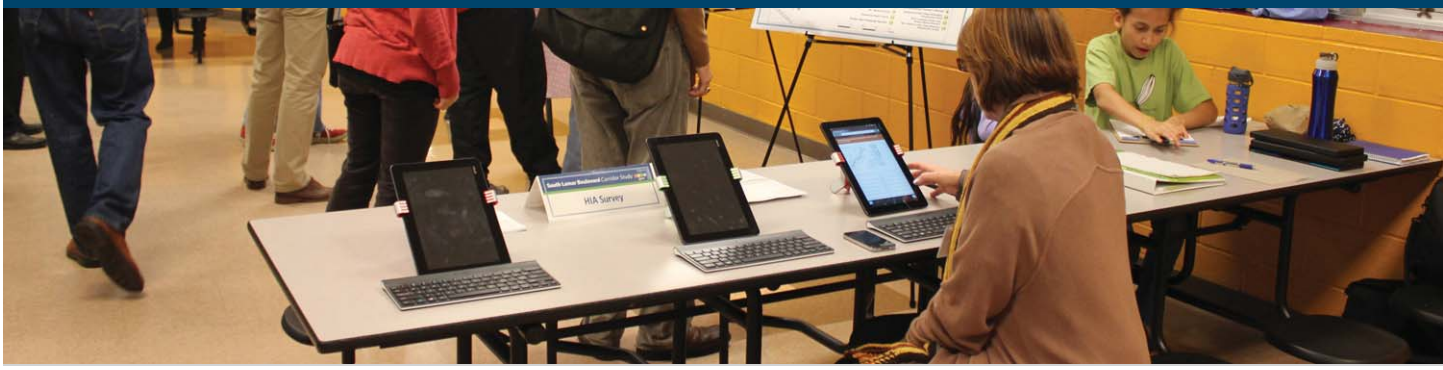
# APPENDIX E
# HEALTH ASSESSMENT IMPACT STUDY



# The South Lamar Corridor Study

# Health Impact Assessment

## Final Report

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# TABLE OF CONTENTS

# TABLE OF TABLES

# TABLE OF FIGURES

# EXECUTIVE SUMMARY

The City of Austin is working to identify short-, mid- and long-term transportation improvements to enhance multimodal mobility, safety, and quality of life along the South Lamar corridor. The project included a Health Impact Assessment (HIA) to help the project team consider public health during the planning process; provide information on the potential health impacts of proposed plan(s); and develop approaches to evaluate future health outcomes related to the corridor improvements.

The transportation environment influences the health of the public by affecting human behaviors, such as physical activity, and environmental exposures, such as traffic hazards. In regards to health, the South Lamar corridor has a number of existing assets and barriers. Assets include access to (i) public transportation (including a new Bus Rapid Transit line), (ii) increasing density of people and destinations, and (iii) existing sidewalks and bike lanes along most of the corridor, (iv) a public interested in walking and bicycling within the corridor area, pending infrastructure improvements. Barriers to health include (i) lack of safe crossing opportunities, (ii) high road speeds, (iii) lack of connectivity from within neighborhoods (particularly to the east), (iv) inadequate pedestrian and bicyclist infrastructure, (v) lack of greenspace and shade, and (vi) lack of bicycle parking.

The South Lamar Corridor Study team has developed a set of policy and infrastructure recommendations that can have a substantial positive impact on public health. The proposed improvements would make walking and bicycling a safe, convenient, and pleasant choice for those who live, work, shop, and recreate along the corridor. Resulting increases in physical activity and social interactions in the short-term can have long term public health benefits such as reductions in rates of diabetes and heart disease. Implementing recommendations related to urban trees and landscaping may have additional health-related benefits such as a reduction in heat-related illnesses. Key components of the study recommendations from a public health perspective include, (i) increased street crossing opportunities and enhanced safety at existing street crossings, (ii) reduced speed limits for motor

vehicles, (iii) the addition of continuous protected bicycle lanes and wide sidewalks along the length of the corridor, and (iv) use of trees and rain gardens as road traffic buffers in select areas of the corridor.

Additional recommendations identified through the HIA process include: (i) increase available bicycle parking, (ii) construct a pedestrian/bicyclist crossing of the railroad tracks at Treadwell, (iii) create pocket parks along South Lamar, (v) take steps to preserve and care for existing heritage trees, (vi) conduct a robust walk audit of the corridor and the ½ mile South Lamar walkshed in order to quantify current conditions, identify gaps that limit connectivity, and prioritize improvements on neighborhood streets to increase access to South Lamar, (v) establish a robust system to collect bicyclist and pedestrian travel data.

Achieving the full vision of the proposals is a long-term prospect. Improvements will require substantial public and private investments, the latter dependent on the time table of redevelopment. Given the long-term nature of full implementation, a set of improvements to be implemented in the next 3-12 months should be established.

To begin, prompt implementation of policy changes related to new development is essential to preserve the opportunity for full implementation of the plan in the long-term. The short-term list of improvements should also include: installation of the Collier Street/Evergreen Avenue traffic signal; reduction in the speed limit; and closure of existing gaps in sidewalks and bicycle lanes. Given the trajectory of growth in population and destinations in the area, short-term actions are essential to achieve the vision for South Lamar as a healthy, active, multimodal corridor as detailed in the Imagine Austin Comprehensive Plan.

# 1. INTRODUCTION

## 1.1. What is an HIA?

A growing awareness and understanding of the effects of the built environment on physical, social, and mental health of communities has prompted efforts to explicitly consider health in the process of planning environmental changes. A Health Impact Assessment (HIA) is a process designed to assess potential health impacts of policies, projects or programs that affect the public. This process identifies opportunities to maximize positive health effects and minimize potential negative outcomes.

## 1.2. HIA components

An HIA is a systematic process using an array of data sources and analytic approaches. The following set of steps provide a general framework for HIA implementation:

1. **Screening** to determine whether an HIA is warranted and feasible.
2. **Scoping** to identify key public health issues, population(s) affected, and methods that will be used for the assessment and recommendations.
3. **Assessment** of existing conditions related to key health issues/factors, estimates of potential health-related outcomes of proposed improvements, and strategies to evaluate outcomes.
4. **Recommendations** that provide practical, specific strategies and priorities to maximize positive health impacts.
5. **Reporting** of findings and recommendations to decision-makers, the public, and other stakeholders in a form that can be integrated with other decision-making factors.

## 1.3. Overview of the South Lamar Corridor Study HIA process

While HIAs are often conducted in response to a completed proposal or set of proposals, this HIA was conducted primarily during the plan development, in order to ensure that health would be considered throughout the process. Therefore, analysis and recommendations were conducted in two phases. The first phase, conducted prior to the completion of corridor study recommendations, provided the corridor study team with information to consider during plan development. The second phase provided a qualitative assessment of the set of proposed recommendations in terms of potential health effects, and offered additional recommendations to maximize health benefits as well as approaches to monitoring and evaluation of health-related outcomes.

**South Lamar Boulevard Corridor Development Study Objectives:**

The project will require the establishment of a vision, plan, and implementation strategy for the corridor that results in the development of a multimodal transportation system supportive of mixed-use, pedestrian, and bicycle friendly development patterns. The results may include, but are not limited to, the following:

a) A comprehensive public involvement process
b) Land use and urban design recommendations to improve the function and appearance of the built environment and stimulate revitalization
c) Transportation analysis and recommendations for creating a safe, multimodal, transit-supportive corridor, and identification of improvements for better circulation or connectivity
d) A health impact assessment (HIA) of any proposed recommendations.
e) Identification of infrastructure improvements that may be required to implement the plan.

*Source: City of Austin Solicitation number VLMP144 Scope of Services*

# 2. SCREENING

## 2.1. Background

In 2014, the City of Austin (COA) Transportation Department requested a Health Impact Assessment (HIA) to be included as part of a preliminary engineering study for future sidewalk, bicycle, pedestrian, transit and vehicle transportation infrastructure facilities along South Lamar Boulevard.[1] (See sidebar for details of the overall study objectives.) The study began in September 2014 with an estimated timeline of 8-12 months.

[1] This project was funded through the City of Austin's 2012 Bond Election Proposition 12, which provided funding for designing, constructing and improving streets, sidewalks, bridges and bikeways.

## 2.2. Purpose of HIA

1. To help the corridor study team consider public health impacts during the planning process;
2. To provide the public and decision-makers with: a) information on the potential health impacts of the proposed plan(s); b) prioritization of improvements in terms of health outcomes; and c) approaches to evaluate future health outcomes related to the corridor improvements.

## 2.3. HIA justification[2]

### 2.3.1. Potential health impacts of corridor study project.

The corridor study will guide infrastructure improvements along the South Lamar corridor, impacting not only how people access destinations but also how they interact with others in the physical space. These and other factors influenced by the built environment have significant potential impacts on public health. The area is in transition, with an increasing density of both people and destinations, which can contribute to increased active transportation, social interaction, and access to community resources. However, other relevant aspects of the built environment are not yet in place. A large and increasing number of people live and work along the South Lamar corridor. Institutional services to vulnerable populations are present in the vicinity of the corridor, including housing sites for low-income people and for disabled adults, an elementary school, and a senior activity center.

### 2.3.2. Potential Impact of HIA process and findings.

The HIA will serve not only to ensure health considerations are integrated into the plan development, it will help inform decisions regarding implementation and evaluation of proposed improvements to the corridor. As the first HIA solicited by

[2] Guided by the HIA screening worksheet created by Human Impact Partners: http://www.humanimpact.org/new-to-hia/tools-a-resources/

the COA, it can serve as a model for considering health in other projects impacting Austin's built environment.

# 3. SCOPING

The objectives of the scoping phase were to:

1. Identify and describe the study area and population
2. Identify potential health impacts of corridor improvements
3. Establish research questions and methods for the HIA
4. Source existing data, identify gaps, and collect additional data

## 3.1. Study area and population

### 3.1.1. Study area

South Lamar Boulevard extends 3.3 miles south from Lady Bird Lake/Riverside Drive to Ben White Boulevard/Highway 71. It consists of four vehicle travel lanes and a center turn lane for most of its length. The study area designated for the HIA consists of the U.S. Census Block Groups located within a one-half mile Euclidian (straight-line, or "as the crow flies") buffer of the corridor, and within the Riverside/Ben White boundaries (Figure 1).

*Study Area: Imagine Austin Comprehensive Plan*

The Imagine Austin Comprehensive Plan, adopted by the Austin City Council in 2012, lays out a vision for a compact and connected city.[3] The plan references activity corridors and activity centers, where an increased density of "people, jobs, businesses and services will be located" (p. A-15). The plan designates South Lamar as an activity corridor and the South Lamar/Ben White area as an activity center (p. A30-A31). Imagine Austin land use and transportation policies outlined

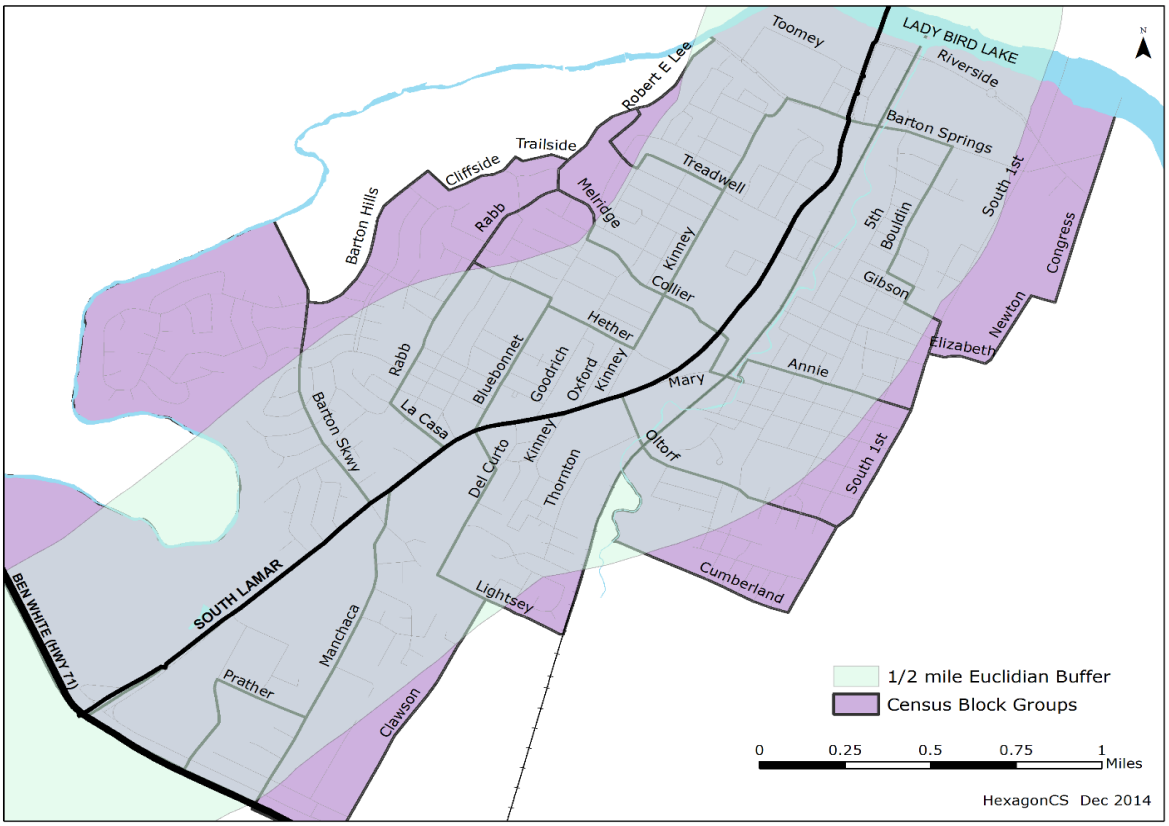
[3] The Imagine Austin Comprehensive plan can be downloaded here: http://www.austintexas.gov/department/imagine-austin-download-center

in Chapter 4 state that development along activity corridors must be "designed to encourage walking and biking" (p.118, LUT P3) via complete street design that considers "the safety needs of people of all ages and abilities" (p.119, LUT P11).

*Study Area: Recent and Pending Development*

Austin is undergoing rapid population growth and in-fill development. The goal of increased density along the South Lamar corridor, as outlined in the Imagine Austin plan, is well underway. According to the City of Austin, over 63,000 square feet of new commercial space and 2,500 new multifamily units are planned or have been recently constructed on or near South Lamar, which will result in a 25% increase in households in the study area, as compared to 2010 US Census data. Many more parcels along the corridor are ripe for redevelopment, and the increase in density of people and destinations is expected to continue.

**Figure 1.** South Lamar HIA study area



### 3.1.2. General population

An essential task of the HIA process is to understand the identified pathways to health in the context of the populations who will be most affected by any changes. The study area is home to more than 18,000 people in nearly 10,000 households. According to the U.S. Census, 15% of the population is under the age of 18, and 7% is 65 years or older. Approximately 6% of the households receive Supplemental Nutrition Assistance Program benefits (SNAP, or food stamps) and 13% of households have at least one person with a disability. Descriptive characteristics of the study population and the overall population in the City of Austin are given in Table 1.

**Table 1**. Population description: study area and City of Austin

| Variables | Study area | | | Austin, Texas | |
|---|---|---|---|---|---|
| | n | % | | n | % |
| Total population | 18,461 | | | 790,390 | |
| Total households | 9,927 | | | 324,892 | |
| White (non-Hispanic) | 13,004 | 70% | | 385,271 | 49% |
| Black/African American | 461 | 2% | | 60,760 | 8% |
| Hispanic/Latino | 4,293 | 23% | | 277,707 | 35% |
| Asian | 353 | 2% | | 49,159 | 6% |
| Other race/ethnicity | 350 | 2% | | 17493 | 2% |
| Ages in groups | | | | | |
| Under 5 | 929 | 5% | | 57,982 | 7% |
| 5-17 | 1,835 | 10% | | 117,483 | 15% |
| 18-39 | 8,591 | 47% | | 342,250 | 43% |
| 40-64 | 5,842 | 32% | | 216,980 | 27% |
| 65 and older | 1,264 | 7% | | 55,695 | 7% |
| Employed | 11,851 | 64% | | 436,192 | 55% |
| Commuters | 10,774 | 58% | | 409,384 | 52% |
| % Households receiving SNAP benefits | 600 | 6% | | 31,983 | 10% |
| % Households with disabilities* | 1,329 | 13% | | 52,598 | 16% |

**Sources:** U.S. Census 2010 (Austin population and demographics); American Community Survey 5-year estimates (2008-2012)
***At least one household member with hearing, vision, cognitive, mobility, self-care or independent living disability.

### 3.1.3. Vulnerable populations

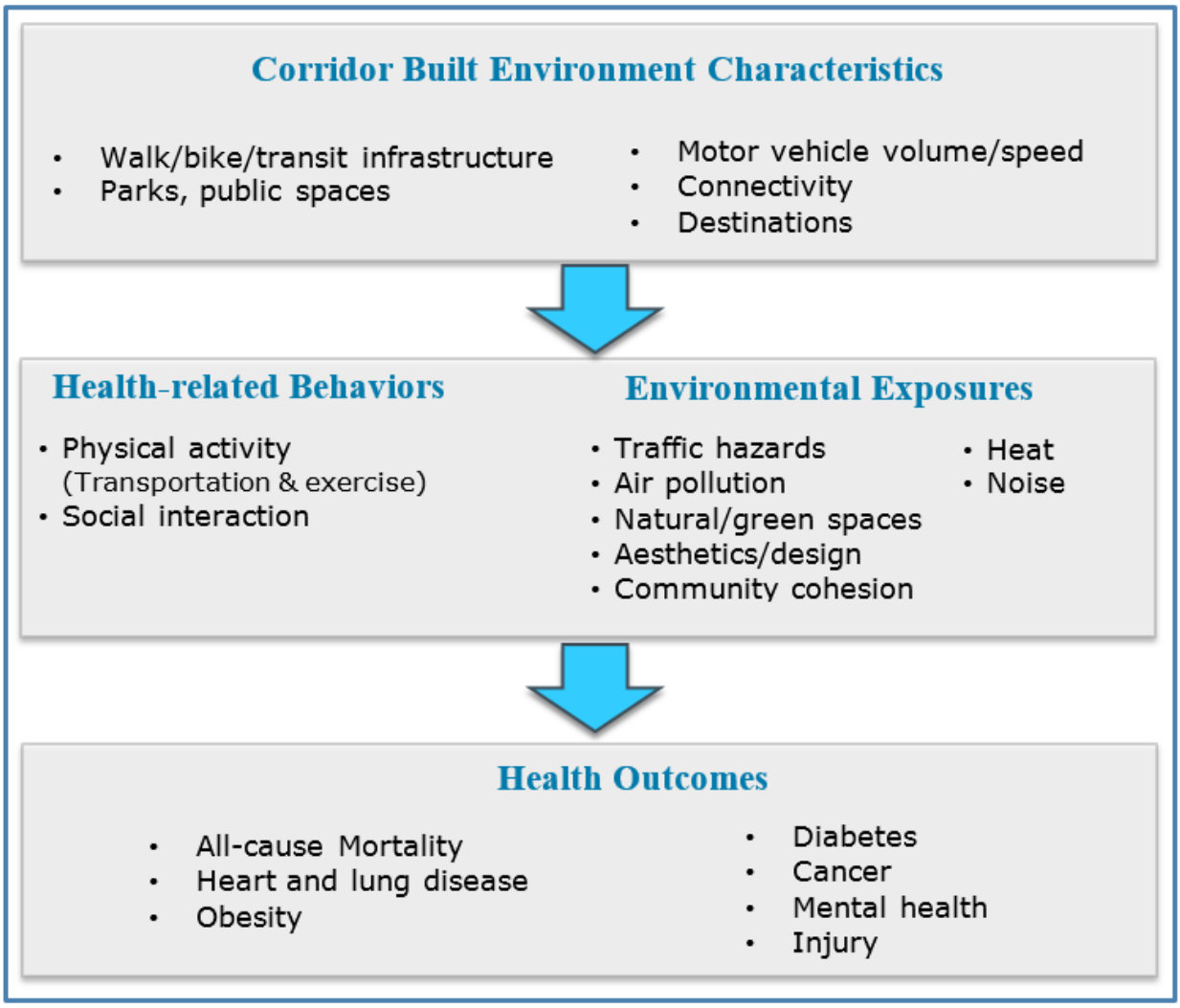
The HIA process includes a consideration of potential health impacts from the perspective of the most vulnerable groups in the affected population. In the context of this project, vulnerable groups include people who may have mobility limitations. Such limitations can include a lack of a reliable personal vehicle, inability to drive a motor vehicle, or personal characteristics such as age or disability that put people at greater risk as a pedestrian or bicyclist. In the South Lamar corridor study area, the following vulnerable populations were identified: people living in public housing projects and housing for disabled adults, and elementary-aged children attending neighborhood schools.

## 3.2. Potential health impacts and pathways

The initial task was to identify potential pathways linking modifications to the South Lamar corridor and the health of the populations living in its vicinity. Elements of the built environment, the human-made surroundings that provide the setting for human activity, exert influence on individuals' health by altering their healthy/un-healthy behaviors. Additionally, the built environment can introduce harmful environmental exposures that can have a strong impact on a person's health. These healthy/un-healthy behaviors and harmful environmental exposures lead to several health outcomes such as heart disease, cancer, injury and death. A review of the built environment-health research identified a number of potential pathways that may link the South Lamar Corridor to specific health outcomes. These linkages are illustrated in Figure 2.

The factors identified as most likely to be influenced by South Lamar corridor improvements are physical activity, social interaction, traffic hazards, and availability of natural/green space. These factors are interrelated; not only do they have direct effects on health, they influence each other. Other factors, such as exposure to air pollution, noise and heat, are also of concern and have been identified as important to the community in the community engagement process.

**Figure 2**. Connections between S. Lamar corridor and public health outcomes




### 3.2.1. Physical activity and health

Among the potential pathways to health, the most salient is physical activity, due to its well-established relationship with health outcomes and the relative strength of its association with the transportation environment. Participation in at least 150 minutes per week of moderate-intensity physical activity has a number of tangible health benefits. Further, physical activity occurring in the public sphere, such as engaging in active transportation, has a reciprocal relationship with both safety and social interaction.

Experts agree that physical activity reduces the risk of several chronic diseases, and ultimately prevents premature death, while also improving mental and cognitive health.[4] Unfortunately, few Americans are able to obtain even minimal amounts of daily physical activity and the effects are profound. The top cause of death, cardiovascular disease, which makes up nearly a quarter of all deaths, is directly attributable to a lack of physical activity.

**Health facts for Texas Department of Health Service Region 7***

- Nearly half (48%) of adults do not meet physical activity guidelines; over one quarter (27%) do not engage in physical activity outside of work.
- Eight percent of adults have diabetes, 28% have high blood pressure, and 1 in 4 (25%) are obese. Each of these conditions are improved by physical activity.
- 1 in 5 children are obese.

*Includes Austin/Travis County
*Data sources: BRFSS 2011, conducted by TDSHS/CDC; SPAN Survey 2009-2011, conducted by TDSHS/Michael & Susan Dell Center for Healthy Living.*

An important aspect of physical activity behavior that is often misunderstood is that the act of engaging in physical activity is more than simply a matter of personal choice – it is also affected by the built environment. Changes in motorized travel, urban-sprawl, a lack of street-level connectivity, and few opportunities for physical activity in public spaces are all aspects of the built environment that contribute to physical inactivity. A recently released review of over 400 peer-reviewed journal articles relating to the built-environment and health concluded that built environment elements such as accessibility and street connectivity, greenery, street scale pedestrian design and mixed land use all had positive effects on physical health, including body mass index (BMI). These and other findings make it clear that the built environment is a key component to healthy community.

[4] Physical Activity Guidelines Advisory Committee. (2008). Physical activity guidelines advisory committee report, 2008. *Washington, DC: US Department of Health and Human Services*, *2008*, A1-H14.

### 3.2.2. Active Transportation

Physical activity does not have to be done specifically as exercise, and does not have to be of vigorous intensity to have positive health effects. Active transportation includes walking and biking to reach destinations, including transit stops. Active transportation can make an important contribution to people's daily dose of physical activity. For instance, accumulating 30 minutes of walking or biking to and from destinations (such as bus stops) five days a week is enough to meet the recommended 150 minutes of physical activity. Studies show community levels of walking and cycling for transportation are directly associated with achieving the minimum amounts of recommended physical activity, and inversely associated with population prevalence of diabetes and obesity.[5] An awareness of the public health contribution of active transportation is reflected in Healthy People 2020 objectives (see sidebar).[6]

**Healthy People 2020:**
**Active Transportation objectives**

- PA-13 Increase the proportion of trips made by walking.
  - PA-13.1 Increase the proportion of trips of 1 mile or less made by walking by adults aged 18 years and older
  - Increase the proportion of trips of 1 mile or less made to school by walking by children and adolescents aged 5 to 15 years
- PA-14 Increase the proportion of trips made by bicycling.
  - Increase the proportion of trips of 5 miles or less made by bicycling by adults aged 18 years and older
  - Increase the proportion of trips of 2 miles or less made to school by bicycling by children and adolescents aged 5 to 15 years.

*Source: http://www.healthypeople.gov/2020/topics-objectives/topic/physical-activity/objectives*

[5] Pucher, J., Buehler, R., Bassett, D. R., & Dannenberg, A. L. (2010). Walking and cycling to health: a comparative analysis of city, state, and international data. *American journal of public health*, *100*(10), 1986.

[6] Office of Disease Prevention and Health Promotion. (2011). US Department of Health and, Human Services: Healthy people 2020. *Office of Disease Prevention and Health Promotion, US Department of Health and Human Services*.

### 3.2.3. Safety from injury, opportunities for social interaction, and access to public green spaces

In addition to influencing physical activity behaviors, the built environment can affect health though a number of other factors. Of major concern is the hazard of motor vehicle traffic, which affects health directly through air pollution, injuries and deaths. Opportunities for social interaction and access to green spaces can also have direct effects on health.[7] These factors can also affect health indirectly, by influencing other health-related factors. For example, urban green spaces provide places for social interaction and appealing destinations for walking and biking. The perception of traffic hazards discourages active transportation. People are more likely to walk or bike when they see others doing the same. A higher prevalence of active travel has been associated with lower risks of pedestrian and bicyclist injury,[8] suggesting that when more people are out walking and biking, the safer it is to walk and bike.

## 3.3. Assessment methods and data sources

The preliminary assessment aimed to document the existing conditions related to the key health pathways, assess the potential for positive health outcomes with improvements to the corridor, and identify key opportunities to unlock this potential. Qualitative and quantitative descriptive methods and visualization (mapping) were used to accomplish the following tasks:

1. Describe current and potential active travel behaviors

    - Identify key destinations in the study area, and describe current and potential active travel practices

[7] Lee, A. C. K., & Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health*, *33*(2), 212-222.

[8] Jacobsen, P. L. (2003). Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury prevention*, *9*(3), 205-209.

- Describe commuting distances, and current and potential active commuting practices

2. Identify key populations, conditions and features of the study area

- Location of vulnerable populations
- Current walkshed of the corridor
- Locations of pedestrian and bicyclist injuries
- Transit stops usage

Existing data included geospatial information and data on traffic injury, public transit use and commute modes. Sources are given in Table 2. Additional data were collected via a public survey, which assessed behaviors, perceptions and priorities related to the study area and the South Lamar corridor. The survey, which was launched at the Open House event held in December 2014, and available online through mid-January 2015, received 272 partial or complete responses. Of these, 82% (223) lived within the study area (shown in Figure 1).

## Table 2: Secondary (existing) Data Sources

| Data | Source |
|---|---|
| Bicycle and pedestrian injury locations, 2009-2013 | Texas Department of Transportation |
| Demographic information, commute distance, commute modes | U.S. Census, American Community Survey |
| Public transit ridership | Capital Metro |
| Locations of schools, parks, libraries and public recreation centers | City of Austin GIS web portal ftp://ftp.ci.austin.tx.us/GIS-Data/Regional/coa_gis.html |
| Public housing sites | City of Austin Data Portal https://data.austintexas.gov/ |
| AISD school locations and attendance zones | AISD |

# 4. PRELIMINARY ASSESSMENT

The preliminary assessment was conducted during the first phase of the HIA, which occurred during the corridor study implementation. The preliminary HIA assessment was provided to the corridor study team during the process to help ensure health was considered in the development of recommendations.

## 4.1. Current and unmet opportunity for health

The South Lamar Corridor study will propose recommendations for creating a safe, multimodal, transit-supportive corridor with improved connectivity, function and appearance for users. These physical factors play an important role in supporting health via increased safety, social interaction and active travel. The extent to which these types of changes can benefit health is contingent on other factors as well. The two primary factors, considered here, are the existence of diverse destinations within the corridor and a public that is interested and able to engage in active travel.

### 4.1.1. Destinations

South Lamar Boulevard was developed in the 1950's as an auto-centric commercial strip, lined with drive-through businesses, auto repair shops, and parking areas fronting the roadway (often with extended curb cuts, making pedestrian travel risky). Modest, single family homes filled the neighborhoods to the east and west of South Lamar. Built in 1958 on South Lamar at Treadwell Street, the Lamar Plaza held a grocery store and Beall's department store behind a wide expanse of pavement (Figure 3).

However, recent and pending mixed-use developments are bringing pedestrian-friendly destinations and numerous residences to the corridor. In 2013, the Lamar Plaza was razed, and Lamar Union is currently under construction (Figure 4). A selection of current destinations in the study area are shown in Figure 5. A farmers market opened on the corridor at Bluebonnet Lane in 2014 in a former used car lot,

although a new location will likely be needed once the property redevelops. A number of neighborhood and regional parks, four schools, two recreation centers, and a branch library are in the area. Of note, the corridor itself lacks any public spaces, such as public greenspaces.

## Figure 3. Lamar Plaza, 1958.


Photo credit: Neal Douglass

## Figure 4. Lamar Union, 2015.

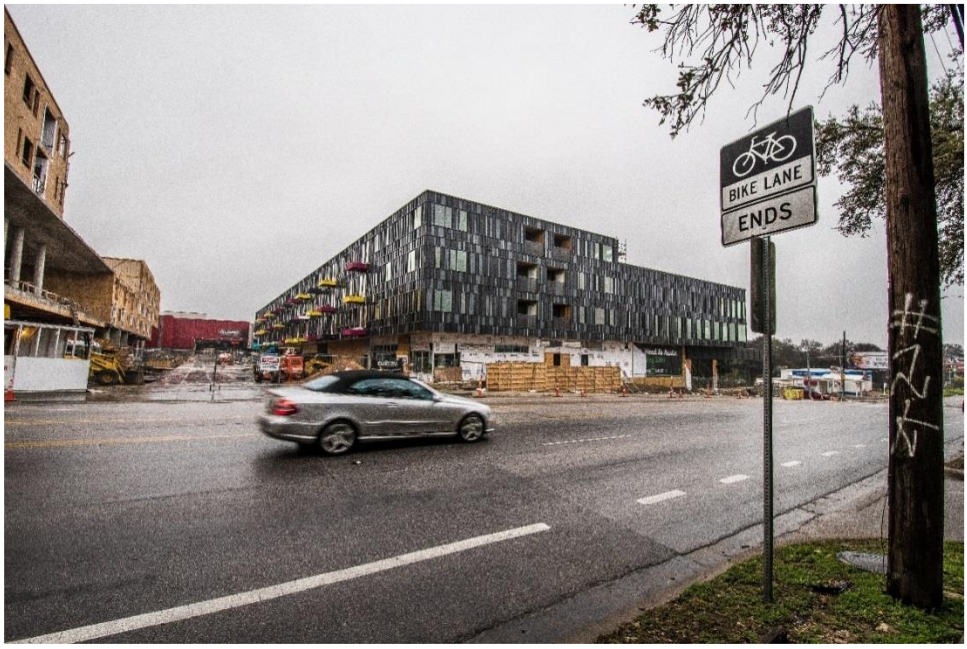
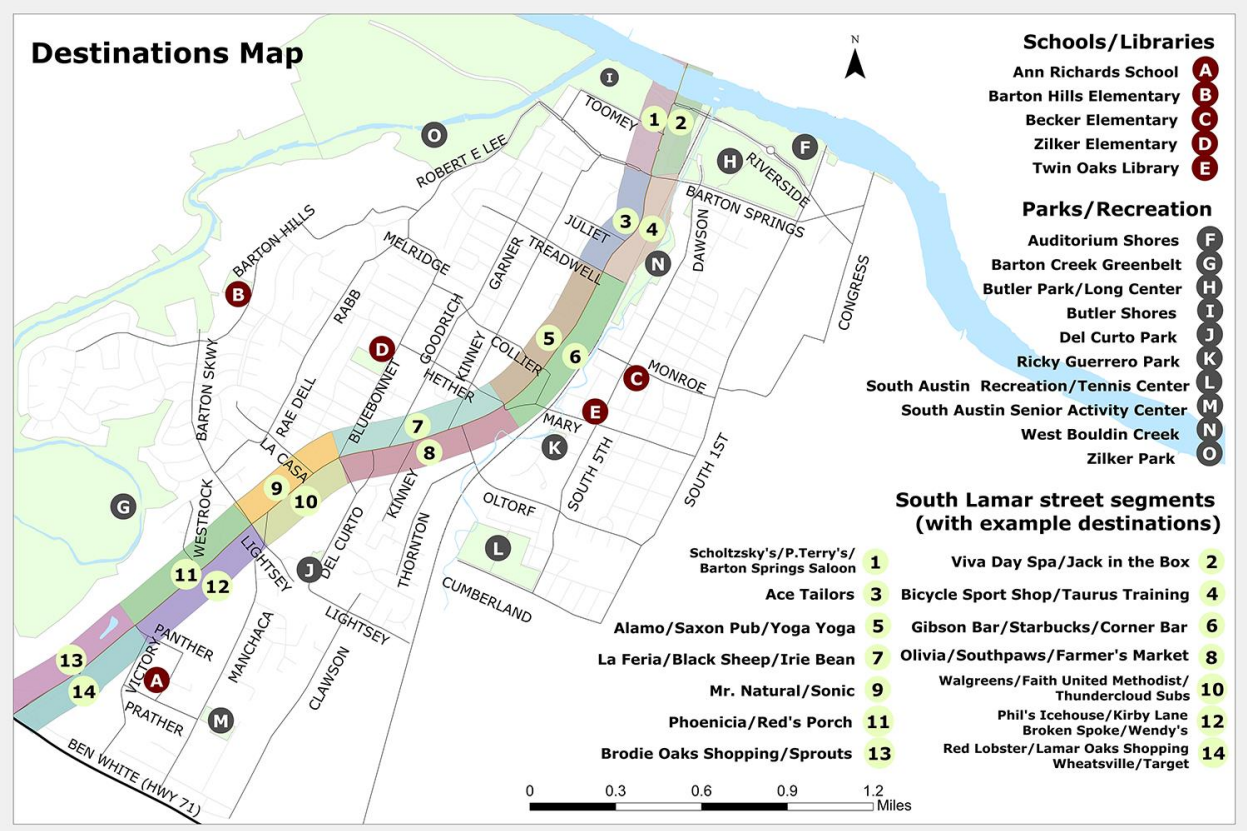



Photo credit: Rene Renteria

## Figure 5. Study area public and selected commercial destinations




### 4.1.2. Current travel behaviors within corridor and potential for active travel

The HIA survey gathered information on respondent travel within the study area. Survey respondents were given a map of South Lamar street segments and area destinations (Figure 5), and asked which destinations and segments they travelled to on a weekly basis. For each street segment, 39-64% reported weekly travel (Table 3), and for each destination, from 5% (South Austin Senior Activity Center) to 59% (Zilker Park) of respondents reported weekly travel (Table 3). These proportions confirm the relevance and popularity of available destinations for the study population. These destinations are all within approximately three miles of any location in the study area, suggesting a substantial existing potential for active travel.

## Table 3. Prevalence of weekly travel to segments and public destinations of South Lamar (illustrated in Figure 5)

| Street Segments | % reporting weekly travel | | Schools, Library, Parks & Recreation Centers | % reporting weekly travel |
|---|---|---|---|---|
| **1** | 52.7 | | A: Ann Richards School | 8.7 |
| **2** | 42.0 | | B: Barton Hills Elementary | 13.0 |
| **3** | 40.5 | | C: Becker Elementary | 6.2 |
| **4** | 39.3 | | D: Zilker Elementary | 23.9 |
| **5** | **61.8** | | E: Twin Oaks Library | 29.0 |
| **6** | 52.3 | | F: Auditorium Shores | **46.0** |
| **7** | **62.2** | | G: Barton Creek Greenbelt | 43.1 |
| **8** | 53.8 | | H: Butler Park/Long Center | **43.5** |
| **9** | 46.9 | | I: Butler Shores | 26.8 |
| **10** | 57.3 | | J: Del Curto Park | 8.3 |
| **11** | 46.6 | | K: Ricky Guerrero Park | 6.9 |
| **12** | 55.7 | | L: South Austin Recreation/Tennis Center | 11.6 |
| **13** | 56.9 | | M: South Austin Senior Activity Center | 5.1 |
| **14** | **63.7** | | N: West Bouldin Creek | 17.8 |
| | | | O: Zilker Park | **59.4** |

**Bold** indicates top three destinations in each category

Despite the proximity of South Lamar and other area destinations to the vast majority of respondents (83% reported living in the study area), most of the destinations were primarily accessed by car. Half to 80% of respondents reported always driving to a given street segment, and less than 10% reported always walking or always biking to any of the segments (Table 4). Area destinations off of South Lamar were more frequently accessed by non-motorized means, but driving

was still the dominant mode for most (Table 5). However, for the South Lamar street segments, depending on the segment, between 38-57% of respondents said they would drive less often given ideal walking and biking conditions. For the other study area destinations, between 30-69% would drive less often, given ideal conditions. These results suggest that a lack of appropriate infrastructure is the limiting factor in realizing the tremendous potential for active travel in the study area.

## Table 4. Study area street segments by mode and potential for change

| Street Segments | Current Travel Mode | | | Change In Travel Mode Given Ideal Walk/Bike Conditions | | |
|---|---|---|---|---|---|---|
| | % always walk | % always bike | % always drive | % walk *more* often | % bike *more* often | % drive *less* often |
| 1 | 2.9 | 6.7 | 55.7 | 60.5 | 69.3 | 51.7 |
| 2 | 2.9 | 7.1 | 60.2 | 57.3 | 63.4 | 50.0 |
| 3 | 1.6 | 9.2 | 65.1 | 49.3 | 50.0 | 39.2 |
| 4 | 1.6 | 6.1 | 59.0 | 50.0 | 61.6 | 48.1 |
| 6 | 3.4 | 2.2 | 63.2 | 58.0 | 64.3 | 51.5 |
| 7 | 7.7 | 5.1 | 50.7 | 62.5 | 66.1 | 57.1 |
| 8 | 8.3 | 3.2 | 51.7 | 58.7 | 57.3 | 49.1 |
| 9 | 2.2 | 5.6 | 54.8 | 55.1 | 57.8 | 45.3 |
| 10 | 1.9 | 4.7 | 61.4 | 61.1 | 58.4 | 51.7 |
| 11 | 2.4 | 3.6 | 67.6 | 52.9 | 55.2 | 44.6 |
| 12 | 2.0 | 3.9 | 69.6 | 48.1 | 55.6 | 47.4 |
| 13 | 2.9 | 1.9 | 79.4 | 36.4 | 52.7 | 39.5 |
| 14 | 2.6 | 1.7 | 79.7 | 31.1 | 48.8 | 37.5 |

Note: Data unavailable for street segment 5 due to technical error in online survey administration.

## Table 5. Regular study area destinations by mode and potential for change

| Schools, Library, Parks & Recreation Centers | Current Travel Mode | | | Change In Travel Mode Given Ideal Walk/Bike Conditions | | |
|---|---|---|---|---|---|---|
| | % always walk | % always bike | % always drive | % walk *more* often | % bike *more* often | % drive *less* often |
| **A:** Ann Richards School | 9.1 | 14.3 | 73.9 | 50.0 | 47.6 | 54.5 |
| **B:** Barton Hills Elementary/park | 21.2 | 6.9 | 23.5 | 45.5 | 51.5 | 48.5 |
| **C:** Becker Elementary | 29.4 | 7.7 | 12.5 | 35.3 | 60.0 | 43.8 |
| **D:** Zilker Elementary/Little Zilker park | 19.3 | 9.8 | 29.3 | 63.9 | 62.1 | 56.4 |
| **E:** Twin Oaks Library | 10.0 | 9.6 | 46.8 | 49.3 | 77.9 | 68.6 |
| **F:** Auditorium Shores | 19.2 | 17.0 | 30.0 | 52.7 | 76.4 | 66.3 |
| **G:** Barton Creek Greenbelt | 23.7 | 10.9 | 30.4 | 54.4 | 66.0 | 52.7 |
| **H:** Butler Park/Long Center | 11.24 | 14.0 | 32.7 | 56.9 | 73.7 | 62.1 |
| **I:** Butler Shores | 13.8 | 10.0 | 26.6 | 66.1 | 75.9 | 66.1 |
| **J:** Del Curto Park | 38.9 | 16.7 | 18.2 | 73.7 | 63.2 | 52.4 |
| **K:** Ricky Guerrero Park | 46.7 | 21.4 | 35.7 | 31.3 | 46.7 | 33.3 |
| **L:** South Austin Rec/Tennis Cntr | 28.6 | 16.7 | 29.6 | 39.3 | 51.9 | 50.0 |
| **M:** South Austin Senior Activity Cntr | 28.6 | 14.3 | 66.7 | 30.0 | 44.4 | 30.0 |
| **N:** West Bouldin Creek | 23.7 | 10.5 | 25.6 | 46.3 | 65.0 | 52.8 |
| **O:** Zilker Park | 11.2 | 9.6 | 29.7 | 60.8 | 72.8 | 55.6 |

### 4.1.3. Current commute behaviors and potential for active commuting

Similar results were found in relation to commuting. Over one-quarter of respondents commute less than three miles, yet only 2% said they ever walk to work, and 4% said they ever bike. However, 22% and 49% said they would walk or bike, respectively, more often under ideal conditions for *all* travel modes (including motor vehicle).

According to the U.S. Census American Community Survey, 11.2% of commuters in the study population census blocks commute less than 10 minutes, and another 42.5% commute less than 20 minutes (Figure 6). However, only 7.0% of study area commuters regularly commute by walking (2%) or bicycling (4%), with an additional 4.9% using transit (Figure 7). (These proportions are nearly identical to those obtained from related questions in the survey). The proximity of the workplace for many commuters, and reported interest in active commuting under ideal environmental conditions, suggests great potential for physically activity en route to work that could be met with appropriate infrastructure improvements.

Figure 6. Commute times: Study area residents

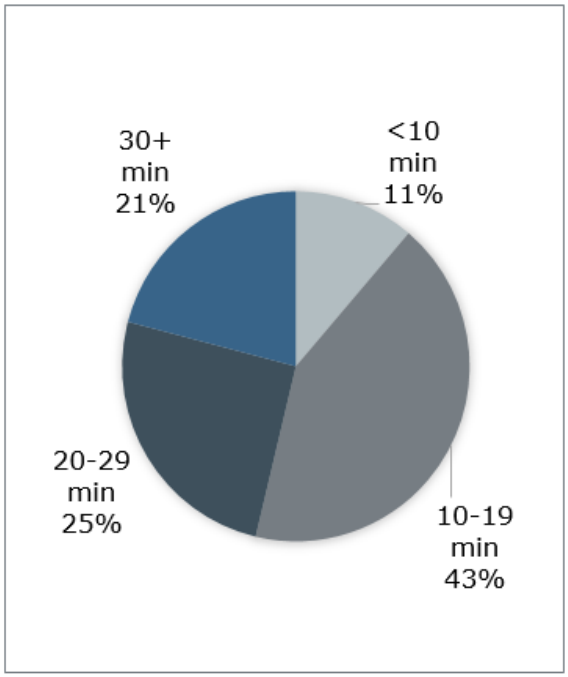
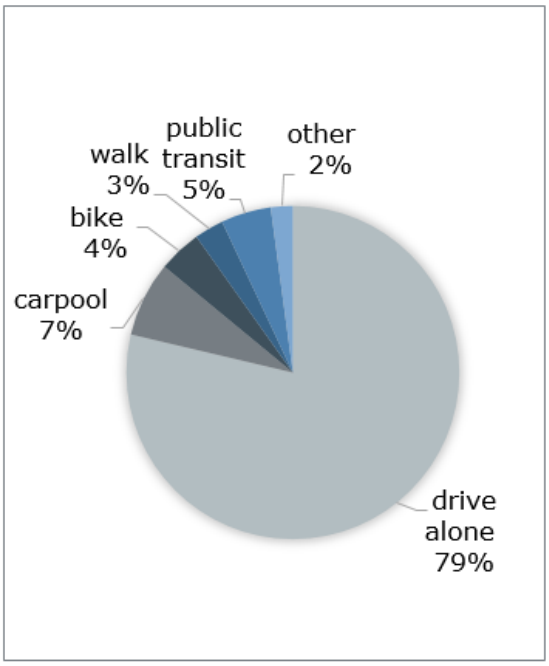



Figure 7. Commute modes: Study area residents




Data sources: U.S. Census American Community Survey, 2009-2013

## 4.2. Current conditions, features and vulnerable populations

A spatial analysis of the study area was conducted to illustrate current conditions and highlight areas that may be of particular relevance to the health of the study population. A map illustrating vulnerable populations, ¼ and ½ mile walksheds,[9] pedestrian and bicyclist injury counts at intersections, transit stops and ridership, and an existing protected bicycle facility is shown in Figure 8.

### 4.2.1. Vulnerable populations

In the South Lamar corridor study area, the following vulnerable populations with potential mobility limitations (whether financial or physical) were identified: people living in subsidized housing projects and housing for disabled adults, and elementary-aged children attending neighborhood schools. Housing projects are listed in Table 6, and illustrated in Figure 8. Of the three locations on or near Lamar, two are near the Bluebonnet intersection.

Table 6. Subsidized housing projects in study area (705 units)

| Organization/site name | Address | Units | population served |
|---|---|---|---|
| Housing Authority of the City of Austin | | | Low-income adults/families |
| Bouldin Oaks | 1203 Cumberland | 144 | |
| Goodrich Place | 2126 Goodrich Ave | 40 | |
| Meadowbrook | 1201 W. Live Oak | 160 | |
| Mary Lee Foundation | 1327 Lamar Square Dr | 215 | Disabled adults |
| U.S. Dept. of Housing and Urban Development Section 8 housing | | | Low-income adults/families |
| Esct Austin Housing III | 3204 Manchaca Rd | 8 | |
| Fourth Street Apartments | 2402 4th St | 11 | |
| Kinney Avenue Apts | 1703 Kinney Ave | 9 | |
| Manchaca Road Apts | 3810 Manchaca Rd | 11 | |
| Foundation Communities | 2301 S. Lamar (planned) | 107 | Very low-income adults |

[9] Walksheds are geographic areas within a walkable distance of South Lamar. Rather than measuring the distance "as the crow flies," walksheds are based on distances along a road network. They help highlight areas that are geographically close but lack connectivity.

Four schools are located in the study area (locations shown in Figure 5). The attendance zone of one of these schools (Zilker Elementary School) crosses South Lamar. Students living in the southeast part of the attendance zone must cross South Lamar at the Bluebonnet intersection. On Bluebonnet to the west of South Lamar, a two-way protected bicycle lane runs through the Zilker neighborhood, passing the elementary school. However, the necessity of crossing South Lamar limits students' ability to take advantage of the comfort and safety of the protected bicycle facility. Of those who reported weekly trips to Zilker Elementary School and the adjacent Little Zilker Park (a joint-use City of Austin and AISD facility), 29% said they always drive, yet 64% and 62%, respectively, said they would walk and bike more often given ideal conditions, suggesting the protected bicycle lane and sidewalks surrounding the school may not extend far enough, or other gaps in a low-stress pedestrian/bicyclist routes exist along routes to school.

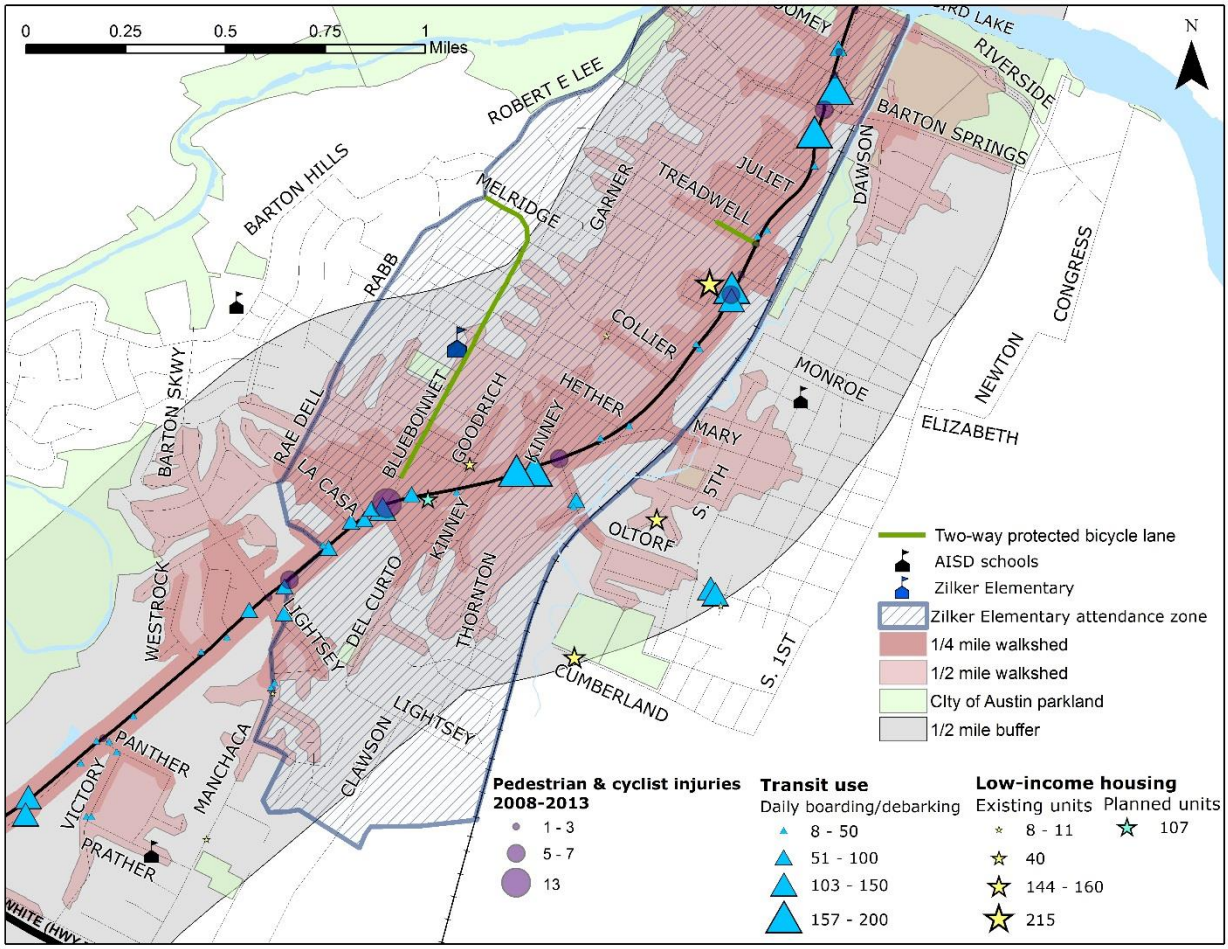
### 4.2.2. Walkshed

Two geographic areas were defined based on road network buffers around South Lamar intersections. These areas, or walksheds, illustrate the geographic area within the larger study area from which the South Lamar corridor can be reached via a ¼ mile or ½ mile trek. The intersection with the largest ¼ mile walkshed is Bluebonnet.

The walksheds also indicate areas in close proximity to the corridor yet lack connectivity. The walkshed areas, shown in Figure 5, disproportionately lie to the west of South Lamar, due to limited crossings of the railroad tracks running parallel to the northern portion of South Lamar. The rail-induced walkshed limitation is especially pronounced in the Bouldin neighborhood in the northeast section of the study area, where the West Bouldin Creek Greenbelt lies. This greenbelt is the closest parkland to the South Lamar corridor. A pedestrian and bicyclist crossing at Treadwell would provide access to the park for neighbors to the west, and would create connectivity to South Lamar for neighbors to the east, substantially increasing the walkshed of South Lamar.

Of note, the walkshed does not identify areas with appropriate infrastructure for walking and bicycling. Segments of roadway within close proximity to South Lamar may be uncomfortable or dangerous for non-motorized travelers. Such segments can serve as significant barriers to connectivity within an otherwise connected landscape. Further, the walkshed only illustrates connectivity *to* South Lamar; it does not illustrate connectivity from the perspective of someone needing to *cross* South Lamar.

## Figure 8. Study area: current conditions




### 4.2.3. Pedestrian and bicyclist injury and transit usage

Information on where pedestrians and bicyclists are most active along the corridor can be estimated from two sources: transit stop usage and pedestrian and bicyclist

injury locations. Locations of pedestrian and bicyclist injury not only reflect potentially dangerous built environments, but also reflect the volume of pedestrian and bicyclist traffic in an area. The use of transit stops for boarding and debarking also indicate areas of high pedestrian activity.

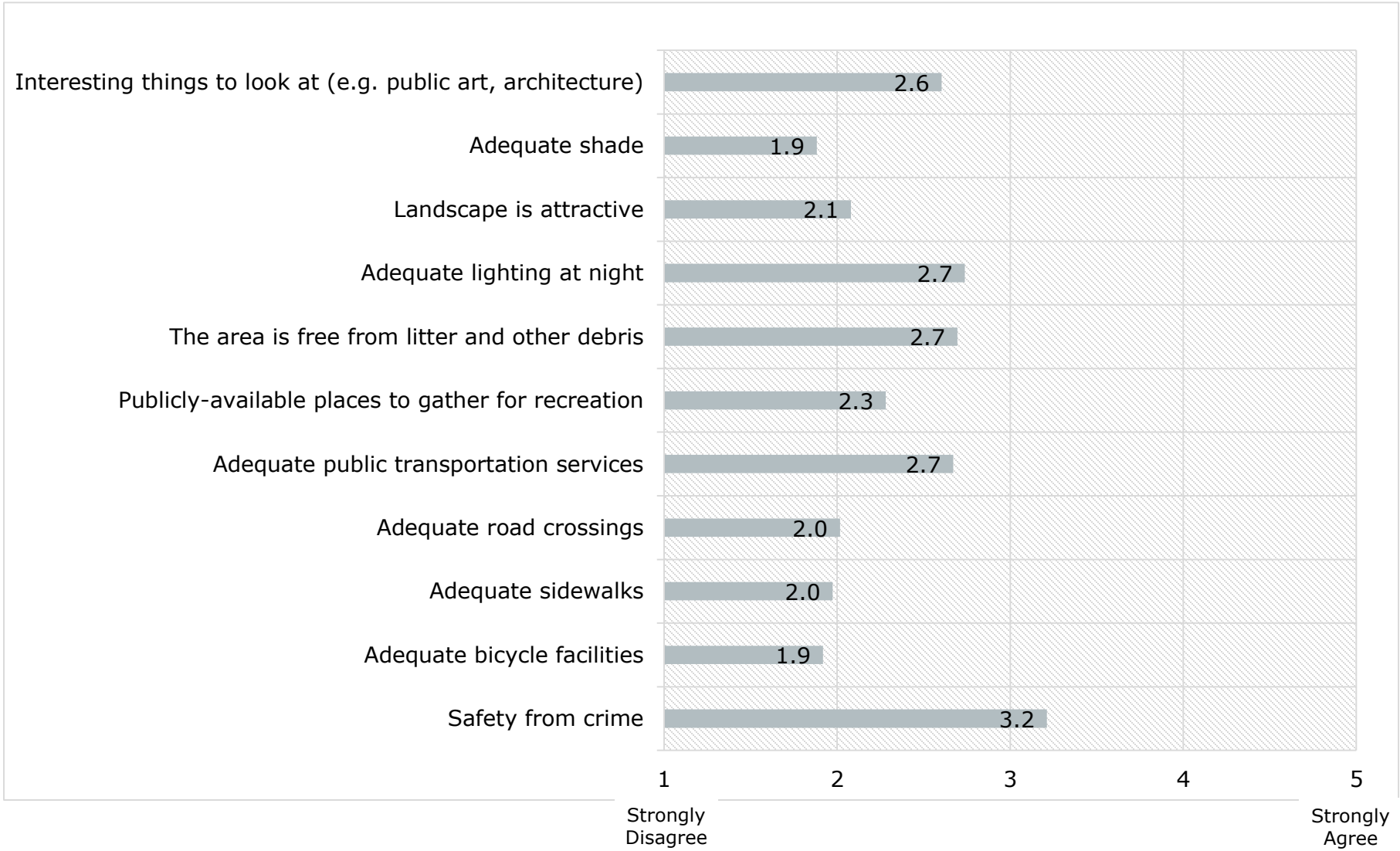
Counts and locations of bicyclist and pedestrian injury events that occurred at or near South Lamar intersections from 2008-2013 are shown in Figure 8. The South Lamar intersection with the highest number of injuries is Bluebonnet, nearly double the next highest number at Lamar Square Drive. Both of these intersections are important for vulnerable populations. The Bluebonnet intersection serves as the crossing for students attending Zilker Elementary, and Lamar Square Drive is home to over 200 adults with disabilities.

The five transit stops located near Bluebonnet and South Lamar intersection combined see an average of 345 boardings/disembarkings daily, and the two near Lamar Square serve an average of 304. The South Lamar intersections at Oltorf and at Barton Springs also experience high transit usage for the corridor, with average of 368 and 376 daily boardings/disembarkings, respectively.

### 4.2.4. Public perception of the South Lamar corridor

HIA survey respondents were asked to state their dis/agreement with certain statements that purportedly describe the environmental features on South Lamar corridor (Figure 9). Generally, respondents do not perceive the corridor as containing adequate environmental features that would encourage active commuting. Where strongly disagree and strongly agree are one (1) point and five (5) points respectively, “adequate shade” and adequate bicycle facilities” each received a score of 1.9; the lowest score recorded.

## Figure 9. Perceptions about environmental features on South Lamar



## 4.3. Preliminary analysis summary and recommendations

1. Given the high density of people and destinations, and the stated interest within the population for active travel, a substantial unmet opportunity exists for increased physical activity. *The current lack of safe bicycle and pedestrian infrastructure and roadway crossings present a significant barrier to health* by limiting physical activity, and exposing active travelers to risk of injury.
2. Given the size of the population and interest in active travel; facilities must be able to accommodate a large volume of non-motorized travelers. Improvements should offer separated space for pedestrians and bicyclists wherever possible to avoid conflicts and potential injuries, and increase comfort for all users. Prioritize improvements that build on existing resources and locations of active transportation, and close existing gaps in facilities. Ensure adequate bicycle parking is available.
3. Although the area contains a diversity of destinations, including parks, the feature most lacking on the corridor itself is public green space. Such spaces can attract people to the area for recreational activity and serve as gathering places for social interaction. Look for opportunities to create public greenspaces along the corridor.
4. The lack of connectivity across South Lamar and between South Lamar and the Bouldin neighborhood due to the rail line limits access to community resources for people on both sides of the roadway and railroad tracks. Consider constructing a pedestrian/bicyclist crossing of the tracks at this location. Doing so would provide access from South Lamar to a large green space in close proximity to the corridor.
5. Although the majority of the corridor can benefit from pedestrian and bicycle facility improvements, the intersection of Bluebonnet and South Lamar (Figure 10) may be of particular significance to active transportation. This location has the highest pedestrian and bicyclist injury counts on the corridor, one of the highest transit access areas; it serves as a key crossing for school children, and connects to a protected bicycle facility.

## Figure 10. Intersection of Bluebonnet and South Lamar

Photo credit:
Rene Renteria

# 5. ASSESSMENT OF CORRIDOR STUDY RECOMMENDATIONS

The remaining sections of this report was completed in response to drafts of proposed recommendations prepared by the corridor study team. A summary of these recommendations, as available for the HIA assessment steps are presented in Tables 7 and 8. These Tables also contain a simple algorithm that the HIA study team developed to produce a numeric value that depicts the level of consideration given that is assignable to each of the key health-related outcomes across all the stated (summary) recommendations.

## Table 7: Matrix of Corridor Study Policy Recommendations vs. Health-related Factors

| | | Opportunities for Physical Activity (Active Transport) | | Opportunities for Physical Activity (Recreational) | | Safety from injury (focus: non-motorized travel) | | Availability of public green spaces | |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **Access Driveway** | | | | | | | | |
| 1.1 | New development on the South Lamar corridor should not be guaranteed full purpose driveway access (i.e., no guaranteed left-turn ingress/egress). | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| 1.2 | A site should be limited to one (1) primary driveway if the property's South Lamar Boulevard frontage is less than 400 feet. A site with additional frontage could be allowed a secondary driveway. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| 1.3 | The maximum driveway width for primary driveways on the South Lamar Corridor should be 30 feet. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| 1.4 | The maximum driveway width for secondary driveways on the South Lamar Corridor should be 24 feet. | Not Certain | 0 | Not Certain | 0 | Yes | 1 | Not Certain | 0 |
| 1.5 | No driveways should be allowed within 100 feet from an intersection. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **2** | **Sidewalk** | | | | | | | | |
| 2.1 | Sidewalks should be constructed along cross streets for pedestrians to provide better connectivity and to access South Lamar Boulevard via cross streets. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| 2.2 | Safe pedestrian crossings of South Lamar Boulevard should be spaced at intervals of 800 to 1000 feet, wherever feasible. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **3** | **Parking** | | | | | | | | |
| 3.1 | The City of Austin should work proactively with individual businesses where parking or other amenities are intruding into, or otherwise obstructing, the public Right-of-Way. To relieve sites where parking is currently utilized in the public Right-of-Way, accessory parking agreements and/or joint access agreements should be explored. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |

| | | Opportunities for Physical Activity (Active Transport) | | Opportunities for Physical Activity (Recreational) | | Safety from injury (focus: non-motorized travel) | | Availability of public green spaces | |
|---|---|---|---|---|---|---|---|---|---|
| 3.2 | The City of Austin should pursue the development of public parking facilities in areas of the Corridor where there is a high concentration of pedestrian activity with retail and entertainment uses to promote a "park-once" pattern of behavior and reduce the burden on individual sites. This should be accomplished with the acquisition of land for parking facilities and/or through parking agreements with private developers. A parking in-lieu fee should be considered to facilitate the financing of such facilities. | Yes | 1 | Not Certain | 0 | Yes | 1 | Not Certain | 0 |
| 3.3 | Parallel, on-street parking should be made available, where possible, to support pedestrian-oriented retail uses. | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| 3.4 | Bus pullout should be considered along South Lamar Corridor where possible. City should consider adopting an ordinance to allow buses to re-enter traffic by making traffic along South Lamar Boulevard to yield to buses at pull outs. | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| 3.5 | Where possible, bus stops should be located on the far side of intersections (i.e., downstream of traffic signals) to reduce obstruction of right-turning traffic. | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| | **Sum of scores [a]** | | 11 | | 7 | | 9 | | 0 |
| | **Index measure [b]** | | 0.92 | | 0.58 | | 0.75 | | 0.00 |

**NOTES:**

- Matrix examines the likelihood that the stated policy recommendations will affect health-related outcomes in a positive direction.
- **Yes [1]** – when particular policy recommendation is likely to directly or indirectly improve/create specific health-related outcome
- **Not certain [0]** – when there is NOT enough expert judgment that particular policy recommendation may improve/create specific health-related outcome
- **a: Sum of scores** – summation of scores (1 or 0) that are assigned to all the stated policy recommendations on specific health-related outcome
- **b: Index measure** – the index measure was the outcome of a simple algorithm that the HIA study team developed to produce a numeric value that depicts the level of consideration given to a particular health-related outcome across all the stated policy recommendations. The algorithm computes the sum of scores across the stated policy recommendations, and then computes the average score (i.e. 0.0 = no evidence of consideration for that particular health-related outcome across the stated recommendations and 1.0 = evidence of consideration across all stated recommendations for that particular health-related outcomes.

## Table 8: Matrix of Corridor Study Built Environment Recommendations vs. Health-related factors

| | | Opportunities for Physical Activity (Active Transport) | | Opportunities for Physical Activity (Recreational) | | Safety from injury (focus: non-motorized travel) | | Availability of public green spaces | |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **General** | | | | | | | | |
| | Reduction of speed limit to 35 mph between Riverside Dr. and Panther Tr. | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **2** | **Toomey Rd.** | | | | | | | | |
| | Signal installation | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **3** | **Barton Springs Rd.** | | | | | | | | |
| | Dual SBLT lanes | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| | NB and SB bus queue jumps | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| | Removal of the outside NB thru lane to accommodate multimodal improvements | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **4** | **Collier St./Evergreen Ave.** | | | | | | | | |
| | Signal installation | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **5** | **Hether St./Mary St.** | | | | | | | | |
| | Removal of NBRT “ramp” | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| | Prohibition of LTs and through for autos from Mary St. (reroute to Evergreen Ave. via roundabout at intersection of Mary St. and Evergreen Ave.) | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **6** | **Oltorf St.** | | | | | | | | |
| | NB bus queue jump | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| | Removal of NBRT channelization | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| **7** | **Del Curto Rd.** | | | | | | | | |
| | Signal installation | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **8** | **Bluebonnet Ln.** | | | | | | | | |
| | Prohibition of LTs and through for autos from WB approach (reroute to Del Curto Rd. via roundabout at intersection of Bluebonnet Ln. and Del Curto Rd.) | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| | NB bus queue jump | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| **9** | **Manchaca Rd.** | | | | | | | | |
| | NB bus queue jump | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |

| | | Opportunities for Physical Activity (Active Transport) | | Opportunities for Physical Activity (Recreational) | | Safety from injury (focus: non-motorized travel) | | Availability of public green spaces | |
|---|---|---|---|---|---|---|---|---|---|
| | NB bus lane between Manchaca Rd. and Barton Skwy. | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| **10** | **Barton Skwy.** | | | | | | | | |
| | NB bus queue jump | Yes | 1 | Not Certain | 0 | Not Certain | 0 | Not Certain | 0 |
| **11** | **West Oak Dr.** | | | | | | | | |
| | PHB installation | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| **12** | **Brodie Oaks** | | | | | | | | |
| | Prohibition of NBLT from US 290/SH 71 ramp | Yes | 1 | Yes | 1 | Yes | 1 | Not Certain | 0 |
| | **Sum of scores [a]** | | 15 | | 9 | | 9 | | 0 |
| | **Index measure [b]** | | 0.83 | | 0.50 | | 0.50 | | 0.00 |

**NOTES:**

- Matrix examines the likelihood that the stated intersection improvements will affect health-related outcomes in a positive direction.
- **Yes [1]** – when particular intersection improvement is likely to directly or indirectly improve/create specific health-related outcome
- **Not certain [0]** – when there is NOT enough expert judgment that particular intersection improvement may improve/create specific health-related outcome
- **a: Sum of scores** – summation of scores (1 or 0) that are assigned to all the stated intersection improvements on specific health-related outcome
- **b: Index measure** – the index measure was the outcome of a simple algorithm that the HIA study team developed to produce a numeric value that depicts the level of consideration given to a particular health-related outcome across all the stated intersection recommendations. The algorithm computes the sum of scores across the stated policy recommendations, and then computes the average score (i.e. 0.0 = no evidence of consideration for that particular health-related outcome across the stated recommendations and 1.0 = evidence of consideration across all stated recommendations for that particular health-related outcomes.

## 5.1. Overall Assessment

The South Lamar Corridor Study team has developed a set of policy and infrastructure recommendations that can have a substantial positive impact on public health. The proposed improvements would make walking and bicycling a safe, convenient, and pleasant choice for those who live, work, shop, and recreate along the corridor. Resulting increases in physical activity and social interactions in the short-term can have long term public health benefits such as reductions in rates of diabetes and heart disease. Implementing recommendations related to urban trees and landscaping may have additional health-related benefits, such as a reduction in heat-related illnesses.

Achieving the full vision of the proposals is a long-term prospect. Improvements will require substantial public and private investments, the latter dependent on the time table of redevelopment. Given the long-term nature of full implementation, a set of improvements to be implemented in the next 3-12 months should be established. To begin, prompt implementation of policy changes related to new development is essential to preserve the opportunity for full implementation of the plan in the long-term. The short list should also include: installation of the Collier Street/Evergreen Avenue traffic signal; reduction in the speed limit; and closure of existing gaps in sidewalks and bicycle lanes. Given the trajectory of growth in population and destinations in the area, short-term actions are essential to achieve the vision for South Lamar as a healthy, active, multimodal corridor as detailed in the Imagine Austin comprehensive plan.

Key components of the study recommendations from a public health perspective include, (i) increased street crossing opportunities and enhanced safety at existing street crossings, (ii) reduced speed limits for motor vehicles, (iii) the addition of continuous protected bicycle lanes and wide sidewalks along the length of the corridor, and (iv) use of trees and rain gardens as road traffic buffers in select areas of the corridor. The potential health impacts of these recommendations were assessed in the sections 5.2 - 5.6 based on the body of work on the relationships among urban design studies, transportation studies and health-related outcomes

studies, combined with data collected through the public involvement process and by the City of Austin.[10]

### 5.2. Reduction of Speed Limits

**Corridor Study Recommendations:** The policy recommendation to reduce the speed limit between Riverside Drive and Panther Trail to 35 mph would lower speeds across most of the corridor. The portion south of Panther Trail that would remain 45 miles per hour (approximately 0.5-mile).

**Current conditions**: Currently, the speed limit on South Lamar Boulevard is as follows[11]:

1. From 832 feet north of West Riverside Drive to 66 feet south of West Gibson Street: **35 miles** per hour.
2. From 66 feet south of Gibson Street to 450 feet south of Barton Skyway: **40 miles** per hour.
3. From 450 feet south of Barton Skyway to Ben White Boulevard (West): **45 miles** per hour.

**Anticipated health-related effects of recommended improvements:**

Within the scope of the current HIA, the recommended speed limit reductions have direct effects on public health in two ways – potential for auto-ped/bike crash reductions and the possibility of increasing active transportation and recreational physical activity.

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[10] Roberts D. & Durbin L. (2013). City of Austin Urban Trails Master Plan Telephone Study.

[11] Data source: City of Austin. Ordinance no. 20070809-004. An ordinance repealing and replacing chapter 12-4 of the city code relating to speed limits; creating offenses; and adopting a savings clause. Retrieved on July 4, 2015 from: http://www.austintexas.gov/edims/document.cfm?id=105775

Researchers have consistently found a close relationship between speed and crash severity, with the likelihood that a crash will result in a fatality increasing as speed increases.[12,13] However, previous research has compared speed limits of 40-45mph to 25-30mph (or slower). For example, one study found that pedestrians hit in speed limit areas of ≤25 mph died 23.5% of the time, whereas those hit in areas of ≥40 mph died 39.4% of the time.[11] Therefore, slower speeds may be appropriate in sections of South Lamar with high pedestrian activity, or during times of high activity.

Slower traffic speeds are objectively safer, and they may also feel safer or more pleasant to pedestrians. A survey of pedestrians found acceptable speeds for cars to be in the range of 20 to 30 mph. An Austin-based study found slower speed limits were associated with greater likelihood of recreational walking.[14] Therefore, lower speed limits may impact public health by decreasing the potential for severe injuries during crashes, as well as by increasing physical activity through active transportation and recreational physical activity.

### 5.3. Improvements to Roadway Crossings

**Corridor Study Recommendations:**

1. Safe pedestrian crossings of South Lamar Boulevard should be spaced at intervals of 800 to 1000 feet, wherever feasible. Specific recommendations for locations of new Pedestrian Hybrid Beacon (PHB) and signalized crossings were given.

2. Alterations to existing intersections designed to improve safety for all travel modes and improve auto traffic flow were given. These include continuation of bicycle lanes and sidewalks across South Lamar, installation of pedestrian

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[12] Gårder, P. E. (2004). The impact of speed and other variables on pedestrian safety in Maine. *Accident Analysis & Prevention*, *36*(4), 533-542.

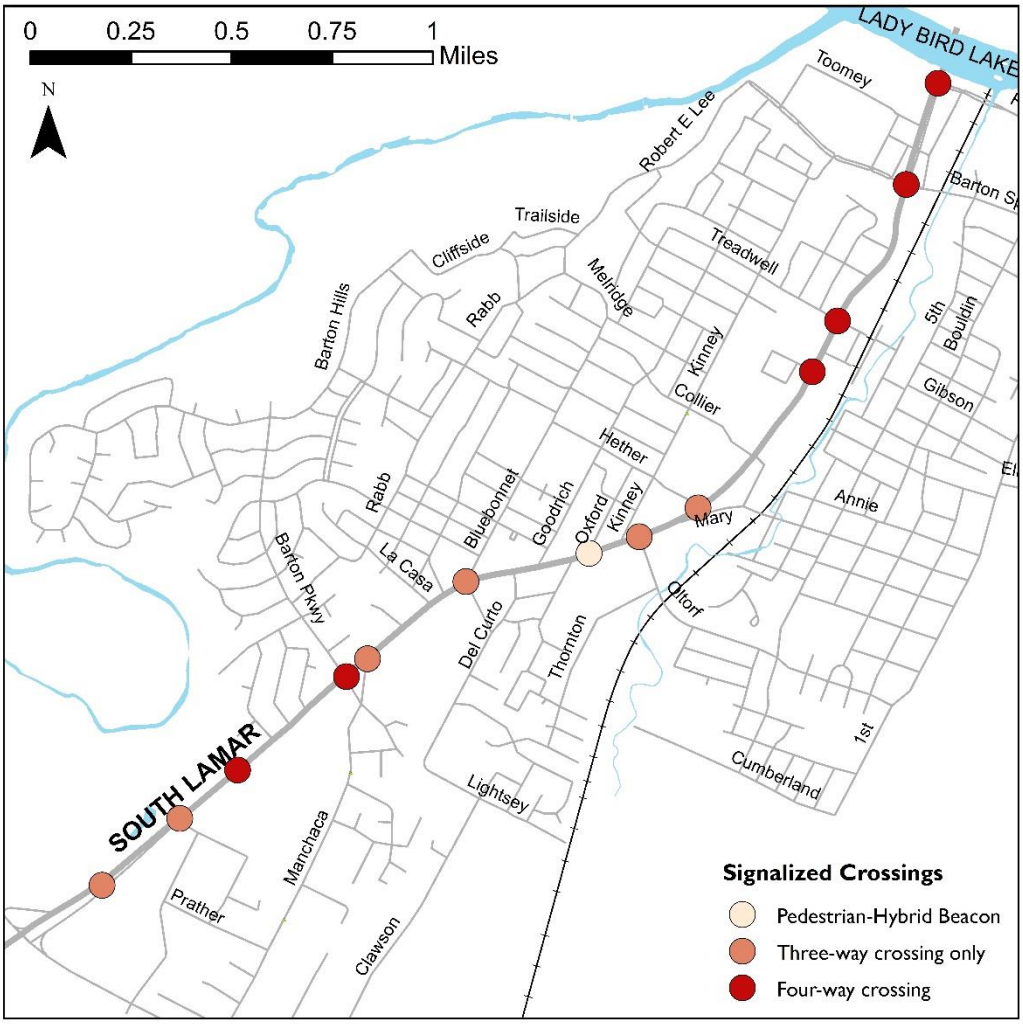
[13] Rosen, E., & Sander, U. (2009). Pedestrian fatality risk as a function of car impact speed. *Accident Analysis & Prevention*, *41*(3), 536-542.

[14] Nehme, E. K., et al. (2015). "Environmental correlates of recreational walking in the neighborhood." *American journal of health promotion.*

crossings where absent, and redistribution of motor vehicle travel and maneuvers across existing intersections, relieving pressure on highly-travelled intersections.

**Current conditions**: Through the community involvement process, many people have voiced concerns about the lack of crossings and the safety of intersections for all travel modes. Thirteen protected crossings are currently in place on South Lamar, including one PHB that was installed in 2015 (Fig. 11). The longest distance between crossings is 2400 feet, or nearly one-half mile (from Hether Street to Lamar Square). Although some cross streets have features such as sidewalks and bicycle lanes, in many cases these features terminate before or at the intersection with South Lamar. Several intersections have crosswalks and pedestrian signals on only three of the four sides (Fig. 11), slowing pedestrian movement. Bluebonnet was identified in the preliminary HIA assessment stage (section 4.3) as having particular relevance to health, due to high pedestrian and bicyclist injury counts at this intersection (relative to the rest of the corridor), and its role as both a transit hub and key crossing for school children.

Figure 11. Current protected crossings on South Lamar




**Potential health-related effects of recommended improvements:**

*Reduced distance between protected crossings*

Distance is one of the strongest predictors of whether a person will walk to a destination.[15] Density (the intensity of development in an area) is thought to

[15] Saelens, B. E., & Handy, S. L. (2008). Built Environment Correlates of Walking: A Review. *Medicine and Science in Sports and Exercise*, *40*(7 Suppl), S550–S566.

encourage active travel by bringing origins and destinations closer together.[16] Density has consistently been found to be correlated with walking for transportation,[13] and more recently, bicycling for transportation.[17] However, due to the limited opportunities to cross South Lamar, the potential impact of increased density on active travel is undermined.

The distance between safe crossings on South Lamar can add up to one-half mile to the journey. Most transportation walking trips taken in the U.S. are under one-half mile.[18] Half of U.S. trips less than one mile are made by foot, with an additional 3% made by bicycle. For trips of 1-2 miles, only 9% are made by foot, and 3% by bicycle.[19] An additional one-third or one-half mile likely deters many walking trips.

> The majority of walking trips taken in the U.S. are under one-half mile. Due to the limited opportunities to cross South Lamar, the potential impact of increased density on active travel is undermined, as distances between roadway crossings can add up to one-half mile to one leg of a trip. The proposed recommendations would reduce this distance to less than one-fifth of a mile, and likely have a significant positive impact on walking within the corridor, by reducing travel distances, and increase safety by reducing unprotected crossings (jaywalking).

The added distance may also tempt pedestrians to cross in a non-protected area, dodging moving cars (sometimes referred to as jaywalking). Jaywalking has been identified as a major factor in pedestrian fatalities, with most fatalities occurring at

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[16] Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: density, diversity, and design. *Transportation Research Part D: Transport and Environment*, *2*(3), 199-219.

[17] Nehme EK, Pérez A, Ranjit N, Amick B, Kohl III HW. Sociodemographic factors, population density, and bicycling for transportation in the U.S. Journal of Physical Activity & Health. In Press.

[18] Agrawal, A. W., & Schimek, P. (2007). Extent and correlates of walking in the USA. *Transportation Research Part D: Transport and Environment*, *12*(8), 548-563.

[19] Litman, T. (2010). Short and sweet: Analysis of shorter trips using national personal travel survey data.

mid-block locations.[20] Installation of protected crossings has been shown to decrease the incidence of unprotected crossings, and increase the perception of safety and convenience.[21]

The proposed recommendations would reduce the maximum added distance to reach a protected crossing to less than one-fifth of a mile. Increased safe crossing opportunities would likely have a significant positive impact on walking within the corridor, by reducing travel distances, and increase safety by reducing unprotected crossings (jaywalking).

*Improved safety of existing intersections*

Safety of roadway crossings have direct effects on health in terms of injury risk, and an indirect effect via its influence on active travel. From 2009 to 2014, at least 750 motor vehicle crashes occurred on South Lamar in the vicinity of intersections, including at least fifty involving pedestrians or bicyclists.[22] Safety of roadway crossings has been identified as an important factor in determining whether a person will walk or bike, particularly for children and the elderly.[23,24] Improving the safety of intersections will likely reduce injury risk and encourage more active travel along South Lamar.

Intersection improvements may also influence the decision to walk or bike to the many popular destinations (such as schools, recreation facilities, and a library) within close proximity to South Lamar (see Figure 5). For many, accessing these locations requires crossing South Lamar. HIA survey results indicated that many

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[20] Kar, K., & Gajula, S. (2008). Focusing on Pedestrian Safety. *Public Roads*,*71*(6).

[21] Havard, C., & Willis, A. (2012). Effects of installing a marked crosswalk on road crossing behaviour and perceptions of the environment. *Transportation research part F: traffic psychology and behaviour*, *15*(3), 249-260.

[22] Data source: Texas Department of Transportation (TxDOT)

[23] Carlson, J. A., Sallis, J. F., Kerr, J., Conway, T. L., Cain, K., Frank, L. D., & Saelens, B. E. (2014). Built environment characteristics and parent active transportation are associated with active travel to school in youth age 12–15. *British Journal of Sports Medicine*, *48*(22), 1634–1639.

[24] Kerr, J., Rosenberg, D., & Frank, L. (2012). The role of the built environment in healthy aging community design, physical activity, and health among older adults. *Journal of Planning Literature*, *27*(1), 43-60.

motor vehicle trips to these neighborhood destinations would be replaced by active travel trips with improved transportation infrastructure. For example, 30% of respondents reported weekly travel to the Twin Oaks Library on West Mary, less than one-half mile from South Lamar. Of these, 47% said they always drive, and 69% said they would drive less often in ideal walking and biking conditions.

Many supportive environmental features currently exist in the immediate vicinity of the library, including sidewalks, bike lanes, and a four-way intersection with curb cuts and pedestrian crosswalks. However, the sidewalk does not extend the entire half-mile to South Lamar (leading to many pedestrians in the bicycle lane), the intersection at South Lamar does not have pedestrian crosswalks on the south side, and the bicycle lane ends at South Lamar, with no accommodation for merging into motor vehicle traffic. Further, the intersection is confusing for motorists, due to the lack of alignment of Mary Street (to the east) with Hether Street (to the west). Therefore, the proposed intersection improvements will fill an important gap in the safety of travel by foot or bicycle, as well as provide an additional location to cross South Lamar (at Collier Street/Evergreen Avenue), and likely lead to an increase in active travel to destinations in the overall South Lamar corridor area.

### 5.4. Improvements to Bicycle Facilities

**Corridor Study Recommendations:** Installation of a separated facility for bicyclists on both sides of Lamar Boulevard. This facility would be one-way on each side of South Lamar up to Barton Springs, and two-way on both sides of South Lamar north of Barton Springs. Bicycle facilities would be separated from motor vehicle traffic by either a 12” concrete barrier or a 7-8’ landscaped area (including trees).

**Current conditions:** Unprotected, striped (painted) bicycle lanes exist for the middle 70% stretch of South Lamar. From Treadwell north on the northbound side of South Lamar and from Barton Springs north on the southbound side of South Lamar, and from Panther Trail south to Ben White, no bicycle lanes currently exist. The lack of bicycle lanes on the north end creates a gap in the connection to

downtown Austin from South Lamar as well as Barton Springs Boulevard, a roadway with protected bicycle lanes to the east of South Lamar and a striped lane to the west. The lack of bicycle lanes on the southern end limits bicycle connectivity to popular commercial destinations, including the two full-service grocery stores on the corridor. Further, the entire corridor lacks adequate bicycle parking. Few businesses have bicycle racks, and public racks are limited to a few spaces at transit stops.

**Potential health-related effects of recommended improvements:**

Studies in the U.S. have demonstrated a stated preference for bicycle facilities that provide physical separation from motor vehicle traffic over striped lanes by current and would-be bicyclists.[25] Similar results were found in a study undertaken by the City of Austin,[26] with an Austin-representative sample of adults expressing greater comfort at the prospect of bicycling on a major urban street with four traffic lanes and speeds of 30-35 miles per hour on a protected bike lane in comparison to a striped bike lane. A before-and-after study of protected bike lanes (including two in Austin) found that roadways with striped bike lanes at baseline experienced an increase of 21%-126% in bicycle trip volume after protected bike lane installation.[27]

One-quarter of surveyed bicyclists who were intercepted while riding on one of the protected lanes included in the study reported that their overall frequency of bicycling increased after the protected bicycle lane was installed, and 49% reported an increase in using the route. In terms of safety, while no studies were found that compared protected bicycle lanes with striped bicycle lanes, protected bicycle lanes have been shown to be both safer (28% lower injury rate) and more

[25] Winters, M., & Teschke, K. (2010). Route preferences among adults in the near market for bicycling: findings of the Cycling in Cities study. *American journal of health promotion*, *25*(1), 40-47.
[26] Roberts D. & Durbin L. (2013). City of Austin Urban Trails Master Plan Telephone Study.
[27] Monsere, C., Dill, J., McNeil, N., Clifton, K., Foster, N., Goddard, T., … & Parks, J. (2014). Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the US.

used (2.5 times as many cyclists) than comparable streets without bicycle infrastructure.[28]

The results of the HIA community survey found that while only 1.7%-9.2% of respondents reported always using a bicycle to reach various street segments on South Lamar, between 49-69% of respondents said they would bike more often to those street segments under ideal conditions for bicycling (street segments shown in Figure 5; complete results given in Table 3). Likewise, while only 4% said they currently commute by bicycle, 49% said they would bike more often under ideal conditions. Given the stated preference of Austinites for protected bicycle lanes over striped bicycle lanes on roadways such as South Lamar, and the strong interest expressed by study area residents in travelling more by bicycle on South Lamar, the installation of protected bicycle lanes the length of South Lamar is likely to have a significant positive effect on bicycling for transportation among study area residents.

### 5.5. Sidewalk Infrastructure

**Corridor Study Recommendations:**

1. Wide sidewalks, buffered from the roadway by street trees and protected bicycle lanes, constructed the full length of the corridor.

2. Sidewalks should be constructed along cross streets for pedestrians to provide better connectivity and to access South Lamar Boulevard via cross streets.

3. Reduce existing driveway width and number of existing driveways

In addition, several policies have been proposed that would affect sidewalk infrastructure, including the requirement that redevelopment comply with underlying zoning setback, preserving ROW for other proposed improvements.

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[28] Lusk, A. C., Furth, P. G., Morency, P., Miranda-Moreno, L. F., Willett, W. C., & Dennerlein, J. T. (2011). Risk of injury for bicycling on cycle tracks versus in the street. *Injury prevention*, *17*(2), 131-135.

**Current conditions:**

Although a quantitative assessment of the corridor walking environment was not undertaken, an informal, qualitative assessment was undertaken by the corridor study team. Through this process, the following conclusions were drawn. With the exception of a short segment on the northwest of the corridor, sidewalks exist on the full length of the corridor. In a few sections, wide sidewalks buffered by street trees have recently been installed, in compliance with current City of Austin codes (Subchapter E) affecting redevelopment (for example, see Figure 12). However, the vast majority of the sidewalks are narrow in width, are often adjacent to the roadway, in disrepair, and lacking ramps at roads and driveways, which limits access for people in wheelchairs or pushing strollers. Further, many properties have curb cuts that extend nearly the full width (for example, see Figure 12), requiring pedestrians to traverse extended driveways.

**Potential health-related effects of recommended improvements:**

Proposed improvements would have a positive effect on safety, physical activity, and opportunities for social interaction. A review of studies that examined how the attributes of the physical environment affect physical activity behaviors found sidewalk availability to be positively associated with walking for transportation for both adults and children.[29,30] However, the quality of sidewalks, including width, maintenance, buffering from road traffic, and presence of ramps, are important factors in the degree to which sidewalks facilitate walking, particularly for the elderly and mobility-impaired.[31,32] Wide sidewalks may have a direct positive

[29] Sugiyama, T., Neuhaus, M., Cole, R., Giles-Corti, B., & Owen, N. (2012).Destination and route attributes associated with adults' walking: a review. *American College of Sports Medicine.*

[30] Panter, J. R., Jones, A. P., & van Sluijs, E. M. (2008). Environmental determinants of active travel in youth: A review and framework for future research. *International Journal of Behavioral Nutrition and Physical Activity*,*5*(1), 34.

[31] Clarke, P., & Nieuwenhuijsen, E. R. (2009). Environments for healthy ageing: a critical review. *Maturitas*, *64*(1), 14-19.

[32] Moran, M., Van Cauwenberg, J., Hercky-Linnewiel, R., Cerin, E., Deforche, B., & Plaut, P. (2014). Understanding the relationships between the physical environment and physical activity in older adults: a systematic review of qualitative studies. *Int. J. Behav. Nutr. Phys. Act*, *11*, 79.

influence on the social environment by allowing people to walk comfortably side by side and to pause in conversation without blocking passage for others.

### 5.6. Greenspace and Street Trees

**Corridor Study Recommendations:**

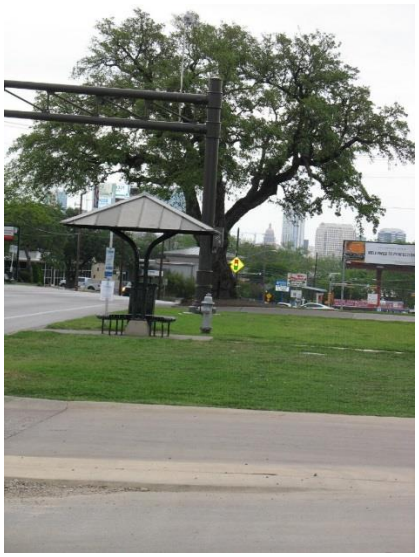
The designs proposed by the corridor study team include the addition of trees both within the roadway median and in greenspaces that buffer sidewalks from roadways. In sections with wider ROW, rain gardens are included in the roadway buffers.

**Current conditions:**

While the northern end of the corridor connects to large regional parks, public greenspace along the rest of the corridor is minimal. Although a number of mature "heritage" trees exist in close proximity to the roadway (see examples in Figure 12), existing landscaping and tree canopy is limited along the corridor. Fig. 13 shows the tree canopy of the corridor area. A lack of safe railway crossing blocks connectivity between South Lamar and the Bouldin Creek greenbelt, which lies less than 1000 feet to the east and runs parallel to the corridor (see Figure 8).

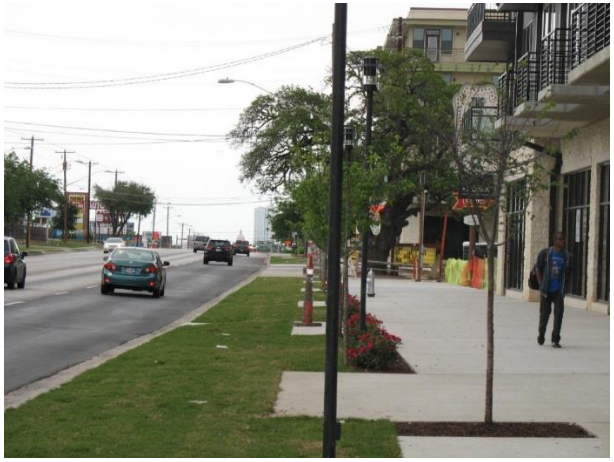
## Figure 12. Examples of landscaping and pedestrian environment along South Lamar corridor

Existing tree canopy at Capital Metro transit stop near Panther Trail.



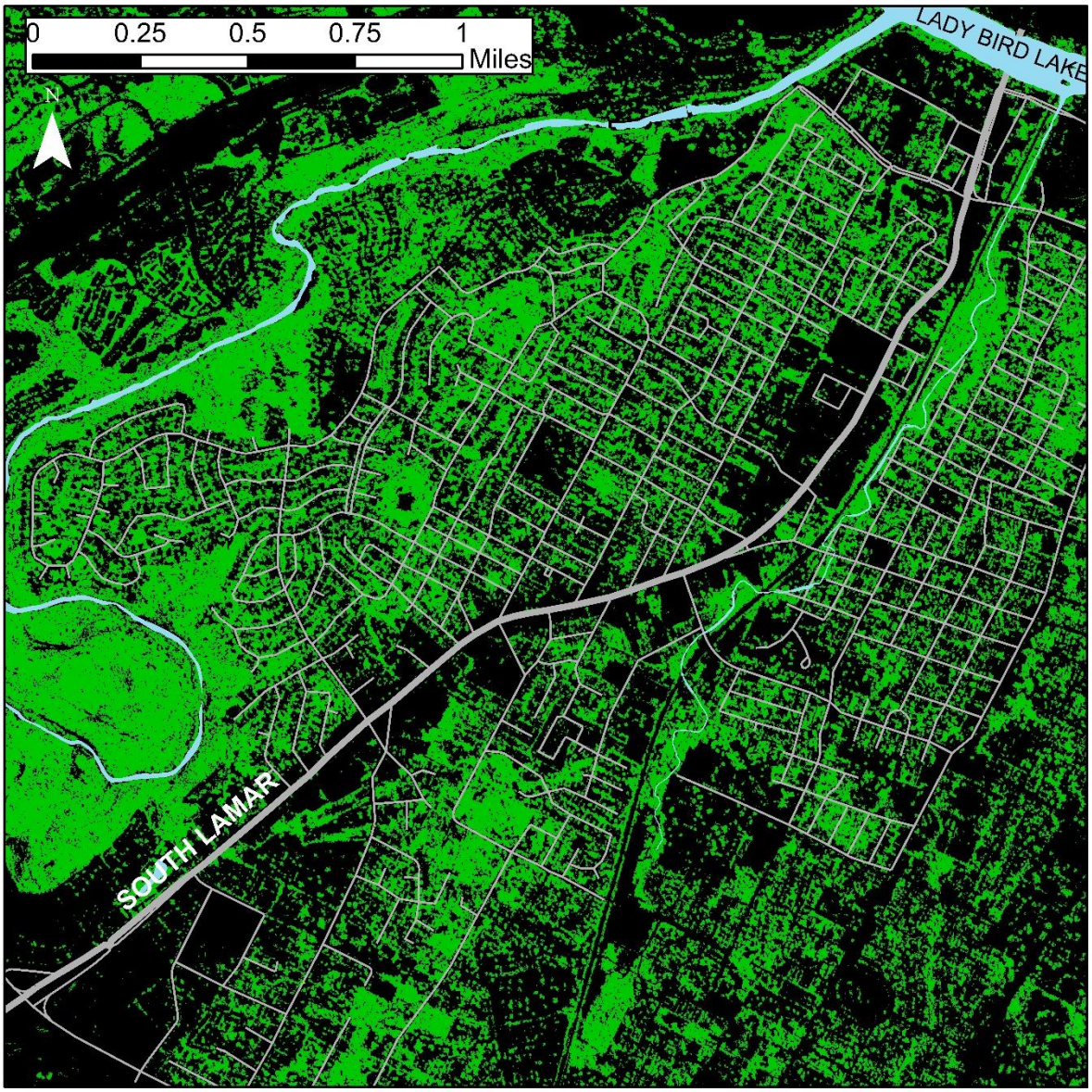
Heritage tree near Dickson Drive.


Example of wide driveways along the corridor, between Barton Skyway and Manchaca Road.



Newly redeveloped section with wide sidewalks, street trees, and green buffer from roadway.

Figure 13. Tree canopy along South Lamar corridor




**Potential health-related effects of recommended improvements:**

Although rigorous research on health-related effects of urban green space is limited, a systematic review found generally consistent evidence that urban green spaces are positively associated with physical activity, mental health, and social

interactions.[33] Living in areas with street trees has been found to be associated with reduced risk of childhood asthma.[34] Green space, and trees in particular, can also have a protective effect on heat-related illnesses, to which the young and old are especially vulnerable. The public health impacts of heat-related illness are expected to rise as climate change increases the frequency and intensity of heat waves.[35] Urban heat islands - the difference in temperature inside and outside of urban areas - are a contributing factor in the impact of heat and heat waves on human health.[36,37] The planting of trees has been identified as an important strategy in reducing the urban heat island effect and mitigating the effects of heat on human health.[38,39] Most recently, tree canopy has been linked to social capital.[40]

The COA Urban Trails study found that 50% of respondents reported an interest in bicycling for transportation more than they currently do. Forty percent of those physically able to ride a bicycle reported that a lack of available shade was a deterrent in bicycling more.[41]

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[33] Lee, A. C. K., & Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health*, *33*(2), 212-222.

[34] Lovasi, G.S., J.W. Quinn, K.M. Neckerman et al. (2008_. Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology and Community Health 62*, 647-49.

[35] USGCRP (2009). *Global Climate Change Impacts in the United States.* In Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). United States Global Change Research Program. Cambridge University Press, New York, NY, USA.

[36] Kovats, R. S., & Hajat, S. (2008). Heat stress and public health: a critical review. *Annu. Rev. Public Health*, *29*, 41-55.

[37] Tan, Z., et al. (2010). The urban heat island and its impact on heat waves and human health in Shanghai, *International Journal Biometeorol, 54*, 75–84,

[38] Rosenzweig, C., et al. (2006). Mitigating New York City's heat island with urban forestry, living roofs and light surfaces, Final Report, New York State Energy Research and Development Authority, Contract #6681, New York.

[39] Bowler, D., Buyung-Ali, L., Knight, T., & Pullin, A. S. (2010). How effective is 'greening' of urban areas in reducing human exposure to ground level ozone concentrations, UV exposure and the 'urban heat island effect'. *Environmental Evidence.*

[40] Holtan, M. T., Dieterlen, S. L., & Sullivan, W. C. (2015). Social Life Under Cover Tree Canopy and Social Capital in Baltimore, Maryland. *Environment and Behavior*, *47*(5), 502-525.

[41] Roberts D. & Durbin L. (2013). City of Austin Urban Trails Master Plan Telephone Study.

# 6. RECOMMENDATIONS

## 6.1 Built Environment Recommendations

1. **Consider implementing a speed limit of 25-30 mph** in specific segments or during specific times where heavy pedestrian/bicyclists activities are expected along South Lamar should be considered. Research indicates that for both safety and encouragement of physical activity, a speed limit below the recommended 35mph would be preferable.

2. **Complete crosswalks/crossing lights for all four sides of existing intersections.** Many have crosswalks on only three of four sides. (See Figure 11)

3. **Increase the availability of bicycle parking** throughout the corridor through policies targeting private businesses as well as the provision of public bicycle parking (e.g. bike corrals).

4. **Construct a pedestrian/bicyclist crossing of the railroad tracks at Treadwell.** Such a crossing would substantially increase access (via active transportation) to Lamar destinations, including the Rapid Transit Lamar Square Station, and increase access to the Bouldin Creek greenbelt/park. For cyclists travelling to or from the neighborhood west of South Lamar, this crossing would provide an off-Lamar route to the protected bicycle facility on Barton Springs east of the South Lamar intersection, and would connect bicyclists to the bicycle facility on Treadwell, west of South Lamar. A crossing at this location was proposed by community members at the public open houses.

5. **Create pocket parks along South Lamar** in areas where existing ROW allows, such as the 2500 block, just south of Bluebonnet Street. Building spaces at transit stops leverages and support existing activity and resources.

6. **Take steps to preserve and care for existing heritage trees** on South Lamar, particularly during any infrastructure installations that may affect the tree root zones.

7. **Develop improvements for southernmost section of the corridor.** The South Lamar/Ben White intersection is a designated Activity Center per Imagine Austin, includes a BRT stop, is a regular destination of many people in the study area (as reported by the HIA survey), provides access to a host of community resources including two full-service grocery stores. Given this significance, greater multimodal access in this area is needed. At minimum, the inclusion of a pedestrian island or other enhancement to facilitate crossing at Brodie Oaks should be included in the overall recommendations.

## 6.2. Prioritization of Improvements

Given the trajectory of growth in population and destinations in the area, short-term actions are essential to achieve the vision for South Lamar as a healthy, active, multimodal corridor as detailed in the Imagine Austin comprehensive plan. The following is a list of improvements are recommended for completion in the first 3-12 months following plan adoption.

1. Implement proposed policy recommendations related to redevelopment to ensure sidewalks are set back far enough to allow future installation of all features of recommended roadway cross-sections.

2. As speed limit reductions are a relatively low-cost strategy that can have a positive impact on public health, their implementation should be included in the short-term improvements for the corridor.

3. The installation of additional crossings in accordance with study recommendations should be a high priority for implementation, beginning with a signal at Collier Street/Evergreen Avenue, due to its location on the longest stretch of South Lamar without a signalized crossing (2400 feet) and its ability to provide an alternative crossing to the problematic Mary/Hether intersection.

4. In the short-term, fill in gaps in existing unprotected bicycle lanes, beginning with implementation of the study recommendations for bike facilities between Treadwell and Riverside.

5. Implement study design recommendations for sidewalks in areas with existing gaps.

In addition to the above list of short-term priorities, it is recommended that full implementation of the proposed intersection modifications (roundabouts to reroute motor vehicle traffic to nearby intersections and prohibition of specific movements for motor vehicles) begin with the Bluebonnet/Lamar intersection. This recommendation is based on the findings of the preliminary analysis of current conditions, as described in section 4.3.

## 6.3. Establish Health-Related Indicators to Assess Change

In order to understand baseline conditions and monitor changes over time, a set of health-related indicators should be selected and clearly defined, and a protocol for measurement and data collection established and implemented. The following is a list of indicators identified in the Imagine Austin Comprehensive Plan (p. 225-226) that are of potential relevance to public health and to the South Lamar corridor study:

- Number of farmers markets, farm stands, and mobile health food carts
- Parks and open space (acres per capita)
- Households within ½ mi distance of park or accessible open space
- Transit ridership (percentage of trips)
- Vehicle miles traveled (total and per capita)
- Bicycle miles traveled (total and per capita)
- Sidewalks (linear miles and % street frontages with sidewalks)
- Bicycle lanes (linear miles)
- Households within ¼ and ½ mile of transit and high capacity transit

Many of these indicators, and others such as counts of pedestrian and bicyclists, can collected by implementing the following two strategies.

**Conduct a robust walk audit of the ½ mile South Lamar walkshed.** As part of the HIA study, a 0.5-mile South Lamar walkshed was created (see section 4.2.2). In the interest of allowing the South Lamar corridor residents to derive the most benefit from the corridor improvements, transportation infrastructure improvements that serve the walkshed would be highly recommended. To do this, baseline diagnostics of the walkshed is needed. Consequently, we propose that the City of Austin should conduct a detailed walk audit for South Lamar corridor walkshed. Such a walk audit will allow the City to objectively document current conditions of both the corridor itself as well as the 0.5 mile walkshed, identify gaps in facilities, and prioritize needed improvements.

Specifically, a walk audit would produce both qualitative and quantitative descriptions of micro-scale built environment features related to public health. Several standardized tools currently exist that can be employed by a team of trained observers, which could include volunteers from the community.[42] For evaluation and monitoring purposes, the audit could be repeated at intervals (2-3 years).

**Establish a system to collect bicyclist and pedestrian travel data** using a combination of automated and manual counts. Robust data on bicycle and pedestrian traffic would greatly enhance understanding of spatial and temporal patterns in bicycle and pedestrian travel along the corridor and changes over time. Existing technology in place on South Lamar – a Wavetronix unit located across the street from Dickson Drive – may have the capability of providing automated counts of bicyclists traveling both north and south. In order to utilize this resource, the City of Austin should develop, test, evaluate, and document a system to collect, store and utilize data on bicycle trips obtained through this device. Doing so would have implications for collecting data on bicyclist travel throughout Austin. To complement automatic data collection and establish a

[42] For a list of available tools, see: http://activelivingresearch.org/toolsandresources/toolsandmeasures

baseline for future evaluation, a comprehensive assessment of bicycle and pedestrian travel utilizing manual counts should be undertaken. These data would allow monitoring over time and assessment of change, as well as facilitate estimates of change in physical activity behaviors resulting from infrastructure improvements.

# 7. Strengths and Limitations

The current HIA study was undertaken simultaneously with the development of transportation study recommendations, which had the benefit of providing preliminary information on health considerations at an early stage of project development, and ensuring health was considered in the proposed transportation study recommendations. A more detailed and precise assessment of health impacts and benefits of proposed improvements would require greater lag time between the completion of design alternatives and the commencement of the HIA. In addition, quantitative assessments of health-related changes would require data that are not currently available. Recommendations related to data collection for this or future corridor studies are offered in section 6.3 (i.e. a robust walk audit and active transportation counts).