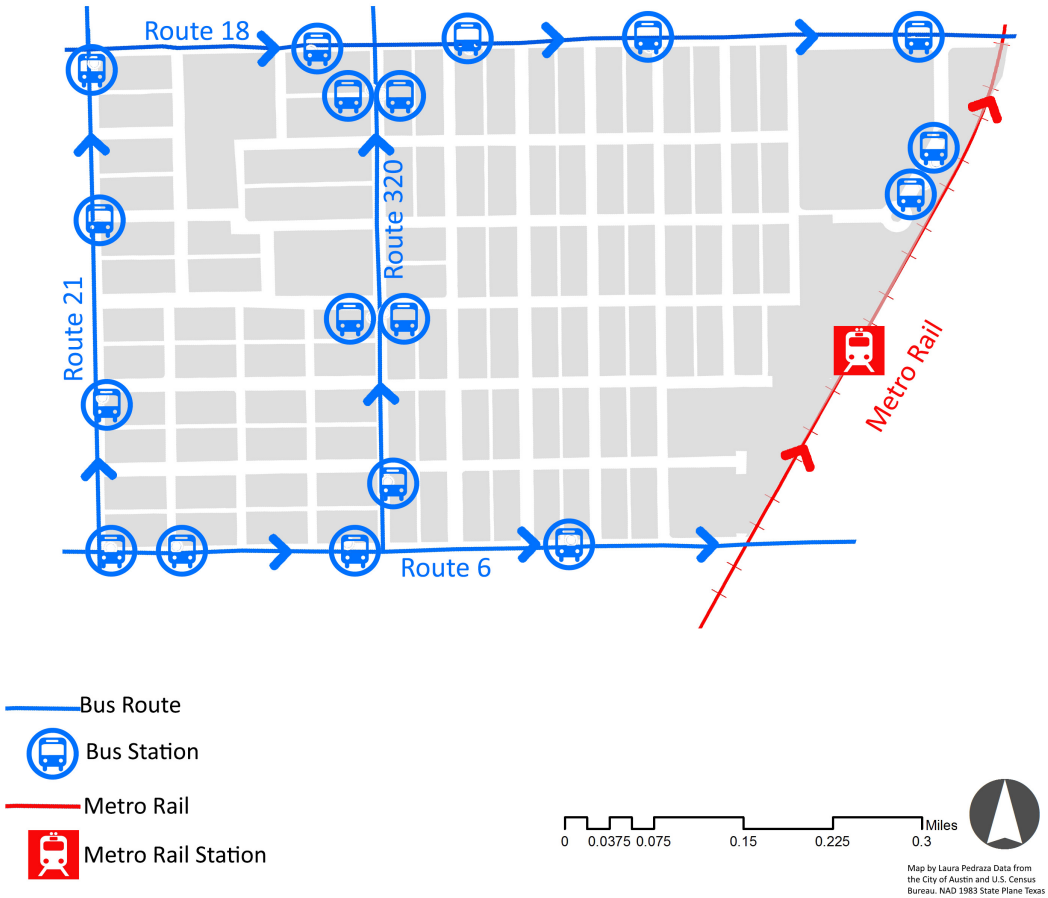


Figure 27: Chestnut neighborhood transit map. Source: City of Austin, 2014

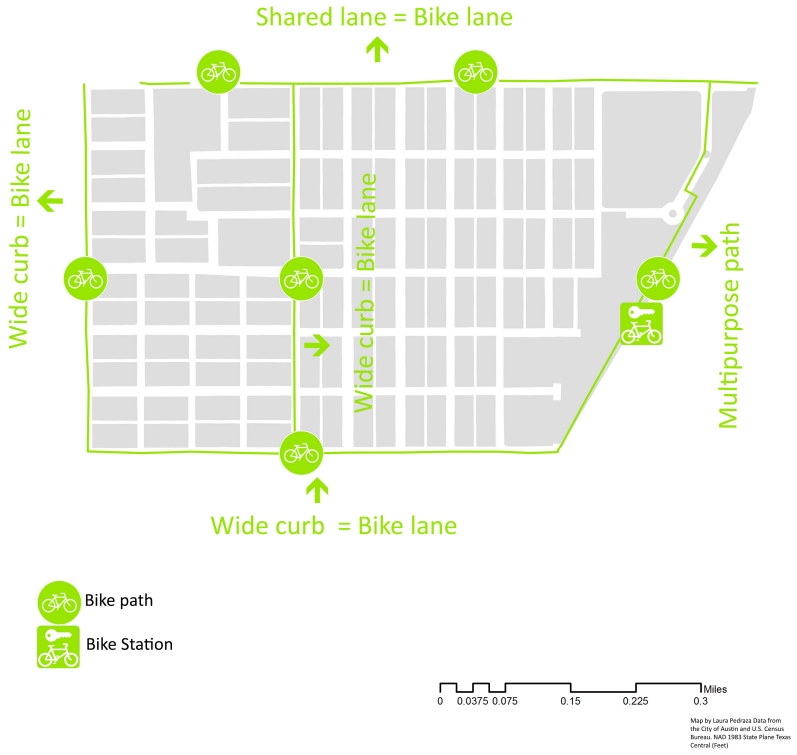


Figure 28: Chestnut neighborhood bike system map. Source: City of Austin, 2014

Figure 29: Bike lane at Chestnut and MLK. Source: City of Austin, 2014

By using GIS, the study sought to determine the effect of distance to public transportation and residential density on the use of SFC East Farmers Market. The most commonly cited standard for walking distance is 400m or 1/4 mi. However, people walk further to faster services. Evaluating distance from the neighborhood nodes to MLK Jr. station the average is 0.5 mile.

Figure 30: Proximity from the SFC East Market to buses and points of interest. Source: City of Austin, 2014

Bus Route	Location	Walking time from SFC East Farmers' Market (Minutes)	Walking distance (Mile)	Frequency bus service Weekday
6	1703 12th/ Leona	20'	1 mile	40'
6, 21, 22, 320	1819 12th/Chicon	18'	0.9 mile	40', 30', 30', 30'
6, 320	2204 12th/Chestnut	14'	0.7 mile	40', 30'
6	2401 12th/Pleasant Valley	12'	0.6 mile	40'
6	2601 12th/Cedar	9'	0.5	40'
6	2733 12th/New York	10'	0.5	40'
21	Chicon /16th	4'	0.7	30'
320	1500 Chestnut/16 th	9'	0.5	30'
320	1810 Chestnut/MLK	11'	0.5	30'
464/465	MLK Station Stop 2	2'	440 ft	30'
18	1703 MLK/Leona	18'	0.9	30'
18, 21	1813 MLK/Chicon	17'	0.8	30'
18	2207 MLK/Ferdinad	13'	0.6	30'
18	2700 MLK/Walnut	7'	0.3	30'

Table 7: Bus stop location, route, walking distance and bus service frequency. Source: Capmetro.org , 2015

Safety

Sidewalks conditions and other barriers:

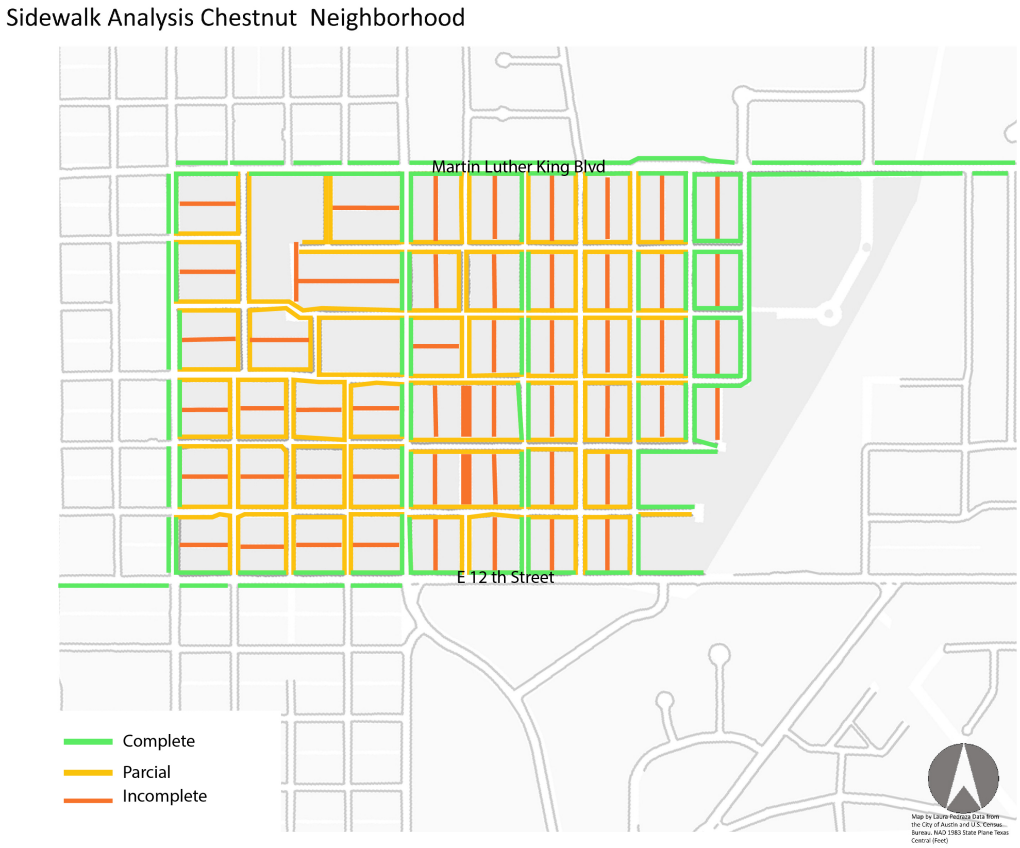


Figure 31: Level of completeness of Chestnut neighborhood sidewalks. Source: Pedraza, 2015.

Sidewalk safety is a key factor of walkability and pedestrian accessibility. Several scholars agree that street conditions have a significant impact on pedestrian safety rather than speed limits. Through the Public Works Department (PWD), the City of Austin annually constructs new or improves sidewalks using CIP bond funding. In the last three years, 147,000 linear feet have been constructed (City of Austin, 2012). Among the

primary objectives of this program is the sidewalk construction of accessible sidewalks to public facilities, eliminate obstructions, manage slopes, and the absence of curb ramps, while maintaining compliance with the requirements of the American with Disabilities Act (ADA).

Figure 32: Handicap accessibility improvements. Source: Pedraza, 2015.

According to Chung's analysis of the MLK Jr. Station and surrounding areas, Manor Rd. and a part of MLK Blvd. were the least safe streets for pedestrians, while the newly developed Miriam Ave. had the safest pedestrian environments. Map xxx introduces areas where obstacles such as incomplete sidewalks, pedestrian barriers such as unpaved

surface, lack of signals and other obstacles may become impediments for increasing walkability throughout the neighborhood and its destinations.

Figure 33: Neighborhood map and study areas. Source: Pedraza, 2015.

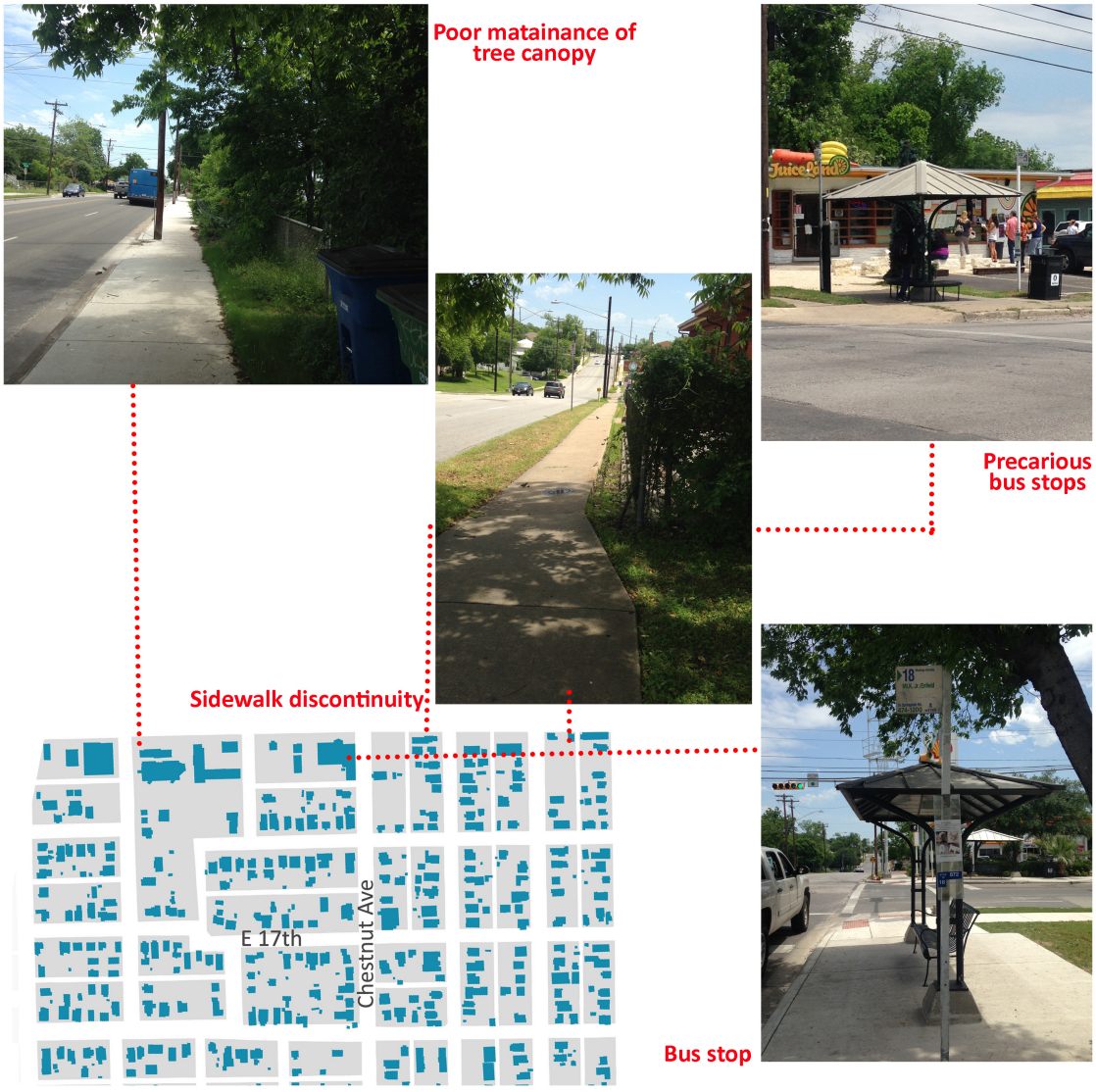


Figure 34: Section A neighborhood characteristics. Source: Pedraza, 2015

Figure 35: Section B neighborhood characteristics. Source: Pedraza, 2015

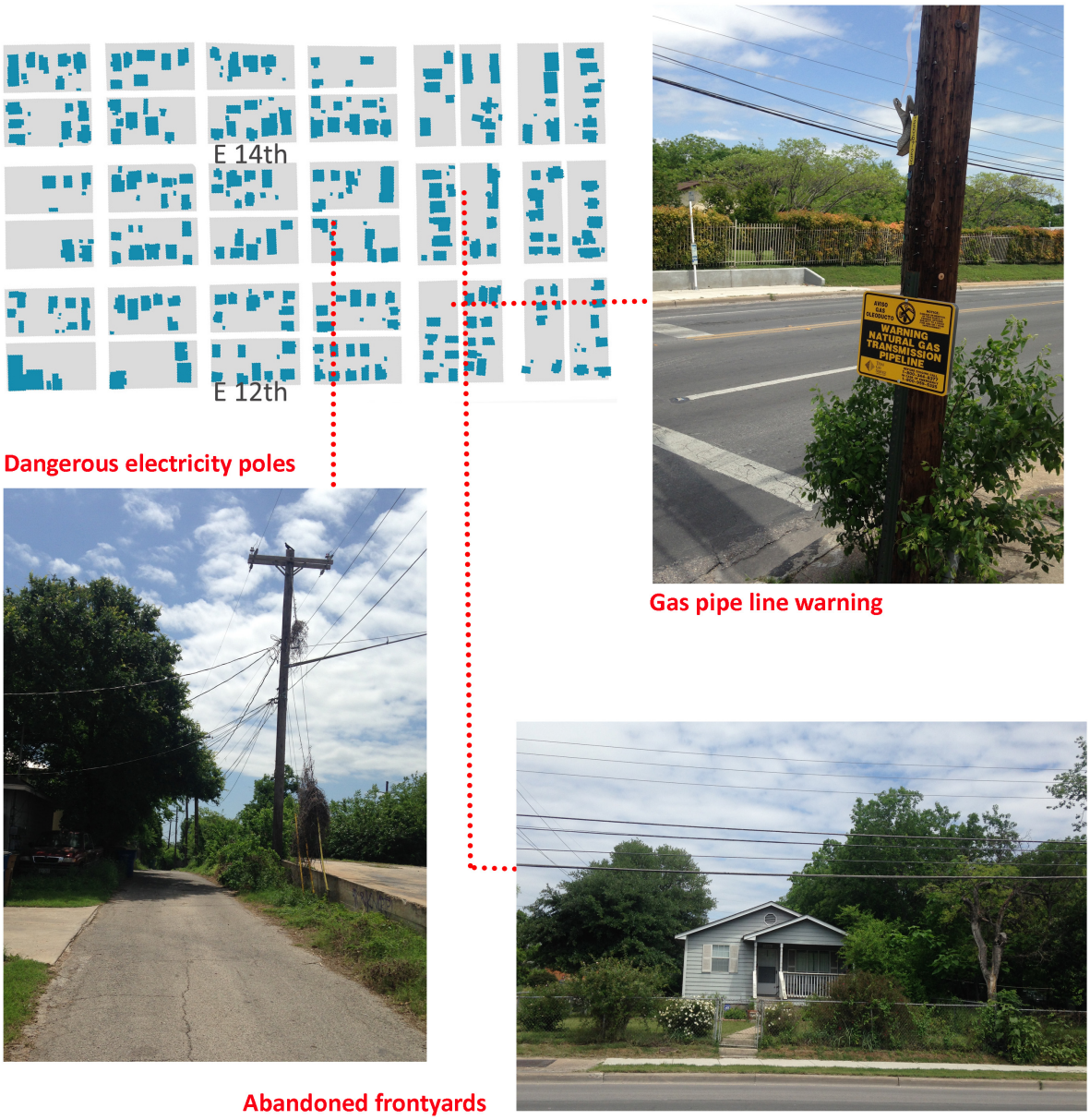


Figure 36: Section C neighborhood characteristics. Source: Pedraza, 2015.

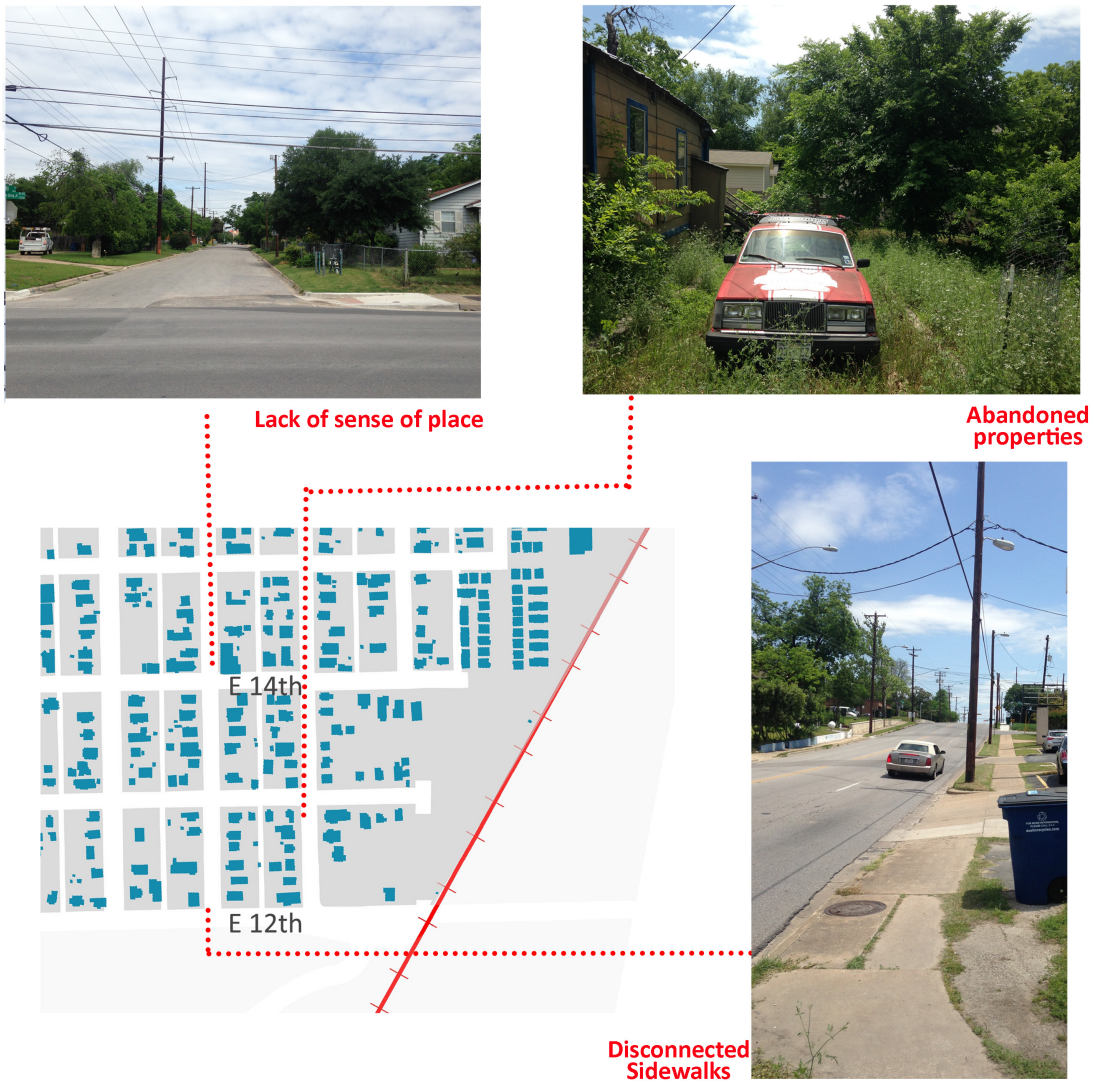
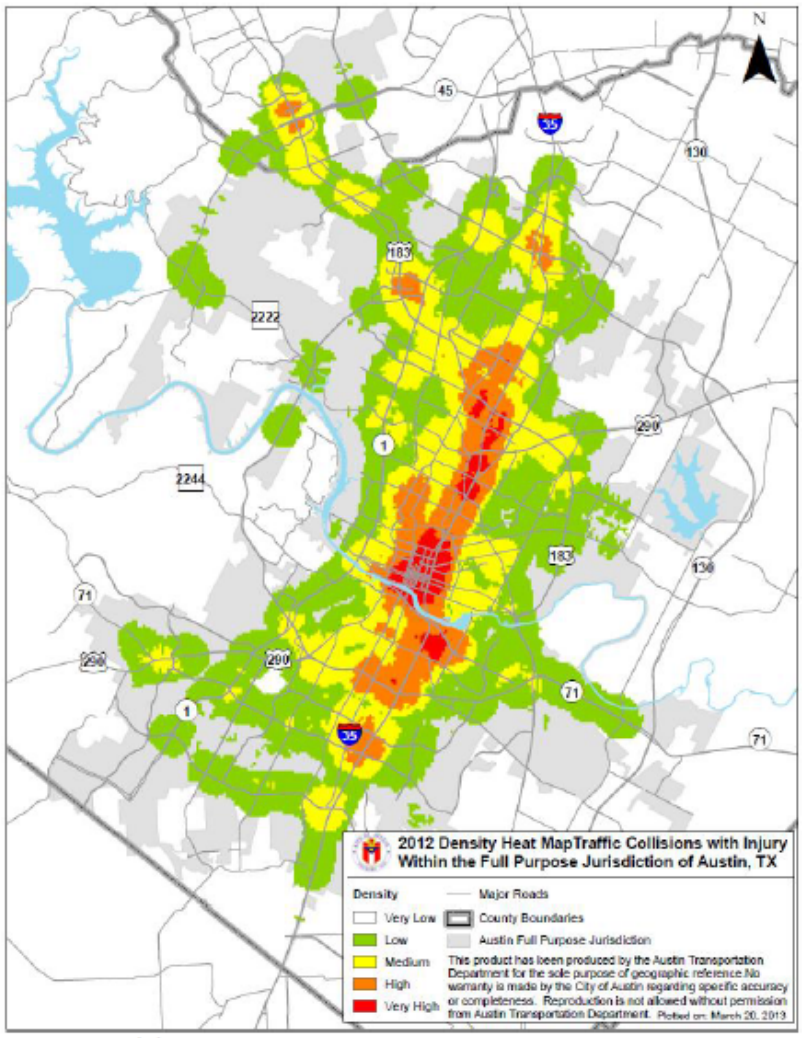


Figure 37: Section D neighborhood characteristics. Source: Pedraza, 2015.

Figure 38: Tree canopy in Chestnut neighborhood. Source: City of Austin, 2010.

Accidents and fatalities:



Source: APD crash data

The density of injury and fatal crashes was highest:

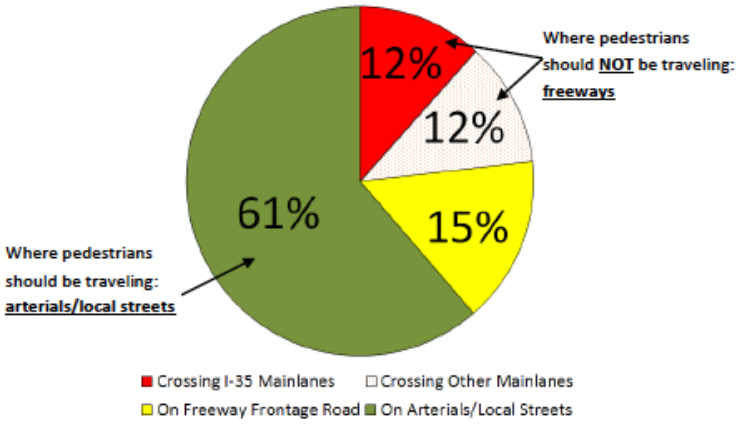
- *Along I-35*
- *Within downtown*
- *Along US 183*

Figure 39: Density of injury and fatal crashes in Austin, TX. Source: City of Austin, 2013

Public safety is one of the primary responsibilities of local government. However, Austin experienced 78 traffic fatalities in 2012--a 42% increase from 2011 (City f Austin, 2013). Additionally 50% of the traffic fatalities where the pedestrian was impaired, 23involved a

pedestrian attempting to cross a street. To help reduce this number, cities can install Accessible Pedestrian Signals (APS), which are integrated devices that communicate information about the WALK and DON'T WALK intervals at signalized intersections in non-visual formats such as audible sounds and vibro-tactile surfaces for pedestrians who are blind or have impaired vision. The City of Austin has installed 42 APSs in order to reduce the rate of accidents and fatalities.

The illustration shows the crash densities of injuries and fatal crashes. Red and orange areas identify higher crash density locations, which are located along the I-35 corridor, the downtown area, and along the US-183 corridor indicating that the Chestnut neighborhood is closer to the more dense injury and fatal crashes sites in Austin. This is because of the high-speed rates of I-35 and main arterial roads that surround the neighborhood. By 2008, the intersection at the I-35 Service Road and MLK Boulevard was among the top 10 crash locations in Austin, ranking 4th on the chart with 19 accidents (City of Austin, 2013)



Source: APD crash data
Note: "Other mainlanes" refers to MoPac, US 290 and SH 71

Figure 40: Pedestrian fatalities by road type Source: City of Austin, 2013

The graph shows a higher proportion of pedestrian crashes and fatalities along arterials/local streets since this is where pedestrians typically travel given the adjacent land use, the multimodal nature of these roadways such as sidewalks, crosswalks, and transit stops.

Crime

The theory of improving the appearance of the urban environment in an effort to improve public safety and reduce crime is known as the "broken window theory".

Several scholars agree that high-density crime discourages walking in neighborhoods therefore a sense of lack of pedestrian safety encourages more protected automobile use.

The “broken window theory” was a term coined by the social scientists James Q. Wilson and George L. Kelling in 1982. The theory states that maintaining and monitoring urban environments to prevent small crimes such as vandalism, public drinking and toll-jumping helps to create an atmosphere of order and lawfulness, thereby preventing more serious crimes from happening.

A report by the Austin American Statesman in 2012 called attention to the demand for public safety in the Chestnut neighborhood, specifically at the corner of 12th and Chicon streets. For more than 40 years, local authorities have been aware of the presence of

empty businesses, blighted houses and dilapidated vacant lots as a factor that increases crime, drug distribution, theft, and occasional violence.

SFC East Market survey results:

In July, 2013 the SFC conducted an East Market costumers' survey that included 101 participants, 73 of them were in English speakers and (73%) and 28 were in Spanish speakers (28%). The gender distribution among the shoppers was 81 % females and 16 % males (SFC, 2013).

Age distribution :(SFC, 2013)

Results indicate shoppers between 22 and 44 combined sum up 66% of all market costumers. The list correspond to age distribution data:

Age	**%**
25-34 year-olds	44 %
35-44 year-olds	22%
18-24 year-olds	18%
45-54 year-olds	7%
55-64 year-olds	6%
65+ years olds	0%

Table 8: Age distribution .Source: SFC, 2013

Ethnicity: (SFC, 2013)

According to previous surveys East and Sunset Valley markets have a preponderance of Hispanic/Latino costumers (SFC, 2013)

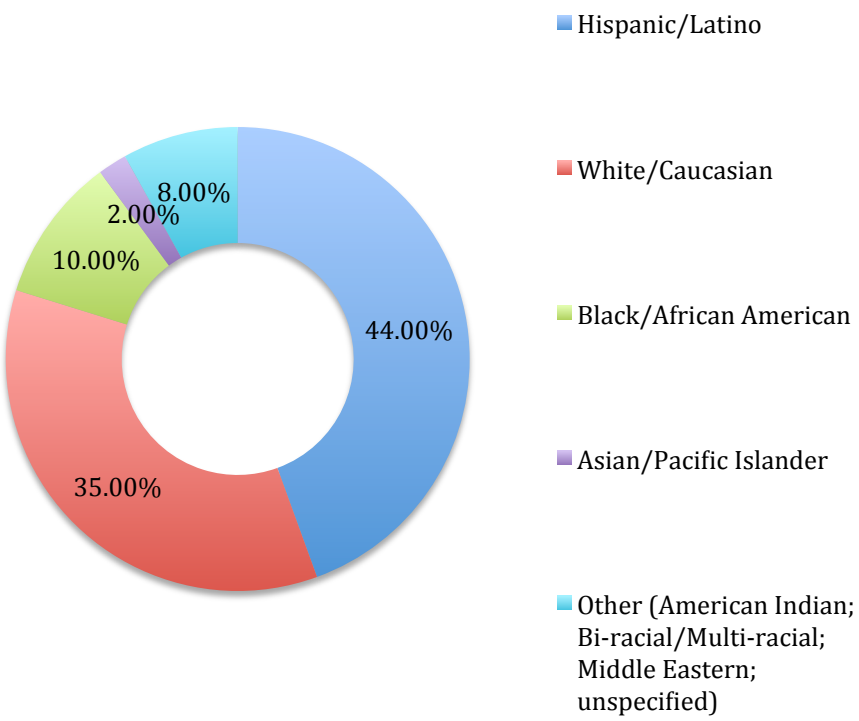


Figure 41: Ethnic distribution. Source: SFC, 2013

Regarding household information for East Market, results reveal 61 % of market participants' conformed households with 2 adults and 70 % of these have more than one children.

Number of adults per household	**%**	**Number of children per household**	**%**
One adult	21	No children	30
Two adult	61	One child	14
Three adults	8%	Two children	29%
Four adults	9%	Three children	15%
		Four children	6%
		Five or more children	

Table 9: Adult and children distribution per household. Source: SFC, 2013

Surveyors provide their zip codes in order to track from where areas Market's costumers came from. SFC Farmers. Market East is located within the 78702 code as the second zip code ranked in the following chart[1]:

[1] Also represented (1 or 2 each): 78207, 78617, 78628, 78640, 78653, 78705, 78725, 78728, 78745, 78747, 78751, 78757.

Zip code	**%**
78741	11%
78702, 78753	10%
78721, 78724	7%
787660, 78704, 78723, 78752, 78758	5%
78722, 78754	4%
78641	3%

Table 10: Zip code distribution among East Market's costumers. Source: SFC, 2013.

The 10% of market's costumers are comprised within the zip code 78702, however the higher percentage is 11% corresponding to the zip code 78741. Remaining number totalized 79% of the costumers whom live in area surrounding the market as it is illustrated on the map. As a consequence residents of these areas require to drive a car or take a bus in order to reach the market since distance from the market to any of these area are larger than half a mile.

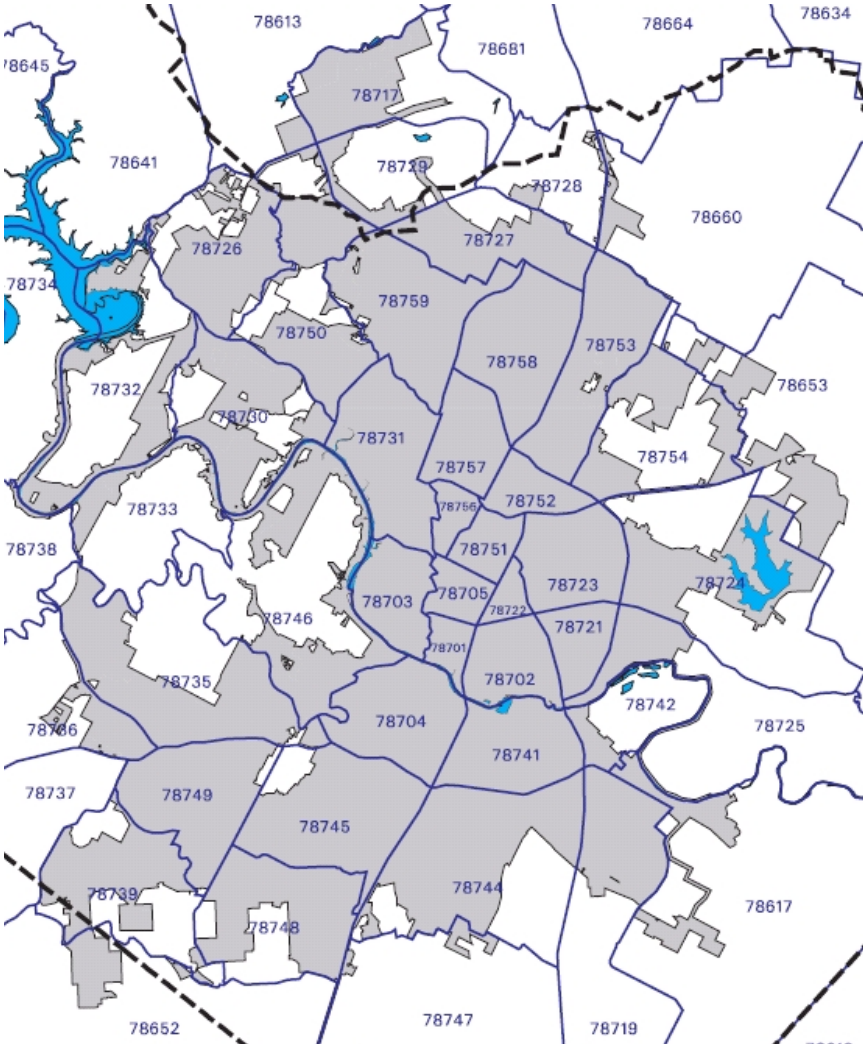


Figure 41: Austin zip code areas map. Source: www.teamprice.com

Regarding the Double Dollar Incentive Program performance of customers surveyed, 58% receive Double Dollars, 34% do not, and 8% did not know about the program but will start using it. While the 92 customers receiving one or more federal benefits, 40% use SNAP, 12% use FMNP vouchers, and 48% use WIC EBT cards with a fruit and vegetable amount. See appendix (SFC, 2013)

Market's impact was measured by evaluating outcomes from market's presence in the area and costumers' shopping behavior, 31% surveyors reported neither easy nor difficult, while 21% found difficult accessing to quality fruits and vegetables in their neighborhoods.

Overall when participants ranked the factors that influence their decision to shop at the East Market 94% of them agree with the quality of fresh fruits and vegetables, followed by the variety of food options. Most of the shoppers, 60 % were experiencing their first visit to the market while 27% were regular market's shoppers visiting at least one or two times per month. Likewise 99% of shoppers agree that East Market has facilitated them buying fruits and vegetables.

Chapter 8: Recommendations and Conclusion

As this document demonstrates, Chestnut neighborhood's walkability is not just only a issue closely related to the physical features of the neighborhood but it is also related to social issues having an impact on residents' needs and activities. This could be due to the neighborhood's characteristics or to residents' socio-economic backgrounds that result in a precarious, sometimes threatening, environment preventing neighborhood residents' decision of "to walk or not to walk". In the case of the SFC Farmers' East Market, walkability assessment and its impact on clientele usage required an approach from a quantitative, qualitative, and spatial perspective to obtain accurately results.

With the lack of transportation and few grocery stores, families concentrated in low-income areas of Austin, such as the Chestnut neighborhood, determine food-shopping choices and food landscape that often explain the high concentrations of convenience stores and fast food restaurants, exacerbating the problem of diet-related health issues in these communities. This suggests the food landscape in this Austin's community as many others resulted from a lack of comprehensive planning decisions.

The results in this report have outlined the strengths and weaknesses of Chestnut's walkable environment but also clearly identified some quick suggestions for future improvements. Future planning decisions in the Chestnut neighborhood should aim for tackling essential community issues based on existing advantageous social, economic, and physical neighborhood settings. In that respect, revitalizing the historic, pedestrian-friendly character of the neighborhood by improving the environmental quality of the neighborhood; promoting the rehabilitation of existing housing and new infill housing; encouraging the business climate of the neighborhood; addressing criminal activity and promoting public safety; and developing a stronger health network for residents will be essential factors to safeguard the community's needs.

For the Chestnut neighborhood, the weakest issue is related to mixed land use. Additionally, woods, a fence, sight barriers, dangerous dogs and parking lot landscaping provide obstacles that create physical barriers to the most efficient routes for pedestrian travel.

The inadequate food system on Austin's eastside as well as food shopping habits can be remedied by implementing creative and collaborative solutions to overcome obstacles in acquiring nutritious food that go beyond increasing families' budgets. This document confirmed that current street conditions and environmental features from the surrounding areas may impact accessibility to the SFC East Market and residents' options in adopting a healthy life style.

The results of this research verify that having an advantageous location; adequate block size and a greater number of facilities and features in the Chestnut neighborhood does not necessarily mean greater walking accessibility for those within the neighborhood to meet access to nutritious food at the SFC East Market.

A multiplicity of applied and simple solutions exist when encountering the Chestnut neighborhood food environment. Throughout community and regional planning that examines food quality and availability systematically, planners can play a significant role in shaping the food environment in low-income communities, like the Chestnut neighborhood, and thus facilitate healthy eating. However, these solutions will require the support of local government, businesses, community groups and the Chestnut neighborhood association in order to make food buying easier and cheaper in this community.

The Austin Comprehensive Plan can provide a roadmap that provides access to healthy and affordable food. Zoning can be a tool to facilitate public health, especially by regulating the presence of particular types of food destinations in low-income communities such as the Chestnut neighborhood.

A successful farmers' market requires choosing a strategic site such as areas with high foot traffic and close to transit stops and by responding to costumers' socioeconomic characteristics and shopping preferences and making them more accessible to vulnerable populations through the use of WIC vouchers and additional food stamps. A farmers' market is not only a place to buy and support local agriculture, but has become a significant community destination to meet friends, interact, and spend time.

In addition, municipal governments also need to change specific sites' zoning regulations to better accommodate farmers' markets. Likewise, local authorities should create institutional and physical infrastructures to create a year-round permanent famers' market. The provision of electricity, a parking lot area, coolers for produce and assistance in signage are needed features to ensure adequate accessibility to costumers.

Planning policies and practices should promote actions to increase public investment in transportation infrastructure. All neighborhoods should have an adequate transportation infrastructure, allowing residents to access basic needs and opportunities that improve health outcomes. Particularly for the SFC East Farmers' Market, initiatives

should move towards achieving several accessibility options. Transportation policies can alleviate obstacles to shopping by improving transportation between existing food retailers, especially the SFC East Farmers' Market.

By evaluating bus routes in terms of their relation to food outlets; subsidizing the cost of return trips from the store to home; establishing partnerships between food stores and public transportation services to facilitate commuting to shoppers; and regulating shuttle service from community centers and facilities like schools, libraries, senior centers and neighborhood food outlets could make shopping easier for community residents.

Additionally, improvements to the Chestnut neighborhood's characteristics will have an impact on influencing people's lifestyles and food shopping behaviors. Promoting improvements to the built environment is also important, such as installing sidewalks and street lighting that increases access to physical activity and enhances safety. Moreover, increasing access to healthy foods by supporting local farmers and developing neighborhood grocery stores is also necessary.

A pedestrian and bike friendly environment will help to create a safe setting for all users of the road system. Using signs and facilities with adequate signage warns drivers of the presence of pedestrians and bicyclists and helps keep these groups of people safe in the built environment. Curbing ramps will provide an accessible route that people with

disabilities can use to safely transition from a roadway to a curbed sidewalk and vice versa.

The presence and condition of sidewalks has been one element of the built environment that impacts the likelihood of physical activity.Marking crosswalks benefit pedestrians by indicating the appropriate place to cross the street (based on existing traffic control such as light signals) and by alerting motorists to the presence of pedestrians.

The canopy tree has a significant impact on how pedestrians and bicyclists experience the built environment. Trees contribute to a safer and more comfortable pedestrian and bicycling environment by creating shade, a buffer between pedestrian spaces and moving vehicles, and by visually limiting street space, thereby reducing traffic.

Studies show that graffiti and litter are likely to discourage physical activity by increasing one's perceived sense of danger on the street and of public places. In that regard, low-cost improvements will be important to lay the groundwork for larger projects that may be more costly and take years to implement. Neighborhood clean-up is a positive way to engage residents, community organizations and businesses in a process that aims to create an environment more conducive to physical activity, by cleaning alleyways and sidewalks of glass, hazardous materials, and trash which are indicators of social disorganization within the community that may discourage appropriate walkable environments to support a community food system based on providing affordability and accessibility to neighborhood residents.

Food deserts are a definite issue that neighborhood planners need to include and address in their community development strategies. City and county governments already understand their role in encouraging private initiatives in low-income neighborhoods that systematically include and engage neighborhoods' residents in the construction of an affordable, strong, and vibrant local food system.

A neighborhood in which farmers sell their produce directly to consumers through farmers markets, small retailers start a cooperative to expand their inventory, supermarkets start community shuttles, transport planners adjust bus routes, residents grow food in thriving gardens and community groups conduct cooking classes will still be low-income, but it will be stronger. And its residents will have a more secure source of good, healthy food.

Appendix

Tuesday SFC Farmers' Market East

Consumer Research Summary

August 2, 2013

MARKET RESEARCH:

Consumer survey of 101 market-goers on July 2, 2013 conducted at the East market on MLK Blvd and Miriam Ave. Of the surveys, 73 were in English (73%) and 28 were in Spanish (28%).

DEMOGRAPHICS:

Gender distribution: 81% females and 16% males; considerably more females are shopping at the farmers' market.

Age distribution:

- 44% 25-34 year-olds
- 22% 35-44 year-olds
- 18% 18-24 year-olds
- 7% 45-54 year-olds
- 6% 55-64

- 0% 65+
    - Shoppers between the ages of 25 and 44 combined to make up 66% of all shoppers.

Ethnicity:

- 44% Hispanic/Latino
- 35% White/Caucasian
- 10% Black/African American
- 2% Asian/Pacific Islander
- 8% Other (American Indian; Bi-racial/Multi-racial; Middle Eastern; unspecified)

This market (as well as Sunset Valley) has a majority of customers reporting as Hispanic/Latino.

Number of Adults Per Household:

- 21% one adult
- 61% two adults
- 8% three adults

- 9% four or more adults

Number of Children Per Household:

- 30% no children
- 14% one child
- 29% two children
- 15% three children
- 6% four children
- 6% five or more children

Zip codes:

- 11% 78741
- 10% 78702, 78753
- 7% (ea) 78721, 78724
- 5% (ea) 787660, 78704, 78723, 78752, 78758
- 4% (ea) 78722, 78754
- 3% 78641

Also represented (1 or 2 each): 78207, 78617, 78628, 78640, 78653, 78705, 78725, 78728, 78745, 78747, 78751, 78757

Double Dollars:

Of customers surveyed, 58% receive Double Dollars, 34% do not, and 8% did not know about the program but will start using it.

Of the 92 customers receiving one or more federal benefits, 40% use SNAP, 12% use FMNP vouchers, and 48% use WIC EBT cards with a fruit and vegetable amount.

Importance of the Double Dollar Incentive Program:

- Very important (would not come without it) 67%
- Not important 23%
- Moderately important 5%
- Slightly important 5%

Expenditures:

On an average day, shoppers will use the following methods of payment:

- 54% Cash, credit, or debit
- 49% SNAP, WIC EBT cash value cards, or FMNP vouchers
- 28% Double Dollar Incentive Program

On an average day, the average shopper will spend approximately the following using the associated methods of payment:

- $17.56 SNAP, WIC EBT cash value cards, or FMNP vouchers

- $16.78 Cash, credit, or debit
- $7.94 Double Dollar Incentive Program

Of those who selected particular payment methods, the following is the amount spent per payment method:

SNAP, WIC EBT cash value cards, or FMNP vouchers:

- $1-9: 8%
- $10-19: 18%
- $20-29: 41%
- $30-39: 13%
- $40+: 21%

Double Dollars:

- $1-9: 0%
- $10-19: 24%
- $20-29: 48%
- $30-39: 5%
- $40-41: 24%

Cash, credit, or debit:

- $1-9: 9%

- $10-19: 40%
- $20-29: 23%
- $30-39: 9%
- $40-49: 16%

9% of customers will spend money elsewhere in the community before or after the market, and their estimated combined purchases will total $110 (significantly less than previous market location).

Market Impact

Ease of buying quality fruits and vegetables in customers' neighborhoods:

- Very easy 26%
- Easy 19%
- Neither easy nor difficult 31%
- Difficult 21%
- Very Difficult 4%

Customers surveyed ranked the following factors as **very important** in their decision to shop at this market:

- Quality of fresh fruits and vegetables (94%)

- Selection of fruits and vegetables (92%)
- Supporting farmers/local businesses (90%)
- Taking part in the community (79%)
- Accepts food stamps, WIC EBT cards, or FMNP (68%)
- Other activities/events at the market (55%)

Frequency:

- 60% first timers (10% increase)
- 27% one or two times per month
- 9% three or more times per month
- 3% less than once a month

Impact of shopping at this market on those shoppers who responded:

- 99% **agree** or **strongly agree** that it is easier for them to buy fruits and vegetables
- 75% buy half or more of their weekly produce at this market.
- 53% have greatly increased the amount of fruits and vegetables eaten (39% have increased somewhat)
- 52% have greatly increased the variety of fruits and vegetables consumed (36% have increased somewhat)

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