A Health Impact Assessment of Non-Motorized Transportation Improvements in East Lansing

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Michigan Department of Community Health
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Prepared by

Public Sector Consultants Inc.
Lansing, Michigan
www.pscinc.com

PSC
PUBLIC SECTOR CONSULTANTS

Project Team

Shanna Draheim, Public Sector Consultants
Harmony Gmazel, Tri-County Regional Planning Commission
Janine Sinno, Ingham County Health Department
Dave Smith, City of East Lansing
Jeri Stroupe, Public Sector Consultants

Advisory Group

Kelly Arndt, City of East Lansing
Karen Jennings, Michigan Department of Community Health
Babette Krause, East Lansing Public Schools
Tracy Moreno, Marble Wellness Committee
Sue Pigg, Tri-County Regional Planning Commission
Dominic Smith, Michigan Department of Community Health
Todd Sneathen, City of East Lansing
Michael Thomas, Land-Use and Health Resource Team
Bethany Waterbury, Michigan Department of Community Health
Jessica Yorko, Ingham County Health Department

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Contents

Introduction

BACKGROUND

In March 2012 the Ingham County Health Department, with support from the City of East Lansing, the Tri-County Regional Planning Commission, and the Marble Elementary Wellness Committee, received funding from the Michigan Department of Community Health to conduct a Health Impact Assessment (HIA) of key non-motorized transportation elements of the City of East Lansing's Climate Sustainability Plan (CSP) and Non-Motorized Transportation Plan (NMTP). The Health Department hired Public Sector Consultants to help conduct the HIA and develop the HIA report.

Photo courtesy Safe Routes to School California.

Both the NMTP and CSP propose a number of transportation infrastructure and program changes aimed at increasing the amount of non-motorized transportation used for travel within and through the City primarily by improving the safety and aesthetic character of the walking and biking environment.[1] This HIA focuses on NMTP and CSP recommendations that could affect the health of residents and visitors in the Burcham Drive and Hagadorn Road intersecting corridors – a primary route between East Lansing's core historic neighborhoods, primary schools, and Michigan State University.

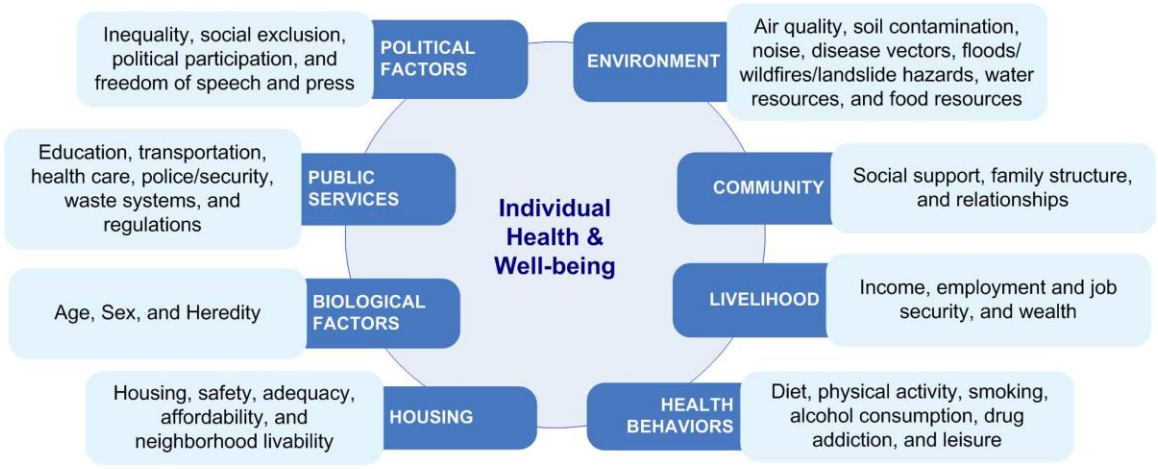
WHAT IS A HEALTH IMPACT ASSESSMENT?

A health impact assessment is "a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a proposed project, plan, or policy on the health of a population and the distribution of those effects within the population. An HIA identifies appropriate actions to manage those effects" (Quigley et al. 2006).

An HIA provides decision-makers with information about potential positive and negative health effects of a proposed program, policy, or project; increases stakeholder participation in the planning process; identifies community health concerns; and provides a model for future transportation and infrastructure planning. Exhibit 1 demonstrates some of the factors that contribute to overall health and well-being for individuals and communities, also known as health determinants, which can be evaluated as part of an HIA.

[1] Throughout this report, the terms walkable and bikeable environment or walkability and bikeability are used to describe the overall ability to use non-motorized transportation, including scooters, skates, skateboards, or any other self-propelled transportation mechanism.

EXHIBIT 1. Determinants of Health and Well-being



SOURCE: Adapted from: R. Bhatia, "Health Impact Assessment: A Guide for Practice," Oakland, CA: Human Impact Partners, 2011.

There are generally six steps involved in conducting a health impact assessment, including:

1. **Screening:** Identify projects or policies for which an HIA would be useful, and determine which aspects of the East Lansing Climate Sustainability Plan in East Lansing to evaluate.
2. **Scoping:** Determine which health effects to consider and develop a map of pathways to describe relationships between inputs and outputs. (e.g., the impact of *x* on *y*).
3. **Assessment:** Identify the appropriate and necessary data sources and methods that will be used to quantify and describe current or existing conditions. Use available data, resources, and literature to describe the predicted health impacts.
4. **Recommendations:** Develop evidence-based recommendations to mitigate negative and maximize positive health impacts. Prioritize recommendations based on feedback from experts, community, and stakeholders.
5. **Reporting:** Develop the HIA report and present findings and recommendations to relevant stakeholders, interested parties, and decision-makers.
6. **Monitoring:** Monitor the decision, implementation, health determinants, and outcomes affected by the decision.

Stakeholder engagement is a core element throughout the entire process, particularly during the scoping phase. This HIA addresses steps one through five above.

WHY FOCUS ON HEALTH?

The built environment plays a significant role in protecting and improving human health. It affects the overall quality of air, water, and natural resources, plays a role in how accessible and appealing our streets and sidewalks are for biking or walking, contributes to the community's aesthetic character, and affects how and when people travel between destinations. All of these environmental and behavioral connections impact people's health and wellness.

Traditionally when transportation, land-use, or other development projects are planned, the economic and environmental impacts (such as water quality, wastewater management, air quality, and hazardous waste) of various alternatives are evaluated. Health issues are sometimes identified or discussed in the environmental evaluation, but rarely in much detail and usually only as they relate to environmental pollutants or exposure. When making decisions about transportation infrastructure in particular, there are significant opportunities to address not only traffic flow and environmental issues, but to make investment decisions that improve human health as well. The introduction of HIAs into project evaluations broadens the definition and scope of health issues to be evaluated to include impacts on physical activity, injury prevention, noise, social capital, health equity, and regional growth objectives.

The proposed programs and infrastructure improvements recommended in the NMTP and CSP have the potential to improve health by reducing people's exposure to air contaminants, increasing their activity levels, decreasing stress and improving mental health, and reducing their risk of injury or accident.

As the City of East Lansing prioritizes its investments in motorized and non-motorized transportation infrastructure, it should consider the social and economic benefits from improving health conditions from those investments, particularly in areas with vulnerable populations such as children and the elderly. This report is intended to help policy advocates and decision-makers in East Lansing and Ingham County evaluate, prioritize, and implement recommended non-motorized transportation infrastructure investments that have been identified in the NMTP, CSP, and other related community plans.

Screening the HIA

The Ingham County Health Department organized a project team to discuss how an HIA might help decision-makers further evaluate and prioritize transportation improvements included in the City of East Lansing's NMTP and CSP, both of which had recently been approved by the East Lansing City Council. The NMTP and CSP make city-wide recommendations related to programming and infrastructure that could help increase the use of non-motorized transportation by residents, businesses, and visitors. For the NMTP, this objective is tied to improving safety, increasing the activity level of residents, and reducing long-term transportation maintenance costs. For the CSP, this objective is tied to reducing emissions from vehicles that contribute to climate change.

Other than some discussion of safety, the plans do not explicitly evaluate or discuss the potential health benefits of making investments in non-motorized transportation infrastructure. The project team determined that an HIA would provide an opportunity to examine the potential health impacts of proposed NMTP and CSP alternatives to help further refine and improve those infrastructure investments and help the City prioritize funding for projects that provide health as well as environmental and economic benefits.

To narrow the focus for this HIA, the Burcham-Hagadorn corridor was chosen as the study area due to the high number of children, young adults, and elderly people living in and visiting the corridor each day whose health might be particularly affected by motorized vehicle use.

OVERVIEW OF THE PLANS TO BE EVALUATED

Non-Motorized Transportation Plan

Approved in May 2011 after extensive research and public engagement activities, the NMTP surveyed and evaluated the existing conditions in East Lansing related to pedestrian and bicycling environment and non-motorized trip characteristics, and then recommended infrastructure improvement policies and programs to improve the non-motorized transportation system in East Lansing, including:

- Additional and improved street crossings
- Additional bike lanes, paths, and marked bike routes
- Sidewalk improvements
- Traffic calming devices
- Lane consolidation
- Education and outreach

The plan prioritized suggestions into near-term and long-term actions. Near-term improvements were further categorized into first, second, and third tier priorities.

Climate Sustainability Plan

The CSP was approved by the City Council in April 2012, and identifies long- and short-term goals and recommended policies, programs, and practices for the community to reduce its contribution to global climate change and improve its local environment. Objective 4.1 of the Plan calls for the City to reduce greenhouse gas emissions by encouraging non-motorized transportation. The Plan supports creating physical and social environments that are conducive to biking and walking, and specifically calls for implementing the recommended policies and programs of the NMTP. It also recommends expanding the

City's bike share program to include residents (City of East Lansing 2012). As the CSP points out, non-motorized transportation options such as walking and biking are often overlooked despite being the most accessible and affordable alternatives to petroleum use. In 2001, the National Household Travel Survey found that half of all trips in metropolitan areas are three miles or less, and almost one-third of all metropolitan trips are one mile or less—a distance easily traversed by foot or bicycle (City of East Lansing 2012).

Other Related Plans

While not the primary focus of this HIA, there are several other related plans or policies that could be informed by the results of this HIA. These include:

- **Complete Streets**. In the fall of 2010, the State of Michigan adopted Complete Streets legislation. The complete streets legislation was in the form of two bills, Public Acts 134 and 135. The bills designate cities, counties, and state transportation agencies as responsible for project planning that adopts Complete Streets design. Complete Streets are defined as "roadways planned, designed, and constructed to provide appropriate access to all legal users...whether by car, truck, transit, assistive device, foot or bicycle" (MDOT 2012).

  The City of East Lansing adopted a Complete Streets Ordinance on March 28, 2012. The intent of the ordinance is to "encourage healthy, active living, reduce traffic congestion and fossil fuel use, and improve the safety and quality of life of residents of City of East Lansing by providing safe, convenient, and comfortable routes for walking, bicycling, and public transportation" (City of East Lansing 2012). There is no provision in the ordinance to allocate funds for Complete Streets infrastructure.

- **Safe Routes to School.** The Marble Elementary Parent Council and the City of East Lansing set forth a Resolution of Support for the Safe Routes to School Program in 2011 and created an Action Plan for the 2010 and 2011 school year. The Marble Safe Routes to School Plan recommendations include:
  - Reduced speed zones
  - Marked crosswalks
  - Signalized crossings at intersections with pedestrian activation
  - Pedestrian crossing islands and bulb outs where needed
  - Special crosswalk striping, painted according to state standards, and "School Crossing" signage where appropriate

  In addition, the plan encourages walking school buses[2], texting and driving bans, and increased city enforcement of traffic speeds.

- **School Transportation Policy.** According to the U. S. Department of Transportation's 2009 National Household Travel Survey, almost half of children 5 to 14 years of age (48 percent) usually walked or bicycled to school in 1969, whereas only 13 percent of children in the same age group walked or bicycled to school in 2009. Even among children who live within a mile of their school, only 38 percent walk or bicycle to school, compared to 87 percent who walked or biked in 1969 (U.S. DOT, 2009). In many communities around the country, schools have policies in place that prohibit students from biking to school.

  East Lansing Public Schools currently provides busing for students who live greater than a mile and a half from school. In addition to busing, students at East Lansing High School and MacDonald Middle

[2] Walking school buses are organized groups of students walking to school, often using a structured or planned route that adds additional kids to the "bus" at each stop.

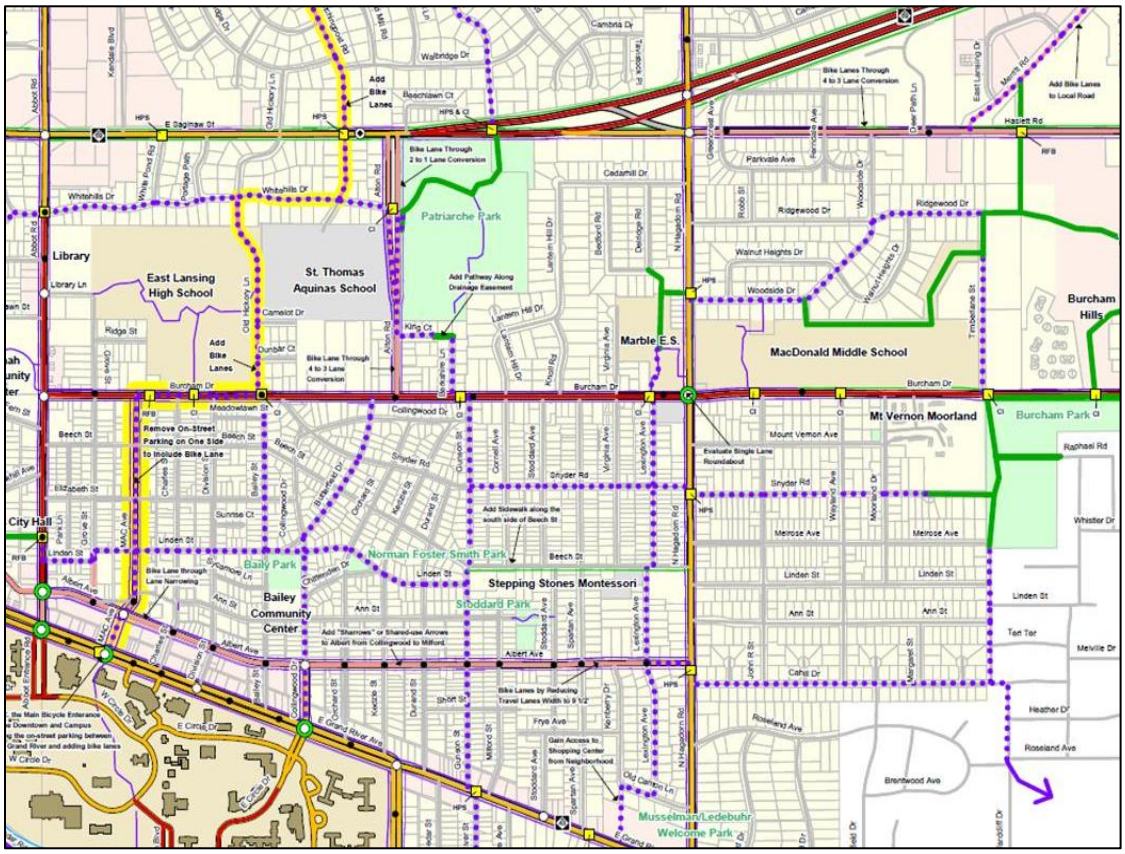
School can walk, drive (or be driven), or ride bikes to school. Sophomores, juniors, and seniors can drive themselves and must purchase an annual $60 parking pass to do so. At the K–6 elementary level (including Marble Elementary within the study corridor), students walk or are bussed or driven to school. The school district prohibits bicycling to school, even accompanied by parents or other adults.

- **Zoning Code.** East Lansing Code of Ordinances sets standards for sidewalk design, requirements for keeping at least five feet of sidewalk space clear, snow removal from sidewalks, and requirements for property owners to keep sidewalks maintained and free of litter (City of East Lansing 2012). These provisions of the zoning code are an important part of keeping sidewalks safe and accessible, and if not enforced, could impede people's ability or willingness to walk or ride their bikes within the study corridor (and city as a whole).

ABOUT THE STUDY AREA

Exhibit 2 shows the study area for the HIA project. It extends 1.8 miles east to west, .8 miles north to south along Abbott Road on the west, and 1.5 miles north to south along Park Lake Road on the eastern border. Burcham and Hagadorn intersect at the center of the study area; Burcham running east-west and Hagadorn running north-south.

EXHIBIT 2. Study Area



SOURCE: City of East Lansing Non-Motorized Transportation Plan. 2011

Study Area Population

There are 48,579 residents in the City of East Lansing (U.S. Census Bureau 2012). The Burcham-Hagadorn Corridor, which falls into all or parts of three census tracts, is home to between 17 and 27 percent of the city's total population. Exhibit 3 shows the population and ethnicity for the study corridor based on these three census tracts.

EXHIBIT 3. Summary of Population Demographics in Study Area

Census Tract	Number of Residents	Percentage of White	Black or African American	Asian	Other Ethnicity
Census Tract 39.02	4,380	83.7%	7.4%	4.2%	4.7%
Census Tract 43.01	3,759	89.5	2.1	4.0	4.4
Census Tract 41	4,781	92.7	1.1	3.4	2.8

SOURCE: City of East Lansing, October 11, 2011.

Socioeconomic Conditions in the Study Area

The median household income in East Lansing is about $17,000 less per year than Michigan's overall median income ($31,167 vs. $48,432); though the unemployment rate is considerably lower than the state average (6.3 percent vs. 11.5). According to the 2010 U.S. Census, East Lansing has a disproportionately high percentage of people with incomes below the poverty level, but this is likely related to the high number of university students living in East Lansing. The city is actually comparable to the rest of the state with regard to percentage below the federal poverty level when considering just the families and children under 18 years of age (11.5 percent of families in East Lansing versus 10.6 percent of families in Michigan) (U.S. Census Bureau 2012).

Vulnerable Populations: Children and Seniors

A substantial number of children live in and/or spend a large amount of their time in the study corridor. According to the 2010 U.S. Census, there are 977 children ages 5 to 17 living in the study corridor (City of East Lansing, October 11, 2011). There are also six primary education (K–12) and/or pre-schools in the study corridor:

- East Lansing High School: 1,137 students ages 13 to 18
- MacDonald Middle School: 528 students ages 11 to 13
- St. Thomas Aquinas Catholic School: 413 students ages 3 to 13 (Guilfoyle, October 31, 2012)
- Marble Elementary School: 361 students ages 4 to 10
- Eastminster Child Development Center: 115 children, generally ages 1 to 5 (Mund, October 31, 2012)
- Stepping Stones Montessori School: 88 children ages 18 months to 12 years (Carlson, October 31, 2012)

This represents a significant vulnerable population of children who live in, travel to, and spend their day in the study corridor.

The corridor is also home to a significant elderly population. Burcham Hills is a senior residence in the northeast corner of this corridor with roughly 300 residents in 38 condominiums called "The Clusters," and up to 188 people in the main building. The average age of Burcham Hills independent and assisted

living residents is about 87, and the average age at the condominiums is about 80. Only a few residents leave the premises each day, and about 25 percent drive themselves. Some residents use Spec-Tran, an on-demand para-transit service provided by CATA, which has a daily stop at Burcham Hills. Burcham Hills also owns two buses and a car that provide transportation options for residents.

Between 350 and 500 seniors attend City of East Lansing Prime Time programs at the Hannah Community Center on weekdays between 8:00 AM and 4:00 PM. According to Prime Time staff, most participants drive to activities themselves.

Community Assets

There are many community assets within and adjacent to the corridor, including schools, community centers, a university, and business and retail outlets. As discussed above, three of East Lansing Public Schools' eight schools are located in the study corridor, as well as three other Pre-K and primary education facilities.

Photo courtesy City of East Lansing.

The Hannah Community Center is at the west end of the corridor, along with some churches, fraternities and sororities, and the East Lansing Public Library. Patriarche Park, a large community park that offers sports facilities, picnic pavilions, and playgrounds, is located in the north central portion of the corridor, just north of Burcham on Alton Street. And, as noted above, the Burcham Hills retirement community is at the northeastern end of the corridor.

The area south of Burcham is also home to numerous businesses, student housing, family homes, religious institutions, and parks, and it borders the campus of Michigan State University. Bailey Community Center, which houses a child care center, numerous community classes, and a playground, is located in the southern part of the corridor. Finally, there are several small pocket parks in the southern part of the corridor.

Scoping Key Health Issues

The scoping phase of the project was used to establish project goals, and to gain an understanding of what health issues are most important to the community and corridor residents and what mechanisms exist to affect those issues through the NMTP and CSP Plan recommendations.

The scoping process began with a meeting of an external Advisory Group (see inside cover of this report for a list of the Advisory Group members) who provided input on key health determinants and conditions in the corridor. Following the meeting with the Advisory Committee, the Project Team hosted a two-hour public scoping meeting on June 21, 2012 at the Hannah Community Center. Invitees to the public meeting included residents in the study area and surrounding neighborhoods; East Lansing City Council; Safe Routes to School coordinators; and representatives from the following organizations: East Lansing Public Schools; City of East Lansing Transportation, Environment, and Seniors Commissions; Ingham County Health Department; City of East Lansing Planning and Public Works Departments; Tri-County Regional Planning Commission; and other regional transportation advocacy organizations. Twenty-three people participated in the scoping meeting.

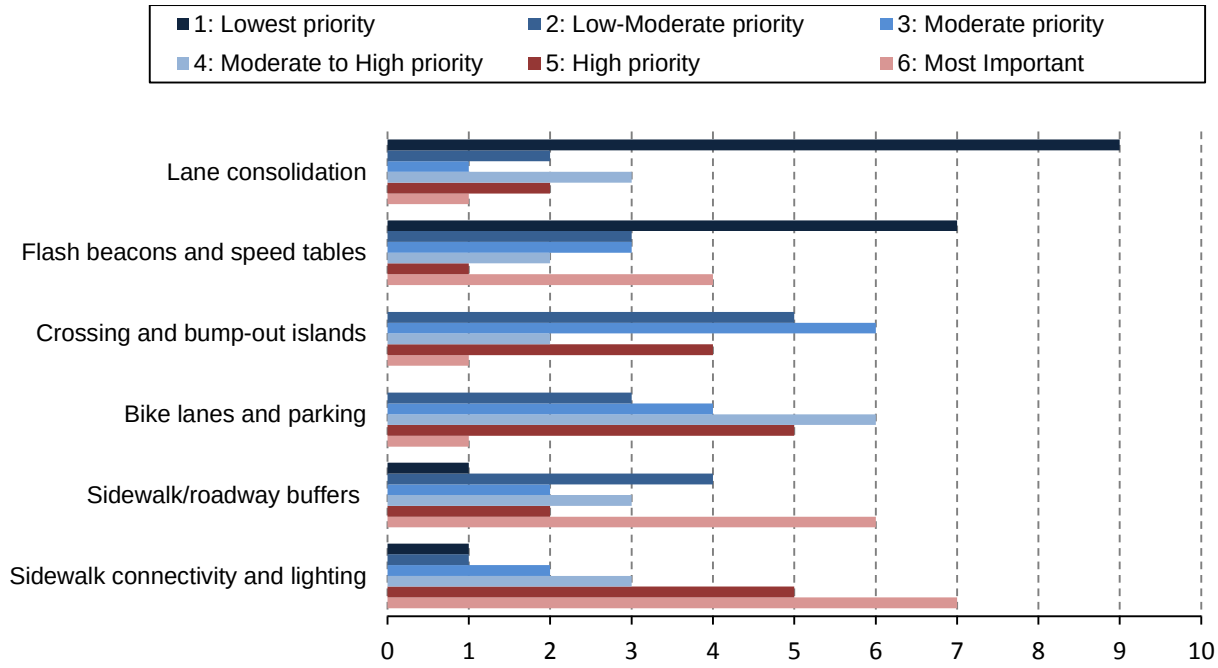
The meeting included a brief overview of the Non-Motorized Transportation Plan, Climate Sustainability Plan, and the Health Impact Assessment process, including a description of the following transportation elements evaluated in the HIA:

- Lane consolidation
- Flash beacons and speed tables (wider, flat speed bump crossings)
- Additional crossings, crossing bump outs and crossing islands
- Bike lanes and parking
- Sidewalk/roadway buffers
- Sidewalk connectivity

Participants worked in small groups to discuss health issues in the study area and broader community, contributing behaviors, and existing conditions, policies, or structures that may lead to healthy (or non-healthy) behaviors. After discussing these topics in small groups, participants reported their findings to the larger group. To prioritize certain issues and focus the discussion, participants then selected the health issue that they felt was most important, and the most closely related behaviors and conditions. A comprehensive list of all of the issues, behaviors, and conditions can be found in Appendix A.

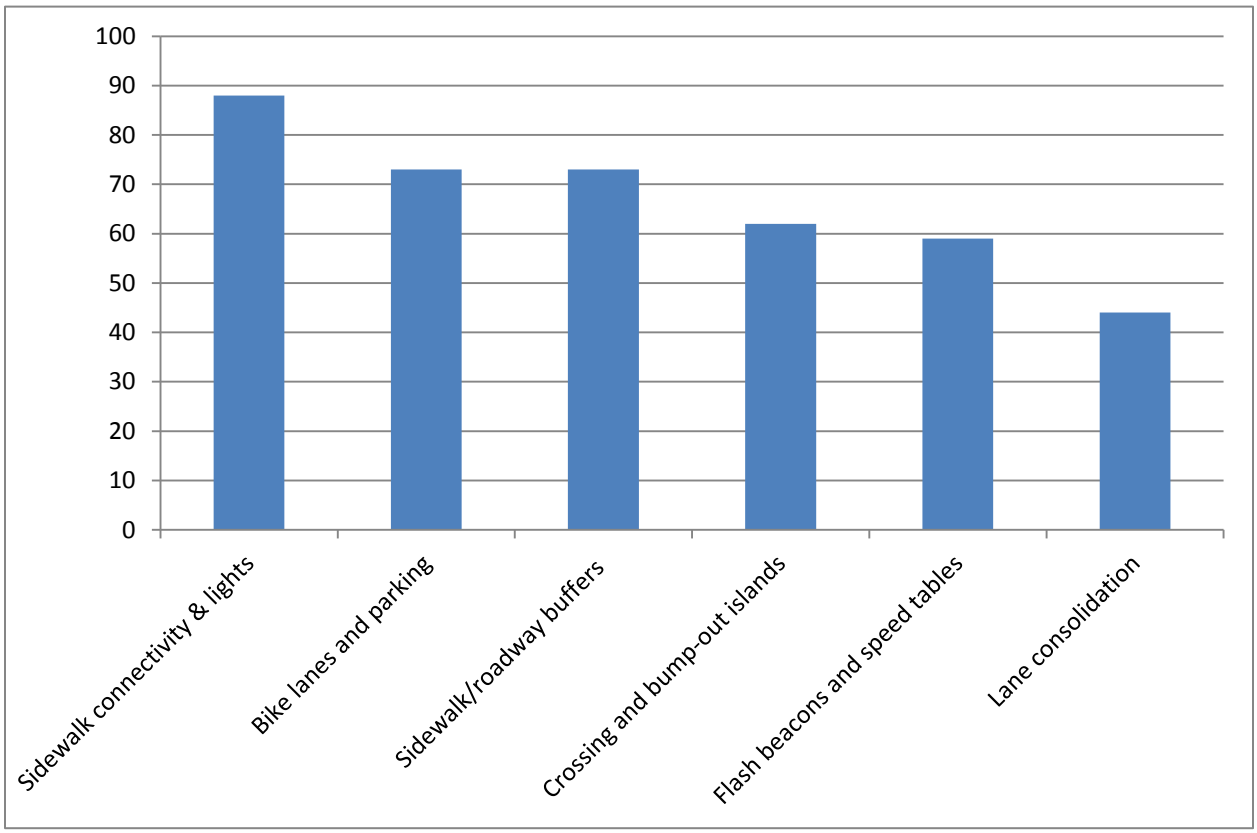
Participants were also asked to consider the potential positive or negative health impacts, the number of people affected, the feasibility of proposed transportation infrastructure changes, and to rank the proposed changes on a scale of one (lowest) to six (highest) priority. Exhibits 4 and 5 show how participants ranked each non-motorized infrastructure element.

EXHIBIT 4. NMTP Element Rankings by Scoping Meeting Participants



SOURCE: Public Sector Consultants Inc., based on data provided by public meeting participants, 2012.

EXHIBIT 5. Number of Participants Who Ranked NMTP Elements as Moderate to High Priority or Above



SOURCE: Public Sector Consultants Inc., based on data provided by public meeting participants, 2012.

As Exhibits 4 and 5 show, sidewalk connectivity and lighting ranked the highest in terms of both the number of people who rated it "most" important, as well as the overall number of people who ranked it as moderate to high priority or greater (score of 4 or 5). Bike lanes and bike parking was ranked second highest overall, although, surprisingly, only one person considered bike lanes and bike parking as the most important priority. The element third highest was sidewalk and roadway buffers, which actually had the second highest number of people (six) who rated it most important.

Flash beacons/speed tables and lane consolidation were ranked lowest by participants, with three-quarters of the group ranking these two elements as the lowest priority. Lane consolidation has been considered several times in the past, and was listed as very low priority in the NMTP due to traffic flow concerns.

Based on the input from the public meeting participants, preliminary research, and the expertise of the Advisory Group, the project team identified four primary health indicators likely to be impacted by the implementation of NMTP and CSP measures within the study corridor. These indicators, the potential contributing causes, and related NMTP and CSP program elements are summarized in Exhibit 6.

EXHIBIT 6. Health Indicators, Related Causes and NMTP and CSP Elements

Health Indicators	Transportation-Related Causes	NMTP and CSP program elements that address causes and health indicators
Obesity	• Driving instead of walking, biking, or other non-motorized transportation	• Sidewalk improvements and connectivity • Bike lanes, bike path connectivity, and bike parking availability • Natural buffers/greenery • Increased number of crosswalks, and improved crossings • Walking/biking policies and education • Bike sharing program • Complete Streets design
Injury	• Vehicle to vehicle interactions • Vehicle to walker/biker/other non-motorized transportation interactions • Individual accidents (motorized and non-motorized)	• Sidewalk improvements and connectivity • Bike lanes, bike path connectivity, and bike parking availability • Increased number of crosswalks, and improved crossings • Better signage/road markings • Walking/biking policies and education • Traffic calming devices • Lane consolidation • Complete Streets design
Asthma, lung cancer, heart disease	• Exposure to local air pollutants and particulates from vehicle emissions	• Sidewalk improvements and connectivity • Bike lanes, bike path connectivity and bike parking availability • Increased number of crosswalks, and improved crossings • Better signage/road markings • Traffic calming devices • Idling policies (City and School District) • Carpool/rideshare • Carpool/rideshare and public transit incentives • Bike sharing program
Mental health and stress (including anxiety and attention disorders)	• Driving instead of walking, biking, or non-motorized transportation • Noise • Lack of time outdoors • Fear of accidents • Traffic congestion	• Sidewalk improvements and connectivity • Bike lanes, bike path connectivity, and bike parking availability • Increased number of crosswalks, and improved crossings • Better signage/road markings • Traffic calming devices • Carpool/rideshare and public transit incentives • Bike sharing • Natural buffers/greenery • Bike sharing program • Complete Streets design

SOURCE: Public Sector Consultants, based on input from public scoping meeting participants and project advisory committee

Potential causes for some of these issues include a lack of physical activity and sedentary lifestyles; busy schedules; exposure to pollutants; and distracted drivers, pedestrians, and cyclists. Scoping meeting

participants said some of the existing infrastructure and corridor conditions that lead to these causes and indicators include traffic congestion, a no bike-riding policy for K–6 schools, and too few bike racks and crosswalks. They also noted that Hagadorn is designed as the thru-way and major north-south link, which is one of several reasons the corridor lacks an enjoyable atmosphere for walking. Other reasons include unsafe sidewalks or lack of sidewalk connectivity, lack of street lighting, and insufficient buffers between sidewalks and streets.

Assessment Findings

The NMTP and CSP recommendations aim to change people's behavior in terms of the transportation choices they make by creating an environment that is safe and sufficiently aesthetically appealing to motivate people to choose non-motorized transportation modes. As stated in the screening section, there are many reasons for this objective, including reduced impact on the environment, making East Lansing a more competitive residence choice for people who value active travel and helping to control long-term maintenance and capital costs associated with transportation infrastructure. The project team began its HIA with the hypothesis that there is also potentially significant health benefits associated with shifting people's transportation choices to non-motorized methods.

For the purposes of this HIA, the proposed recommendations of the NMTP and CSP are evaluated in terms of how they affect a person's transportation choices, and in turn, how those transportation choices affect a person's health, focused on the four priority health indicators identified during scoping. It is beyond the scope of this analysis to measure or quantify the potential direct and indirect effects of implementing the NMTP and CSP recommendations on corridor residents' behavior or the subsequent health impacts. Instead, the assessment is based on application of research on similar policies, programs, and infrastructure to the study corridor, which characterizes the nature and potential magnitude of impact from investing in non-motorized transportation infrastructure and programs.

Evaluation of the existing conditions in the study used corridor or city-level data whenever possible. However, the majority of available health data is reported only at the county level. This analysis assumes that county-level health data is generally reflective of the city and this corridor specifically, although the project team recognizes there are likely minor differences driven particularly by demographics.

Exhibit 7 summarizes the status of health indicators in Ingham County compared to the state of Michigan as a whole. These current conditions and the relationship between the NMTP and CSP elements and these health indicators are discussed in more detail below.

EXHIBIT 7. Summary of Health Indicator Status for Ingham County

Indicator	Ingham County	Michigan
Obesity and overweight		
Adult overweight	30.0%	34.2%
Adult obesity	24.1%	31.3%
Adolescent obesity	16.7%	11.9%
Annual heart disease deaths (average for years 2008–2010)	487	207
No leisure time physical activity	18.4%	23.6%
Preventable hospitalizations due to diabetes per 10,000 adults	15.7%	16.5%
Air quality and asthma, lung cancer and heart disease		
Adult asthma: Lifetime (18 years or older)	13.6%	14.8%
Adult asthma: Current (18 years or older)	8.8%	9.9%
Childhood asthma: Lifetime	23.3%	14.5%
Childhood asthma: Current	11.6%	10.0%
Preventable hospitalizations due to asthma per 10,000 children under age 18	25.6	14.1

Indicator	Ingham County	Michigan
Rate of lung cancer deaths per 100,000	37.6	52.3
Rate of heart disease deaths per 100,000	198.1	204
Injury		
Accidental Injury per 10,000	29.5	35.4
Unintentional motor vehicle deaths	62 people in 24 crashes	2,062 people in 843 crashes
Mental health and stress		
Adults with poor mental health	12.1%	13.1%

SOURCES: Larrieux, 2011; Healthy! Capital Counties *2012 Community Health Profile & Health Needs Assessment*, N.d.; 2011 Michigan Behavioral Risk Factor Survey 25th Annual Report, 2012; Michigan Traffic Crash Facts, 2011; MDCH *Michigan Youth Risk Behavior Survey,* 2011. MDCH *1989 - 2010 Michigan Resident Death Files, 2010.*

OVERWEIGHT AND OBESITY

Current State of Overweight and Obesity

Overweight and obesity are risk factors for chronic diseases including diabetes, cardiovascular disease, stroke, several types of cancer, and chronic pulmonary obstructive disease. More than half of Ingham County adults are overweight or obese (30 percent overweight and 24.1 percent obese), and one in six adolescents is obese. Although the adult prevalence of obesity in Ingham County is slightly lower than the statewide average (31.7 percent), the adolescent obesity rate of 16.7 percent is higher than the state average of 11.9 percent (Healthy Capital Counties 2012).

The risk of cardiovascular disease death and accidental injury death is greater in Ingham County than in the greater tri-county region, which includes Clinton, Eaton, and Ingham counties. Adults in Ingham County also have higher rates of diabetes hospitalizations than the other two counties in the tri-county region, despite an equal prevalence (Healthy! Capital Counties 2012).

Physical activity is a key factor in maintaining a healthy weight and avoiding chronic disease. It is defined by the *Capital Area Behavioral Risk Factor & Social Capital Survey 2008–2010 (BRF&SC)*BRF&SC as "any movement produced by the contraction of skeletal muscle that increases energy expenditure above normal levels." This includes walking, gardening, playing sports, or other exercise. According to the BRF&SC, about four out of five Ingham County adults engage in physical activity in their free time, which is slightly more than the Michigan average (ICHD and CAUW 2011).

Rates of physical activity among youth are falling. Among high school students in the U.S. and in Michigan, just under half (49.5 percent) met physical activity recommendations in 2011 (being active at least 60 minutes/day on 5 or more days a week) (CDC YRBS 2012). In 1969, eighty seven percent of school-aged children nationwide regularly walked or bicycled to school when they lived within a mile of school, whereas only 38 percent of children in the same age group walked or bicycled to school in 2009. (U.S. DOT 2009).

Current Condition of Infrastructure and Behavior that Influences Physical Activity and Obesity

Sidewalks and Bike Lanes

Walkability and bikeability are significant determinants of residents' ability to be physically active. The NMTP rated the quality and accessibility of sidewalks in the city based on an "A" to "E" scale (see Exhibit 8). Most of the sidewalks on Burcham received a rating of "B," meaning the sidewalk is set back from roadway but contains no vertical elements, such as trees or plants. The eastern portion of Burcham has two sections with a "D" rating, and another with a "C."

Hagadorn's sidewalk is also rated as "B" from Burcham to Grand River. There are sidewalks along each side of the road, but they are uneven, not connected throughout the corridor, and lack vertical buffers between the sidewalk and street (City of East Lansing, May 11, 2011).

Hagadorn sidewalk

Photo courtesy of Shanna Draheim,

The photo above shows a section of Hagadorn sidewalk just south of Burcham that is narrow, lacks any buffer between the sidewalk and street, and has an obstruction (wall) on the east side that limits pedestrian space.

EXHIBIT 8. NMTP Sidewalk Ratings

Grade	Description
A	Sidewalk is set back from roadway and contains vertical elements such as closely spaced trees and/or light poles.
B	Sidewalk is set back from roadway but contains no vertical elements.
C	Sidewalk is directly adjacent to the roadway along the curb and has no buffer space or vertical elements.
D	No sidewalk facility is built, but the area is physically passable by foot.
E	No sidewalk facility is built and the area is not physically passable by foot. Physical barriers such as streams or expressway overpasses usually contribute to this type of situation.

SOURCE: City of East Lansing NMTP, 2011.

There are paved shoulders and bike lanes along Burcham, but none along Hagadorn. In the context of the larger corridor, this means that there is a lack of north-south connectivity for bicyclists in an area where there is the greatest amount of vehicle traffic on a daily basis.

Existing Transit

Public transit that residents can walk or bike to is available in the corridor, but it is limited. The Capital Area Transportation Authority (CATA) provides public transit access to the greater Lansing area, and has three bus routes (22, 24, and 26) that run through the study corridor, connecting the north part of East Lansing to Michigan State University's campus, and the east part of the city and MSU campus to Okemos. There is no bus route that travels the length of Burcham. CATA ridership in fiscal year 2012 on routes 22, 24, and 26 was 129,276, 158,909, and 880,837 riders, respectively (Oudsema, November 7, 2012).

School Transportation

As noted in the screening section of this report, East Lansing Public Schools currently provides bussing to students living more than one-and-a-half miles from their school, and only allows students to bicycle to school at the middle and high school levels. East Lansing High School has 1,137 students for the 2012–2013 school year. In the 2011–2012 school year, a total of 246 students had parking permits (22 sophomores, 103 juniors, and 121 seniors), and a total of 221 students ride the bus to the high school (Moore 2012).

MacDonald Middle School has 528 students in the 2012–2013 school year. A small portion of the student body rides a bike to school, 210 ride the bus, and a substantial number are driven in automobiles (Moore 2012). An informal count of car "drop-offs" conducted by parent volunteers during the weeks of September 3 and 10, 2011, found that 250–300 cars enter the parking lot to drop students in the morning (Hittner, November 5, 2012).

Marble Elementary has 361 students for the 2012–2013 school year. Over 70 of Marble's students ride the bus each day (Moore 2012). In 2010, parent volunteers completed an informal count of cars that drop or pick up students from Marble as part of the Safe Routes to School Audit for the school. The volunteers counted an average of 200 cars travelling through the parking lot at morning drop off (Hittner, November 5, 2012). The 2010–2011 Safe Routes to School Marble Elementary School Action Plan recommends adoption of a policy to allow bicycles to be ridden to school by students accompanied by parents, and a policy to walk bikes within 30 feet of school property (Marble Elementary Safe Routes to School Committee 2009).

Relationship between NMTP and CSP Elements on Obesity and Chronic Disease

Levels of physical activity play an important part in a person's well-being, both physical and mental. Exercise and physical activity help manage weight and reduce obesity, and play a role in preventing and treating related chronic disease such as heart attack, stroke, and diabetes.[3] Active travel (walking and cycling) has been shown to be positively related to the amount of physical activity people get and negatively associated with obesity and diabetes (Pucher et al. 2010). Another study found that for each hour per day spent in a car the odds of obesity increase by 6 percent; for each additional kilometer walked, the odds of obesity decrease by 4.8 percent (Frank et al., August 2004). The Alliance for Biking and Walking used BRF&SCS and American Community Survey data to chart walking and biking levels in each state against obesity levels. Though the data are limited to bicycling and walking trips to work (commuting trips), the general trend shows that states where bicycling and walking levels are lowest have the highest levels of obesity (Alliance for Biking and Walking 2012).

In a review of the literature, studies show that providing bike parking and bike lanes or other marked bike pathways that create bike-friendly environments can increase the number of people who use bicycles for active commuting. The League of American Bicyclists found that the 27 communities it has designated as "bike friendly communities" have had greater increases in the number of bicycle commuters than other cities (League of American Bicyclists N.d.). Similarly, a study in New Orleans found that bicycle ridership increased by an average of 57 percent after bicycle lanes were added to St. Claude Avenue (Parker et al. 2011). These results were consistent with several studies in other cities cited by Parker et al.

Transit availability can also have an impact on people's activity level and related obesity/chronic disease risk. When transit routes are close and convenient, more people will utilize this method of transportation and get some additional physical activity walking to and from transit stops. Research shows that people who live near transit stations are five to six times more likely to commute via public transit than other

[3] See National Center for Chronic Disease Prevention and Health Promotion, 2009; Moore, 2004; U.S. Centers for Disease Control, Physical Activity website, Nd.

residents in a region (Lund et al., January 2004), and that almost one-third of those who use public transit to commute to work meet the daily recommended amount of physical activity (Besser and Dannenberg 2005).

TRAFFIC ACCIDENTS AND INJURY

Current State of Traffic Accidents and Injury

Infrastructure improvements that address safety not only affect people's willingness to use non-motorized transportation, they can also decrease the number and severity of transportation accidents and subsequent injuries, including vehicle to vehicle accidents, and vehicle-pedestrian or vehicle-bike accidents.

In 2011, there were 49 crashes involving cyclists and 24 crashes involving pedestrians in East Lansing. Some of these accidents took place within the Burcham-Hagadorn Corridor and along its perimeter (Saginaw Highway, Grand River Avenue, and Abbott Road). In Ingham County, there were 22 fatal traffic crashes—one of which was in East Lansing (Michigan State Police 2012). The most common traffic offense in East Lansing is driving under the influence (623 incidents in 2011), which has almost doubled in frequency from 2001 (City of East Lansing 2011).

The NMTP and CSP include several measures that could help improve overall safety of transportation in the corridor, including road crossing additions and improvements, sidewalk improvements and greater connectivity, improved signage and road markings, speed lowering infrastructure, and additional bike infrastructure (lanes or marked paths).

Current Condition of Infrastructure and Behaviors That Influence Traffic Accidents and Injury

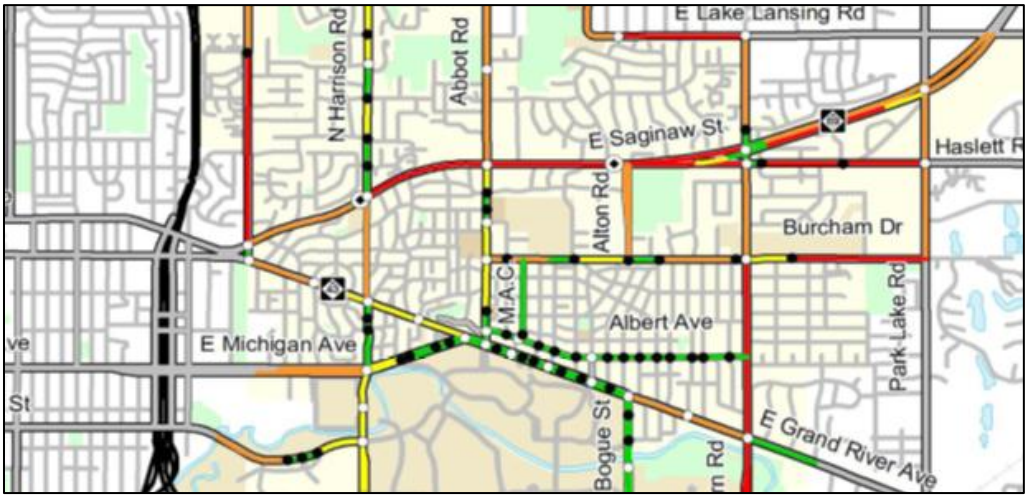
Safety Behaviors

According to the Youth Risk Behavior Surveillance survey conducted by the Michigan Department of Community Health, most high school students in Michigan say they never or rarely wear a bicycle helmet while riding their bike (89 percent), but they do use safety measures when riding in vehicles (only 6 percent rarely or never wear a seat belt when riding in a vehicle) (MDCH 2011). There is no data available on the number of pedestrians who jaywalk in the corridor or choose to cross at cross-walks when they do not have the right of way.

Street Crossings

The distance between crosswalks in the corridor is generally one-quarter mile, as shown in Exhibit 9. Along Burcham there are six unsignalized crossings, as well as the signalized crossing at the corner of Burcham and Hagadorn. Along Hagadorn, there are two signalized road crossings, one at Grand River and one at Burcham, and these are more than a half-mile apart. Because of these distances, road crossing difficulty is rated at a C or D along Burcham and Hagadorn. Along the southern, western, and most of the northern borders of the study corridor, the road crossings are rated a D or E. Road crossing difficulty is a measurement of how difficult a person would typically find it to cross a road at an unmarked mid-block crosswalk. It is based on the number of lanes, speed and average daily traffic. Roads graded C have traffic speeds averaging 35 miles an hour, and average daily traffic volumes between 10,000 and 15,000 cars. Road crossings rated D or E have average speeds in excess of 40 miles an hour and daily traffic volumes greater than 15,000 cars (City of East Lansing 2011).

EXHIBIT 9. Existing Street Crossings in the Study Corridor



Distance between crosswalks

- 0 to 1/8 mile
- 1/8 to 1/4 mile
- 1/4 to 1/2 mile
- Over 1/2 mile

- Signalized road crossings
- Unsignalized road crossings
- Pedestrian bridges

SOURCE: East Lansing NMTP, 2011

Traffic Flow

Greater traffic volumes and vehicle miles traveled can greatly impact traffic speeds and the sense of safety for pedestrians and bicyclists. The NMTP designates Burcham and Hagadorn as major arterials, based on National Functional Classifications referenced in American Association of State Highway and Transportation Officials guidelines. The greatest flow of traffic throughout the study area runs north to south, primarily on Hagadorn (City of East Lansing, May 11, 2011). The southern border of the study area (Grand River Avenue) is a major route along the Michigan State University Campus. There is some "cut through" traffic between Haslett/East Lansing/Lansing that occurs on Burcham as well.

Speed limits along Burcham Drive are 25 mph, and 35 mph along Hagadorn. School zones along Hagadorn drop to 25 mph at certain times of day. In 2005, average daily traffic volumes on Burcham were 5,000–10,000, and 15,000–100,000 on Hagadorn depending on the season or day of the week (Newman et al., spring 2005).

In the 1990s, Burcham Drive changed from four lanes to three, including two lanes for thru traffic, a turning lane, and marked bike lanes on either side. A 2005 report by graduate students at Michigan State University's School of Urban Planning found that "converting the study area [Hagadorn] from a four-lane to a three-lane road would have the effects of reducing the perceived driving speed, provide safer crossings for pedestrians, allow for the addition of bike lanes and improve neighborhood aesthetics" (Newman et al., spring 2005). However, Hagadorn has remained a four-lane road.

Relationship between NMTP and CSP Elements on Traffic Accidents and Injury

Sidewalk Connectivity and Quality

A person's willingness to walk—to work, school, shopping or friends—is tied not only to available transportation time, but also to whether they feel safe and experience an enjoyable environment. To the extent that sidewalks are connected, free from obstruction, and provide a safe buffer between the walker and the roadway, they can help encourage people to choose walking over automobile transportation. Studies show that communities that are more walkable, defined as having many destinations near home, a higher residential density, good walking/biking infrastructure, and a greater land-use mix, help foster greater active transportation such as walking and biking. A study in Atlanta, for example, demonstrated that people who live in walkable neighborhoods are two times more likely to meet the daily recommended moderate-intensity physical activity than those who don't (Frank et al., February 2005).

The NMTP and CSP propose sidewalk buffers, which can include plants, trees, and other natural or constructed buffers between the roadway and sidewalk. These features improve safety and create a pleasant environment that helps encourage people to walk or ride instead of drive. Research on the effect of trees and safety, for example, shows that car drivers generally perceive suburban streets with trees to be safer than urban streets with no trees, and both fast and slow drivers exercise slower driving speeds when trees are present (Naderi 2003; Topp 1990). Kweon and Naderi studied parents' willingness to let their children walk by conducting focus groups and having parents participate in a simulated street environment exercise. The researchers found that participants' perception of walking safety was much greater when sidewalks were set back from the roadway (Kweon and Naderi 2004).

Traffic Calming and Awareness Measures

Traffic calming measures recommended in the NMTP and CSP include speed bumps, raised crossings, signalized and striped crossings, and sidewalk/street buffers. The NMTP indicates that crossings more than one-quarter mile apart are more likely to result in pedestrians crossing at unmarked places ("jaywalking"), which increases the risk of accident and injury (City of East Lansing, May 11, 2011).

Speed table
Photo courtesy of FHWA.

Infrastructure such as speed bumps and speed tables, sidewalk-street buffers, and high-visibility crosswalks have all been shown to reduce speeds, and subsequently reduce the number and severity of traffic accidents. A study conducted in Westminster, Colorado, and another in Gwinnet County, Georgia (metro Atlanta), found that drivers reduced their speeds between six and nine miles per hour after the installation of speed tables or raised crossings, which reduced the number of crashes and injuries. The before and after study in Gwinnett County found that total crashes dropped by 38 percent and total injuries decreased by 93 percent after speed tables were installed (Bretherton 2003; Noyes and Normandin 2007).

Streetscape improvements such as raised concrete planters, shrubs, flowers, grass, and trees have also been shown to decrease the rate of accidents in urban and highway roads, though the extent to which reductions occur varies. A study in Toronto demonstrated a reduction in mid-block accidents of between 5 and 20 percent (Naderi 2003). A study in Germany showed that similar landscape enhancements reduced overall accidents by 30 percent, with injuries and pedestrian collisions decreased at even greater percentages (Topp 1990). A well-defined edge between streets and clear zones (or shoulders) is important in decreasing off-road collisions with obstacles, which suggests that investing in treatments for climate change mitigation, such as trees or plantings, may simultaneously improve public health and safety (Naderi 2003).

Some of the proposed NMTP and CSP measures can also help reduce accidents by improving drivers' awareness of pedestrians and cyclists in the corridor with more visible traffic prompts and traffic infrastructure. Distraction among drivers, pedestrians, and cyclists can contribute to the overall number, as well as severity of traffic accidents. According to the National Highway Traffic Safety Administration (NHTSA), about one in five (18 percent) injury crashes in 2010 were reported as distraction-affected crashes (NHTSA 2012). Researchers at UNC Charlotte observed the behaviors of drivers and pedestrians at seven midblock crosswalks on the university campus to evaluate the impact of driver, pedestrian, and cyclist distraction on traffic conflicts between these road users. The study found that distracted drivers were about 15 times less likely to yield to pedestrians in crosswalks (5 percent compared to 77 percent) and about four times more likely to be involved in conflicts with pedestrians (Brumfield and Pulugurtha 2011). Measures that help counter driver distraction, particularly for mid-block crossings, such as striping, lighted signage, and other proper signage, have all been found to help better alert drivers and reinforce laws that require yielding to pedestrians (Brumfield and Pulugurtha 2011).

A more welcoming environment for non-motorized users can also help reduce the overall traffic volume in the corridor by encouraging people to choose to walk or bike rather than drive. Fewer cars in the corridor can have safety and injury implications as well, particularly for children. In corridors with high traffic volumes, there is about 13 times greater risk for pedestrian injury among children than in areas with low traffic volumes (Jackson and Kochtitzky 2011). In addition, some studies have shown that when there are more walkers and cyclists on sidewalks and roads, motorists are more likely to expect them and this lowers the likelihood of crashes (Jacobson 2003; Leden 2002).

ASTHMA, LUNG CANCER, AND HEART DISEASE

Current State of Asthma, Lung Cancer, and Heart Disease

Asthma among children is higher in Ingham County than in the state of Michigan (11.6 percent versus 10.0 percent). The rate of preventable hospitalizations due to asthma per 10,000 children under 18 in Ingham County is nearly twice the state rate. Ingham County children also have higher rates of preventable asthma hospitalizations compared to the tri-county region (ICHD and CAUW 2011; MDCH, August 10, 2012).

The overall leading cause of death in Michigan and the United States is cardiovascular disease. In Ingham County, the rate of cardiovascular disease deaths is 174.3 per 100,000 people (MDCH 2010). In Michigan, lung cancer is the leading cause of cancer-related deaths; although the primary cause of lung cancer is smoking, environmental exposure is one of several risk factors for lung cancer. The rate of lung cancer incidence in Ingham County is 68.3 per 100,000—lower than both the Michigan and U.S. rates (Detroit News, July 30, 2009).

Current Condition of the Environment and Behaviors That Influence Asthma, Lung Cancer, and Heart Disease

Air pollution, particularly ozone and particulate matter, has been shown to trigger asthma and make symptoms worse, and contribute to lung cancer, cardiopulmonary disease, and other respiratory health conditions (Pope et al., March 6, 2002; USEPA N.d.). The Michigan Department of Environmental Quality, in partnership with local health departments and other agencies, monitors levels of ozone and particulate matter (as well as other air quality pollutants). When levels of ozone and/or particulate matter are predicted to be unhealthy for sensitive groups, the state declares Action! Days that help alert people to the potential for increased health-related exposure. Air quality in the Lansing area meets federal and state air quality standards, and the Lansing region has had only one Action! Day in 2012, and one in 2011 (MDEQ MIair N.d.). However, day-to day-vehicle emissions can still have localized health impacts, particularly related to asthma and other respiratory conditions.

Relationship between NMTP and CSP Elements: Air Quality, Asthma, Lung Cancer, and Heart Disease

Vehicle Emissions

Air pollution from motor vehicles is responsible for millions of days of restricted levels of activity, and thousands of cases of respiratory illness and premature death in the U.S. each year (McCubbin and Deluchi 1999; Wargo et al. 2006). Reductions in the number of vehicle trips taken (by swapping single-occupancy car trips for non-motorized or ride-share programs) can have a greater environmental and health impact than simply reducing the number of vehicle miles travelled. Air pollution emissions can also be reduced since the number of engine "cold starts" will be fewer (vehicle engines emit pollutants at a much higher rate when cold compared to when the engine is warm) (FHA, January 2006). For example, reducing the number of car commutes by 5 percent should result in approximately a 5 percent reduction in emissions of all pollutants (FHA, January 2006).

When people travel by motorized vehicle, there are emissions of pollutants such as carbon monoxide, oxides of nitrogen, volatile organic compounds, and particulate matter. These pollutants contribute to asthma, respiratory illness, lung cancer, and cardiopulmonary health problems. A 2006 study that looked at the short-term relationship between PM2.5 (so-called "fine particles" that are believed to pose the greatest health risks) and hospital admissions found that an increase of 10 $\mu g/m^3$ in $PM_{2.5}$ was associated with over a 1 percent increase in same-day hospital admissions for heart failure (Domenici et al., March 8 2006). Particulate matter (both $PM_{2.5}$ and PM_{10}) and ozone are also irritants that have been shown to increase the incidence (trigger) for, and exacerbate, symptoms of asthma (Jackson and Kochtitzky 2001; FHA, January 2006).

Even when vehicles idle, they release air pollutants such as carbon monoxide, volatile organic compounds, and oxides of nitrogen that affect health and contribute to global climate change. Idling vehicles release these pollutants as the engine and exhaust system vaporize gasoline. The U.S. Environmental Protection Agency (EPA) estimates that a regular gasoline-fueled passenger car emits about 1.187 grams per minute of carbon monoxide (CO), 0.045 grams per minute of volatile organic compounds (VOC), and 0.059 grams per minute of nitrogen oxide (NOx) (USEPA 2008).

Idling diesel-fueled buses are even greater contributors of pollutants. Diesel exhaust from idling buses contains significant amounts of particulate matter, which contributes to thousands of premature deaths across the nation every year. The EPA conducted a health impact assessment on the impact of diesel exhaust and found that long-term, chronic exposure could pose a lung cancer risk, and even short-term exposures can be harmful by causing respiratory inflammation and asthma (USEPA 2002). Idling of cars and buses near schools is of particular concern. Carbon monoxide released during idling can cause headaches, fatigue, and vision impairments for those in nearby areas (FHA, January 2006).

A single idling car sitting in the Marble Elementary, MacDonald Middle School, or East Lansing High School parking lot releases about 0.04 pounds of carbon monoxide by idling there for 15 minutes. The cumulative effects of the idling are significant. If between thirty and forty cars are idling in the parking lot, they release between one and one and a half pounds of carbon monoxide every day.

Based on EPA emissions factors for carbon monoxide (USEPA 2008)

The health effects from vehicle emissions are of particular concern for areas with a high number of vulnerable populations, such as children and elderly populations in the Burcham-Hagadorn corridor. Asthma is the leading chronic condition among children in the United States, and it is estimated that in

2010, over 7 million children (1 in 11) had asthma (CDC N.d.). The East Bay Children's Respiratory Health Study looked at actual concentrations of traffic pollutants at schools in ten neighborhoods in northern California, including PM10, PM2.5, total nitrogen oxides, nitrogen dioxide, nitric oxide (NO), and black carbon. The school sites included those both upwind and downwind of major roads. The study found that school children living within 225 feet (about ¾ the length of a football field) of a major road had an increased risk of lifetime asthma, prevalent asthma, and wheezing. Even in areas with good regional air quality, local air pollution from nearby traffic may be associated with risks to children's respiratory health (Kim et al. 2004).

Urban Tree Canopy

Finally, there have been studies that evaluate the relationship between tree canopy cover and asthma, although study findings have been mixed and more research is needed. One study in New York demonstrated that children living in areas with more street trees have a lower incidence of asthma compared with children living in areas with fewer trees (Lovasi et al. 2008). However, a study of major metropolitan areas in Texas found no statistical correlation between tree canopy cover and asthma rates (Pilat et al., October 2012).

The City of East Lansing maintains a street tree inventory and management plan, and plants new trees when funds are available. In recent years, the city's trees have been hard hit by Emerald Ash Borer disease (as in many other communities), and many trees on city and private property have died. Budget challenges over the last three to four years have kept the city from planting new trees to replace all those lost by disease or other injury. Opportunities to plant trees as vertical buffers between sidewalks and roadways, as proposed in the NMTP, could help address traffic and safety issues and potential health issues associated with pollutant emissions as well.

MENTAL HEALTH AND STRESS

The Current State of Mental Health and Stress

Mental health is defined as "a state of successful performance of mental function, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to change and to cope with adversity" (HHS 1999). In a 2010 survey, about 12 percent of Ingham County residents reported poor mental health in the last 14 days, which is about the same as the Tri-county and state average (Healthy! Capital Counties 2012).

Mental health can be affected by physical activity levels and just spending time outdoors. As previously described in the sections on Obesity and Chronic Disease, four of five adults in Ingham County engage in physical activity in their spare time. There is no data available on how much time East Lansing or Ingham County residents spend outdoors.

Relationship between NMTP and CSP Elements and Mental Health and Stress

Physical Activity

Sedentary lifestyles and declining amounts of physical activity contribute to emotional and mental stress, cognitive function, and anxiety or attention deficits. This is particularly relevant in the study corridor, given the high number of vulnerable populations such as children, young adults, and elderly residing in or travelling to the corridor each day. Exercise, both regular and single bouts of physical activity, has been shown to improve children's capacity to learn and academic performance, and increase their memory and

attention.[4] It can also help prevent and alleviate some forms of depression and anxiety.[5] A secondary analysis of existing studies done by Stephens found that physical activity, independent of socioeconomic status or other health conditions, is "positively associated with general well-being, lower levels of anxiety and depression, and positive mood" (Stephens 1988).

More Time Spent Outdoors

Clean, appealing, and natural environments can motivate people to spend more time outdoors, being physically active and just enjoying outdoor time. Spending time outdoors has been shown to have positive psychological benefits, including reduced stress, depression, anxiety, attention deficit, and hyperactivity.[6] Children, in particular, benefit socially, academically, and psychologically by spending time outdoors (Louv 2005). Spending time outdoors has also been shown to reduce aggressiveness and violence (Kaplan 1995).

Public spaces that including natural elements such as flowers, plants, and trees can serve as important venues for social interaction and physical activity. Those street and park features that best encourage physical activity are close in proximity to where people live and work, are accessible, and have attractive scenery, among other features (Frumkin 2001, 2003).

The NMTP and CSP propose sidewalk buffers, which can include plants, trees, and other natural or constructed buffers between the roadway and sidewalk. This not only improves safety, it also contributes to a better aesthetic quality of the corridor environment and creates a welcoming environment that helps encourage people to walk or ride instead of drive.

[4] See Hillman et al. 2009; Castelli, Hillman, Buck and Erwin 2007.
[5] See Mayo Clinic; Craft et al. 2004; Callaghan 2004.
[6] See Stiggsdotter 2010; De Vries et al. 2003; Peacock et al. 2007.

Recommendations

The NMTP and CSP include many important transportation-related recommendations. Based on the HIA assessment, it seems likely that all of the recommended measures in these plans, if implemented, could have at least a nominal effect on increasing the amount of non-motorized transportation in the study area, and thus improve health outcomes. The extent to which these plan elements will impact people's health depends on how much their behavior changes, as well as the magnitude of the changes in relation to the overall population. In terms of overall impacts on health conditions, the countywide impact is likely to be slight, but the relative impacts at the city and neighborhood levels could be significant.

A number of the recommendations stand out as particular opportunities for improving health in the corridor, and there are some additional recommendations for further actions by project partners that could also help shift behaviors and capitalize on potential health benefits. These recommendations are summarized below.

- **Connect the dots (or sidewalks) and improve them.** Given the significant health and safety considerations (perceived and actual) of people walking in this study corridor, particularly school children and college students, ensuring adequate connectivity of sidewalks and making improvements targeted toward safety should be a high priority for decision-makers. School kids in particular are likely to benefit from sidewalk/street buffers in order to protect them from vehicle-pedestrian accidents caused by inattention, or playing around while walking along the sidewalks. These improvements, if trees or other natural barriers are used, provide the extra benefits of absorbing pollutants and adding to the aesthetic appeal of the community.

  Additional sidewalk connections are needed in the southern part of the study area along Beech Street and along Burcham east of MacDonald Middle School; these would serve the retirement community at Burcham Hills and create a safer route to schools for the Southeast Marble neighborhood.

- **Implement pro-bike and pro-walk policies.** The East Lansing school district should revisit and revise its policy prohibiting bicycling to elementary schools. The potentially substantial physical and mental health benefits from additional exercise would likely outweigh safety hazards and liability issues, assuming the policy is changed in conjunction with other safety infrastructure measures proposed (such as better crossings, marked bike pathways, and improved signage and education).

  East Lansing Public Schools (or individual schools) and the City of East Lansing should also continue to support efforts to encourage kids to walk to school, such as Walk to School Day, use of walking school buses by students and families, and providing information on the benefits of active transportation to residents and students.

- **Create additional and improved crosswalk opportunities.** There is a significant need for one or more crossing opportunities along Hagadorn between Burcham and Grand River. This is an area that serves both K–12 students accessing their schools as well as many Michigan State University Students travelling to the east side of campus. Crossings should be highly visible, signalized, and include speed slowing mechanisms (such as raised speed tables) as applicable to help slow traffic and increase driver awareness of pedestrian crossings.

- **Teach safety as a great first defense.** The city, Ingham County Health Department, and East Lansing Public Schools should partner on a pedestrian and bicycle safety outreach and training program. This should include both general outreach to residents and students, as well as auto/pedestrian/cycling traffic safety courses that students (K–college) could participate in to learn more about sharing space and rules of the road.

Conclusions

The City of East Lansing is already well ahead of the curve in thinking about and pursuing opportunities to get its residents using more active forms of transportation. The NMTP, CSP, Complete Streets Ordinance, and ongoing enforcement of traffic and safety laws are all important elements of creating a highly walkable/bike-able community. This is an important issue in a college town for creating and maintaining a good quality of life that attracts students, faculty, businesses, and other residents to the community.

While financial resources for implementing the city's policies are always a significant challenge, it is the hope of the Project Team that this HIA helps shed some light on the importance of this corridor in particular for making some of the proposed transportation improvements. As a next step, the project partners should work collaboratively to seek funding, community support, and opportunities for implementing the recommendations above and included in the NMTP and CSPs in the near term. The costs of not acting, in terms of the health and well-being of the city's population, are too great.

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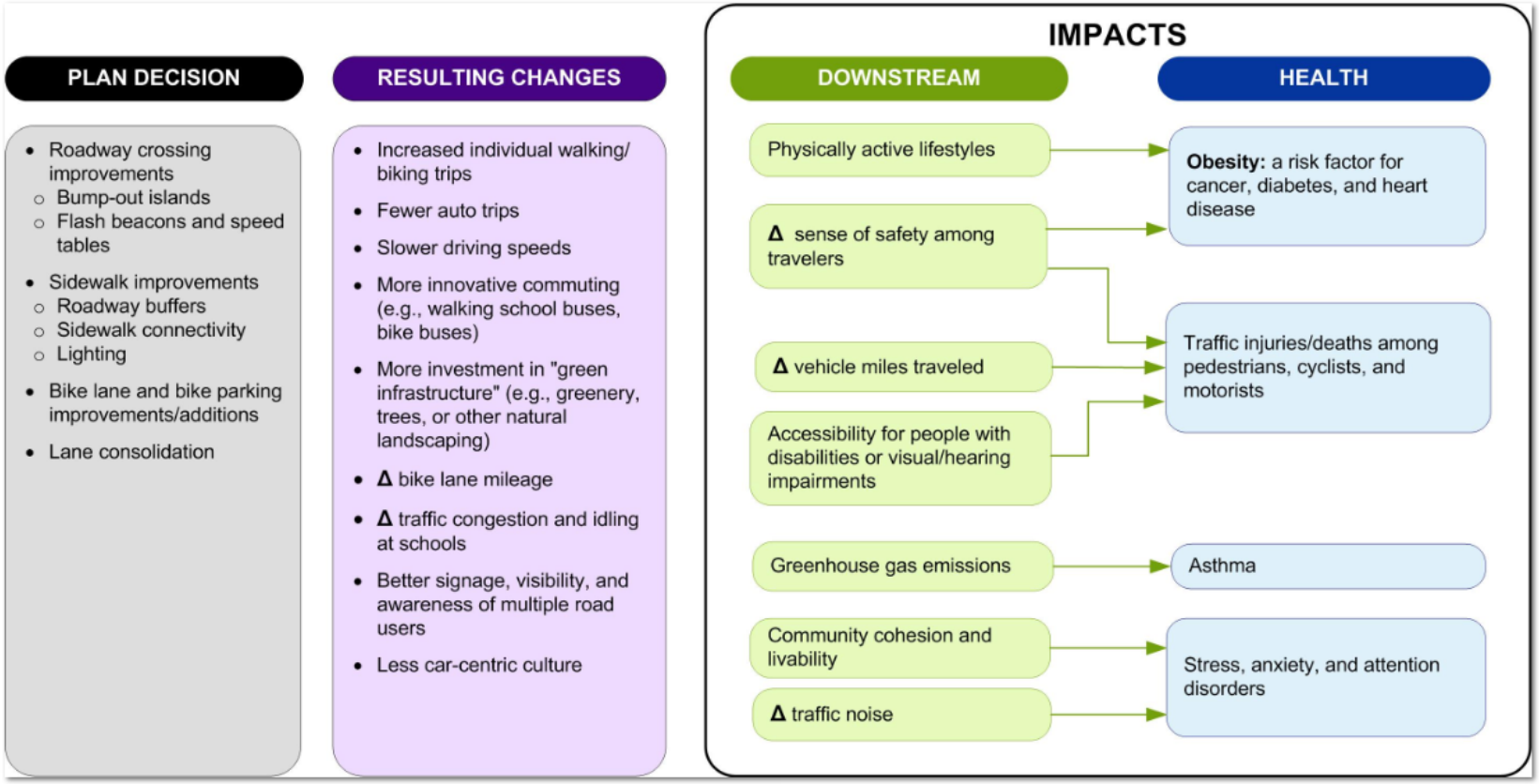
Appendix A:
Issues Identified at the Public Scoping Meeting

Community health issues		
poor nutrition	obesity	asthma and respiratory disease
stress anxiety	low birthright	heart disease
poor sense of direction	personal injury	addiction
childhood obesity	chronic diseases	depression
attention difficulties	diabetes	poor mental health
acting out	hypertension	
Contributing behaviors		
screen time, TV, video games	college partying, fraternities	distracted walking
sedentary lifestyle	substance abuse	failure to follow traffic rules
texting and distracted driving	jay-walking and jay-biking	social and emotional isolation
lack of enforcement for personal vehicle and pedestrian conflicts	fear or lack of sense of safety for walking and biking	attitudes and lack of awareness of pedestrian traffic laws, especially among kids and students
car-centric culture and GIS reliance		
Existing conditions		
low level of gym/recess in schools	Unpleasant walking atmosphere	Michigan vehicle code-only pedestrians in crosswalk
Burcham is a major link between East Lansing and Okemos	pedestrian activated lights are lacking (only provided for trail)	Hagadorn is designed as the thru-way and major north-south link
Poverty	no places to rest	connection to nature is lacking
Aging population	too few bike racks	proximity to services
"driving with blinders" and unawareness of other modes of transportation	numerous schools	too few cross walks
Congestion and GHG emissions	schools of choice increase traffic	high density development increases VMT and congestion
no bike-riding policy for K–6	noise pollution	

Appendix B:
Initial Health and Behavior Pathway Diagram

This diagram, showing the pathway between plan elements and potential behavior changes and health impacts, was developed as an initial tool to help the Advisory Committee understand the potential health impacts to be addressed in this HIA. This pathway diagram was an important early tool for identifying the final program elements to include in the HIA analysis.



Appendix C:
Flyer for Public Forum

Please join us for a hands-on community conversation about

Health and Safety Impacts of Potential Improvements in the Burcham-Hagadorn Corridor

Thursday, June 21
6:00 P.M. – 8:00 P.M.
Hannah Community Center, Room 211

Join your neighbors to discuss some of the potential health and safety impacts of road, sidewalk, crossing, or path improvements along the intersecting Burcham-Hagadorn roads corridor.

This corridor is host to three East Lansing public schools, strong family and student residential neighborhoods, and a senior living facility. Improvements to this corridor have been recommended in East Lansing's Non-Motorized Transportation and Climate Sustainability Plans, as well as Marble Elementary School's draft Safe Routes to Schools plan.

The community conversation is part of a larger effort by the Ingham County Health Department, in partnership with the City of East Lansing, the Tri-County Regional Planning Commission, the Marble Elementary Wellness Committee, and Public Sector Consultants to conduct a Health Impact Assessment (HIA) of key non-motorized transportation improvements in the corridor.

We hope you can make it to this interesting and engaging discussion.

Please RSVP to sdraheim@pscinc.com

Funds for the project have been provided by the Michigan Department of Community Health (MDCH). The MDCH supports the use of HIAs to objectively evaluate the potential health effects of a project or policy before it is built or implemented. The Department provides recommendations to increase positive health outcomes and minimize adverse health outcomes.

Ingham County Health Department

Tri-County Regional Planning Commission

PSC PUBLIC SECTOR CONSULTANTS

Appendix D:
Handout for Public Forum

PRIORITIZING PROPOSED CHANGES

Please rank the following 6 proposed infrastructure changes in the order of importance to you (1 being *least* important, and 6 being *most* important). You may want to consider the potential positive or negative health impacts, the number of people affected, and the feasibility of proposed changes. Feel free to write additional comments.

Sidewalk connectivity and lighting


Rank:

Bike lanes and parking


Rank:

Sidewalk/roadway buffers (e.g., plantings, or other "vertical" elements)


Rank:

Crossing and bump-out islands


Rank:

Flash beacons and speed tables


Rank:

Lane consolidation


Rank:

Anything else? What did we miss?

Appendix E:
Small Group Discussion Guide

1. List any community health issues that exist in the study area (i.e., the Burcham-Hagadorn intersection and corridor).

2. What behaviors on behalf of residents, employers, or visitors to the study area contribute to the health issues and/or conditions listed above?

3. What social, economic, or environmental policies or conditions influence or shape the behaviors described above?

A pathway diagram can demonstrate the connections of program, project, or policy changes with immediate, intermediate, and longer-term health, social, environment, and economic impacts.

4. Based on your findings from the first three questions, what is missing from the pathway diagram on the opposite page? *(Feel free to write directly on the pathway diagram or modify it as you and your group members see fit.)*

5. What data sources are available to measure the health or climate change impacts included in the far-right column(s) of the pathway diagram?

Given the information you've shared with us today, PSC and partners will begin to estimate and quantify the health impacts of proposed transportation and infrastructure changes to the Burcham-Hagadorn intersection and corridor. We appreciate your time and input into this process and encourage you to send any additional insights to jstroupe@pscinc.com.