Bottineau Transitway Health Impact Assessment Final Report

Hennepin County
Public Works
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The Bottineau HIA Advisory Committee also provided agency and community knowledge and substantial input and guidance on scoping, the community profile, assessment findings, and recommendations and reviewed drafts throughout the HIA stages. The committee's members included:

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Executive Summary

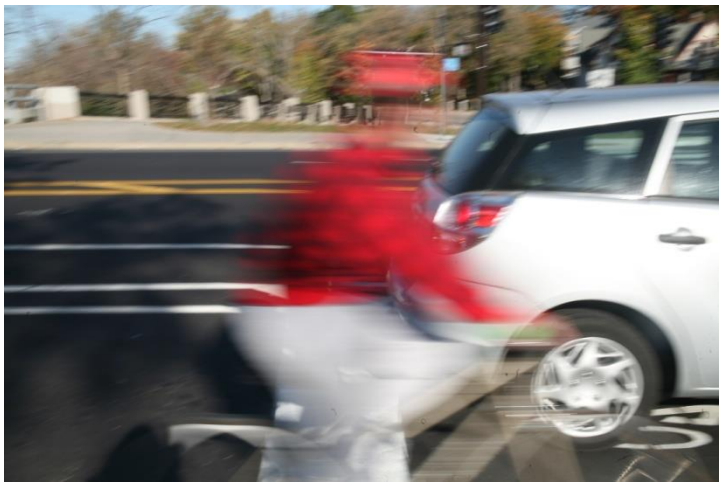
Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact." –The World Health Organization

Our transportation systems and the characteristics of our neighborhoods have a substantial impact on our health. Transportation systems and neighborhood characteristics can benefit people's health by helping them access basic necessities like grocery stores and health services. At the same time, they can have negative consequences. For example, when transportation systems and neighborhoods lack safe places to walk and bike, people tend to be less active and suffer from obesity, diabetes and other health problems as a result. The consequences are costly too. In 2008 alone, the health costs of the U.S. transportation system totaled an estimated 400 billion dollars. These costs are attributed to a myriad of side-effects from traffic collisions and air pollution to obesity.[1]

For a long time, transportation and land use planning did not consider the health costs and benefits of projects. That is changing, for we can no longer afford to ignore transportation and land use impacts on health. New practices, tools and collaborations are emerging throughout the United States to incorporate health considerations into project planning. Health Impact Assessments (HIAs) are among these. The HIA approach is a practice for assessing the potential effects of a proposed policy or project on the health of a population and the distribution of those effects within the population.

This HIA report provides policymakers, planners, community members and other interested stakeholders with information about how the Bottineau Transitway and surrounding land uses could play an important role in improving the health of our communities. This report is intended to help stakeholders consider health as they make decisions and participate in the next phases of the Bottineau Transitway project development and Bottineau station area land use planning. It provides recommendations for advancing the transitway's positive health impacts.

Overall, the HIA findings show that the Bottineau Transitway offers real potential to improve health for communities living near the transit stations. People accessing the light-rail line who live elsewhere in the region could also benefit. From a public health perspective, the findings support the construction of the Bottineau Transitway. The magnitude of the project's impacts on health and who is impacted will depend on surrounding land uses and the strategies to ensure access to the new light rail transit's (LRT's) benefits.



About the Bottineau Transitway

The Bottineau Transitway (also known as the METRO Blue Line Extension) will bring LRT into the northwest area of the Twin Cities. The 13-mile corridor will start in downtown Minneapolis, pass through the cities of Golden Valley, Robbinsdale and Crystal, and end in Brooklyn Park (see Map 1). The Bottineau Transitway will connect to the region's system of transitways, including the Hiawatha LRT (METRO Blue Line), the METRO Green Line and Green Line extension (Central Corridor and Southwest LRT) and Northstar Commuter Rail at Target Field Station in Minneapolis. As a major infrastructure project, it will shape the transportation system and neighborhood characteristics in the Bottineau Corridor and thus, potentially impact health.

The Hennepin County Regional Railroad Authority (HCRRA) and the Metropolitan Council are the local co-partners for the development of the Bottineau Transitway. Following publication of the Draft Environmental Impact Statement (DEIS) in early 2014, the Metropolitan Council will become the sole transitway project sponsor, with HCRRA continuing to provide leadership of the land use planning.

Map 1: The Bottineau Transitway

Sources: Hennepin County, MN Department of Transportation

About this Report

This report and the process to develop it followed leading standards, frameworks, and practices in the HIA field. The findings and recommendations are based on continuous input from the Bottineau Transitway HIA Advisory Committee, interviews with stakeholders, focus group discussions, a breadth of data sources, analysis from earlier reports and processes related to the Bottineau Transitway, and extensive literature review. As is common for most HIAs, this report does not provide quantitative estimates of expected health outcomes. The data and methodologies for making quantitative health predictions for a transit project of this scale are either unavailable, would not offer reliable or valuable estimates, or would require time and resources well beyond those available for this HIA.

The Bottineau Transitway HIA Advisory Committee guided the direction of the HIA and provided feedback on each stage of the HIA process. The Committee consisted of representatives of community organizations and networks, public health practitioners and researchers, transit engineers, the HIA project consultants, and neighborhood association board members. A list of the Committee members can be found in the acknowledgements at the beginning of the report.

Bottineau Transitway HIA Goals

The Bottineau HIA Advisory Committee identified the following five key goals for the overall HIA process.

1. Educate Bottineau Transitway stakeholders and decision-makers about the connections between transportation, health, and health equity.

2. Engage diverse stakeholders most impacted by the Bottineau Transitway and incorporate their input into recommendations for optimal, equitable health outcomes.

3. Make recommendations that support greater equity and optimal community health outcomes, and that reflect the interests and priorities of the impacted communities.

4. Influence decision-making to ensure that equitable and optimal community health benefits result from the Bottineau Transitway project.

5. Build and strengthen partnerships between community organizations and government agencies.

Summary of Existing Conditions

The Bottineau Transitway will serve an increasingly diverse area.
The proposed line intersects with cities that differ greatly in population density, median income, poverty rates, unemployment rates, average age, and percentages of foreign-born, minority, youth, and senior populations.

From 2010 to 2030 the population in the Bottineau Corridor cities is anticipated to grow by about 80,000 people. This represents nearly a third of the population growth anticipated for all of Hennepin County.[2] Demographic shifts are also occurring. Minority, low-income, and foreign-born populations have all increased in the Bottineau Corridor cities between 2000 and 2010. The changing and increasingly diverse population indicates that the new transitway will serve communities with a wide range of needs and strengths.

The Bottineau Transitway is situated in a region facing social and racial equity challenges. Many measures including unemployment, educational attainment, and health outcomes indicate stark disparities for minority and low-income populations in Hennepin County and the greater metro area.

In Hennepin County, low-income communities and communities of color have higher rates of preventable health problems such as obesity and type II diabetes than do white and higher income populations. Other disparities in health include life expectancy, stress, rates of cancer incidence, and traffic fatalities. These disparities are the result of a wider set of forces: economics, social policies, politics, and our built environment. It is important that the health-promoting benefits of the transitway reach these communities.

Much of the built environment in the suburban Bottineau Corridor cities, as well as in the county and region, is characterized by job decentralization, low density development, and land-uses that prioritize automobile use over non-motorized forms of transportation. These characteristics influence health outcomes and health disparities in the region. Though the built environment caters largely to

automobile-oriented land uses, there are some areas along the Bottineau Corridor where between 19 and 58 percent of households do not have cars, which indicates a need for transit service and land uses that are designed for motorists and non-motorists alike.

Summary of Findings

Through the HIA process, many potential project impacts were considered from which six categories of *health determinants* emerged for detailed assessment. Health determinants are the circumstances that affect population health. Health determinants include factors such as where people live, the state of their environment, genetics, income and education level, and relationships with friends and family. This HIA focuses on health determinants categorized as physical activity, location affordability, employment, education access, traffic safety, and healthy food access. It also includes brief explanations of the potential health impacts of air quality, social cohesion, noise and vibration, and crime and personal safety.

Key Findings

Overall, the Bottineau Transitway has the potential to improve health in the region by influencing multiple factors that shape our health. The new transitway could have health benefits for communities by improving physical activity levels, employment access, housing and transportation costs, traffic safety, education access and access to healthy food.

Enhancements to the land uses surrounding the station areas could greatly advance the new LRT's impact on health. The Bottineau Transitway is very likely to be accompanied with some degree of development and capital improvements with transit-oriented development (TOD) characteristics and with improvements to pedestrian and bicycle facilities. Such improvements, though still early in the planning stage, could serve to greatly advance the new LRT's impact on health through improving walkability, improving location affordability, spurring job growth, reducing pedestrian and bicycle traffic fatalities and injuries, and encouraging the placement of vendors of healthy, affordable food.

The degree to which these health promoting benefits reach communities experiencing health disparities, such as minority and low-income populations, will depend on measures to ensure their access to the LRT. For communities that are experiencing health disparities in the Bottineau Corridor cities, the proposed transitway project represents an opportunity to improve health and address health disparities. For example, adjustments to the bus connector route service and preserving and supporting affordable and mixed-income housing near transit locations could facilitate accessibility to the new transitway project and its benefits for these populations.

Physical Activity Impacts

The Bottineau Transitway could increase people's daily physical activity. Nationally, people who use transit get 24 minutes of exercise per weekday just by walking to and from transit. The Bottineau Transitway will likely increase transit ridership, which could result in more people walking to and from transit.

The station areas of the transitway could include improved environments for biking and walking, such as more

Why physical activity matters for health

Research shows that exercise is vital for good health. However, about half of adults and three-quarters of children living in Hennepin County do not get the recommended levels of exercise.

crosswalks and paths. Research shows that streets that are safe and comfortable for pedestrians and bicyclists encourage people to get exercise as part of their daily routine.

The Bottineau Transitway will improve access to Theodore Wirth Park with proposed station options near Golden Valley Road or Plymouth Avenue. Studies show that when people have access to parks they are more likely to be physically active.

Location Affordability Impacts: Housing and Transportation Costs

The Bottineau Transitway could make the combined costs of housing and transportation more affordable. Transportation and housing costs are the two largest expenses for American families. Sometimes neighborhoods that have low housing costs can be expensive to live in because people have to drive most places and end up spending more on transportation.

Why location affordability matters for health

Households that have lower transportation costs have more left over in their budgets for resources that promote health like nutritious food and health care. Budgets that are less burdened by transportation costs can also help to reduce stress and prevent foreclosure and homelessness.

The Bottineau Transitway could help make the combined costs of housing and transportation more affordable because neighborhoods with access to transit, walkable streets and a variety of services have lower transportation costs. The new transitway also has the potential to raise property values, which could spark economic development, increase housing options in station areas, and help homeowners access capital for home improvements.

In some cases throughout the country, property value increases have reduced the affordability of the housing stock. Cities, communities and developers should work together to keep housing options affordable in station areas. These efforts can ensure that neighborhoods near the transit stations continue to be affordable for low-income households.

Employment Impacts

The Bottineau Transitway could improve access to jobs for communities in the station areas. Increasing transit connections to jobs throughout the region expands people's options for employment. The light-rail line also encourages economic growth and more jobs in communities surrounding the transit stations. The construction and day-to-day service of the Bottineau Transitway will also create jobs in the construction, operation, and maintenance fields.

Why employment matters for health

When people have quality jobs that provide a living wage they tend to live longer and have better physical and mental health. Many factors affect whether a person is employed and what kind of job he or she has. One important factor is transportation.

Currently, jobs are spread throughout the region, making it difficult and expensive for workers with limited car access to reach potential jobs. In some areas of the Bottineau Corridor, nearly 60 percent of households do not own a vehicle.

Education Access Impacts

The Bottineau Transitway will provide access to educational and vocational institutions.
The Bottineau Transitway will connect riders to North Hennepin Community College and other educational and vocational training institutions in the project area, which will help to increase education access, especially for students with limited car access or for those for whom transportation costs are a barrier to enrollment. Currently, some students living in Hennepin County find that limited car access and high transportation costs are barriers to attending college.

Why education matters for health

When people have more education they have better chances of securing jobs that pay well and do not expose them to dangerous or unhealthy conditions. They also gain knowledge and skills that help them access health information and resources.

Traffic Safety Impacts

The Bottineau Transitway could improve traffic safety.
Transit is one of the safest forms of transportation available. More people riding transit means people will be using a safer mode of transportation and will be less likely to be involved in traffic crashes.

The neighborhoods surrounding the transitway stations could include improved environments for walking and biking, such as more crosswalks and bike lanes. Such investments can reduce the risk of traffic-related injuries and deaths.

Research shows that streets that are safe and comfortable for pedestrians and bicyclists encourage more people to walk and bike. When more people are walking and biking there are lower rates of traffic accidents involving pedestrians and bicyclists.

Why traffic safety matters for health

Injuries from motor vehicle crashes can impact quality of life and have huge costs for the people involved and their families. In 2011, 5,089 people were injured in crashes in the cities along the Bottineau Transitway.

From 2001 to 2011 there were 5,094 total lives lost in collisions in the State of Minnesota. In 2011 alone, there were more than 72,000 motor vehicle crashes resulting in 368 deaths statewide. Out of the 368 deaths, 40 were pedestrians.

Healthy Food Access Impacts

The Bottineau Transitway could improve access to healthy food. Investments in station areas could encourage the placement of grocery stores nearby. The Bottineau Transitway could also help households decrease their transportation costs, freeing up more of their income for nutritious foods. However, more research and evidence is needed to identify the link between transit service and healthy food access.

Less than one-third of residents living in cities along the Bottineau Transitway eat recommended amounts of fruits and vegetables.

Why healthy food access matters for health

Good nutrition is vital to health, disease prevention and childhood development. A growing body of research provides evidence that environmental and socioeconomic factors, such as access to healthy foods, influence people's food choices and diet quality. When people have access to healthy food options they are better able to include healthy food in their diets.

Summary of Recommendations

Our environments and transportation systems play a major role in shaping the health of communities. The Bottineau Transitway and the land use changes that it could spark present a valuable opportunity to address health challenges in this corridor.

The following is a list of five key recommendations for the next phases of project development and station area land use planning to advance the transitway's positive impacts on health. These recommendations were developed based on input from the Bottineau HIA Advisory Committee and focus group participants and on HIA findings and strategies culled from research, case studies, and other HIAs. A complete list of recommendations can be found in the Recommendations section of this report.

The neighborhoods along the transitway are unique and have different characteristics; therefore, each will have different needs. For this reason, not all recommendations will apply to every neighborhood.

Recommendation to: Metropolitan Council and Hennepin County	**1. Conduct additional analysis to determine transit-dependent, low-income, minority, immigrant, non-English speaking, disabled, senior, and youth populations in the Bottineau Corridor cities who live outside the Bottineau Station Areas but for whom a connector route service could efficiently connect them to the Bottineau Transitway.** **Rationale**: The HIA findings show that these populations are experiencing health disparities and that the Bottineau Transitway is likely to offer many positive health benefits. Ensuring these populations will have access to the Bottineau Transitway means connecting them to the transitway's wide range of health-related benefits.
Recommendation to: Metropolitan Council, Hennepin County, and Bottineau Corridor cities with support from Metropolitan Council and Hennepin County	**2. Continue to engage populations living in the Bottineau Corridor during the Bottineau Transitway Project Development and Bottineau station area land use planning processes and incorporate engagement strategies to reach traditionally underrepresented groups such as low-income, minority, immigrant, and non-English speaking populations.** **Rationale:** The HIA findings show that these populations are experiencing health disparities. Meaningful participation from these populations could result in both the light rail line and station areas better serving their needs and creating better access for them.
Recommendation to: Bottineau Corridor cities with support from Metropolitan Council and Hennepin County	**3. Focus Bottineau Corridor cities' residential and commercial growth in the station areas and implement zoning, parking requirements, and building codes that encourage higher density, mixed-use development and benefit existing communities.** **Rationale**: Targeting growth in these areas will help increase transit-accessible employment opportunities and could improve location affordability. A large body of research shows that employment and lower housing and transportation costs for households can have numerous health benefits. Automobile-oriented development decreases physical activity and limits access to employment, education, and healthy foods for transit-dependent and low-income populations and is associated with increased traffic fatalities and injuries for pedestrians and cyclists. Higher-density, mixed-use development is more accessible for transit-dependent populations, requires less driving and can also result in better environments for walking.

Recommendation to: Bottineau Corridor cities and Hennepin County	**4. Incorporate pedestrian and bicycle infrastructure improvements into station area plans to improve traffic safety and facilitate access to the transit stations by foot and bike.**
	Rationale: This will improve traffic safety and facilitate bike and pedestrian access to the transit stations, thereby increasing the opportunity for physical activity. Facilitating bike and pedestrian access can also improve economic growth for surrounding businesses.
Recommendation to: Bottineau Corridor cities and Hennepin County	**5. Preserve existing affordable housing and support the development of affordable and mixed-income housing near transit locations using strategies that have been successful for other transit-related investments throughout the U.S.**
	Rationale: This could also help ensure more transit-dependent, minority and low-income populations have access to the new light rail line's wide range of health-related benefits.

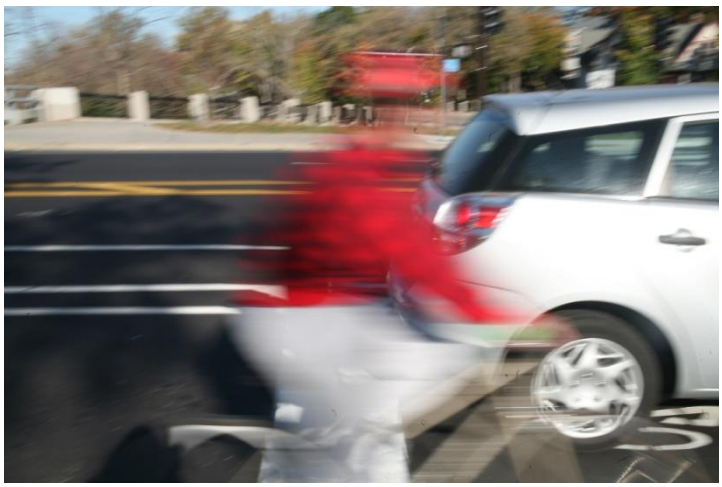
Introduction

Our transportation systems and the characteristics of our neighborhoods have a substantial impact on our health. Transportation systems and neighborhood characteristics can benefit people's health by helping them access basic necessities like grocery stores and health services. At the same time, they can have negative consequences. For example, when transportation systems and neighborhoods lack safe places to walk and bike, people tend to be less active and suffer from obesity, diabetes and other health problems as a result. The consequences are costly too. In 2008 alone, the health costs of the U.S. transportation system totaled an estimated 400 billion dollars. These costs are attributed to a myriad of side-effects from traffic collisions and air pollution to obesity.[3]

For a long time, transportation and land use planning did not consider the health costs and benefits of projects. That is changing, for we can no longer afford to ignore transportation and land use impacts on health. New practices, tools and collaborations are emerging throughout the United States to incorporate health considerations into project planning. Health Impact Assessments (HIAs) are among these tools. The HIA approach is a practice for assessing the potential effects of a proposed policy or project on the health of a population and the distribution of those effects within the population.

The Bottineau Transitway (METRO Blue Line Extension) will bring light rail transit (LRT) into the northwest area of the Twin Cities. As a major infrastructure project, it will shape the transportation system and neighborhood characteristics in the Bottineau Corridor and thus has the potential to impact health. Based on this premise, Hennepin County conducted an HIA to assess the potential effects of the Bottineau Transitway on the health of communities living near the Bottineau Transitway and in the region.

This HIA report provides policymakers, planners, community members and other interested stakeholders with information about how the Bottineau Transitway and surrounding land uses could play an important role in improving the health of our communities. This report is intended to help stakeholders consider health as they make decisions and participate in the next phases of the Bottineau Transitway project development and Bottineau station area land use planning. This report provides recommendations for advancing the transitway's positive health impacts.



The primary intended audiences for this report are the Hennepin County Regional Railroad Authority (HCCRA), the Metropolitan Council, city planners involved in station area planning for the Bottineau Transitway, and community members and stakeholders of the Bottineau Transitway.

The Bottineau Transitway HIA Advisory Committee guided the direction of the HIA and provided feedback on each stage of the process. The Committee consisted of representatives of community organizations and networks, public health practitioners and researchers, transit engineers, the HIA

project consultants, and neighborhood association board members. The advisory committee members reviewed HIA drafts and participated in six meetings of two hours each throughout the HIA phases to provide feedback on the HIA process, project scope, and findings. A list of Committee members can be found in the acknowledgements at the beginning of the report.

The findings and recommendations in this report are based on continuous input from the Bottineau HIA Advisory Committee, interviews with stakeholders, focus group discussions, a breadth of data sources, analysis from earlier reports and processes related to the Bottineau Transitway, and extensive literature review. As is typical for most HIAs, this report does not provide quantitative estimates of expected health outcomes. The data and methodologies for making quantitative health predictions for a transit project of this scale are either unavailable, would not offer reliable or valuable estimates, or would require time and resources well beyond those available for this HIA.

This report and the process to develop it followed standards, frameworks, and practices recommended in leading guidebooks and reports in the HIA field including Human Impact Partners' "A Health Impact Assessment Toolkit: A Handbook to Conducting HIA, 3rd Edition",[4] The National Research Council's "Improving Health in the United States: The Role of Health Impact Assessment",[5] The International Association of Impact Assessment's "Health Impact Assessment: International Best Practice Principles",[6] and "Health Impact Assessment: A Guide for Practice" by Rajiv Bhatia, Director of Occupational and Environmental Health for the San Francisco Department of Public Health.[7]

Bottineau Transitway HIA Goals

The Bottineau HIA Advisory Committee identified the following five key goals for the overall HIA process. Following the completion of the release of this report, these goals will be used to evaluate the HIA process and outcomes.

1. Educate Bottineau Transitway stakeholders and decision-makers about the connections between transportation, health, and health equity.

2. Engage diverse stakeholders most impacted by the Bottineau Transitway and incorporate their input into recommendations for optimal, equitable health outcomes.

3. Make recommendations that support greater equity and optimal community health outcomes, and that reflect the interests and priorities of the impacted communities.

4. Influence decision-making to ensure that equitable and optimal community health benefits result from the Bottineau Transitway project.

5. Build and strengthen partnerships between community organizations and government agencies.

Definitions of Key Terms

Below is a list of key terms and how they are defined for the purposes of this report.

Bottineau Corridor: In this report, the Bottineau Corridor is the geographic area that falls within a half-mile radius of the Bottineau Transitway.

Bottineau Corridor cities: cities whose borders fall within a half mile of the Bottineau Transitway. These include Brooklyn Center, Brooklyn Park, Crystal, Golden Valley, Minneapolis, New Hope, and Robbinsdale. When possible, data will focus on north Minneapolis rather than the entirety of Minneapolis because it is the section of the city closest to the line and is a distinct geographic area with much of it physically separated by Interstates 394 and 94 and the Mississippi River.

Bottineau Station Areas: In this report, station area is a half-mile radius surrounding a proposed station location.

Draft Environmental Impact Statement (DEIS): The Environmental Impact Statement (EIS) process includes the preparation of a Draft Environmental Impact Statement (Draft EIS or DEIS), which must be made available to the public for review and comment. The Draft EIS is also distributed to public agencies for review and comment.

The DEIS describes and discusses:

1. The purpose and need for the project;
2. The alternatives considered;
3. The impacts of those alternatives; and
4. The agencies and persons consulted.[8]

Equity: This report uses the Corridors of Opportunity definition of equity, which is the principle that "everyone regardless of race, economic status, ability or the neighborhood in which they live has access to essential ingredients for environmental, economic, social and cultural well-being including: living wage jobs, entrepreneurial opportunities, viable housing choices, public transportation, good schools, strong social networks, safe and walkable streets, services, parks and access to healthy foods."[9]

Health Determinants: "Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact. The determinants of health include: the social and economic environment, the physical environment, and the person's individual characteristics and behaviors." –The World Health Organization[10]

Health Disparities: A health disparity is defined in this report as "a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion." - U.S. Department of Health and

Human Services. The Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020. [11]

Health Equity: Health equity is the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities." - U.S. Department of Health and Human Services, Office of Minority Health[12]

Light Rail Transit (LRT): Light rail transit utilizes electrically powered vehicles that operate on two rails and receive electrical power from an overhead wire. LRT vehicles are usually smaller and slower than subways, but often travel faster and carry more passengers than streetcars or buses.

Locally Preferred Alternative (LPA): The LPA is the physical design concept and scope for a major propsed transit investment that Hennepin County, Metropolitan Council, and the cities along the transitway select.

Minority Populations: Minority populations include people belonging to Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander races and/or Hispanic ethnicity, as defined in the U.S. Census.

New Starts: The New Starts program is the federal government's primary financial resource for supporting locally-planned, implemented, and operated transit "guideway" capital investments. From heavy to light rail, from commuter rail to bus rapid transit systems, the New Starts program has helped to make possible hundreds of new or extended transit fixed guideway systems across the country.[13] The region will apply for funding through the FTA's New Starts. About half of the funding for construction of the Bottineau Transitway is anticipated to come from the New Starts program.
Twin Cities 7-county metro region: includes the counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington

Vulnerable Populations: populations that could be at risk for or are experiencing health disparities. The Advisory Committee determined that, for the purposes of this report, the following populations should be defined as vulnerable populations:

- Families with small children
- Non-English speakers
- Persons with physical and developmental disabilities
- Seniors
- Youth
- Low-income populations
- Minority populations

The Bottineau Transitway Project

The Bottineau Transitway (METRO Blue Line Extension) will bring light rail transit (LRT) into the northwest area of the Twin Cities. The 13-mile corridor will start in downtown Minneapolis, pass through the cities of Golden Valley, Robbinsdale and Crystal, and end in Brooklyn Park. The Bottineau Transitway will connect to the METRO Green Line and Green Line extension (Central Corridor and Southwest LRT) and Northstar Commuter Rail at Target Field Station in Minneapolis. (see Map 2, page 18 and Map 3, page 19).

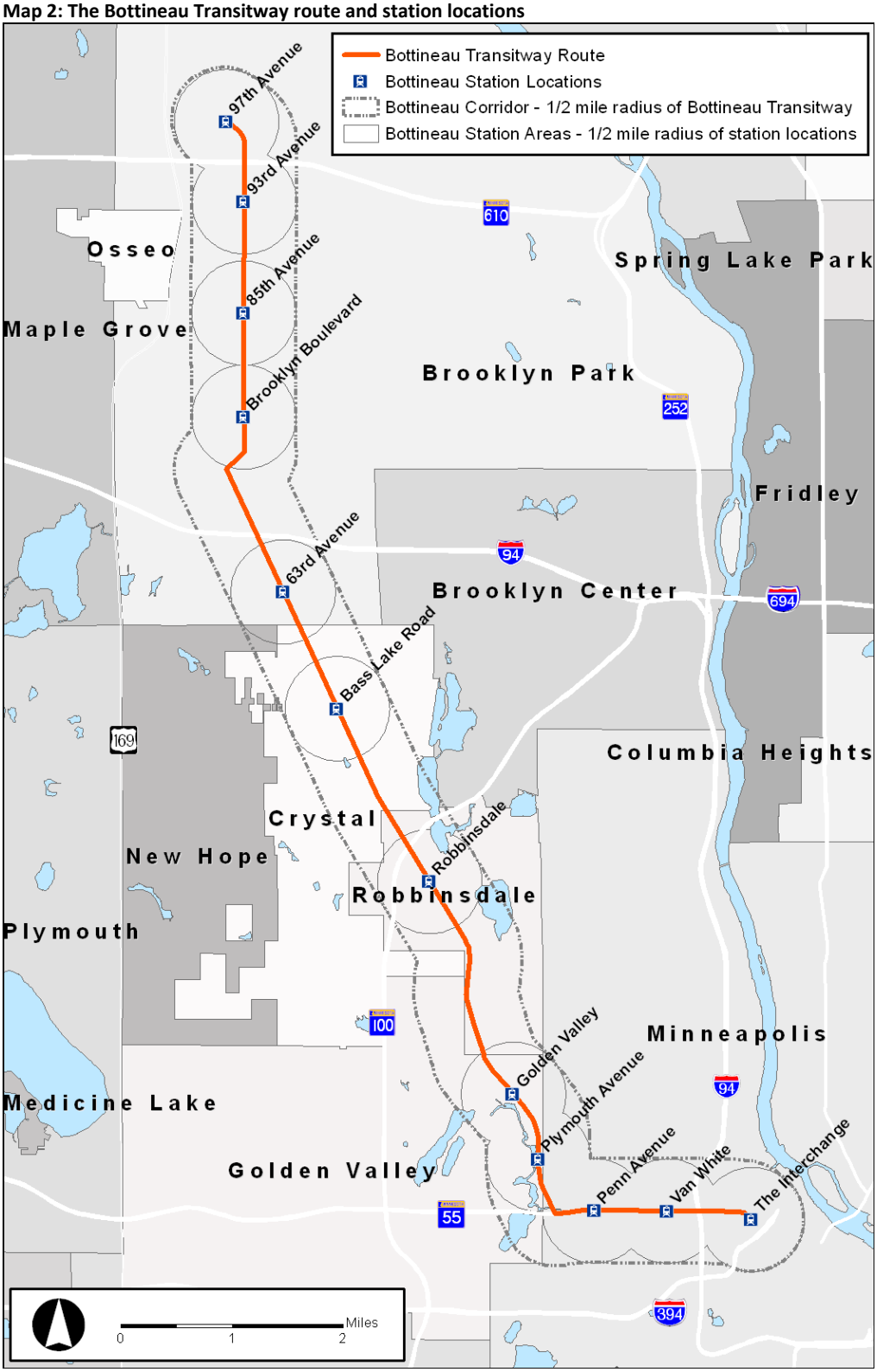
The Hennepin County Regional Railroad Authority (HCRRA) and the Metropolitan Council are the local co-partners for the development of the Bottineau Transitway. Following publication of the Draft Environmental Impact Statement (DEIS), the Metropolitan Council will become the sole transitway project sponsor with HCRRA continuing to provide leadership of the land use planning.

The Bottineau Transitway will represent a major increase in transit service for the cities along the transitway. The trains will run every 7 ½ minutes during rush hours, every 10 minutes during the daytime and evening, and every 30 minutes during late night and early morning periods. Local and express bus service will be maintained or enhanced throughout the corridor including connector route service to Bottineau Transitway stations. This new LRT is anticipated to be in operation by 2020 and provide an estimated 27,000 rides daily.

The transitway development process includes several phases: environmental review (including the Draft Environmental Impact Statement (DEIS)), Preliminary Engineering (PE), Final Design, and Construction. These phases are coordinated with the planning process for Bottineau station area land. The Hennepin County Regional Railroad Authority (HCRRA) and the Federal Transit Administration (FTA), in partnership with the Metropolitan Council, are preparing a (DEIS) in accordance with the National Environmental Policy Act (NEPA) to analyze the Bottineau Transitway's potential environmental impacts.

Hennepin County conducted this HIA during the DEIS and station area pre-planning phases. The HIA provides supplemental information on the relationship between health and transit to these transitway development and land use planning processes.

Map 2: The Bottineau Transitway route and station locations



Sources: Hennepin County, MN DNR, MN-DOT

Note: The Plymouth Avenue and Golden Valley station locations are two station options currently under consideration. The Bottineau Transitway will likely only include one of these stations.

Map 3: Regional Transit System

Source: Hennepin County Regional Railroad Authority, http://www.bottineautransitway.org/about_rts.htm

About Health Impact Assessments

A Health Impact Assessment (HIA) is a structured process for assessing the potential effects of a proposed policy, plan, or project on the health of a population and the distribution of those effects within the population. The overarching goal of an HIA is to make the health impacts of decisions more explicit and help shape decisions to improve a population's health. HIA uses diverse quantitative, qualitative, and participatory techniques including engagement of stakeholders with local knowledge. The HIA framework is founded on widely-documented evidence that a broad range of social, physical and environmental factors influence physical and mental health outcomes (see Table 1). These factors are also known as *health determinants*.

Health Determinants: "Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact. The determinants of health include: the social and economic environment, the physical environment, and the person's individual characteristics and behaviors." –The World Health Organization

Table 1: Examples of health determinants

Fixed Individual Factors	Individual Health Behaviors	Public Services and Infrastructure	Environmental Conditions	Social, Economic, and Political
• Genetic makeup • Gender • Age • Existing health conditions and disabilities	• Diet • Physical activity • Addictions • Coping	• Transportation • Education • Health care • Parks • Community centers • Economic development • Housing adequacy	• Air, soil and water quality • Community noise • Disease vectors	• Poverty • Inequality • Social cohesion and inclusion • Political participation

Source: Human Impact Partners

Health Impact Assessment principles and values

The Health Impact Assessment practice is based on five guiding principles. The International Association of Impact Assessment defines these as the following[14]:

1. **Democracy** – "emphasizing the right of people to participate in the formulation and decisions of proposals that affect their life, both directly and through elected decision makers. In adhering to this value, the HIA method should involve and engage the public, and inform and influence decision makers. A distinction should be made between those who take risks voluntarily and those who are exposed to risks involuntarily."

2. **Equity** – "emphasizing the desire to reduce inequity that results from avoidable differences in the health determinants and/or health status within and between different population groups. In adhering to this value, HIA should consider the distribution of health impacts across the

population, paying specific attention to vulnerable groups and recommend ways to improve the proposed development for affected groups."

3. **Sustainable development** – "emphasizing that development meets the needs of the present generation without compromising the ability of future generations to meet their own needs. In adhering to this value, the HIA method should judge short- and long term impacts of a proposal and provide those judgments within a time frame to inform decision makers. Good health is the basis of resilience in the human communities that support development."

4. **Ethical use of evidence** – "emphasizing that transparent and rigorous processes are used to synthesize and interpret the evidence, that the best available evidence from different disciplines and methodologies is utilized, that all evidence is valued, and that recommendations are developed impartially. In adhering to this value, the HIA method should use evidence to judge impacts and inform recommendations; it should not set out to support or refute any proposal, and it should be rigorous and transparent."

5. **Comprehensive approach to health** – "emphasizing that physical, mental and social well-being is determined by a broad range of factors from all sectors of society (known as the wider determinants of health). In adhering to this value, the HIA method should be guided by the wider determinants of health."

The HIA process

There are many ways to conduct an HIA. Typically, the HIA process involves a series of key stages: Screening, Scoping, Assessment, Recommendations, Reporting, and Evaluation and Monitoring. These are the stages followed for this HIA. The final stage, Evaluation and Monitoring, will not be included in this report because it will be addressed following the report's completion. Table 2 summarizes these key HIA stages.

Table 2: Key steps in the HIA process

HIA Stages	Summary of Activities
Screening	• Determine whether a HIA is feasible, timely, and would add value to the decision-making process.
Scoping	• Identify the health determinants that the project will likely impact, identify the study area and affected populations, prioritize research questions, identify evidence and research methods, establish stakeholder roles, and establish a timeline for the process.
Assessment	• Create an existing conditions profile for a geographic area and/or population in order to understand baseline conditions and to be able to predict change. • Assess potential health impacts, including the magnitude and direction of impacts, using quantitative and qualitative research methods and data.
Recommendations	• Develop recommendations to improve the project, plan or policy's health benefits and/or to mitigate any negative health impacts.

Reporting	• Create a written or visual presentation of the HIA results and recommendations, which take many forms including written reports, Power Point presentations, and comment letters. • Communicate the results within the decision-making process. A communications plan can include media outreach and public input.
Monitoring and Evaluation	• Track the impacts of the HIA on the decision-making process and the decision, the implementation of the decision, and the impacts of the decision on health determinants. • Evaluate the HIA process.

Sources: Health Impact Partners[15] and National Research Council[16]

Stakeholder Engagement and Technical Expert Participation

The HIA process for developing this report included engaging key informants, transit and public health experts, technical experts and other stakeholders throughout all stages of the HIA. They reviewed HIA processes and assessment results, provided input on recommendations, identified which HIA findings are of primary importance to stakeholders and decision-makers, and helped to communicate results.

The strategy for engaging stakeholders and incorporating their input involved multiple methods including:

- Convening an advisory committee of community representatives and representatives from stakeholder organizations;
- Hiring local organizations to serve as project consultants;
- Conducting focus groups with community members;
- Conducting interviews with representatives of communities and stakeholder organizations;
- Participation in community meetings and public hearings on transit; and
- Reviewing results from other relevant community engagement efforts in Bottineau Corridor cities.

Advisory Committee

The Bottineau Transitway HIA Advisory Committee guided the direction of the HIA and provided feedback on each stage of the process. The Committee consisted of representatives of community organizations and networks, public health practitioners and researchers, transit engineers, HIA project consultants, and neighborhood association board members. The advisory committee members reviewed HIA drafts and participated in six meetings of two hours each throughout the HIA phases to provide feedback on the HIA process, project scope, and findings. A list of Committee members can be found in the acknowledgements at the beginning of the report.

Project consultants

The project consultants were African, Career, Education and Resource, Inc. (ACER), NorthPoint Health and Wellness Center, and Northwest Hennepin Human Services Council (NWHHSC). These local organizations conducted focus groups and interviews to collect stakeholder input on community transit and health needs and met multiple times with the Hennepin County HIA staff to advise on the project scope.

Meetings, interviews, focus groups, and public hearings

During meetings, focus groups, and interviews the HIA project consultants and county HIA staff members provided participants with information about the HIA process, explained the concept of social determinants, and shared updates regarding the transitway project development. The meetings county HIA staff members attended included public hearings on the Locally Preferred Alternative (LPA) decision, a Transportation Equity Partnership station area design charrette in Heritage Park, a Northside Transportation Network working group meeting, Bottineau Transitway Community Advisory Committee (CAC) and Policy Advisory Committee (PAC) meetings, a focus group discussion with largely immigrant and refugee residents from the northwest suburbs convened by ACER, and three focus group discussions convened by the 2012-13 Humphrey Policy Fellows: Reshaping the Conversation on Transit

Development. NWHHSC facilitated discussions on the transitway and health impacts and collected input for the HIA from residents during meetings with NWHHSC-affiliated committees including Healthy Together Northwest, the Senior Leadership Committee, and the Northwest Advisory Commission. In addition, NWHHSC coordinated HIA activities with the North Hennepin Community College (NHCC) Student Senate. The NHCC Student Senate surveyed NHCC students on how transportation impacts their education and provided their responses for this HIA.

Review of other community engagement efforts

The county HIA staff reviewed results from public comments submitted during the Bottineau Transitway public involvement process[17], community engagement efforts led by Northside Transportation Network and the Minnesota Council for Environmental Advocacy[18], and the NorthPoint Health and Wellness community engagement work regarding food access and residents' priorities in north Minneapolis.

Experts and key informants engaged

Hennepin County HIA staff members worked closely with the Hennepin County Bottineau Transitway project manager, Kimley Horn & Associates, and the Metropolitan Council to ensure that the foundational basis for the HIA is consistent with the DEIS technical analysis and that the HIA findings and recommendations are relevant to the transitway project development. Additionally, SRF Consulting – a sub-contractor on the Bottineau Transitway DEIS – provided employment forecasts for the Bottineau station areas.

Table 3 provides a list of stakeholder organizations engaged during the HIA process, the area of expertise or perspective they shared, and how they were engaged.

Table 3: Organizations engaged during the Bottineau HIA process

Key informant, technical or community expert, stakeholder organization	Area of expertise	How engaged
African Career, Education, and Resource, Inc. (ACER)	Community engagement	Project consultant, advisory committee member
Alliance for Metropolitan Stability	Community engagement and equity	Interview
Asian Economic Development Association (AEDA)	Community engagement, equity, public health, Southeast Asian perspective, and HIA	Interview, advisory committee member
Asian Media Access (AMA)	Community engagement, community health, Southeast Asian perspective	Interview
Harrison Neighborhood Association (HNA)	Community engagement and equity	Meeting
Healthy Together NW Network	Community perspective	Focus Group, advisory committee member
Hennepin County DEIS team	Transit planning and DEIS	Meetings, advisory committee member
Hennepin County Bottineau Station-area Pre-planning team	Land use and station area planning	Meeting
Hennepin County Public Health Promotion	Public health	Interview, advisory committee member

Heritage Park Neighborhood Association	Community engagement and equity	Meeting, advisory committee
2012-13 Humphrey Policy Fellows: Reshaping the Conversation on Transit Development	Transit equity and community engagement	The Humphrey Policy Fellows convened and facilitated focus groups to develop recommendations for the HIA
Kimley Horn & Associates	Transit planning and DEIS	Meeting, advisory committee member
Lao Assistance Center	Community engagement and equity	Interview
Metropolitan Council Member	Decision-making and affordable housing	Interview
Metropolitan Council Staff	Transit planning, project development, DEIS	Meeting, Advisory Committee member
Metropolitan Interfaith Council on Affordable Housing (MICAH)	Community perspective and affordable housing	Interview, Advisory Committee member
Minnesota Center for Environmental Advocacy	Transit planning	Interview
Minnesota Department of Health	Public health and HIA	Advisory committee member
Minnesota Pollution Control Agency	Air quality	Meeting, email correspondence
Neighborhood Hub	Community perspective and health needs	Interview/meeting
North Hennepin Community College – Student Advisory Committee	Community perspective	Student Advisory Committee collected survey data on transportation and attending college for the HIA
North Point - Innovation Group	Community health needs and public health	Interview, advisory committee member, and project consultant
Northside Transportation Network (NTN)	Community perspective	Interview and attended meeting
Northwest Hennepin Human Services Council	Human services research, planning and network coordination	project consultant, advisory committee member
Redeemer Center for Life	Community engagement	Interview
Robbinsdale councilperson	Decision-making	Interview
Senior Leadership Committee	Senior health, community perspective	Focus Group, advisory committee member
Sonoma Technology, Inc. (STI)	Air Quality	Email correspondence
SRF Consulting Group, Inc.	Air quality and DEIS	Meeting, email correspondence
Summit Academy OIC	Workforce training	Interview
Wilder Research	Public health research	Advisory committee member

Bottineau Transitway HIA Scope

This section describes the scope of this HIA including the project alternative analyzed, the study area and affected populations included, and the health determinants selected to assess.

Project Alternative Analyzed

In June 2012, the Hennepin County Regional Rail Authority (HCRRA) recommended construction of the LRT line along West Broadway Avenue in Brooklyn Park, the Burlington Northern Santa Fe Railroad corridor, and Olson Memorial Highway/Trunk Highway 55 (called the B-C-D1 Alignment). As part of the transportation funding and construction process, the Metropolitan Council adopted HCRRA's recommendations into the region's 2030 Transportation Policy Plan (TPP) on May 8, 2013.
In addition to the proposed route described above, the Draft Environmental Impact Statement (DEIS) analyzes five alternatives including a No-Build alternative, a Transportation System Management alternative, and three other alternative routes.

The locally preferred alternative (LPA) identified for the Bottineau Transitway will begin in Brooklyn Park near the Target North Campus (located just north of Highway 610), follow West Broadway Avenue, and cross Bottineau Boulevard at 73rd Avenue to enter the BNSF railroad corridor. It will continue in the railroad corridor through the cities of Crystal and Robbinsdale. South of Robbinsdale, the LRT will continue into Golden Valley along the BNSF railroad corridor to Olson Memorial Highway (Highway 55), and then follow Olson Memorial Highway to downtown Minneapolis. In addition to the in-progress Interchange station downtown, the Bottineau Transitway includes 11 proposed stations (see Map 2, page 18).

This HIA focuses on examining the LPA and the potential health impacts of possible changes in land uses and economic development surrounding the station areas that may occur in response to the Bottineau Transitway.

Study Area and Affected Populations

The geographic and temporal boundaries for this HIA will vary by health determinant analyzed because 1) not all health determinants will impact people within the same geographic boundaries or time frame and 2) the data available varies both in geographic and temporal scope. However, the majority of the assessment will focus on the cities the Bottineau Transitway will pass through. In this HIA, the cities in the Bottineau Corridor include cities whose borders fall within a half mile of the LPA route - Brooklyn Center, Brooklyn Park, Crystal, Golden Valley, Minneapolis, New Hope, and Robbinsdale. The Bottineau Corridor in this case is defined as the half-mile radius surrounding the proposed transit route.

Because the Bottineau Transitway will connect to the regional transit system and impact the level of transit service in the region, health impacts of the project may extend to populations throughout the Twin Cities region. This HIA examines these impacts within the context of trends, characteristics, and conditions in Hennepin County and the Twin Cities region. When possible, data is presented specifically for populations within a half mile of the transitway or a half-mile radius of the station locations. Additionally, when possible, data focuses on north Minneapolis rather than the entirety of the city because north Minneapolis is the section of Minneapolis closest to the line and is a distinct geographic area with much of it physically separated from the rest of Minneapolis by Interstates 394 and 94 and the Mississippi River.

Health Determinants Selected

This section describes the broad categories of health determinants identified in HIA scoping, how they were selected, and the ways through which they connect to the Bottineau Transitway and health outcomes.

The identification and selection of health determinants studied in the HIA Assessment phase involved several stages:

1. **Identification of key themes** - First, through early interviews, focus groups and review of research and other community engagement results, Hennepin County HIA staff categorized the concerns and priorities of stakeholders. County HIA staff used the selection criteria listed below and the HIA guiding principles of Democracy, Equity, Sustainable Development, and Ethical Use of Evidence as a framework for identifying health determinants.

2. **Prioritization** – Second, in an advisory committee meeting and in later interviews and focus groups, project consultants and the county HIA staff asked participants to rank the health determinant categories in terms of priority for study using the selection criteria below.

3. **Selection** – Lastly, the final selection was based on a review of the ranking results, the feasibility of available methodologies, and knowledge from stakeholder engagement.

Selection criteria:

The criteria for selecting health determinants included the following:

- Existing research establishing connections between transit service and health determinants;
- Availability of data and resources for assessing the relative impacts of the different alternatives on health determinants;
- Direction of impacts (positive or negative);
- The potential magnitude of impacts;
- Health outcomes affected;
- Potential adverse impacts for vulnerable sub-populations, primarily elderly, disabled, minority, and low-income populations;
- Likelihood that benefits will be provided to vulnerable sub-populations, primarily elderly, disabled, minority, and low-income populations;
- Existing local and regional momentum around an issue; and
- Degree to which the issues will be covered in the DEIS with the intent of avoiding duplication.

Selected determinants

The six broad categories of health determinants identified for focused assessment include: 1) Physical Activity, 2) Location Affordability: Housing + Transportation Costs, 3) Employment, 4) Education, 5) Traffic Safety, and 6) Access to Healthy Foods.

Physical Activity

Physical activity was selected because (1) it is the strongest predictor of health outcomes, from type 2 diabetes and life expectancy to psychological well-being, (2) extensive research demonstrates that transportation systems and land use characteristics impact physical activity levels, (3) the Bottineau Transitway DEIS analysis will not include an assessment of transitway impacts on physical activity.

Location Affordability: Housing + Transportation Costs

Location Affordability – also described as the combined household cost burden of housing and transportation costs – was selected because stakeholders identified concerns and interests regarding transitway impacts on housing affordability. Studies demonstrate that affordable and stable housing is associated with a wide range of physical and mental health outcomes. Increasingly, the U.S. Department of Housing and Urban Development (HUD) and other organizations are recognizing that measures of housing affordability should include the transportation costs associated with where housing is located.[19] This HIA utilizes this new definition of affordability and looks at the combined costs of housing and transportation rather than housing affordability alone.

Employment

Employment was selected because employment was consistently identified as a top priority for stakeholders and because a large body of research shows that employment is a critical determinant of physical and mental health.

Education Access

Education access was selected because the Advisory Committee and stakeholders identified education as a topic of interest, the North Hennepin Community College Student Senate expressed interest in participating in the HIA, and because education is a strong predictor of health outcomes, including mortality, self-rated health, and cardiovascular disease.

Traffic Safety

Traffic safety was selected because traffic-related injuries and deaths for pedestrians, motorists, and vehicle passengers represent a preventable public health concern that disproportionately impacts the vulnerable populations identified for this HIA and because transit and land use improvements can play an important role in improving traffic safety. Additionally, while the DEIS will cover transit impacts on traffic safety at the neighborhood and intersection level, it will not cover several other potential transitway impacts on traffic safety related to increases in transit ridership and walking.

One concern identified by some residents is whether the Bottineau Transitway trains would pose a danger to children who play in the area and might try to cross the tracks in non-designated crossings. This HIA will not cover this aspect of traffic safety because the DEIS will cover the safety of rail crossings.

Access to Healthy Foods

Healthy food access was selected because stakeholder and Advisory Committee input indicated that healthy food access is a priority issue, especially in north Minneapolis, and previous studies and community engagement results provide some information on baseline conditions. Additionally, healthy food access may contribute to diet quality which is closely associated with health outcomes.

Additional health impacts covered in brief

There are many additional ways the Bottineau Transitway could impact health, however the resources and timeline for this HIA did not provide for a full analysis of every potential health determinant. The following health determinants are briefly covered in the Additional Health Impacts section: air quality; social cohesion; noise and vibration; and crime and personal safety.

Impacts not covered in the HIA

Parking

Concerns regarding parking came up in interviews with stakeholders and public comments collected from community engagement during the DEIS scoping phase. This HIA did not examine parking impacts. While parking is an important component of land use practices, it is not a key determinant of health and the Advisory Committee did not identify parking as a priority concern. Additionally, the DEIS will include thorough neighborhood-level assessment of changes in parking, access to affected properties and roadways, and short-term construction impacts.

Health Equity and Health Disparities

Based on the guiding HIA principle of *equity*, this report considers current *health disparities*, examines the potential for the Bottineau Transitway to impact *health equity* in the region, and identifies populations that could be vulnerable to or experiencing health disparities.

Equity: Equity is the principle that "everyone regardless of race, economic status, ability or the neighborhood in which they live has access to essential ingredients for environmental, economic, social and cultural well-being including: living wage jobs, entrepreneurial opportunities , viable housing choices, public transportation, good schools, strong social networks, safe and walkable streets, services, parks and access to healthy foods." – Corridors of Opportunity[20]

Health Disparities: A health disparity is "a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion." - U.S. Department of Health and Human Services. The Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020. [21]

Health Equity: Health equity is the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities." - U.S. Department of Health and Human Services, Office of Minority Health[22]

Vulnerable populations

Stakeholder input indicated that the following populations should be defined as vulnerable populations who may be disproportionately impacted by the new LRT.

- Families with small children
- Non-English speakers
- Persons with physical and developmental disabilities

- Seniors
- Youth
- Low-income populations
- Minority populations

Equitable access to the Bottineau Transitway

Many studies demonstrate the link between transportation and health determinants, and the health benefits associated with increased transit usage and decreased automobile dependency.
The Bottineau Transitway has the potential to offer health benefits for populations in Bottineau Corridor through many interrelated health pathways. For populations experiencing disproportionate rates of disease and mortality in the Bottineau Corridor cities, the proposed transitway project represents an opportunity to improve health and address health disparities. In interviews and focus groups with stakeholders, public hearings, and community engagement summaries, some stakeholders expressed concerns that some low-income, minority, and vulnerable populations – particularly those in north Minneapolis – might not have access to the Bottineau Transitway.

While the proposed route for the Bottineau Transitway has fewer transit stations in north Minneapolis – the area with the highest density of low-income, minority, and transit-dependent populations – than one of the alternatives (known as the B-C-D2 alternative and also studied in the DEIS), there may be opportunities for adjustments to the bus connector route service that could facilitate good accessibility to the new transitway project and its benefits for these populations.

Community Profile

The following section provides an overview of the demographic, health, and built environment characteristics of the communities that may be impacted by the Bottineau LRT. The communities identified in this HIA vary by health determinant analyzed because 1) not all health impacts will impact people within the same geographic boundaries or time frame and 2) the availability of data varies both in geographic and temporal scope. Depending on data availability, demographic, health and built environment characteristics are presented for the following areas:

1. **Bottineau Station Areas** – half-mile radius surrounding proposed station locations.
2. **Bottineau Corridor –** half-mile radius of the Bottineau Transitway.
3. **Bottineau Corridor cities** - cities whose borders fall within a half mile of the Bottineau Transitway. These include Brooklyn Center, Brooklyn Park, Crystal, Golden Valley, Minneapolis, New Hope, and Robbinsdale. When possible, data will focus on north Minneapolis rather than the entirety of Minneapolis because it is the section of the city closest to the line and is a distinct geographic area with much of it physically separated by Interstates 394 and 94 and the Mississippi River.
4. **Hennepin County**
5. **Twin Cities 7-county metro region –** includes the counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington

Summary

- **The Bottineau Transitway will serve an increasingly diverse area.** The proposed line intersects with cities that differ greatly in population density, median income, poverty rates, unemployment rates, average age, and the percentages of foreign-born, minority, youth, and senior populations. For example, the age 65 and older population in Golden Valley is 20 percent - more than double that of Minneapolis and Brooklyn Park. The changing and increasingly diverse population indicates that the new transitway will serve communities with a wide range of needs and strengths, and that different strategies will be required for different communities to achieve the greatest and most equitable health benefits of the transitway.

- **The Bottineau Transitway is situated in a region facing social and racial equity challenges.** Numerous indicators including unemployment rates, educational attainment, and health outcomes show stark disparities for minority and low-income populations in Hennepin County and the greater metro area.

Health Indicators

- **In Hennepin County, low-income communities and communities of color have higher rates of preventable health problems such as obesity and type II diabetes than do white and higher income populations.** Other disparities in health include life expectancy, stress, rates of cancer incidence, and traffic fatalities. These disparities are the result of a wider set of forces: economics, social policies, politics, and our built environment. It is important that the health-promoting benefits of the transitway reach these communities.

Built Environment Conditions

- **Much of the built environment in the suburban Bottineau Corridor cities, as well as in the county and region, is characterized by job decentralization, low density development, and land-uses that prioritize automobile use over non-motorized forms of transportation. These characteristics influence health outcomes and health disparities in the region.** Though the built environment caters largely to automobile-oriented land uses, there are some areas along the Bottineau Corridor where between 19 and 58 percent of households do not have cars, which indicates a need for transit service and land uses that are designed for motorists and non-motorists alike.

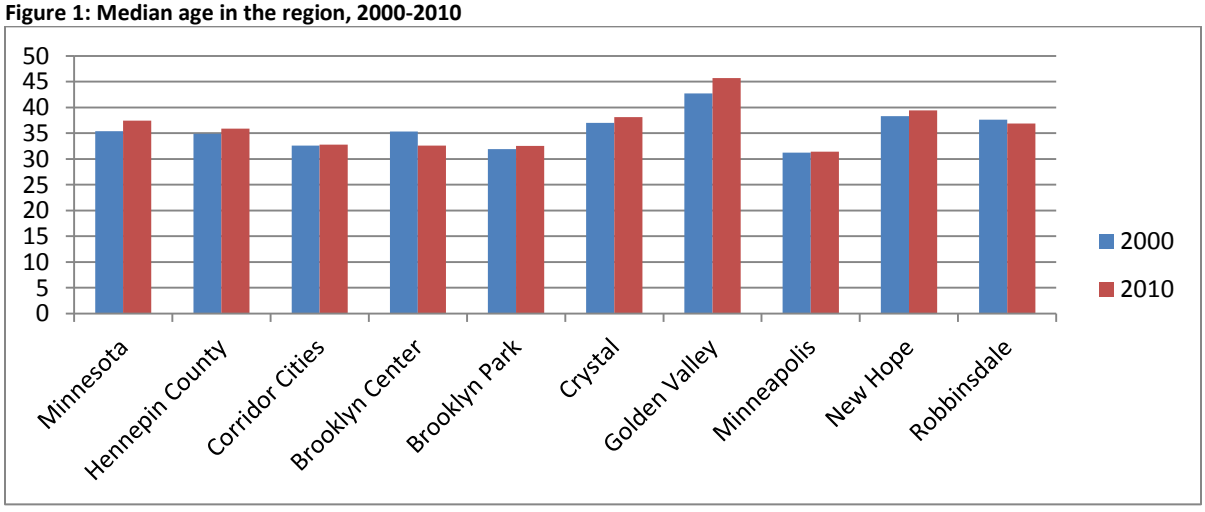
Demographic Characteristics

Age trends

Declining birth rates and increased longevity are contributing to an unprecedented trend in which the population in Hennepin County is aging. During the last two decades, the number of residents older than age 46 increased by nearly 70 percent while younger age groups did not keep pace.[23] As of 2010, more than 11 percent of the county was age 65 or older and the median age had increased from 34.9 in 2000 to 35.9. By 2035, an estimated 20 percent of the Hennepin County will be age 65 or older. [24]

With a median age of 32.8 years in 2010, the population in the Bottineau Corridor cities is, on average, younger than in the surrounding area and the state overall. Many of the western suburbs have a median age of 43 years or older. [25] As Figure 1 illustrates below, there is considerable variation in the median age among Bottineau Corridor cities. While Golden Valley exceeds the county median age by nearly 10 years, Minneapolis is relatively young (median age 31.4), holding down the county's overall median age.[26]

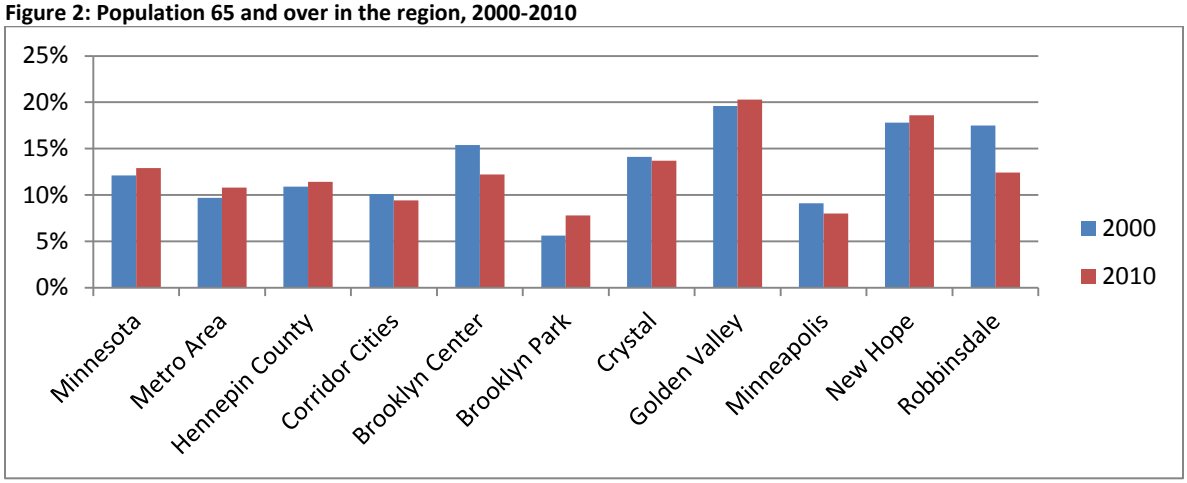
Figure 1: Median age in the region, 2000-2010



Source: U.S. Census 2000, 2010

Figure 2 shows similar variation in the percentage of the population age 65 and older among Bottineau Corridor cities. While over one fifth of Golden Valley's population was 65 and older in 2010, a much smaller percentage of the populations in Brooklyn Center and Minneapolis were 65 and older in 2010 (8.0 and 7.8 percent, respectively).

Figure 2: Population 65 and over in the region, 2000-2010

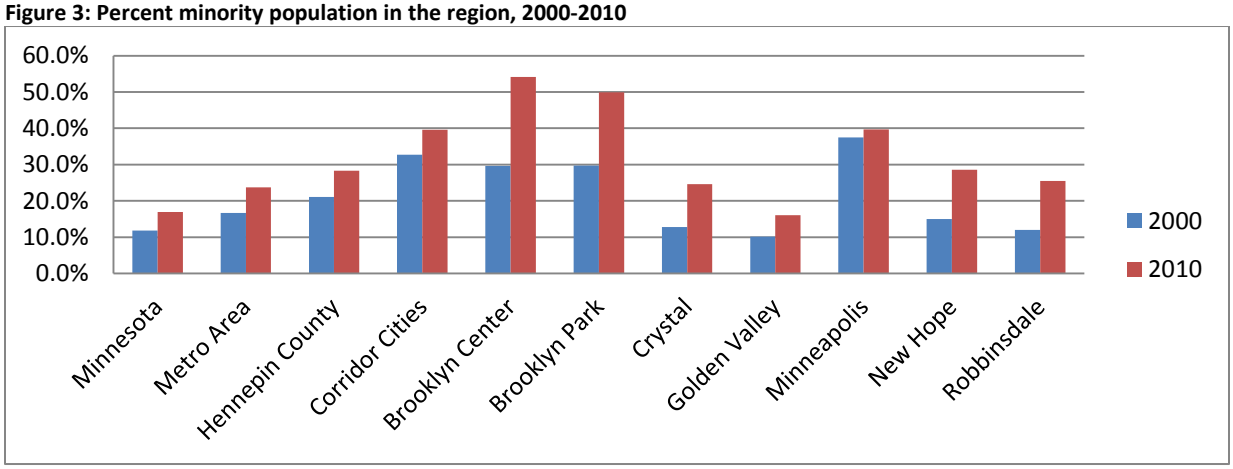


Source: U.S. Census 2000, 2010

Minority populations

The Bottineau Transitway line passes through suburban cities that have much greater percentages of minority populations than Hennepin County, the metro area, and Minnesota. Racial and ethnic diversity is increasing in Hennepin County as well as in the greater metropolitan region. In the Bottineau Corridor, all of the suburban cities have become increasingly diverse. As of 2010, nearly 40 percent of the population in the Bottineau Corridor cities was minority. In comparison, 17 percent of Minnesota's population and 28 percent of Hennepin County's population were minority in 2010. There is considerable variation among corridor cities. While 16 percent of Golden Valley's population was minority as of 2010, Brooklyn Center (54 percent) and Brooklyn Park (50 percent) have the highest percentages of minority populations in the state – a notable increase from 2000, in which the minority populations in both cities were about 30 percent (see Figure 3).

Figure 3: Percent minority population in the region, 2000-2010

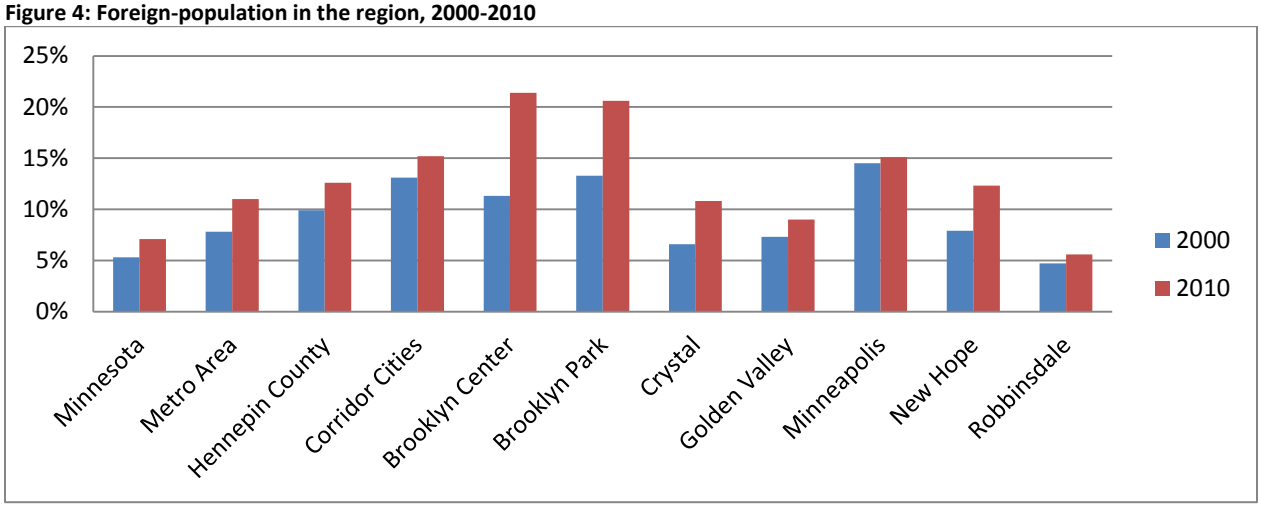


Sources: 2000 and 2010 U.S. Census, MN Compass accessed at http://www.mncompass.org
Minority population is defined as people belonging to Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander races and/or Hispanic ethnicity, as defined in the U.S. Census.

Foreign-born population

The Bottineau Corridor is now home to a percentage of people born outside of the United States that is unprecedented for the area. By 2010, in Brooklyn Center and Brooklyn Park more than one out of every five people was foreign-born. This represents a shift towards increasing immigrant populations in suburban areas (see Figure 4). Trends in immigration and the aging native-born population show that the foreign-born population will make up a growing share of the workforce in coming decades.[27]

Figure 4: Foreign-population in the region, 2000-2010

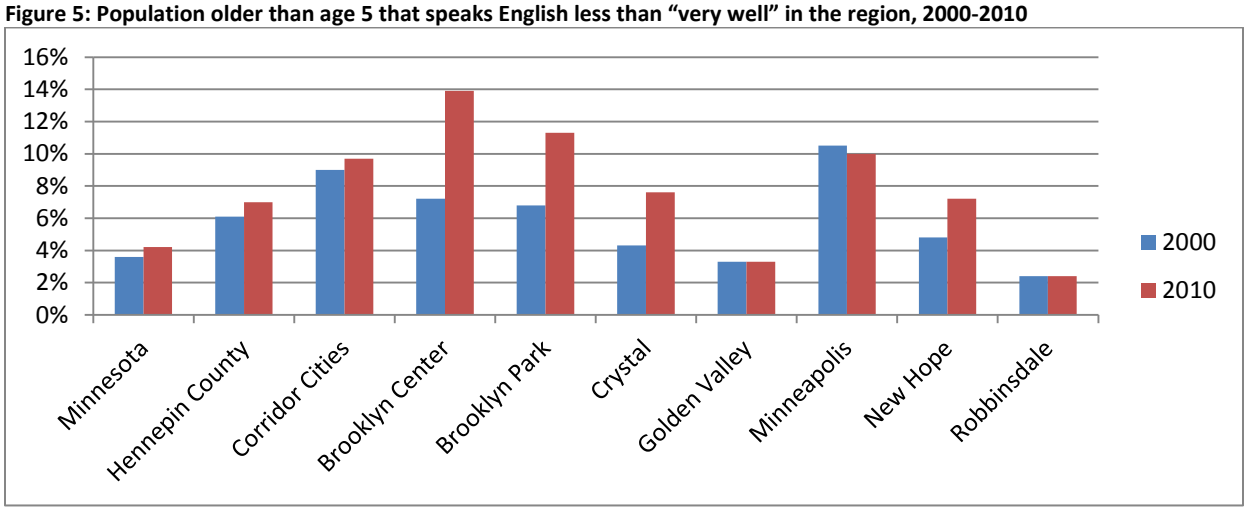


Source: 2006-2010 American Community Survey 5-Year Estimates, 2000 U.S. Census, Minnesota Compass

Language

A growing percentage of the population older than 5 years of age in the Bottineau Corridor has limited English proficiency. The percentage of the population older than age 5 that speaks English less than "very well" has increased markedly in Brooklyn Center, Brooklyn Park, and Crystal during the past decade. In Brooklyn Center and Brooklyn Park more than 10 percent of the population speaks English less than "very well". This growing population with limited English proficiency in the Bottineau Corridor cities suggests that translation of communications regarding the new transitway maybe be needed (see Figure 5).

Figure 5: Population older than age 5 that speaks English less than "very well" in the region, 2000-2010

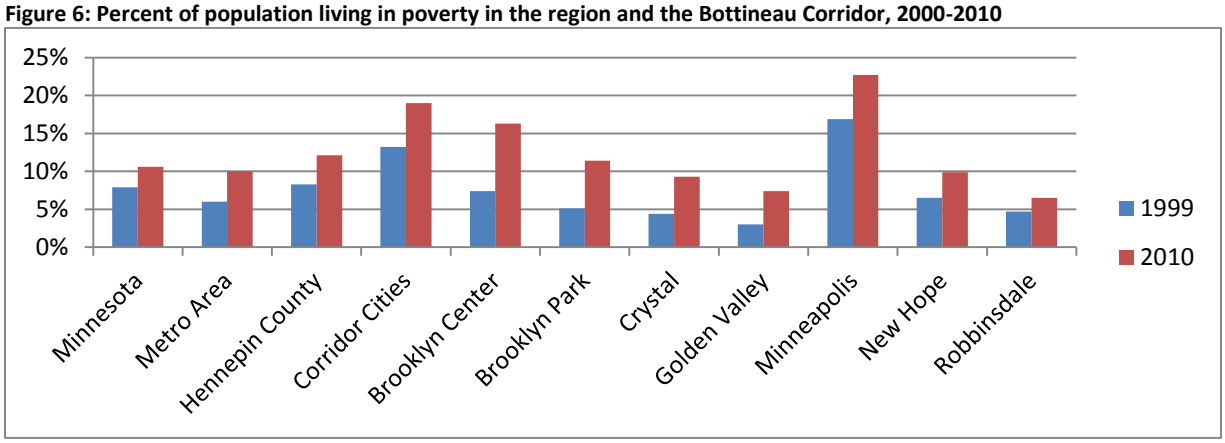


Source: 2000 U.S. Census, 2006-2010 American Community Survey 5-Year Estimates

Poverty

The percent of the population living in poverty[28] in 2010 in the Bottineau Corridor cities (19.0 percent) exceeds the percentages in Hennepin County (12.1 percent), the metro area (10.0 percent), and Minnesota (10.6 percent). Of the Bottineau Corridor cities, Brooklyn Center, Brooklyn Park, and Minneapolis have the highest poverty rates (see Figure 6). Poverty is more highly concentrated in some of the station areas along the corridor. The station areas surrounding the Brooklyn Boulevard, 63rd Avenue, Plymouth Avenue, Penn Avenue, and Van White stations all have 2011 poverty rates that exceed the corridor city average of 19 percent (see Figure 7). The 2010 poverty rates in Minnesota and Hennepin County were well below the national poverty rate of 15 percent. However, the poverty rate rose in the state, county, and in all the Bottineau Corridor cities from 1999 to 2010.

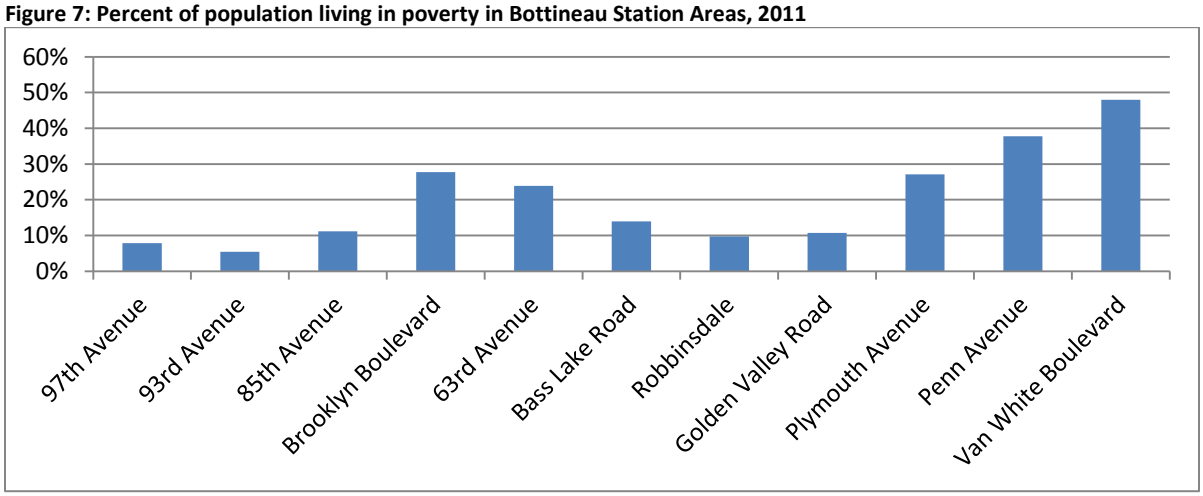
Figure 6: Percent of population living in poverty in the region and the Bottineau Corridor, 2000-2010



Sources: 2000 U.S. Census and 2006-2010 American Community Survey 5-Year Estimates, MN Compass accessed at http://www.mncompass.org

Percent of the population in poverty represents the percent of the population below the poverty level for 12 months or more at the time of the 2010 U.S. Census.

Figure 7: Percent of population living in poverty in Bottineau Station Areas, 2011



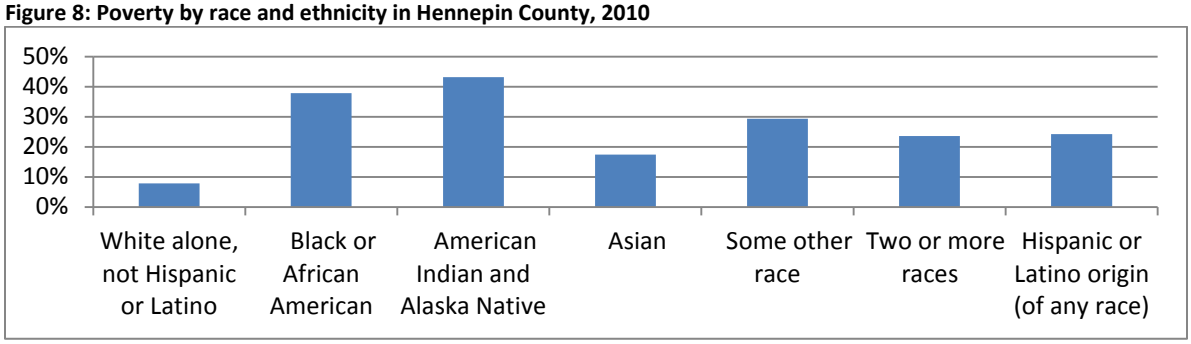
Source: American Community Survey 2007-2011 5-year Summary File: Low-Income Population

Poverty in the metro area, as well as in the Bottineau corridor, tends to be concentrated in certain neighborhoods rather than evenly distributed across the region. Of the 689 census tracts in the Twin Cities, 33 are very high poverty (40 percent or more of the population is below the poverty line) and 80 are high poverty (20 to 39.9 percent of the population is below the poverty line).[29,30] Among census

tracts that fall within half a mile of the transitway, there are three with very high poverty rates and six with high poverty rates (see Map 4, page 37). Poverty concentration is a concern because living in neighborhoods with high rates of poverty can place additional challenges on low-income families beyond what their individual circumstances dictate. These challenges often include underperforming schools, poor housing and health conditions, and limited access to private services and job opportunities.[31]

While the poverty rates in Minnesota and Hennepin County are low relative to the national rate, a disproportionate percentage of minority populations are living in poverty. In 2010, an estimated 38 percent of African Americans and 43 percent of Native Americans were living in poverty. In Hennepin County, African Americans are 4.8 times and Native Americans are 5.5 times more likely to be living in poverty than are white, non-Hispanics (see Figure 8).

Figure 8: Poverty by race and ethnicity in Hennepin County, 2010

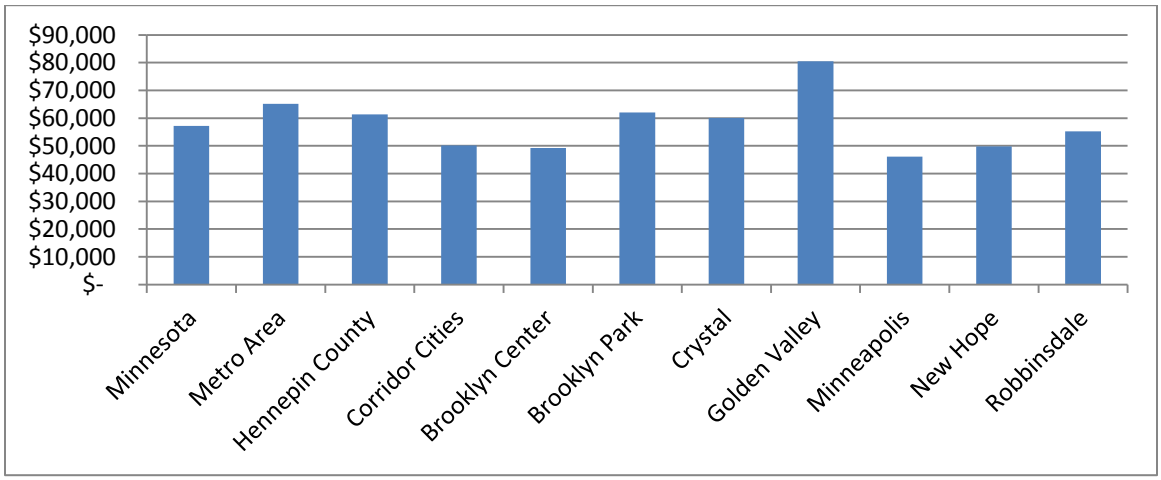


Source: U.S. Census Bureau, 2010 American Community Survey

Median income

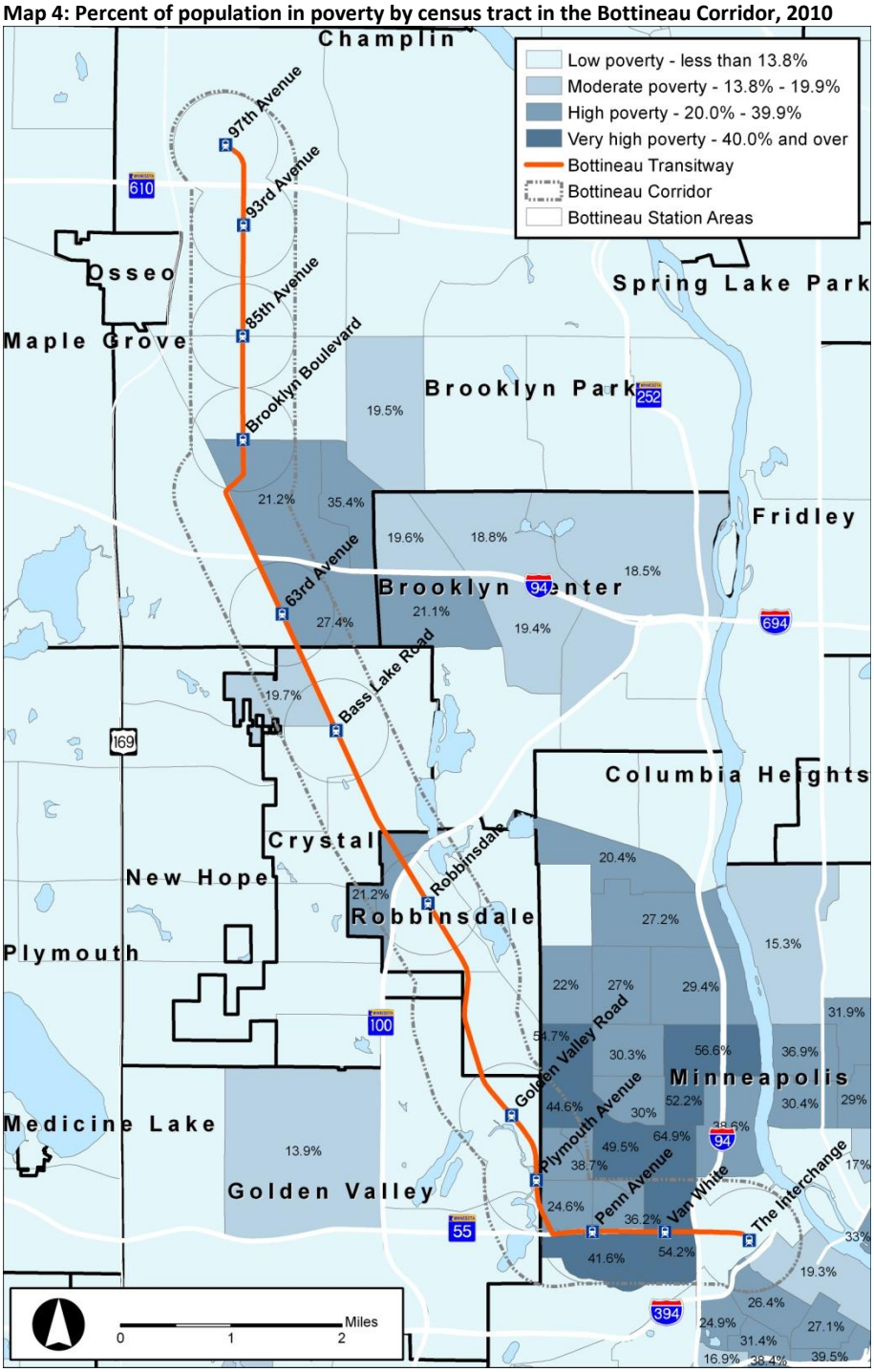
The 2010 median income for households in Bottineau Corridor cities ($50,103) was, on average, lower than it is in Hennepin County ($61,328) and the Twin Cities ($65,181) overall. However, as with the other demographic indicators presented in this HIA, there is notable variation among the Bottineau Corridor cities. The median incomes in Brooklyn Center, Minneapolis, and New Hope are below $50,000 while the median income in Golden Valley is $80,487 (see Figure 9).

Figure 9: Median household income in the region and the Bottineau Corridor, 2010



Source: 2006-2010 American Community Survey 5-Year Estimates, Metropolitan Council Metro Stats Dec 2011

Map 4: Percent of population in poverty by census tract in the Bottineau Corridor, 2010



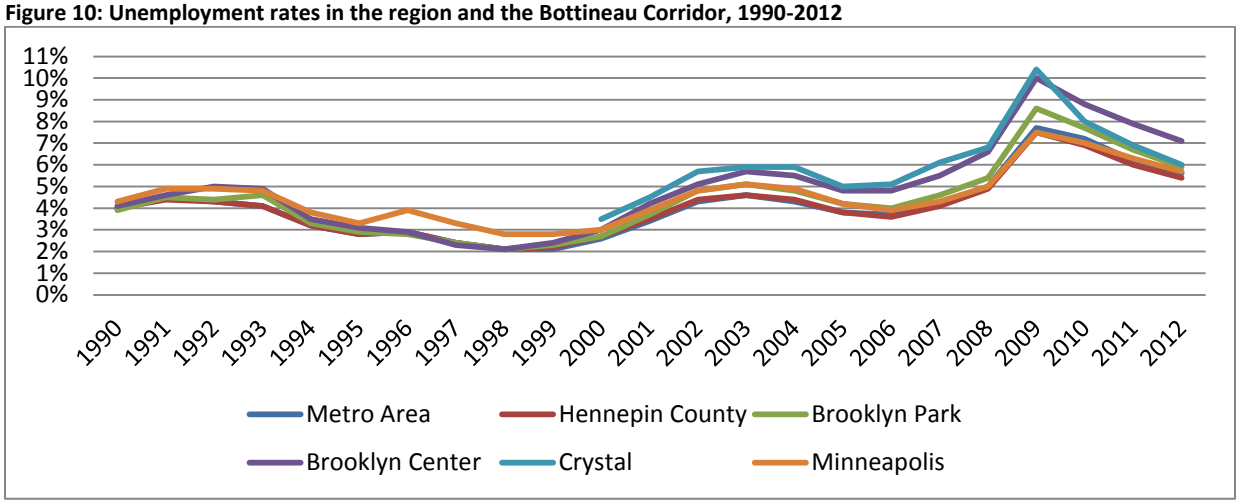
Sources: Hennepin County, American Community Survey 5 Year Estimate 2006-2010, MN DNR, MN-DOT
Bottineau Corridor is ½ mile radius of the transitway. Station area is ½ mile radius of the station

Unemployment

The Twin Cities metro area and Hennepin County consistently have notably low unemployment rates when compared to national averages. The 2011 average annual unemployment rates in the metro area and Hennepin County were 6.2 and 6.0 percent respectively as compared with the national average of 8.9 percent.[32]

Rates of unemployment have been consistently higher in the cities of Brooklyn Center, Brooklyn Park, and Crystal than in Minneapolis, Hennepin County and the region overall. Unemployment rates in the metro area, Hennepin County, and the Bottineau Corridor cities have followed similar trends in the past two decades. Unemployment rates in the region peaked in 2009, coinciding with the national economic downturn. Of the Bottineau Corridor cities, the City of Crystal saw the highest average annual unemployment rate during this period (10.4 as compared with 7.7 percent for the metro area). The rates have steadily declined in the region during the past few years (see Figure 10).

Figure 10: Unemployment rates in the region and the Bottineau Corridor, 1990-2012

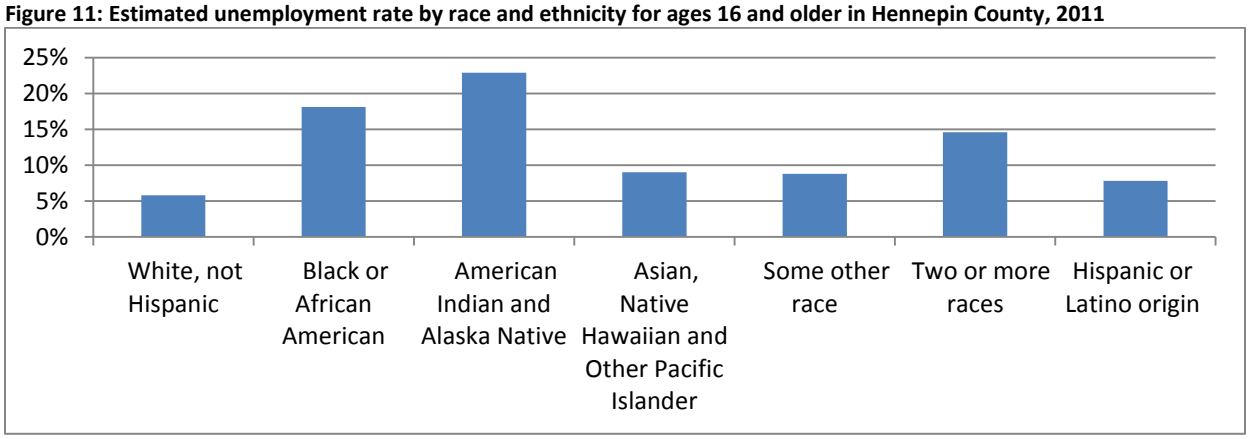


Source: Local Area Unemployment Statistics, Minnesota Department of Employment and Economic Development. Accessed at http://stats.metc.state.mn.us

Unemployment data not available for Golden Valley, New Hope, and Robbinsdale. Annual unemployment data for Crystal only available from 2000 through 2012.

While unemployment rates in the region are on a steady decline and are low relative to the national unemployment rate, stark disparities among race and ethnicity persist. In particular, the gap in unemployment rates among whites and African Americans in the region[33] was one of the highest in the country, ranking second among the nation's largest 29 Metropolitan areas in both 2009 and 2010. In 2010, blacks were 3.6 times more likely to be unemployed than whites.[34] Estimated unemployment rates by race in Hennepin County reveal similarly severe disparities in unemployment, with Native Americans being nearly 4 times more likely to be unemployed and African Americans being more than 3 times more likely to be unemployed than their white, non-Hispanic counterparts (see Figure 11).

Figure 11: Estimated unemployment rate by race and ethnicity for ages 16 and older in Hennepin County, 2011

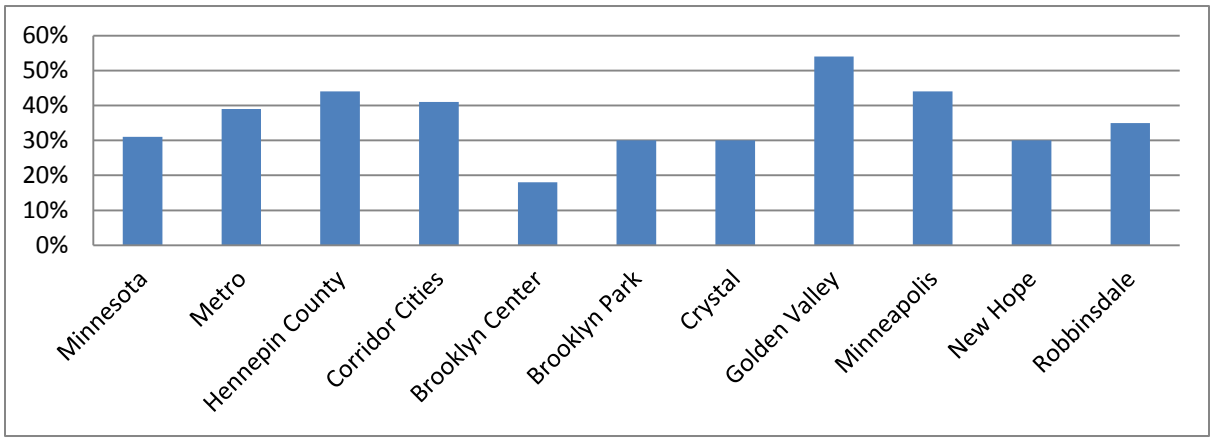


Source: 2007-2011 American Community Survey 5-Year Estimates

Educational attainment

In Hennepin County and the metro area overall the percentages of the populations age 25 and older with at least a Bachelor's degree exceeds the state percentage (44 and 39 percent respectively as compared with 31 percent) in 2010. The percentage of the county population age 25 and older with a Bachelor's degree or higher is on the rise, increasing from 39 percent in 2000. As with many of the other demographic indicators presented in this HIA, there is considerable variation in educational attainment among the cities along the Bottineau Corridor. While approximately 54 percent held a Bachelor's degree or higher in Golden Valley in 2010, 18 percent of the population in Brooklyn Center and 30 percent in Brooklyn Park, Crystal and New Hope reached this level of educational attainment.

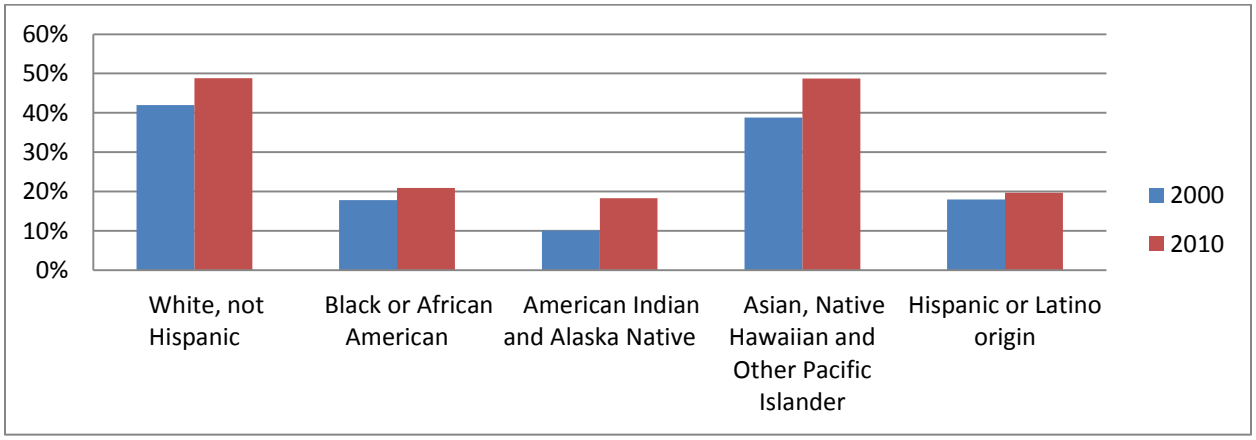
Figure 12: Percent of population with Bachelor's degree or higher age 25 and older in the region, 2010



Source: 2006-2010 American Community Survey 5-Year Estimates, Metropolitan Council

In 2010, nearly an estimated 50 percent of white, non-Hispanics and Asians held a Bachelor's degree or higher as compared with around 20 percent of African Americans, American Indians, and Hispanics (see Figure 13). However, 2010 estimates show notable increases in the percentage of people with a Bachelor's degree or higher among both whites and minority groups. The largest increase in the proportion of the 25 and over population with a Bachelor's degree occurred among Asians (11 percentage points) and American Indians (8 percentage points).

Figure 13: Percent of population with Bachelor's degree or higher age 25 and older by race and ethnicity in Hennepin County, 2000-2010



Source: 2000 Census, 2010 American Community Survey Estimate, Compiled by Hennepin County Research, Planning and Development Department

Health Indicators

The following section presents data on the leading causes of death, other measures of health, and health disparities. Unlike the demographic indicators discussed earlier in this report, most of the health information was not readily available at the city or census tract level and is largely presented at the county, metro area, or state level.[35] Nevertheless, the following information provides a picture of current trends and disparities in health that can be applied to the Bottineau corridor and brings to light how changes in the built environment could promote many different aspects of health.

Summary

In the Twin Cities 7-County region, cancer is the leading cause of death across all races/ethnicities and across all income levels. This is followed by heart disease, stroke, and unintentional injury.[36] Residents in Bottineau Corridor cities have relatively high rates of being over-weight and obese, which increases the risk of many health conditions including hypertension, type 2 diabetes, and certain cancers.[37,38] Many of the measures of health outcomes indicate disparities between white and minority populations and between those experiencing poverty and those who are not. Many of the prevalent health conditions and health disparities in Hennepin County are influenced by socio-economic and built environment factors.

Chronic Diseases: diabetes, obesity, cardiovascular disease, high blood pressure, and cancer

Obesity, cardiovascular disease, high blood pressure, type 2 diabetes, and cancer are chronic diseases that are responsible for 7 out of 10 deaths in the U.S. each year.[39] Although there are some unpreventable risk factors such as age, gender, and race, these chronic diseases share four common preventable risk factors: lack of physical activity, poor nutrition, tobacco use, and excessive alcohol consumption. These factors are closely tied with numerous socio-economic and built environment conditions from poverty and employment to healthy food access.

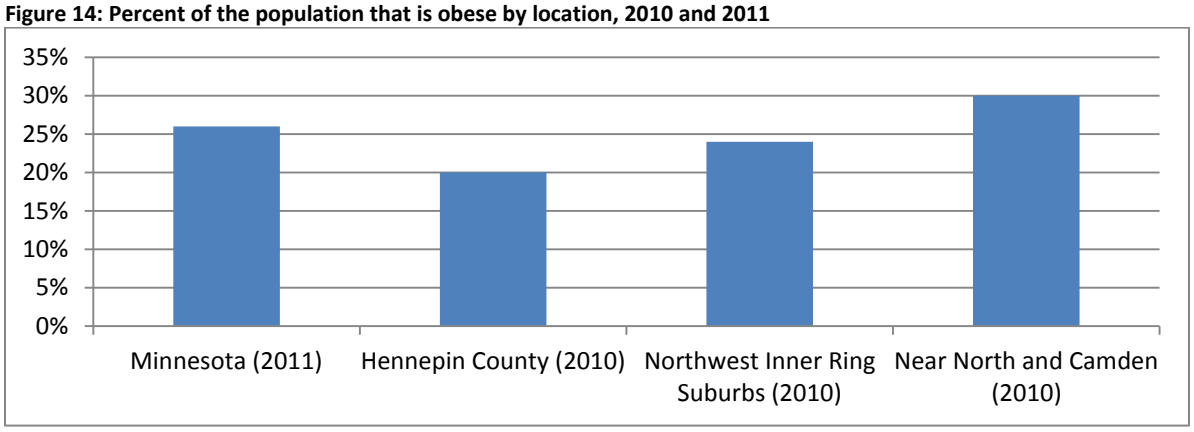
Diabetes

In 2007 of the 53,207 potentially avoidable hospitalizations in Minnesota, 10 percent - or over 5,000 - were diabetes related.[40] Hennepin County's 2010 Survey of the Health of All the Population and the Environment (SHAPE) data indicates that an estimated 5 percent of the population has diabetes and that low income residents are more than twice as likely as their higher income peers to have diabetes (9 percent versus 4 percent).[41] 2006 SHAPE data shows that US-born African Americans are twice as likely as the general population to have diabetes in Hennepin County.[42]

Obesity rate

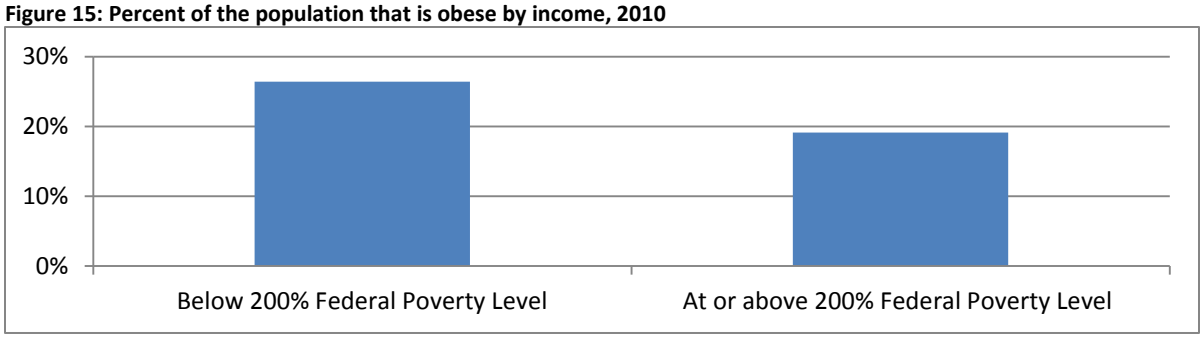
The obesity rate for adults in Hennepin County is lower in comparison to the rate in Minnesota (20 percent as compared to 26 percent). However, SHAPE data for 2010 shows a higher prevalence of obesity among adults in the areas surrounding the Bottineau Transitway (Near North and Camden in Minneapolis and the northwest inner ring suburbs) than in Hennepin County overall (see Figure 14 page 41).[43] Additionally, people who are low income in Hennepin County are more likely than those who are not to be obese (see Figure 15, page 41).

Figure 14: Percent of the population that is obese by location, 2010 and 2011



Sources: 2010 Hennepin County SHAPE Adult Data Book, CDC BRFSS Prevalence and Trends Data

Figure 15: Percent of the population that is obese by income, 2010



Source: 2010 Hennepin County SHAPE Adult Data Book

Cardiovascular disease

Cardiovascular disease includes heart disease and strokes and is the leading cause of death for both men and women in the U.S.[44] In Minnesota approximately 139,000 Minnesotans (3.5 percent of adults) have coronary heart disease (CHD), and over 90,000 (2.3 percent of adults) have had a stroke.[45] In 2009 heart disease and stroke were the second and fourth leading cause of death among Minnesota adults; 3,836 males and 3,396 females died from heart disease in Minnesota during this time period.

Hennepin County estimates that in 2010 about 5 percent of its population has been told by a doctor or other health professional that they have had a heart attack, angina, or stoke. In Minneapolis overall, 4.7 percent of residents had been told that they have one of these three conditions. Rates of cardiovascular disease were higher for cities in the Bottineau corridor, at 6.3 percent for Near North and Camden and 7.3 percent for the northwest inner ring suburbs.[46]

High blood pressure

Rates for high blood pressure are similar across geographies. Approximately 22 percent of individuals in the U.S. and Minnesota, 17 percent in Hennepin County, and 20 percent to 22 percent in north Minneapolis and the Northwest Hennepin Suburbs have been diagnosed with high blood pressure. Although these rates are substantially similar it is important to note that African Americans tend to develop high blood pressure at a younger age than whites, have higher average blood pressure levels and are less likely to have their blood pressure controlled than their white counterparts.[47,48]

Additionally, there is a 5 percentage point difference in hypertension rates between Hennepin County residents who are low income[49] (20 percent) and those who are not (15 percent).[50]

Cancer rates

In 2008, cancer caused 26 percent of deaths and an estimated 211,070 of Minnesotans are living with cancer. Nearly half of all Minnesotans will be diagnosed with cancer during their lives.[51] The Minnesota Age-Adjusted Invasive Cancer Incidence Rate per 100,000 Population in 2008 was 485 with a cancer death rate of 161. In Hennepin County between 2004 and 2008 the cancer incident rate was 545 for males per 100,000 population and 420 for females.[52] Also, between 2003 and 2007 the annual average number of new cancer cases diagnosed in Hennepin County was 5,009.[53] The Hennepin County rates are additionally reported as 470.4 per 100,000 between 2004 and 2008.[54] In its examination of cancer trends through 2009, the National Cancer Institute reports that cancer death rates for Hennepin County, while similar to the state of Minnesota, are trending downward.[55]

In Minnesota data is consistent with national data showing the risk of developing and dying from cancer differs by race and ethnicity. [56] Racial disparities in cancer deaths are even starker than disparities in diagnosis. Adjusting for population size and age distribution shows that African Americans were three percent more likely to be diagnosed with cancer than their non-Hispanic white counterparts but 34 percent more likely to die of cancer.[57,58]

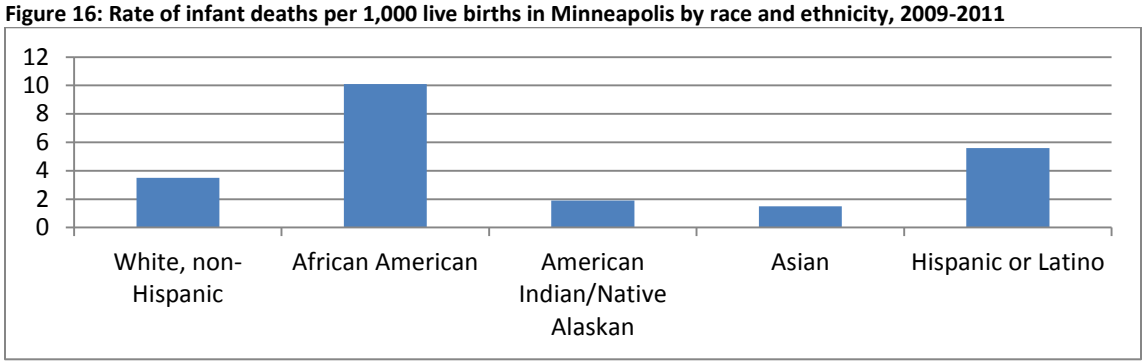
Infant mortality rates

The infant mortality rate (IMR) is the rate of infants per 1,000 live births who die before their first birthday.[59] IMRs are often used as a proxy for the health and well-being of a population because they are determined by factors that influence the health of all members of a population. Women's health, notably diet, weight, level of physical activity, and alcohol and tobacco use, is thought to be the most important factor in determining pregnancy-related outcomes like infant mortality.[60] Other important factors include race, ethnicity, income, and age. IMRs provide another indicator of concerning racial health disparities in the region.

Nationally, in 2009 the IMR was 6.39. The IMR of 12.4 for African Americans was more than double the White, non-Hispanic IMR of 5.29.[61] In 2010 in Minnesota the IMR was 4.6. While much lower than the national IMR, the average African American IMR for years 2006-2010 was 9.8, which was more than double the White, non-Hispanic IMR of 4.4.[62]

The City of Minneapolis reports three-year rolling averages for infant mortality rates city-wide, by race and ethnicity, and by region (see Figure 16, page 43). In 2011, there were an estimated 6.4 infant deaths per 1,000 live births. The IMR was much higher for African Americans (10.1) than for Whites (3.5) during the 2009-2011 period.[63] IMRs are not reported at the smaller geographic level of the other cities along the Bottineau Transitway corridor.

Figure 16: Rate of infant deaths per 1,000 live births in Minneapolis by race and ethnicity, 2009-2011



Source: Minneapolis Vital Statistics, Minneapolis Health Department

Low birth weight

Low birth rates are defined as a baby weighing less than 5.5 pounds at birth. Low birth weight babies are at risk of short term problems, such as infections, and longer term problems including delayed motor and social development and learning disabilities. Low birth weight is more common among twins and multiples. For this indicator, the statistics are limited to singleton births (one child births). Similar to infant mortality, the Center for Disease Control and Prevention states that risk factors for low birth weight include smoking, drinking, poor nutrition, stress, high blood pressure, lead in drinking water, and air pollution - factors that are tied to socio-economic and built environment conditions. The National Healthy Start Association reports that despite efforts by multiple health agencies, low birth weight rates have not declined over the past decade, and notably, the rate for African Americans is consistently twice that of white births. [64]

In 2010, 5.4 percent of infants (not including twins and multiples) were born at a low birth weight in Hennepin County.[65] Approximately 3.8 percent of white singleton births in Hennepin County were classified as low-birth weight in comparison to 8.7 percent of African American births. [66]

Mortality and life expectancy

Mortality rates differ greatly by race and income in the Twin Cities. For example, from 2005 to 2007 across the Twin Cities 7-county region the mortality rate was 248 per 100,000.[67] American Indian and African American county residents, however, had higher mortality rates at 814 and 704 per 100,000 respectively.

However, controlling for income group shows that mortality rates decline as the income of the area in which people live increases for all racial groups. African Americans and American Indians living in higher income areas have mortality rates that more closely match their white, Hispanic, and Asian counter-parts. In other words, racial disparities in mortality rates are closely related to neighborhood income levels.

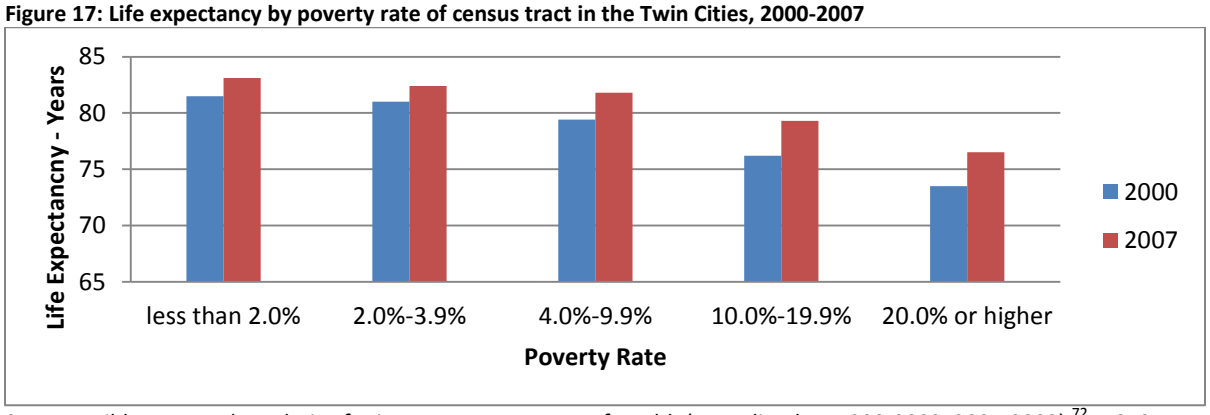
Like mortality rate, life expectancy in the Twin Cities differs greatly by race. In Minnesota, 2007 data showed that life expectancy at birth is 80.1.[68] Across the Twin Cities metro area between 2005 and 2007 life expectancy was 80.6 years, but high disparities existed among African American residents with a life expectancy of 74.4 years and American Indian residents at 61.5 years. [69]

Trends in life expectancy are also closely linked to income and poverty level. Wilder Research demonstrates that in the Twin Cities from 1998 to 2002, residents who lived in the areas of highest income and lowest poverty had any average life expectancy of 82 years, while residents who lived in the

areas of the lowest income and highest poverty had an average life expectancy of 74 years. This is a full eight-year difference. [70]

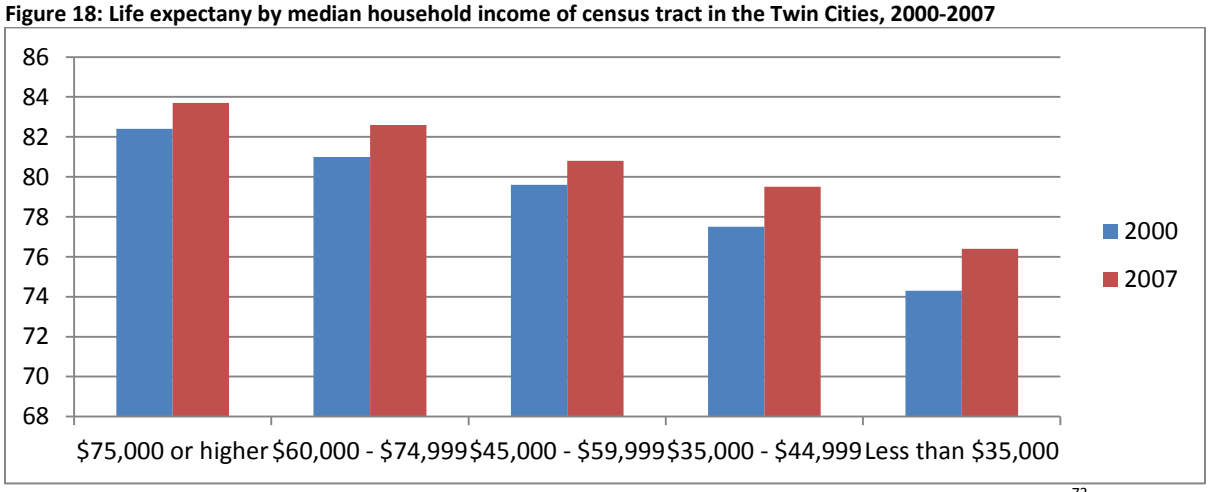
A comparison of life expectancy by census tract between 2000 and 2007 shows that the average standardized life expectancy increased across income levels with higher life expectancy reported among the lowest income zip codes. Still, the relationship between poverty rates, median household income, and life expectancy persists (see Figure 17 and Figure 18). [71]

Figure 17: Life expectancy by poverty rate of census tract in the Twin Cities, 2000-2007



Source: Wilder Research analysis of Minnesota Department of Health (mortality data 1990-2002, 2005-2009).[72] U.S. Census Bureau 2000 and American Community Survey 2005-2009

Figure 18: Life expectany by median household income of census tract in the Twin Cities, 2000-2007



Source: Wilder Research analysis of Minnesota Department of Health (mortality data 1990-2002, 2005-2009).[73] U.S. Census Bureau 2000 and American Community Survey 2005-2009

Built Environment Conditions: Decentralization, low density development patterns, vehicle access, and modes of transportation

Decentralization/Low Density Development Patterns

Similar to many metropolitan areas, the Twin Cities has experienced a notable decentralization of population and jobs during recent decades and has seen some of the greatest increases in traffic congestion in the United States.[74] When jobs decentralize, car access becomes increasingly critical for workers, transit is less viable, and workers must commute longer distances, which worsens traffic

congestion.[75] Low-income workers who do not have access to cars have fewer job opportunities. Workers who do own cars may be forced to make difficult trade-offs between other important expenses such as food or medical care. This growth pattern may also have implications for racial disparities in employment rates. Studies show that in metropolitan areas with higher levels of job decentralization, African Americans tend to be more geographically isolated from jobs.[76]

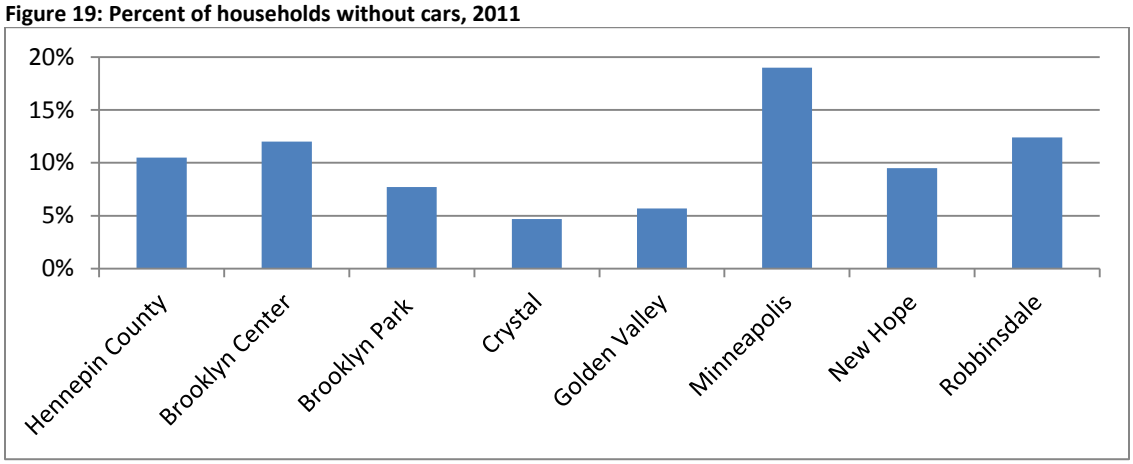
Conversely, job clustering supports lower delivery costs of public services, and more efficient uses of water and sewer lines, highways, and major roads. Additionally, services such as daycare can be provided near other job locations, helping to reduce commute times for working parents. Clustering is necessary for viable transit and when transit is a feasible option, lower income workers without access to a car have better access to jobs. [77] As metropolitan areas decentralize and low-density development characterized by separated residential and commercial uses increases, cost-effectively connecting people to jobs through transit becomes increasingly challenging.[78]

Vehicle access

In Hennepin County, an estimated 10.5 percent of households do not have a vehicle. In the Bottineau Corridor there is wide variation in vehicle access among the cities. While the cities of Brooklyn Park, Crystal, Golden Valley, and New Hope all have percentages of households without cars below the county average (see Figure 19) there are areas where households without cars are more concentrated. As shown in Map 5 there are census tracts throughout the Bottineau Corridor cities where many households do not own cars. In census tracts within the Penn Avenue and Van White station areas between 37 and 58 percent of households do not own a vehicle and in census tracts within the Robbinsdale and 63rd Avenue stations areas 24 and 19 percent of households do not own a vehicle, respectively.

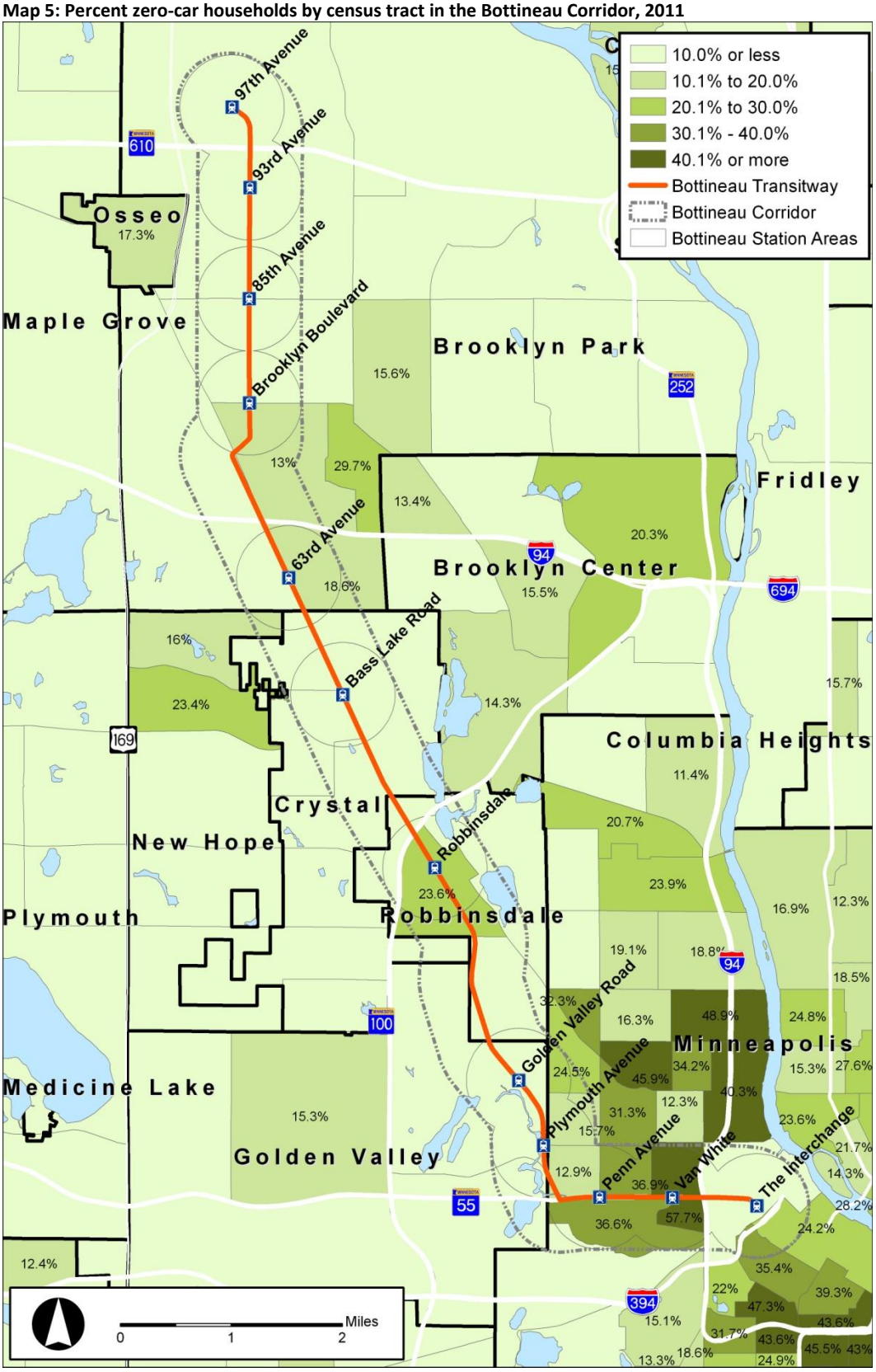
In census tracts within the Penn Avenue and Van White station areas between 37 and 58 percent of households do not own a vehicle and in census tracts within the Robbinsdale and 63rd Avenue stations areas 24 and 19 percent of households do not own a vehicle, respectively.

Figure 19: Percent of households without cars, 2011



Source: American Community Survey 5 Year Estimate 2007-2011

Map 5: Percent zero-car households by census tract in the Bottineau Corridor, 2011



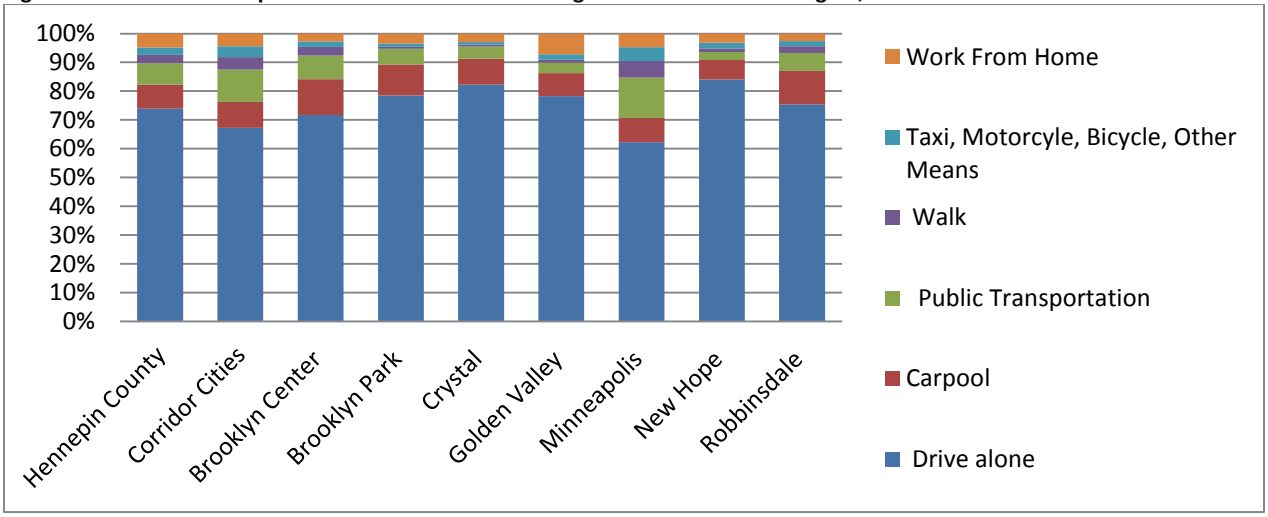
Sources: Hennepin County, American Community Survey 5 Year Estimate 2007-2011, MN DNR, MN-DOT
Bottineau Corridor is ½ mile radius of the transitway. Station area is ½ mile radius of the station.

Modes of transportation

In the Bottineau Corridor cities, two thirds of workers age 16 and older get to work by driving alone. A small percentage of workers in the corridor cities use public transportation (11 percent).

In the Bottineau Corridor cities, two thirds of workers age 16 and older get to work by driving alone. A small percentage of workers in the corridor cities use public transportation (11 percent). Minneapolis, which has the highest level of transit service, also has the lowest percentage of workers driving alone (62 percent) and the highest percentage workers using public transportation (14 percent). In Minneapolis, public transportation use for commuting exceeds the rate in all the other Bottineau Corridor cities by more than two-fold, with the exception of Brooklyn Park (see Figure 20).

Figure 20: Means of transportation to work for workers age 16 and older in the region, 2011



Source: American Community Survey 5 Year Estimate 2007-2011

Assessment: Physical Activity

This section describes the relationship between health and physical activity and provides an examination of the ways the Bottineau Transitway could impact physical activity levels for some populations.

Summary

Physical Activity, Transit, and Land Uses

- Physical activity is one of the most important predictors of a person's health.
- Only about half of adults in Hennepin County get recommended levels of physical activity and low-income adults are less likely to get recommended levels of physical activity than adults who are not low-income (49 percent as compared with 53 percent).
- Transportation options and the built environment can impact health by encouraging walking and bicycling or creating barriers to walking and bicycling. Current land use characteristics in the Bottineau Corridor, such as wide arterials, large blocks, discontinuous streets, freeways, rail corridors, and low density development present barriers to walking and bicycling.
- Parks and trails provide numerous opportunities for physical activity. A wide range of factors influence usage of parks including physical accessibility, park size, park attractiveness, and the facilities available at the parks.

Projected Impacts

- Research on transit usage and physical activity shows that about 29 percent of transit riders get their recommended physical activity from walking to and from transit. Based on available ridership projections, by 2030 an estimated 885 more people (14 percent more) per weekday would get recommended levels of physical activity from walking to and from transit if the Bottineau Transitway were built.
- The built environment characteristics surrounding the Bottineau station areas will play a crucial role in determining the degree to which Bottineau LRT impacts physical activity levels. City and regional plans demonstrate a commitment to supporting transit-oriented development, which suggests that Bottineau Transitway's impact on walking is likely to be positive.
- There are many parks in the Bottineau Corridor. However, Theodore Wirth Park is the most likely to attract Bottineau Transitway riders because of the wide range of recreational amenities and unique natural resources. The new transitway is likely to increase access to Theodore Wirth Park. Both the Golden Valley Road and the Plymouth Avenue station options provide access, with Plymouth Avenue providing the most direct access.

Projected Impacts - Equity Considerations

- Currently the majority of visitors to Theodore Wirth Park access the park by car, which indicates that improved transit service to the park could increase access for transit-dependent populations.

- Assessment findings indicate the physical activity impacts of the Bottineau Transitway are likely to be positive for the populations who have access to the transitway and live within station areas. Because a large percentage of the populations living in Bottineau station areas includes low-income and minority populations – populations that disproportionately experience poor health – the new transitway could improve health equity in the region.

- The physical activity impacts of the transit line are less likely to be a benefit for populations for whom walking to and from transit would be difficult such as elderly and disabled populations, and parents with small children.

Physical Activity and Health

Physical activity is one of the most important predictors of a person's health. Physical activity is associated with a long list of health benefits including overall health-related quality of life, physical fitness, mental health, and reduced risk of premature mortality, type 2 diabetes, hypertension, obesity, certain forms of cancer, and hip and vertebral fracture.[79,80,81,82] Research has also shown physical activity to have benefits beyond physical and mental health, including improved learning and educational attainment among adolescents.[83]

To improve overall health and reduce the risk of many chronic diseases, the Centers for Disease Control and Prevention (CDC) recommends that adults, including adults 65 and over, either engage in moderate aerobic activity (e.g., brisk walking) for at least 30 minutes 5 days a week, or in vigorous aerobic activity (e.g., jogging or running) for at least 20 minutes 3 days a week. Children should do 60 minutes or more of physical activity every day.[84]

Physical activity does not have to be intensely vigorous or strenuous to yield health benefits. Rather, regular moderate physical activity such as brisk walking, bicycling, gardening, and working around the house can improve peoples' health and quality of life and reduce their risks of many health problems including coronary heart disease, hypertension, diabetes, and colon cancer. [85] Walking and bicycling offer particularly valuable opportunities for improving health; while many forms of physical activity require free time, money, and skill, walking and bicycling provide practical, more affordable options for increasing physical activity.[86]

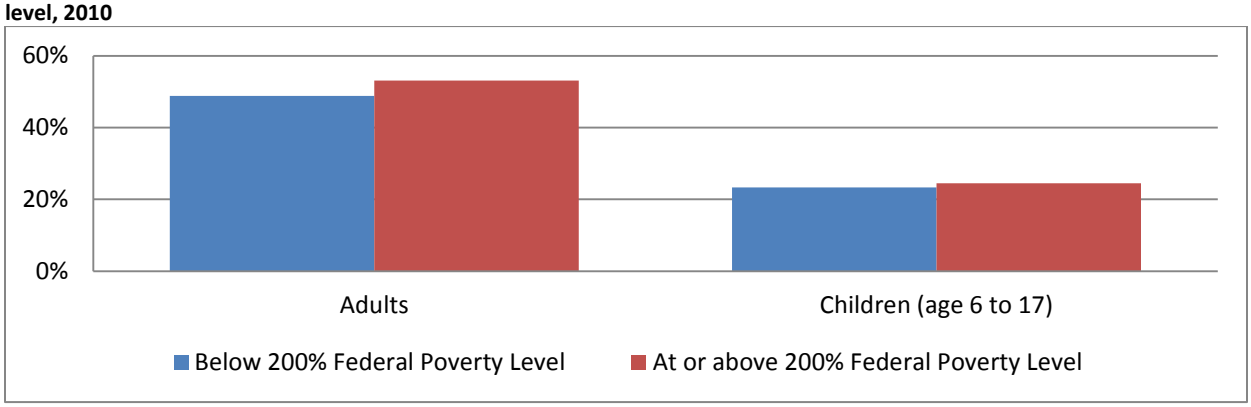
Existing Physical Activity Levels

Despite the well-established link between health and physical activity, many Americans live sedentary lifestyles and do not achieve recommended levels of physical activity. In the United States, less than half of adults and less than one third of high school students get recommended levels of physical activity.[87]

Adults living in poverty are less likely to get recommended levels of physical activity than those whose who are not. Non-Hispanic black African American adults and Hispanic adults are both less likely than non-Hispanic White Adults to get recommended levels of physical activity.[88]

Hennepin County's 2010 SHAPE[89] data show that only about half of adults in the county get recommended levels of physical activity and that adults living below 200 percent of the Federal Poverty Level (FPL) are less likely to get recommended levels of physical activity than those at or above 200 percent FPL. A much smaller percentage of children get recommended levels of physical activity in the county. Only 23.3 percent of low-income children get recommended levels of physical activity as compared with 24.5 percent of children at or above 200 percent FPL (see Figure 21). SHAPE data for 2010 of Hennepin County residents getting recommended levels of physical activity by race and ethnicity is not available.

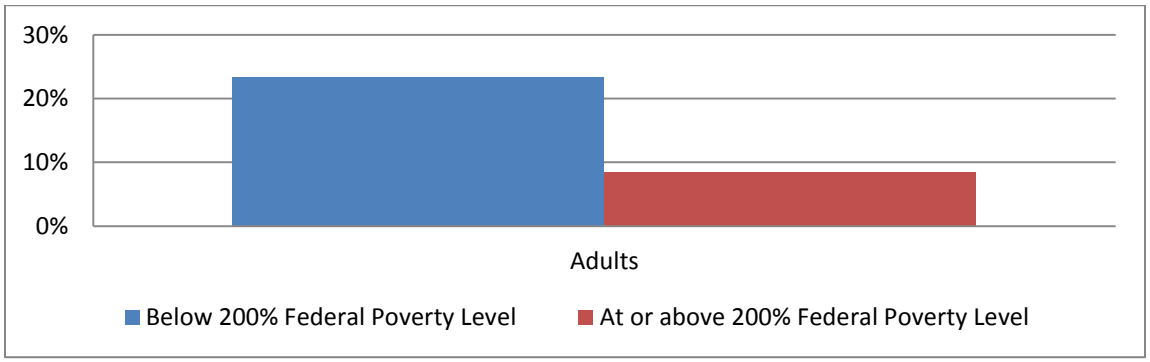
Figure 21: Estimated percent of population in Hennepin County who get recommended levels of physical activity by poverty level, 2010



Source: 2010 Hennepin County SHAPE
For adults, recommended physical activity amounts include either moderate 30 minutes 5 days/week or vigorous 20 minutes 3 days/week. For children, the recommended physical activity amount is 60 minutes 7 days a week.

In Hennepin County, approximately 12 percent of the adult population does not engage in leisure time physical activity at all. Rates vary by poverty level and geography. An estimated 23.4 percent of low-income adults in the county do not engage in physical activity outside of work as compared with 8.4 percent adults whose incomes are at or above 200 percent of the Federal Poverty Level (see Figure 22). Results by race and ethnicity for 2010 are not available.

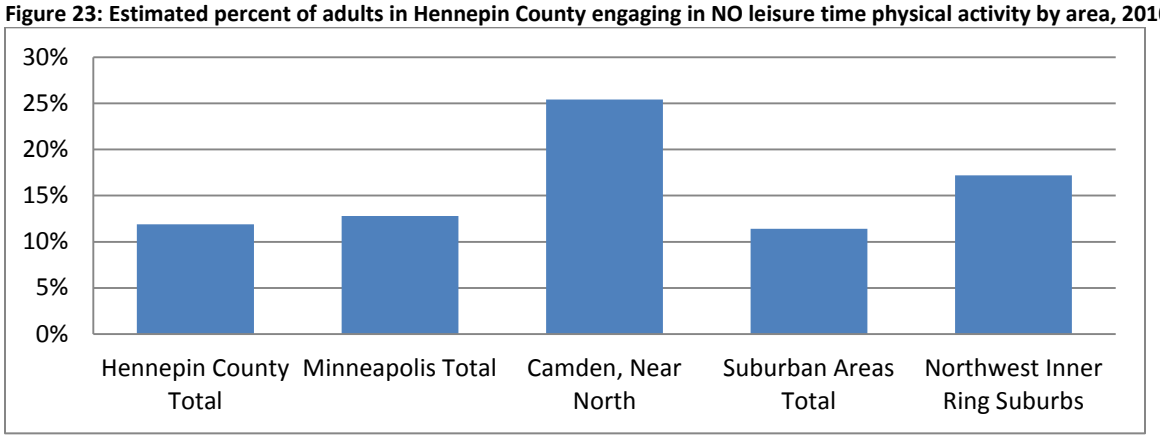
Figure 22: Estimated percent of adults in Hennepin County engaging in NO leisure time physical activity by poverty level, 2010



Source: 2010 Hennepin County SHAPE

SHAPE results indicate that populations living in the cities along the Bottineau Corridor are less likely to engage in any leisure time physical activity than the county population overall. In the Camden and Near North neighborhoods of Minneapolis, more than a quarter of the adult population does not engage in physical activity outside of work as compared with approximately 13 percent of the Minneapolis adult population overall. In the northwest inner ring suburbs, more than 17 percent of adults do not engage in physical activity outside of work as compared with approximately 11 percent of adults in Hennepin County's suburbs overall. The northwest inner ring suburbs include all the suburbs along the Bottineau Corridor with the exception of Golden Valley. Results by individual suburban cities are not available (see Figure 23).

Figure 23: Estimated percent of adults in Hennepin County engaging in NO leisure time physical activity by area, 2010



Source: 2010 Hennepin County SHAPE

The high rate of physical inactivity is linked to concerning public health consequences such as heart disease, stroke, type 2 diabetes, depression, and early death. A current study that ranked preventable causes of death showed physical inactivity to be the fifth most preventable cause of death in the United States and estimated physical inactivity to be responsible for 191,000 premature deaths in 2005.[90]

Impact Analysis

While physical activity is commonly thought of as an individual lifestyle choice, studies in public health have increasingly demonstrated that the built environment shapes choices regarding physical activity.[91,92] Crime and personal safety, population density, land use, pedestrian and bicycling infrastructure, transportation modes, and access to parks, trails and open spaces are all correlated with the amount of physical activity people get. Given the many connections between the built environment and physical activity, the Bottineau Transitway has the potential to impact physical activity for populations in the Bottineau Corridor through multiple pathways.

- **Transit as an incentive/destination for walking -** Several studies demonstrate that transit usage is directly related to physical activity and health outcomes because transit riders get physical activity through walking to and from transit.[93,94,95] By increasing the number of people using transit, and increasing the frequency that current riders use transit, the Bottineau Transitway could increase physical activity for Bottineau Corridor populations.

- **Walkability: Transit Oriented Development (TOD) and pedestrian/bicycle infrastructure –** A breadth of studies show that land use patterns, density, and the mix of residential and commercials uses can all impact health by encouraging physical activity. [96,97,98,99,100] Investments

in transitway station areas often include changes in density and land uses, as well as improvements to surrounding bicycle and pedestrian infrastructure. If a transit project spurs TOD and enhancements to pedestrian and bicycle infrastructure it could improve walkability and lead to increases in physical activity.

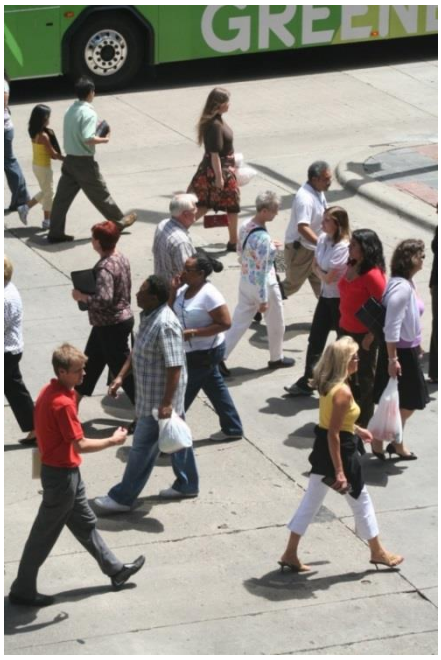
- **Improving or impeding physical access to parks -** The location and design of the rails, station platforms and other supporting infrastructure could alter access to parks, sidewalks, and trails and could alter or reconfigure bicycle and pedestrian routes. Numerous studies have found that increased access to recreational amenities positively impacts physical activity levels.[101,102,103,104]

Incentive/destination for walking

Transit usage is directly related to physical activity and health outcomes because transit riders get physical activity through walking to and from transit, whereas more time spent driving is associated with measurable increases in obesity. [105] This section estimates the number of people who would likely get recommended levels of physical activity as a result of using transit in 2030 in the Bottineau LRT scenario as compared to the No-Build scenario.

Nationally, an estimated 29 percent of transit users get 30 minutes or more of physical activity per weekday solely by walking to and from transit.

The estimated number of these transit riders who would get 30 minutes of moderate-to-vigorous physical activity as a result of transit usage is based on Besser and Dannenberg's analysis of the 2001 National Household Travel Survey (NHTS). The study controlled for a variety of socio-demographic variables and assessed the impact of transit types on physical activity amounts. The study found that 29 percent of transit users (N=3,312) got 30 minutes or more of physical activity per weekday solely by walking to and from transit and that the average amount of time that transit users spent walking to and from transit was 24 minutes. Additionally, rail users were 1.67 times more likely than bus riders to get 30 minutes or more of physical activity per weekday by walking to and from transit.



For this assessment, the estimated number of people riding transit is based on the ridership forecasts for a year 2030 from the 2010 Hennepin County Regional Railroad Authority Stage 3 Travel Demand Modeling and User Benefit Analysis.

Average weekday regional ridership forecasts are reported as "linked trips". A linked trip represents a transit user who makes a trip between origin and destination, regardless of the number of transfers the user makes. In this measure, a person travelling from home to work and back counts as two linked trips. To calculate the number of people who would use transit in each build option, this analysis assumes that each person in the ridership forecasts makes two linked trips to complete one round trip.

The limitation of this calculation is that, on an average weekday, some individuals will make multiple round trips while others will make one "linked" trip. While Besser and Dannenberg's study

shows a difference between rail and transit on the likelihood of getting recommended levels of physical activity, the estimated impact for each scenario in this assessment does not account for the difference in impact by transit mode because ridership forecasts of linked trips are not available by transit type.

Table 4 below presents the estimated impact of the different build options on physical activity in the Twin Cities. In both the No-Build and LRT scenarios, the estimated numbers of people in the Twin Cities who would get 30 minutes of physical activity or more per weekday will substantially increase from 2005 to 2030 because regional transit ridership is anticipated to increase even without Bottineau Corridor improvements due to other transit infrastructure improvements in the region. The Bottineau LRT would lead to a greater increase in riders than the No-Build option and therefore a greater increase in the number of people getting physical activity as a result of walking to and from transit.

According to these findings, the Bottineau Transitway could lead to an estimated 885 more transit users per weekday getting recommended levels of physical activity than in the No-Build scenario (14 percent above the No-Build scenario). Because ridership forecasts by city, neighborhood, or demographic variables are not available, data is not available to calculate the distribution of impacts or the numbers of people getting recommended levels of physical activity within sub-populations (e.g. low-income, minority, youth, senior, etc.). More up-to-date forecasts on the Bottineau Transitway's impact on transit ridership will be available in the Bottineau Transitway Draft Environmental Impact Statement.

Table 4: Estimated impact of Bottineau Transitway on physical activity in the Twin Cities

	2005	2030 – No-Build	2030 – Bottineau LRT
Average weekday linked trips	29,400	43,700	49,800
Average weekday number of people riding transit	14,700	21,850	24,900
Estimated number of people who get ≥ 30 minutes/weekday of physical by walking to and from transit (29% of all transit riders)	4,263	6,337	7,221
Estimated number of people riding transit as a result of the Bottineau Corridor improvements	-	-	3,050
Estimated number of people getting recommended levels of physical activity as a result of Bottineau Corridor Improvements	-	-	885
Percentage increase over No-Build scenario	-	-	14%

Source: Hennepin County Regional Railroad Authority Stage 3 Travel Demand Modeling and User Benefit Analysis[106]

Walkability: Transit-oriented development (TOD) and pedestrian/bicycle infrastructure

The following section examines the Bottineau Transitway's potential to impact physical activity through spurring transit-oriented, walkable environments. The built environment can encourage a variety of non-motorized transportation modes including walking and bicycling. This section primarily focuses on walkability and walking because walking is more accessible (walking does not require owning bicycle equipment and having skills for riding in traffic) and because of the greater availability of research and analysis on walking and walkability.

While Besser and Dannenberg's study demonstrates that transit can increase physical activity because people walk to and from transit stations, many other factors in the built environment surrounding transitways impact whether and how much people walk such as density, connectivity of pedestrian and bicycle infrastructure, and the commercial and residential mix of land use. New transit projects have the

potential to catalyze walkable urban development through facilitating TOD and by incorporating enhancements to connect pedestrian and bicycle infrastructure, thereby impacting station-area walkability and levels of physical activity. [107,108]

The built environment and TOD

Transit-oriented development is an integrated approach to transportation and land-use planning that encourages more compact development within easy walking distance of transit stations (often defined as a half mile) and includes a mix of land uses such as housing, jobs, shops, restaurants and entertainment.[109] A key component to TOD is the pedestrian access between the transit stop and the surrounding area. [110] The success of TOD is contingent on multiple factors, including high density, land use mix, roadway connectivity and design, pedestrian connectivity, building design, and private sector investment.[111]

The Bottineau Transitway represents an opportunity to encourage TOD and support walkable environments. However, a transit project alone does not automatically result in TOD and increased walking. In fact, in a comparative analysis of two corridors in Minneapolis – the Hiawatha corridor, which includes the region's only operating LRT as of 2013 and the Nicollet Avenue corridor – the University of Minnesota Center for Transportation Studies found that built environment characteristics, rather than transit, were the key variables in determining how much people walk.[112] This study suggests that the development in station areas can critically influence walkability and ultimately the level of physical activity people will get. Although transit is an important component of TOD and walkable built environments, many other variables beyond transit must also come together to improve walkability.

Current walkability and the built environment in the Bottineau Corridor

In the Twin Cities, walkable land use is not the norm. A study by the Brookings Institution found that the Twin Cities region ranked below average in the number of regionally significant walkable urban places compared to other American cities.[113] The land uses surrounding much of the Bottineau Corridor are no exception. For much of the Bottineau Corridor, the current design of the roads creates challenging barriers to would-be pedestrians and cyclists[114] such as wide arterials that are difficult to cross on foot or bicycle, including Bottineau Boulevard (a six lane arterial highway), West Broadway (a four lane arterial road), and Highway 55 (a six lane divided highway).[115] Existing land use patterns are characterized by low density housing and employment, and buildings with auto-oriented footprints and designs. A freight rail line runs parallel to segments of the proposed transitway, posing as a barrier to bicycle and pedestrian access at certain points.[116] The images in Figures 24, 25, and 26 depict these land use characteristics common to the Bottineau Corridor (see pages 55 and 56).

As Figure 24 illustrates, the area surrounding the propose site for the 85th Avenue Station has low-density housing and wide arterials that would be difficult for a pedestrian to cross. In addition, the smaller streets do not connect well with one another.

Figure 24: Proposed 85th Avenue Station location in Brooklyn Park

As shown in Figure 25, the area surrounding the proposed Brooklyn Boulevard Station location has low-density commercial development dominated by expansive parking lots and buildings designed to be accessed by vehicles rather than by people on foot. The area lacks connecting sidewalks and places for people to cross the wide arterials safely.

Figure 25: Proposed Brooklyn Boulevard Station location in Brooklyn Park

Similarly, as illustrated in Figure 26, the proposed location for the 63rd Avenue Station is also characterized by low-density uses and wide arterials that would be difficult for pedestrians to cross safely.

Figure 26: Proposed 63rd Avenue Station location in Crystal

Anticipated TOD and changes in pedestrian infrastructure

While methods have been developed for evaluating TOD success, walkability, and how well pedestrian infrastructure in station areas connects to transit stations, at the time of the writing of this report, neither station area plans nor pedestrian and bicycle infrastructure enhancements for the Bottineau Transitway station areas have been developed. Because there are no plans currently in place, a reliable assessment of station area development and changes in walkability is not possible. **However, several factors suggest that if the Bottineau Transitway is constructed it will be accompanied by some changes in land uses and pedestrian infrastructure that are more encouraging for walking than current conditions provide:**

- About half of the funding for construction costs will come from the Federal Transit Administration's (FTA) New Starts program. Current and planned future land uses are one of the major criteria for determining whether a transit project is awarded New Starts funding. Plans that encourage higher densities, a mix of uses, and pedestrian infrastructure improvements will increase FTA's economic development rating. The Bottineau Land Use Planning Framework notes, "integrating transportation and land use planning is key to improving the Bottineau Corridor's competitive success with the FTA and to making the most of future development opportunities."[117]

- Metropolitan Council's Regional 2030 Transportation Policy Plan (2010) includes land use and transit development strategies that support the development of walkable, transit-oriented environments. The plan states that local units of government are expected to develop local comprehensive plans, zoning, and community development strategies that ensure more

intensified development along transitways and that this development should be effectively linked to the transitway through compact, walkable environments.

- The comprehensive plans for Brooklyn Park, Crystal, and Robbinsdale indicate support for characteristics favorable to walkable, TOD environments such as higher-density and mixed-use development. In particular, the Bottineau Transitway could lead to improvements in walkability for the currently car-dependent area surrounding the 63rd Avenue Station if TOD occurs as the Brooklyn Park comprehensive plans states.

In short, while transit usage is shown to correlate with increases in walking, the built environment characteristics surrounding the Bottineau station areas that result from TOD will play a crucial role in determining the degree to which Bottineau LRT impacts physical activity levels. Current land use characteristics for the majority of the Bottineau Corridor, such as wide arterials and low density development, present barriers to walking and bicycling. City and regional plans demonstrate a commitment to supporting TOD which suggests that Bottineau Transitway's impact on walking is likely to be positive.

Access to parks and trails

The Bottineau Transitway has the potential to impact park and trail access through increased transit service and transit station proximity to park access points. This section will assess the potential for the new LRT to impact access to parks and trails, and ultimately influence physical activity. In assessing the relative improvements in park accessibility it will be assumed that relative improvements in accessibility will be accompanied by relative improvements in physical activity levels.

The Bottineau Corridor includes numerous parks and parkways that provide opportunities for physical activities. Parks and trails encourage physical activity and health outcomes by providing low cost choices for recreation, recreational facilities, scheduled and supervised activities, and destinations to which people can walk.[118] These features can also play a role in facilitating physical activity in minority communities.[119] Research suggests that whether and how often people visit parks and use them for physical activity is dependent upon numerous factors including the distance people live from parks, accessibility, park size, park attractiveness, and the facilities available at the parks.[120,121,122,123,124] The Minneapolis Park and Recreation Board notes that park visitors in Minneapolis will choose to visit parks near where they work, where a program is offered they prefer, or where they can meet with friends. Additionally, playgrounds and pools are strongly associated with park usage.

In Table 5, data from the Metropolitan Regional Parks and Trails 2008 survey shows that in the Twin Cities, the majority of visitors (58 percent) to the Metropolitan Regional Park and Trail system access these parks and trails by car, truck, RV, or van (N=7245). Among only *park* visitors surveyed (N=4191), the percentage who access the regional parks by car, truck, RV, or van is even greater (79 percent). According to the survey, the percentage who access Theodore Wirth Park by car, truck, RV, or van was much higher (90 percent), though this percentage should be interpreted with caution due to the small, non-representative sample size (N=30). Still, these survey results show that private vehicle is the primary mode of transport for accessing regional parks and trails. For populations that do not live close enough to walk to these parks and have limited vehicle access, these parks and the low-cost opportunities for physical activity they offer may be out of reach. The survey findings suggest that an improved level of transit service to these parks could increase access to the parks and the physical activity opportunities they provide.

Table 5: Mode of transportation to Metropolitan Regional Parks and Trails 2008

	N	Walk, ran, or inline skates	Bicycle	Drove or rode in auto, truck, RV, or van	Metro Transit or LRT	Charter Bus	Some other way*	Refused
Region-wide Parks and Trails	7245	19%	21%	58%	<1%	1%	1%	<1%
Region-wide Parks	4191	11%	8%	79%	<1%	1%	1%	<1%
Minneapolis Regional Parks	414	36%	8%	54%	1%	<1%	<1%	<1%
Theodore Wirth Park	30	3%	3%	90%	-	-	3%	-

Source: Minneapolis Park & Regional Board, Metropolitan Council Regional Parks and Trails Survey 2008
*Some other way includes: motorcycle, boat, motorized scooter, horse and combination of modes.
Percentages may not equal 100% due to rounding.

Theodore Wirth Park

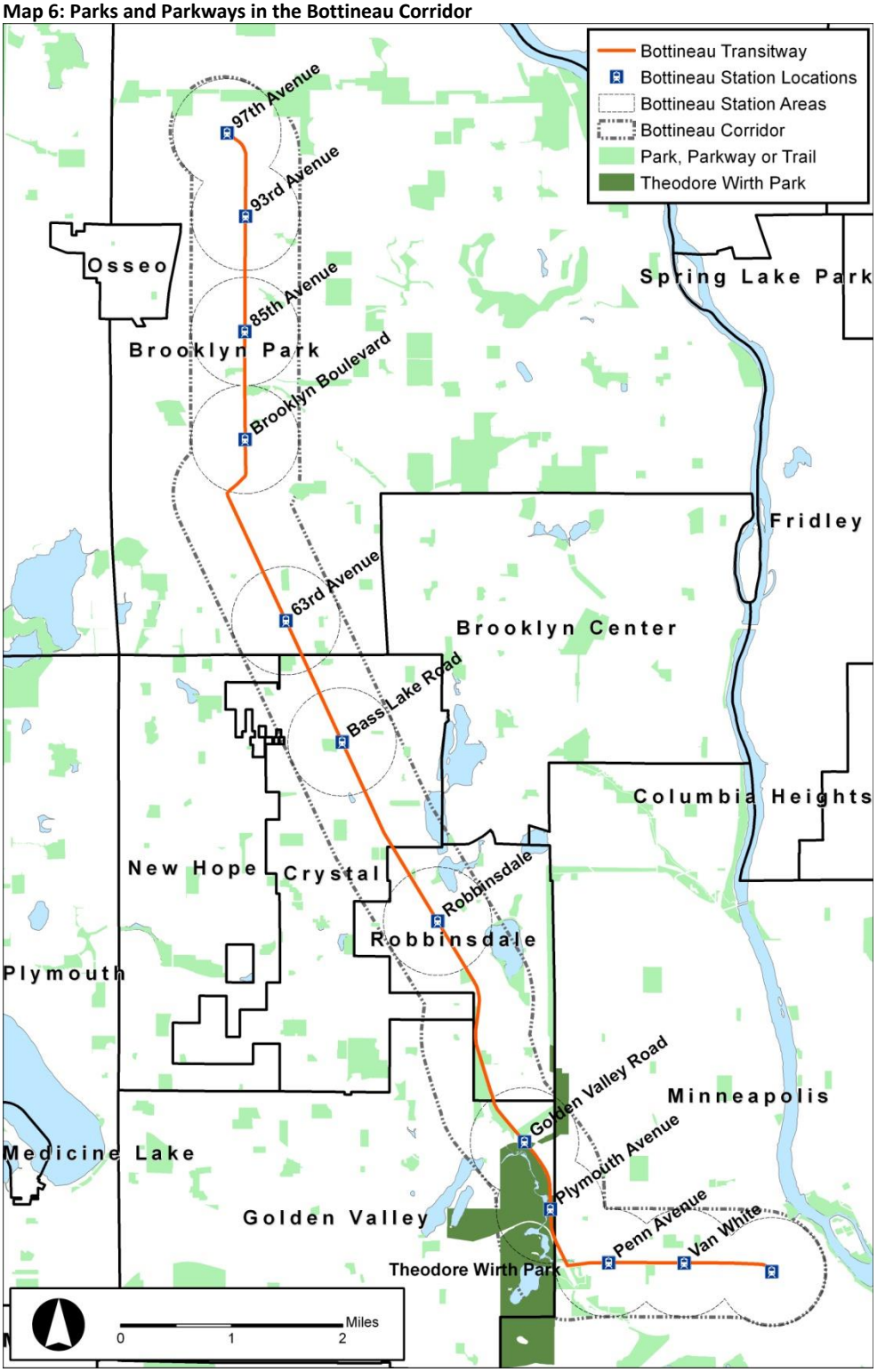
The Bottineau Transitway includes stations that are located within a half mile or less of many parks (see Map 6, page 59). However, most of these are small parks (less than 10 acres) with limited facilities and are more likely to serve populations that live near these parks than to be a destination point for Bottineau Transit riders. In contrast, Theodore Wirth Park is the largest regional park in the Minneapolis Park system, offering 759 acres of unique landscape characteristics - such as wetlands, prairies and the oldest public wildflower garden in the nation - and cultural resources. The park provides opportunities for a wide range of activities year-round. Summer activities include swimming, walking, off-road biking, golf, disc golf, picnicking, tennis, basketball, and volleyball. Winter activities include cross-country skiing, sledding, tubing, snowshoeing and snowboarding.[125]

Theodore Wirth Park is west of Downtown Minneapolis with the northern two-thirds located within Golden Valley and the southern third within Minneapolis. The route identified for the Bottineau Transitway would border the eastern boundary of Theodore Wirth Park within an existing BNSF railroad corridor. Two potential station locations near Theodore Wirth Park are under consideration – the Plymouth Avenue option and the Golden Valley Road option. The Plymouth Avenue station option would be located at the main entrance of the park and would provide direct access.

While the Golden Valley Road station option borders the park, it is more than half a mile from the main visitor entrance. Yet, the Golden Valley Road station option still has the potential to provide access to the park. If the Golden Valley Road option was selected, enhancements to the park such as a visitor center near the Golden Valley Road station and/or a park circulator could increase the transitway's impact on park access. Overall, for populations with limited vehicle access the Bottineau Transitway could serve to increase access to Theodore Wirth Park and the opportunities it provides for physical activity.

Other parks in the Bottineau Corridor to which the Bottineau Transitway could impact access include Becker Park and Harrison Park.

Map 6: Parks and Parkways in the Bottineau Corridor



Sources: Hennepin County, MN Department of Transportation

Note: The Plymouth Avenue and Golden Valley station locations are two station options currently under consideration. The Bottineau Transitway will likely only include one of these stations.

Bottineau Corridor is ½ mile radius of the transitway. Station area is ½ mile radius of the station.

Becker Park

Becker Park is a 12.4 acre park in the City of Crystal. The Bass Lake Road station would be located directly east of Becker Park. The park is heavily utilized and has broad appeal according to the Crystal Park and Recreation Department. The park's amenities include a basketball court, playground, tennis courts, softball fields, playground, trails, picnic tables, horseshoe courts, and an activity center. The park also has a stage and provides cultural events. The City of Crystal does not collect data on where park visitors live and how they use the park which limits analysis on whether the park would serve as a destination point and location for physical activity for transit riders. However Crystal's Park and Recreation Department staff notes that the park serves visitors from outside the neighborhood and is a destination point for events and organized activities such as the City of Crystal's four-day annual festival and an adult softball league.[126] The softball league allows players from other cities to join and includes teams from Brooklyn Center. [127]

Becker Park's high level of use and wide range of activities and amenities suggests that the park could be a destination point for transit riders and that the Bottineau Transitway could increase access to the park. The degree to which transit riders can walk safely from the station to the park will be determined by the location of the station at the Bass Lake Road and Highway 81 intersection and the supporting pedestrian infrastructure. This is a major intersection in Crystal and both Bass Lake Road and Highway 81 are high traffic thoroughfares.

Harrison Park

Harrison Park is 6.9 acre park located in north Minneapolis next to Olson Memorial Highway, the route for the Bottineau LRT in north Minneapolis. A vital part of the community, the park is adjacent to Harrison Education Center and Harrison Neighborhood Association. The park offers a picnic area, fields for baseball, softball, football and soccer in addition to basketball courts and a tennis court. Other amenities at the park include a playground and wading pool.[128] The park includes the Harrison Recreation Center which provides a gymnasium and a wide variety of programs and activities for children, teens, and families.

The Bottineau LRT would result in the closure of the pedestrian crossing at the intersection of Olson Memorial Highway and James Avenue North, the pedestrian crossing closest to the park from north to south of Olson Memorial. However, the Draft Environmental Impact Statement of the Bottineau Transitway shows that the closing would result in less than 0.1 mile diversion to cross at Humboldt Avenue North and characterizes this as a minor impact.

The Minneapolis Park and Recreation Board has limited information where park visitors live and how they use the park. However, the Park and Recreation Board notes that use from residents on the north side of Olson Memorial Highway is highly probable because Harrison Park partners with North Commons park on activities programming, which is north of the highway, and because Harrison Park is the only recreation center within a quarter mile. Overall, there is no evidence that the pedestrian crossing closure would prevent residents north of Olson Memorial Highway from accessing Harrison Park and the physical activity opportunities it provides.

Equity Considerations

Overall, assessment findings indicate the physical activity impacts of the Bottineau Transitway are likely to be positive for the populations who have access to the line and live within station areas. A large

percentage of the population in the Bottineau Transitway station areas are minority or low-income populations. These populations are currently experiencing disparate health outcomes. Improved built environment conditions, such as better pedestrian infrastructure and increased access to parks, could represent an improvement in physical activity opportunities for these populations.

Park access

The Metropolitan Council's 2030 Regional Parks Policy Plan identifies a need to reduce barriers to the regional parks and trails for "special populations," which the council defines as people with physical and mental disabilities, low-income populations, racial-ethnic minorities, single parents, and elderly people. These populations largely match the populations identified as vulnerable populations for this HIA. The 2008 Regional Parks Visitor Study found that racial-ethnic minorities underuse the Metropolitan Regional Park and Trail system, which further demonstrates a need to address accessibility.

While more study is needed to identify barriers for vulnerable populations, the Metropolitan Council identified safety problems, cost, transportation, and lack of information about programming and facilities as potential barriers. Findings from the 2008 study also show that the private vehicle has been a primary mode of transportation to the parks and in particular, to Theodore Wirth Park, which suggests that transportation could be a potential barrier for populations with limited or no vehicle access. An improved level of transit service to Theodore Wirth Park may serve to mitigate health disparities by increasing access and providing more opportunities for physical activity for these populations. However, the other barriers noted above may still hinder accessibility and the potential for transit to improve park access.

One potential consequence for health identified and considered in this assessment is the possible closure of a pedestrian crossing on Olson Memorial Highway near Harrison Park. There is a lack of evidence that closing the pedestrian crossing will inhibit park access and lead to adverse health consequences as a result. Additionally, there is an alternative pedestrian crossing less than 0.1 mile away.

Distribution of project benefits

One concern some stakeholders raised is that the new transitway investment will not directly serve the majority of the largely low-income and minority communities in the section of north Minneapolis that was originally one of the options under consideration for the LRT route. The population in this area is currently experiencing numerous health and socio-economic disparities. While the route identified for the line does travel through part of north Minneapolis, a large section of this area will not be directly served by the line. This section would have been directly served by the new LRT had the other alignment, known as D2, been selected for the route. Due to the projected budget and engineering challenges, and stakeholders' concerns regarding negative impacts such as the removal of homes and businesses that would have resulted from the D2 alignment, the Bottineau Policy Advisory Committee voted against this option. While the selected route will still serve low-income and minority populations, a greater number of individuals who are either low-income and/or of a racial/ethnicity minority group would have been within walking distance to stations along a route that included the D2 alignment.

The Bottineau HIA Advisory Committee members noted that increases in opportunities to walk and bike through increased transit usage would be marginal or not applicable to populations who have difficulties walking or are unable to walk, such as elderly populations and populations with physical disabilities. Additionally, minority and low income populations already use transit at higher rates and have lower levels of vehicle ownership than the overall population in Hennepin County and the Twin Cities.

Equity Conclusions

In short, changes to physical activity levels for vulnerable populations that result from the Bottineau Transitway are likely to be positive. However, there is limited data available to determine what specific vulnerable populations will benefit and the degree to which physical activity will increase and improve health outcomes. For populations that are already walking to public transit, the impacts may be small. The people in north Minneapolis living outside of a half mile of the proposed station line are currently experiencing health disparities. This population could potentially benefit more from the Bottineau Transitway if a high frequency connector route service was implemented to help ensure convenient access to the LRT.

Assessment: Location Affordability (Housing + Transportation Costs)

This section describes the relationship between health and location affordability. Location affordability is the affordability of living in a neighborhood when the costs of both housing and transportation are taken into consideration. This section provides an examination of the ways the Bottineau Transitway could impact location affordability.

Summary

Health and Location Affordability

- The affordability, stability, and quality of housing can affect a wide range of physical and mental health outcomes such as stress, hypertension, and disease transmission.
- Emerging studies and data analysis tools demonstrate that housing affordability should factor in transportation costs. Transportation and housing costs are the two largest expenses for American families and often neighborhoods that have low housing costs can be expensive to live in because people have to drive most places and end up spending more on transportation.

Existing Conditions

- Much of the Bottineau Corridor includes older housing stock and lower median home values than the Twin Cities and Hennepin County overall, signifying a greater availability of affordable housing stock. However, data shows that housing might not be affordable for low and very low income families when factoring in household transportation costs.
- Land uses in the Twin Cities region and Bottineau Corridor are characterized largely by job and population sprawl and automobile-dependent developments. Convenient transit options are limited in the Bottineau Corridor suburbs. As a result of these conditions, the majority of workers in the Bottineau Corridor cities, including low income workers, depend on driving alone to get to work.
- Fluctuating gas prices and car repair costs associated with owning and driving a vehicle put low-income working families at risk for homelessness.

Projected Impacts

- The new transitway is anticipated to increase transit ridership and time savings and decrease driving which would reduce transportation costs for some households in the Bottineau Corridor and region.
- By facilitating Transit-oriented development (TOD), the Bottineau Transitway could improve location affordability and reduce household transportation costs in the Bottineau Corridor. Station area planning will play an important role in determining improvements in location affordability.

Projected Impacts – Equity Considerations

- There is a lack of data available to assess the degree to which transportation costs will decrease and which households will see reduced household transportation costs. However, currently 24 percent of the populations within a half mile of the Bottineau Corridor have incomes below the Federal Poverty Level. While demographics in the region are subject to change, the fact that low-income populations currently live near the route suggests they will have access to the Bottineau Transitway and could benefit from improved location affordability.

- Although the new transitway could reduce households' transportation costs, housing costs could increase in some areas. Transit has been shown to result in increases in property values. However, increased property/market value potential can also spur economic development and result in development projects that provide more housing options in transitway station areas. Additionally, increases in property values could help homeowners to access capital for home quality improvements. In short, at this point there is limited evidence available to predict how the Bottineau Transitway will affect property values.

Affordable, Quality Housing and Health

Many studies demonstrate that the affordability, security, and quality of housing affect physical and mental health through a myriad of interacting pathways. These direct and indirect pathways make housing one of the key social determinants of health.[129] These pathways include:

- **Housing cost-burden** – Several studies demonstrate that working families that spend more than 30 percent of their monthly income on housing have less income available for the prerequisites of good health—health care, nutritious food, clothing, childcare, medication, and family activities that promote exercise and emotional stability – and are more likely to face food insecurity.[130,131,132,133] The stress due to a lack of affordable housing is associated with a greater likelihood of developing hypertension, lower levels of psychological wellbeing, and increased visits to the doctor.[134,135]

- **Unhealthy physical environment** – Substandard and deteriorating housing - such as compromised climate control, growth of mold and mildew, and pest or rodent infestation – can contribute to a variety of illnesses, from asthma and neurological disorders to psychological and behavioral dysfunction.[136,137,138,139] Some of these conditions are exacerbated when residents do not have enough money to maintain healthy housing conditions (making sure appliances work, utility bills are paid, etc.). Lack of affordable housing and disposable income can also lead low-income families to share housing which can lead to overcrowding. Overcrowding brings risks such as transmission of infectious disease, noise and fires.

- **Displacement** – A decrease in the availability of affordable housing can result in displacing families as they are forced to relocate to locations with more affordable housing. This resulting

displacement can have numerous consequences associated with negative health outcomes. Displacement is a stressful life event that can result in loss of job, a loss of protective social networks, and for children, difficult school transitions, academic delay, and emotional and behavioral problems.[140,141,142,143] Additionally, the long commutes of workers who are forced to move further away from their jobs to locations with more affordable housing encroach on quality family time and contribute to increases in greenhouse gases, both of which have health implications for future generations.[144] Money spent on the increased transportation costs associated with long commutes is not available for other goods and services that may contribute to health. [145]

Housing + Transportation Costs

The widely used definition of affordable housing is housing that costs no more than 30 percent of household income. However evidence increasingly suggests that affordability is closely related to the transportation costs associated with a household's location. Housing and transportation are the two largest expenditures in most household budgets and the biggest tradeoff working families make in balancing household budgets is between housing and transportation costs.[146]

Households situated in neighborhoods characterized by compact development, mixed use, and easy access to jobs, services, transit, and amenities tend to have lower transportation costs. Conversely, households located in places that require automobiles for most trips tend to have high transportation costs.

The characteristics of the neighborhoods people live in have a large impact on how much they spend on transportation. Households situated in neighborhoods characterized by compact development, mixed use, and easy access to jobs, services, transit, and amenities tend to have lower transportation costs. Conversely, households located in places that require automobiles for most trips tend to have high transportation costs.[147] When people move further away from their jobs to less efficient locations and commute, they take on a larger transportation cost burden and become more sensitive to jumps in gas prices.[148, 149] These findings on the relationship between household location and transportation cost indicate that an assessment of true housing affordability should include transportation costs.

Based on the benchmark established by the Center for Neighborhood Technology, an affordable location is one where the combined housing and transportation costs are no more than 45 percent of household income.[150] Under the traditional view of affordable housing, 76 percent of neighborhoods in the United States are affordable to a typical household.[151] However when factoring in transportation costs, the percentage of neighborhoods in the United State that are affordable to a typical household plummets to 28 percent.[152]

Housing affordability paired with location affordability through good public transportation can return health benefits including easier access to health care, reduced commuting costs, more disposable income available for health supporting resources such as healthy food and exercise, and reduced time spent in traffic allowing more time to be spent with family.[153] In contrast, the longer distances associated with sprawl and location inefficiency translate into less leisure time with families as workers spend more time in their cars getting to and from jobs, and higher greenhouse gas emissions, which will have health consequences for future generations.[154]

Transportation Costs and Public Transit Service

Owning and driving a vehicle incurs many costs including the purchase price of a vehicle, parking, tolls, tax and registration, insurance, fuel, maintenance and repairs. On average, these expenses add up to account for the majority of transportation costs in American households.[155] If transit service improvements provide a viable, time-competitive alternative to driving a personal vehicle, they can help reduce household transportation costs by allowing households to reduce their number of vehicles or drive less, thereby incurring lower expenses in fuel, parking, tolls, and maintenance and repairs.

Studies show varying estimates on the costs of driving and the impact of transit service on vehicle use and household transportation costs. Still, overall they demonstrate that improved transit access can help to reduce household transportation costs:

- Estimates from the American Public Transportation Association show that, on average, individuals who ride public transportation instead of driving save $9,242 (in 2010 dollars) annually in parking and fuel costs.[156]

- A report investigating the incremental costs and benefits of transit service in U.S. cities finds that high quality public transit typically requires about $268 in additional subsidies and $104 in additional fares annually per capita, but provides vehicle, parking and road cost savings averaging $1,040 per capita.[157]

- Reconnecting America's Center for Transit-Oriented Development reports that while the average household in the U.S. spends about 19 percent of its budget on transportation, households with good access to transit spend only 9 percent.[158] A study from the National Center for Transit Research finds savings from reducing vehicle ownership is approximately $3,544 (in 2010 dollars)[159] for each relinquished vehicle with variations in savings by household type.[160,161]

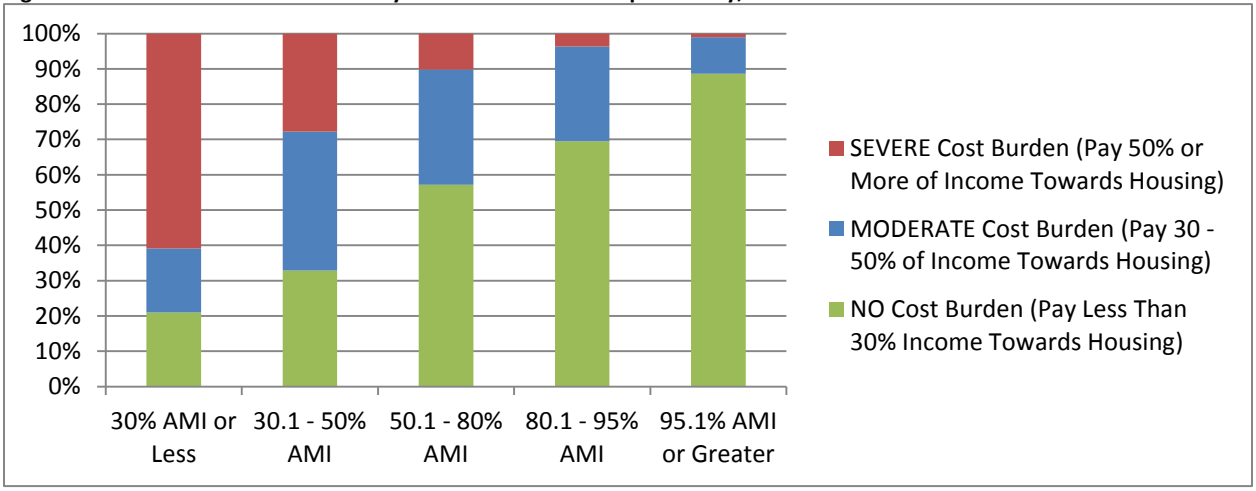
Notably, simply becoming a zero-car household does not automatically eliminate household transportation costs attributable to automobile expenses. Zero-car households are shown to still have vehicle expenditures attributable to renting vehicles occasionally, maintaining driver's licenses, or paying for gas, tolls, or parking when riding with others.[162] Location affordability characteristics, such as access to public transit, street connectivity, and walkability are still important for reducing the transportation costs for zero-car households.

Affordability in Hennepin County and the Bottineau Corridor

Census data demonstrates that 36 percent of Hennepin County households are cost burdened - meaning they pay more than 30 percent of their income towards housing.

Looking at household cost burdens alone in Hennepin County indicates that housing is already not affordable for many households even without factoring in transportation costs. Census data from the 2009-2011 American Community Survey demonstrates that 36 percent of Hennepin County households are cost burdened – meaning they pay more than 30 percent of their income towards housing. Low income households are the most likely to experience housing costs burdens. For example, 60 percent of households earning 30 percent of area median income (AMI) or less pay more than one-half of their income towards housing (see Figure 27, page 67).

Figure 27: Cost burdened households by income level in Hennepin County, 2005-2007



Source: 2005-2007 American Community Survey (HUD 2009 CHAS)

As described in the community profile section of this HIA, while there is a wide range of demographic characteristics among the Bottineau Corridor cities, the median income is lower and the average poverty rate is higher for these cities combined than in the Twin Cities and Hennepin County overall. The 2010 median income for households in the Bottineau Corridor cities ($50,103) is, on average, 23 percent lower than the Twin Cities ($65,181). The percentage of the population living in poverty[163] in 2010 in the Bottineau Corridor cities (19.0 percent) is nearly double the percentage in the metro area (10.0 percent). For populations living within a half mile of the station areas, the poverty rate is even higher (24 percent). Despite these lower incomes and higher rates of poverty, quantitative and qualitative data provides evidence that many neighborhoods in the Bottineau Corridor are not necessarily affordable for low and very low income families when factoring in household transportation costs, and that transportation costs place a heavy burden on low income families.

The current level of transit service in the suburban areas along the Bottineau Transit is generally not sufficient to compete with personal vehicles for many trips. Housing and employment density is critical for mass transit to be effective and efficient.

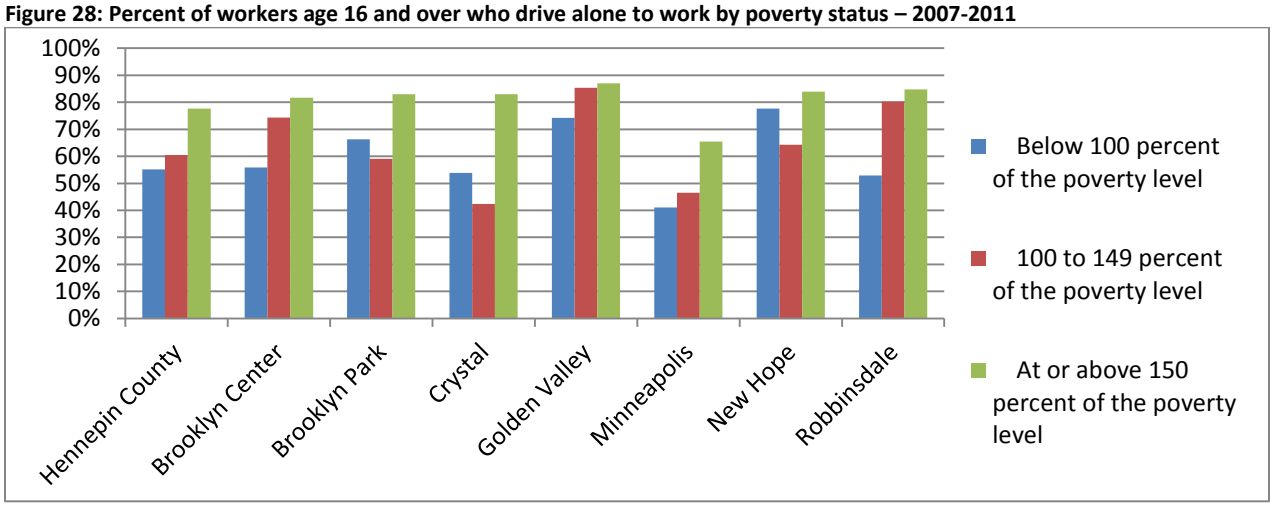
The current level of transit service in the suburban areas along the Bottineau Transitway is generally not efficient enough to compete with personal vehicles for many trips.[164] Housing and employment density is critical for mass transit to be effective and efficient.[165] Currently suburban northwest Hennepin County does not have the population and job densities required to support a high level of transit service.[166] As a result, existing transit service levels lack the service, frequency, speed and directness that are needed to significantly increase transit use in the corridor. Sprawl, low-density development, and limited non-downtown transit service in the corridor requires most residents to rely on driving for transportation, to drive further, and to spend more time in traffic.[167]

Given these conditions it is not surprising that the majority of residents in the Bottineau Corridor drive alone to get to work. Even many of those who have incomes below poverty level are still dependent on driving to get to work and are thus facing the costs

Among workers living in poverty in New Hope, 78 percent drive alone to work.

associated with car ownership and fluctuating gas prices. For instance, among workers living in poverty in New Hope, 78 percent drive alone to work. Minneapolis, which has the highest population density and level of transit service of the corridor cities, also has the lowest percentage of workers below 100 percent FPL who rely on driving alone to get to work (see Figure 28).

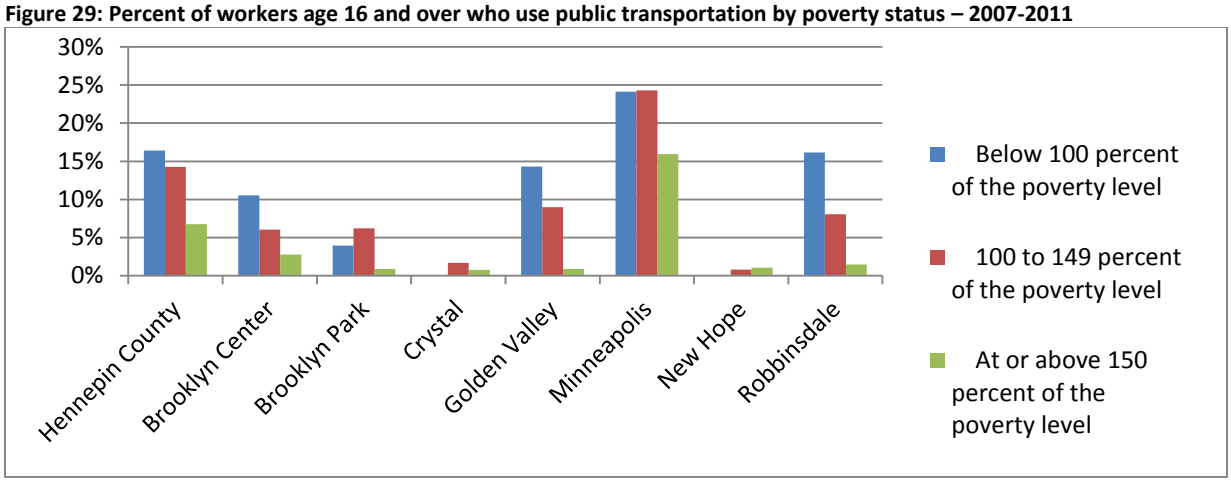
Figure 28: Percent of workers age 16 and over who drive alone to work by poverty status – 2007-2011



Source: US Census American Community Survey 5-Year Estimate, 2007-2011

As Figure 29 demonstrates, in Hennepin County and throughout the Bottineau Corridor cities, lower income populations are more likely to use public transportation to get to work but public transportation use for getting to work is not widespread. Minneapolis has the highest use of public transportation among workers. In Brooklyn Center, Brooklyn Park, Crystal, and New Hope, less than 10 percent of workers, regardless of poverty status, use public transportation to get to work.

Figure 29: Percent of workers age 16 and over who use public transportation by poverty status – 2007-2011



Source: US Census American Community Survey 5-Year Estimate, 2007-2011

The high rate of reliance on driving and the low rate of public transit usage provide strong evidence that household transportation budgets in the Bottineau Corridor as well as the region are largely consumed by the costs of operating and owning a vehicle. How affordable, then, are locations in the Bottineau Corridor when considering transportation costs?

Estimates from the Location Affordability Index (LAI) show that when household transportation costs are factored in, fewer neighborhoods are affordable for low income families. The LAI is based on a variety of data inputs to produce accurate estimates of the housing and transportation costs at the census block-group level for different household types (households with different incomes, numbers of people, and numbers of workers).[168]

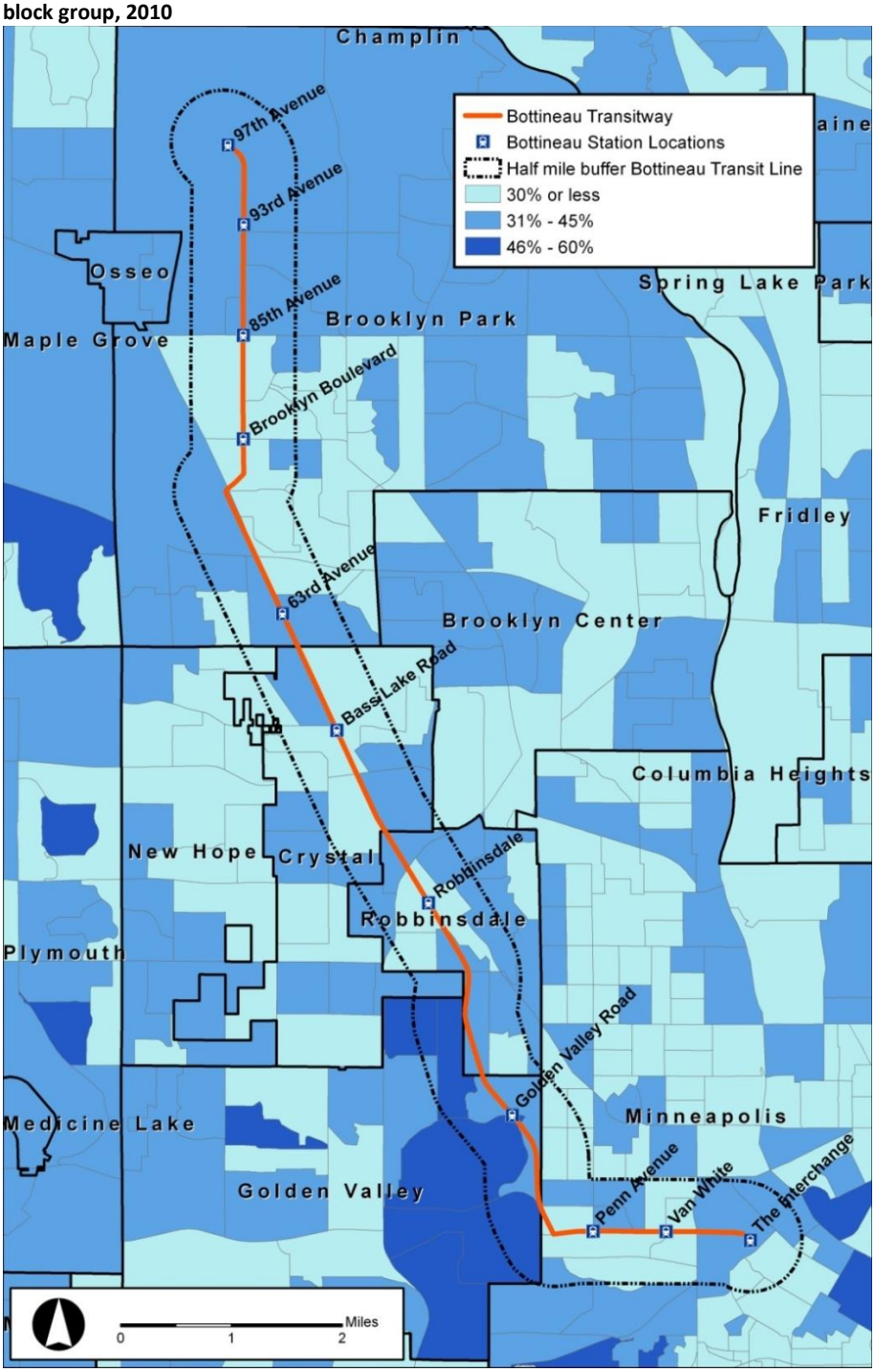
Based on the LAI, when only housing costs are considered there are 40 neighborhoods (block groups) within a half mile of the Bottineau Transitway that are affordable for a low-income, three person household with one worker in the Bottineau Corridor. When transportation costs are factored in, the number of neighborhoods that are affordable for this household type declines from 40 to 31 neighborhoods (see Map 7, page 70 and Map 8, page 71). Low income in the LAI is defined as 50 percent of the HUD Area Median Family Income. For the Twin Cities region this equates to an annual income of $37,800 for a three person household in 2010.

Evidence from local social service agencies indicates that transportation costs place a heavy burden on low-income working families. PRISM,[169] CEAP,[170] and CROSS[171] help families during times of financial hardship, including families that live in the suburban cities of the Bottineau Corridor. These agencies find that the costs of operating and maintaining a car are a major expense for low-income households and that car repair costs are one of the reasons people lose their homes and face homelessness. If people do not have transportation they can lose their jobs and in the suburban areas of the Bottineau Corridor, transportation largely requires a car. The resulting loss of income leads to households not being able to pay their rent or mortgage. Inability to pay for gasoline costs also has a similar chain reaction.[172]

Because of the relationship between housing stability and the transportation costs associated with car ownership, emergency assistance programs serving families in the corridor cities provide support for transportation costs.[173] In 2011, 3,127 people in the northwest Hennepin region (number represents all family members in each recipient household) received gas cards totaling a sum value of $16,761. In addition, 278 clients in Northwest Hennepin served by a Domestic Violence Shelter received 165 taxi vouchers to get to employment or services (numbers represent all family members in a family). [174]

Map 7 illustrates the variation by block group in the estimated average housing costs as a percentage of income for a low-income, three person household with one worker in the Bottineau Corridor.

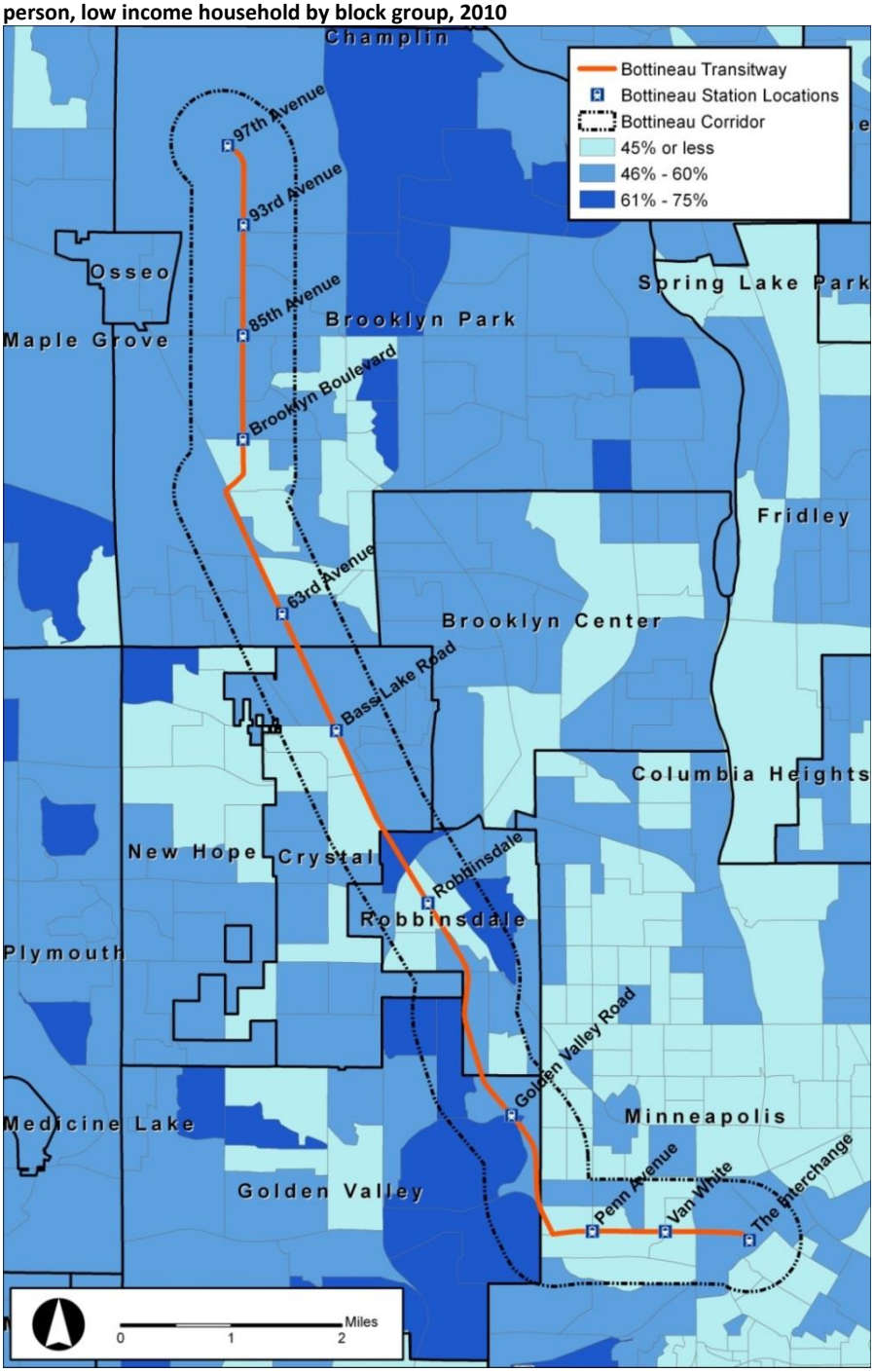
Map 7: Housing costs as a percentage of income for a 3-person, low income household by block group, 2010



Sources: US Dept. of Housing and Urban Development's Location Affordability Index, MN-DOT, Hennepin County
Note: Low income refers to households with incomes 50% of Housing and Urban Development Area Median Family Income
Bottineau Corridor is ½ mile radius of the transitway.

Map 8 illustrates the variation by block group in the estimated average *combined housing and transportation costs* as a percentage of income for the same low income household type defined above.

Map 8: Combined housing and transportation costs as a percentage of income for a 3-person, low income household by block group, 2010



Sources: US Dept. of Housing and Urban Development's Location Affordability Index, MN-DOT, Hennepin County

Note: Low income refers to households with incomes 50% of Housing and Urban Development Area Median Family Income

Bottineau Corridor is ½ mile radius of the transitway.

Impact Analysis

The following section examines the Bottineau LRT's potential impact on health by assessing the project's likely role in affecting location affordability as measured by combined housing and transportation costs. The Bottineau LRT has the potential to impact location affordability through three interrelated pathways:

1. **Increased transit service**: By increasing transit service to locations where housing is affordable, the Bottineau Transitway has the potential to decrease the combined housing and transportation cost burden for low-income households. A decrease in combined housing and transportation expenses could allow for a larger share of household income to be available for healthy food, medical care, and other health supportive resources and services.

2. **Transit-oriented development**: The Bottineau Transitway could reduce transportation costs by encouraging TOD in station areas. Successful TOD improves location efficiency by increasing the locations residents can walk to in station areas such as jobs, shops, restaurants, grocery stores, and community services.

3. **Increase in property values:** The Bottineau Transitway could result in an increase in property and market values of housing near station areas which could potentially reduce the affordability of housing. However, increased property/market value potential can also spur economic development and result in development projects that increase housing options in transitway station areas. Increases in property values could also help homeowners access capital for home quality improvements.

This section will consider the potential for the Bottineau Transitway to affect location affordability by assessing the impacts on level of transit service, transit-oriented development, and property values. In judgments about the impacts of the new LRT on health, it is assumed that improvements in location affordability will be accompanied by relative improvements in health outcomes and that decreases in location affordability will be accompanied by a relative worsening of health outcomes. No attempt will be made to quantify resulting changes in location affordability or health outcomes because the methodology for doing so based on available evidence has not yet been developed.

Increased transit service

By improving the level of transit service in the Bottineau Corridor, the new LRT is projected to increase transit ridership, increase travel time savings, and decrease vehicle miles travelled (VMT). These impacts suggest that the new LRT could provide a time-competitive, viable alternative to transport by personal vehicle.

As summarized in other sections of this HIA the Bottineau LRT is anticipated to lead to a 14 percent increase in transit ridership in the region per weekday in comparison to the No-Build scenario (an additional estimated 3,050 people using transit per day) in 2030. While the data does not show what mode of transportation these transit users would choose for these trips in the No-Build scenario, forecasts also show an estimated reduction of 27,123 VMT traveled per weekday in the region in 2030.[175] Further, we know that driving a personal vehicle is the primary mode of transportation in the region and corridor, supporting the likelihood that many of these transit users will be riding transit as an alternative to driving a personal vehicle.

Data on projected ridership numbers does not provide information regarding the demographic characteristics of the new transit riders, limiting the potential to assess what percentage of these transit users will be vulnerable populations as defined in this HIA (youth, senior, minority, low income, and disabled populations) that would benefit from reduced household transportation costs. Still, a greater percentage of the populations within a half mile of the Bottineau Corridor have incomes below the Federal Poverty Level as compared with the county and Twin Cities overall. While demographics in the region are not static and are subject to change, their proximity suggests that populations living in poverty will have access to the Bottineau Transitway and could benefit from improved location affordability.

Overall, these forecasts provide evidence that the Bottineau Transitway could offer a time-competitive alternative to a personal vehicle, help households reduce their dependence on personal vehicles for transportation, and ultimately increase the location affordability of their homes. However, the magnitude of the impact on transportation costs and the number of households that will enjoy a reduction in transportation costs is unclear.

Transit-oriented development (TOD)

While time-competitive, high frequency, transit service can provide an alternative to driving a personal vehicle, level of transit service is not the only factor determining travel behavior, mode choice, and transportation costs. Numerous studies show that built environment factors such as street network connectivity and population and job density significantly influence automobile dependence and transportation.[176,177,178] As summarized in other sections of this report, the Bottineau Transitway has the potential to complement and facilitate Transit-oriented development (TOD) surrounding the station locations. By complementing changes in the built environment, the new LRT could also indirectly encourage reductions in automobile use and dependency, and improve location affordability.

TOD that successfully *orients* transit to compact, walkable, mixed land use can facilitate multi-purpose trips thus increasing the types of destinations that people in the corridor and region can reach via transit and walking. When implemented well, such changes in the built environment can complement transit service and further improve location affordability. People who live in or have easy access to these areas could have a reduced need for a personal vehicle and face a smaller transportation cost burden.

However, neither a new transit project alone nor development near transit automatically results in successful TOD. Many communities have attempted to implement TOD, some with mixed results and some with success.[179] While preliminary studies show interest locally in implementing TOD principles into station area plans, station-area planning for the Bottineau Transitway is currently in a preliminary stage and is likely to evolve and change.

Property values

There is a wide variation in home values in the corridor, but on average, the median home value in the transitway project area has been consistently below the median metro-wide home value over the past decade. As of 2012, the median sales price of homes within one mile of the Bottineau Corridor was $123,000, which is about 27 percent less than the median sales price of $167,900 for the Twin Cities Metro Area. [180] This gap in home values widened considerably during the 2007-2009 recession from 10 percent before the recession to 36 percent at the end of the recession, indicating the recession disproportionately impacted housing values along the corridor.[181] Between downtown Minneapolis and Robbinsdale, the majority of the housing stock is more than 60 years old. In Crystal and the southern

part of Brooklyn Park, the housing stock is mostly between 40 and 60 years old. [182] These current conditions help make housing in the corridor affordable relative to other areas in the region.

While the Bottineau Transitway is likely to reduce transportation costs in the Bottineau Corridor through improving the level of transit service and facilitating TOD, the new LRT could have some negative impacts on housing affordability by increasing property values.

Because of speculation, even before a transitway is operational, land prices can increase when a new transitway is announced.[183] Research from the Dukakis Center for Urban and Regional Policy finds that transit investments often change the surrounding neighborhood characteristics and that the patterns of neighborhood change vary among transit investments.[184] However, more commonly, housing becomes expensive.[185] In some cases, this impact can lead to a set of unintended consequences in which the low income and transit dependent populations are priced out of the neighborhood and ultimately displaced. [186]

A University of Minnesota Center for Transportation study shows that the Hiawatha LRT, also located in Hennepin County, resulted in average residential property value increases near station areas of more than $5,000 for single family homes and more than $15,500 for multi-family homes.[187] The changes in residential property values observed near Hiawatha station areas do not imply that displacement occurred or that the same property value changes will automatically occur in Bottineau Station areas. The Hiawatha and Bottineau corridors have many differing characteristics in surrounding land uses and housing stock. Still, these findings show that property value increases surrounding transit stations are clearly possible in the region.

Property value increases surrounding station areas would not necessarily lead to reductions in housing affordability; they could have desirable effects as well. Property/market value increases could also spur economic development and result in developers proposing new projects. Such development projects could potentially increase housing in the location efficient transitway station areas. Additionally, increases in property values could help homeowners access capital for important housing quality improvements.

The available research and visioning process carried out for the Bottineau Corridor indicate that neighborhood characteristics will most likely change in some capacity surrounding the Bottineau Station areas. At this stage it is too early to predict how neighborhoods will change and which, if any, and to what degree, neighborhoods will experience housing value changes that displace lower income residents. Though evidence suggests that displacement can occur as the result of transit investments and increased housing costs, it does not lay the case for preventing transit investments. Rather, planners and policy makers should manage the changes and utilize strategies to preserve affordable housing and ensure lower income households can benefit from improvements in transit service and location affordability.

Assessment: Employment

This section describes the relationship between health and employment and provides an examination of the ways the Bottineau Transitway could impact employment opportunities.

Summary

Health and Employment

- A large body of research provides consistent evidence that employment is a key predictor of health outcomes from self-reported well-being and mental health to life expectancy.

Existing Conditions

- While Hennepin County has a low average annual unemployment rate relative to the national rate, some populations are experiencing notably higher rates, such as minority populations and persons living in north Minneapolis.

- Numerous complex social, economic, policy, and individual conditions affect a person's employment opportunities. While transportation and land use alone will not determine employment options and rates, evidence suggests that current limited transit service in the suburbs of the Bottineau Corridor and low job density may pose a barrier to employment for low-income and transit-dependent populations.

Projected Impacts

- The Bottineau Transitway is likely to improve employment opportunities in the Bottineau Corridor and Metro Area in three ways:

    1. **Construction, operations, and maintenance jobs** - The new transitway will produce short-term and long-term jobs as a result of the construction, operation and maintenance of the line. Income dollars from these jobs would cycle into the local economy creating additional opportunities.

    2. **Better connectivity to jobs** – The transitway will connect to an increasing number of jobs near station locations and, additionally, it will be part of a broader regional transit system that will improve employment accessibility for residents throughout the region.

    3. **More jobs created through economic development** - If the transitway is accompanied by TOD initiatives, it could spur economic growth surrounding station locations, which, in turn, could produce more employment opportunities. TOD characterized by close proximity of housing, jobs, retail and services could enable transit dependent populations to more conveniently access jobs.

    - Overall, while the Bottineau LRT is very likely to result in increased employment opportunities in the Bottineau Corridor, there is insufficient data to predict with any certainty which vulnerable populations will experience improved employment access.

Employment and health

A large and growing body of research consistently demonstrates a strong link between health and employment. Employment is a complex health determinant that can impact health through numerous pathways. These pathways include but are not limited to:

- **Income -** Higher paying jobs enable workers access to many health-promoting resources and lifestyle conditions such as better housing in safer neighborhoods, stable housing, access to recreational facilities, more nutritious diets, better healthcare, more time with family members and friends, and the reduced need to work multiple jobs to make ends meet. [188.189,190]

- **Job quality** - Occupations that are higher quality may allow workers more control at their jobs[191] and be safer, more interesting, and comparatively less stressful than lower quality jobs. [192]

- **Job insecurity** – The threat of unemployment is shown to have adverse health impacts.[193]

- **Occupation status** - Higher status occupations may carry the prestige necessary to attain better health promoting resources. [194]

Employment is linked to overall better physical and mental health[195] and unemployment and underemployment are associated with premature mortality, cardiovascular disease, hypertension, depression, suicide.[196,197] In the United States, in comparison with adults who are employed, those who are unemployed have 35 percent higher risks of death.[198] Those who are not in the labor force and are also not looking for work have 60 percent higher risks of death.[199] Whether one is employed, unemployed or underemployed also correlates with health-promoting behaviors.[200]

However, not all jobs lead to better health outcomes. Some work conditions are dangerous, posing high risks of injury and fatality.[201] Jobs that are highly demanding of workers but give them minimal control over conditions may also be linked to increased mortality[202], in particular from suicide[203] and cardiovascular disease.[204] Yet other studies have shown that occupations with low demands may also be associated with higher risks of death.[205]

Despite the well-documented correlation between health and employment, determining whether employment status causes health outcomes is an ongoing challenge. For example, poor health may be correlated with employment measures because people who have worse health or disabilities have a reduced ability to work and may be more likely to lose their jobs and less likely to earn high incomes.[206] Studies that have attempted to control for such factors find that the relationship between employment and health is generally a reinforcing process in which better health increases the likelihood of employment and employment increases the likelihood of better health.[207,208]

Numerous studies demonstrate that income - a primary component of employment - is a critical predictor of health. Higher incomes are linked to lower mortality.[209] Attainment of self-sufficiency income correlates with better health, improved nutrition, and lower mortality[210] while more frequent episodes of income loss correlate with higher levels of depression.[211] The effects of income extend from individual earners to their children as well. Low socioeconomic position during both childhood and adulthood are associated with poorer self-rated health.[212]

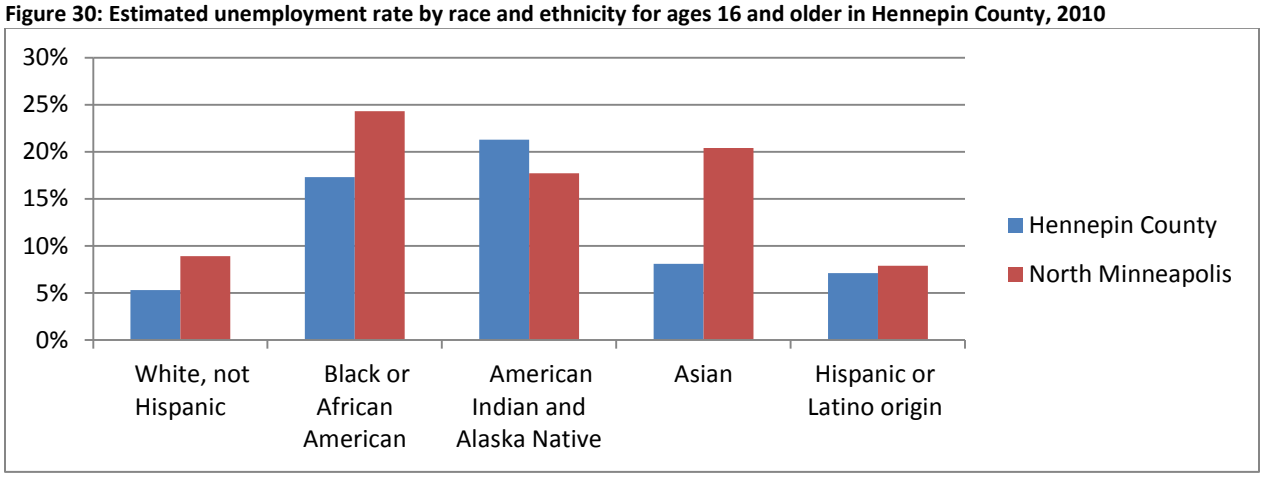
Existing Conditions

Employment

As described in the Community Profile section, the Twin Cities metro area and Hennepin County have notably low unemployment rates when compared to national averages. The 2011 average annual unemployment rates in the metro area and Hennepin County were 6.2 and 6.0 percent respectively as compared with the national average of 8.9 percent.[213] However, for the past several years unemployment rates in Brooklyn Center, Brooklyn Park, and Crystal have been consistently higher than in Minneapolis, Hennepin County and the region overall.

While unemployment rates in the region are on a steady decline and are low relative to the national unemployment rate, stark disparities among subpopulations persist. In Hennepin County Native Americans are nearly 4 times more likely to be unemployed and African Americans are more than 3 times more likely to be unemployed than their white, non-Hispanic counterparts (see Figure 30). In north Minneapolis, unemployment rates for minority populations are even more concerning than in the county overall at 24 percent for African Americans and 21 percent for Asians.

Figure 30: Estimated unemployment rate by race and ethnicity for ages 16 and older in Hennepin County, 2010



Source: 2006-2010 American Community Survey 5-Year Estimates

Income

Locally, the link between income and health is consistent with the research. In the Twin Cities residents living in the highest income areas have an average life expectancy of 82 years, while residents living in the lowest income areas have an average life expectancy of 74 years.[214] Mortality rates differ greatly by race in the Twin Cities. However, mortality rates are lower for all racial groups in higher income areas such that African Americans and American Indians living in higher income areas have mortality rates that more closely match their white, Hispanic, and Asian counter-parts.[215]

Income is also closely related to mental health. In Hennepin County an estimated 20 percent of adult Hennepin County residents living in households below 200 percent of the Federal Poverty Level (FPL) experience frequent mental distress as compared with 6 percent living in households at or above 200 percent FPL.[216]

Impact Analysis

The Bottineau Transitway could impact employment access by increasing the number of jobs in the region, and increasing connectivity to jobs. The three primary pathways for improving employment access include:

1. **Construction, Operation and Maintenance of the Bottineau Transitway** - The construction of the new line will require hiring for construction services and lead to a temporary increase in jobs and benefits for the local economy. In the long term, operations and maintenance of the line will create new employment opportunities. Income dollars from these jobs could cycle into the local economy creating additional opportunities.

2. **Transit connectivity to jobs** - By increasing access level of transit service, the new transitway could increase the number of jobs accessible by transit within a reasonable commute time.

3. **Transit-oriented development** (TOD) - Through TOD, the Bottineau Corridor could support an increase in the number of jobs that the line connects to by encouraging the clustering of jobs near station locations.

This section examines potential changes in employment access by assessing the impacts on level of transit service, transit-oriented development, and property values. In judgments about the impacts of the new transitway on health, it is assumed that improvements in the job accessibility will be accompanied by relative improvements in health outcomes.

Construction, operation and maintenance of the Bottineau Transitway

The construction of the Bottineau Transitway will create economic stimulus, which will create one-time benefits to local economies including increased earnings and new construction-related jobs on site, in factories, and in offices. Construction of the Bottineau LRT is anticipated to generate additional employment earnings for households and payroll expansion and generate jobs for all industries in the Minneapolis-St. Paul-Bloomington Metropolitan Statistical Area (MSA) for the duration of the construction.

The new LRT is anticipated to create long-term jobs and additional earnings for workers in the region as a result of Operations and Maintenance (O&M) expenditures. The expansion of transit service from the Bottineau LRT will likely result in an expansion of economic activity in the Twin Cities metro and generate long-term net economic impacts both through direct hiring to fill transit jobs and indirect impacts as these transit workers spend their earnings. Additionally, potential federal funds through grants could be applied to maintenance activities in later years, thus generating increased employment and earnings in local and state economies. In short, income dollars from construction and O&M jobs would cycle into the local economy creating additional opportunities.

The Bottineau Transitway Draft Environmental Impact Statement (DEIS) will provide an analysis and forecasts of the one-time impacts of the LRT construction on the local economy and the long-term impacts of O&M activities on the local economy. The analysis will not provide estimates on economic impacts specific to the Bottineau Corridor or the populations that will likely benefit as a result of the increased hiring. Findings will be available when the DEIS is released for public comment.

Transit connectivity to jobs

Transportation, land use and employment in the Twin Cities

A wide range of factors impact whether or not an individual is employed. One potential barrier to employment is lack of transportation. In the Twin Cities, evidence suggests that job sprawl and low density land uses present barriers to job access particularly for transit-dependent populations. Mirroring the growth trends in many American metropolitan areas, jobs and people steadily migrated outward into the Twin Cities suburbs during the past few decades and dispersed away from employment centers.[217] While the rate of land development has since slowed over the recent decade, [218] this growth pattern has resulted in the region becoming less dense with a deconcentrated and decentralized population and economy.[219] This pattern of job decentralization and low-density development, characterized by separated commercial and residential uses, makes cost-effectively connecting people to transit a challenge. It also forces workers to commute longer distances, and increasingly makes the daily availability of a vehicle a necessity for workers in the region.[220,221]

Land use characteristics in the region have implications for low-income workers as well as in the Bottineau Corridor cities. As car access has become critical for job access, low-income workers with limited or no car access are disadvantaged and have reduced access to employment opportunities.[222] Those with car access, while better able to reach job opportunities, are burdened by the costs of maintaining and operating a vehicle.

By providing faster and more frequent transit service, the new transitway will help to connect transit users to employment locations throughout the region. One measure of the new LRT's impact on employment access is the number of jobs within a half mile of the Bottineau stations.

Forecasts by station area to 2030 for total population and employment were developed for this project. These forecasts were based on the comprehensive plans of communities near the transitway, existing 2010 information, and land use maps. Development data for 2010 and 2030 were reviewed by local communities prior to the DEIS to confirm consistency with the local comprehensive plans. Developable land was identified using Hennepin County parcel data. These data are subject to change as the transitway project develops, and when new comprehensive plans are developed by communities later this decade.

Overall, forecasts for the Bottineau Station areas show that both the population and the number of jobs are anticipated to increase from 2010 to 2030, and that the percent increase in employment (61 percent) is likely to be greater than the percent increase in population (35 percent). These forecasts indicate that the new transitway will connect to a greater number of jobs than are currently located in the station areas. Important employment nodes exist near the Robbinsdale, Bass Lake Road, Brooklyn Boulevard, and 97th Avenue (Target Campus) stations (see Table 6, page 80).

Overall, forecasts for the Bottineau Station areas show that both the population and the number of jobs are anticipated to increase from 2010 to 2030.

Projected increases in jobs vary throughout the transitway, with the greatest increase near the 93rd and 97th Avenue stations, due to the expansion of the Target corporate campus. The forecasts show a decline in population and employment for the Penn Avenue station area and a decline in population for the Golden Valley Road station area. This is because the data for the forecasts are based on the 2030 comprehensive plans, which were developed *before* the adoption of the Bottineau Transitway into the

Metropolitan Council's Transportation Policy Plan. As a result, the plans that provide the data do not account for the potential changes in land use plans and economic development that the Bottineau Transitway may encourage. In other words, with the operation of transitway, and possible transit-oriented land uses and capital improvements, the number of jobs at each station area has the potential to exceed these forecasts.

Table 6: Employment and population within a half mile of Bottineau station areas, 2010 counts and 2030 forecasts

Station Name	Employment 2010	Employment 2030	Employment Change	Total Population 2010	Total Population 2030	Population Change
97th Avenue	1,745*	16,300*	**834%***	51	3,600	**6959%**
93rd Avenue				788	900	**14%**
85th Avenue	1,309	1,900	**45%**	2,755	2,800	**2%**
Brooklyn Boulevard	1,715	2,800	**63%**	2,339	2,600	**11%**
63rd Avenue	238	380	**60%**	4,065	4,400	**8%**
Bass Lake Road	1,899	2,700	**42%**	2,405	2,700	**12%**
Robbinsdale	1,377	1,900	**38%**	3,984	4,500	**13%**
Golden Valley Road Station	735	750	**2%**	2,351	1,600	**-32%**
Penn Avenue	396	350	**-12%**	5,743	5,600	**-2%**
Van White Boulevard	2,700	4,400	**63%**	4,576	5,900	**29%**
The Interchange	39,046	51,200	**31%**	5,156	11,700	**127%**
Transitway Total**	50,714	81,900	61%	33,121	44,800	35%

Source: Department of Economic Development's Quarterly Census of Employment, Metropolitan Council.[223]
Notes: Alignment totals account for station area overlap.
* 97th Avenue and 93rd Avenue employment information combined due to privacy concerns
**The total includes Golden Valley and not Penn Avenue. The Bottineau Transitway will likely include either the Golden Valley Road or the Penn Avenue Station. The station selection will be made in the future based on information from environmental impact review, engineering, and public involvement.

The jobs within a half mile of each station area are not the only jobs to which the Bottineau Transitway will connect workers. Within one to two miles of the corridor there are much larger employment nodes that are not within walking distance of the stations, but could be accessible to transit riders with a well-coordinated connector route service.[224] Additionally, the line connects with the greater regional transit system, expanding the number of jobs accessible to workers in Bottineau Corridor.

By connecting to a greater regional transit system, the Bottineau LRT will function as part of an improved transit system that will return benefits to the Bottineau Corridor and the Twin Cities region. Cambridge Systematics conducted a return on investment (ROI) analysis of a regional 2030 "Transit Buildout System" scenario for the Itasca Project.[225] The Transit Buildout System scenario includes numerous existing, planned and proposed transit investments throughout the Twin Cities region including the Bottineau LRT.[226,227] The analysis shows that this scenario is expected to decrease average travel times on the transportation network. As a result, job opportunities available to workers, and the labor shed available to employers, will increase in the Twin Cities. The study shows that, compared to

the base no-build scenario, the Buildout would, by 2030, result in an additional 14,500 to 24,000 jobs annually[228] and that 500,000 more working-age residents would be accessible to employers within a 30 minute trip time.[229] Although estimates at the Bottineau Corridor level are not available, these findings indicate more employment opportunities will be accessible to residents throughout the region.

Overall, the Bottineau LRT will connect to an increasing number of jobs near station locations and additionally, it will be part of a broader regional transit system that will improve employment accessibility for residents throughout the region. While transit-dependent populations will have greater physical access to employment, transportation is only one factor of employment access, and it is unclear to what extent the LRT will lead to higher employment rates for vulnerable populations.

Transit-oriented development (TOD)

As summarized in other sections of this report, the Bottineau Transitway has the potential to complement and facilitate TOD such as walkable, mixed-use, higher density, residential and commercial developments around station locations. This type of development can spur economic growth near station locations as well as cluster jobs, transit, housing, retail, and services. Economic growth could mean more employment opportunities, and the close proximity of housing, jobs, retail and services could enable transit dependent populations to more conveniently access job opportunities. TOD initiatives could also further increase job opportunities if strategies are incorporated to enable small business development. For some people who have trouble finding employment, starting a small business can be an opportunity to generate income and a creative way to serve their communities.[230]

Such changes would, theoretically, both increase the number of jobs in the Bottineau Corridor and physical access to jobs. Case studies throughout the United States demonstrate that with coordination among government, nonprofit and private sectors, TOD initiatives can create such scenarios and spur economic growth in a way that is equally inclusive of lower and upper income families.[231]

As part of a built-out regional transit system, the Bottineau LRT would return benefits to the Bottineau Corridor and the Twin Cities region.[232] The Cambridge Systematics ROI analysis includes a comparison of a Land Use Impact Transit Buildout scenario in which transit investments are accompanied by more dense development surrounding transit stations to a No-Build scenario in which limited transit investments are made. This Land Use Impact Transit Buildout scenario assumes that 25 percent of all projected development in the transitways occurs within a one-third mile buffer of transit station areas. The analysis finds that this scenario would result in an additional 11,594 to 23,602 jobs in 2030 and expand the regional economy by an additional $1.6 to $3.4 billion.[233] While estimates for job increases and economic growth at the Bottineau Corridor level are not available, these findings demonstrate the potential for TOD to increase employment opportunities.

Preliminary studies show an interest locally in implementing TOD principles into station area plans. However, station-area planning for the Bottineau Transitway is currently in a preliminary stage and likely to evolve and change. It is too early in the planning process to assess the degree to which station area planning for the Bottineau Transitway will increase employment access through economic growth and job concentration.

Equity Considerations

In general, assessment findings indicate the employment impacts of the Bottineau Transitway are likely to be positive for the populations who either have access to the line and/or live in station areas. Currently, a large percentage of the populations living the Bottineau Corridor cities are minority or low-income populations. These populations are experiencing higher rates of unemployment and poor health than the county average. Job growth and improved connectivity to jobs could represent better employment opportunities for these populations. In particular, lower-income populations and those with limited vehicle access could benefit greatly by being able to reach more jobs with a reduced transportation cost burden. However, there is currently not enough available evidence to determine whether and to what degree the Bottineau Transitway will improve employment rates for the vulnerable populations identified in this HIA (see Definitions of Key Terms section). Additionally, disparities in employment measures – such as unemployment rates and income - are related to multiple complex factors. Transportation and land use conditions are but two factors. More information is needed on how transportation factors into employment as compared to other barriers to employment.

Assessment: Education Access

This section describes the relationship between health and education and provides an examination of the ways the Bottineau Transitway could impact access to education.

Summary

Health and Education

- Educational attainment is closely linked to health and is a significant predictor of health outcomes, including mortality, self-rated health, and cardiovascular disease.

Existing Conditions

- In Hennepin County, those with lower levels of education, experience notably higher rates of unemployment. As describe above, employment is a predictor of health outcomes.

- Transit service to North Hennepin Community College is limited. While many factors impact one's educational attainment, surveys of North Hennepin Community College students indicate that transportation costs and limited transportation options present barriers to attending college classes.

Projected Impacts

- The Bottineau Transitway will improve transit connectivity to post-secondary educational and vocational training opportunities both in the Bottineau Corridor and the Twin Cities.

- By providing a time-competitive, more affordable transportation mode option to prospective students, the Bottineau Transitway could help to reduce the transportation cost burden for lower-income students who struggle to balance transportation and tuition costs.

Health and Education

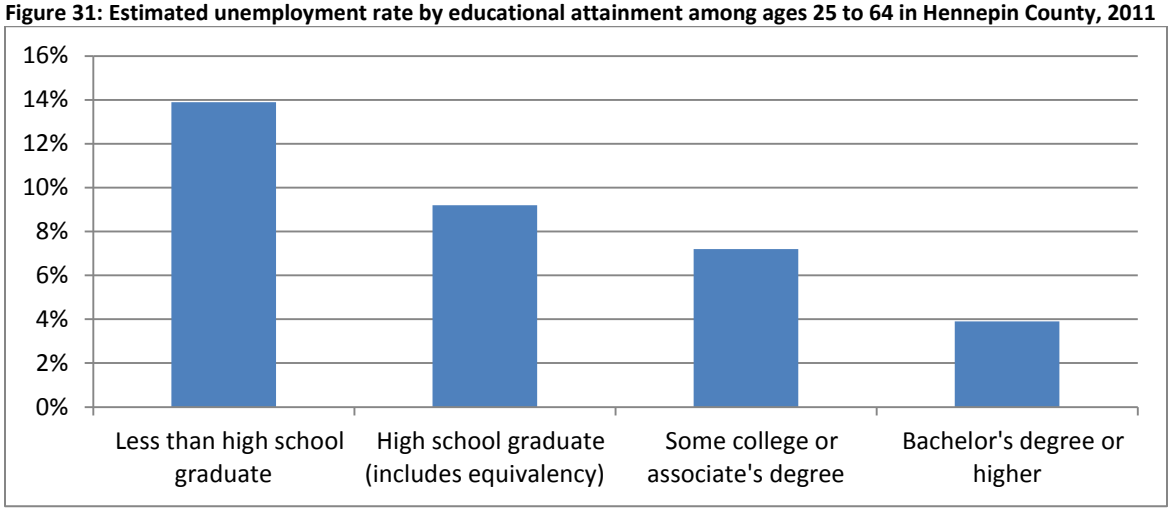
Education plays an important role in impacting peoples' chances for securing jobs that are well-paying and do not expose them to dangerous or unhealthful conditions.[234] Education is a significant predictor of health outcomes, including mortality, self-rated health[235], and cardiovascular disease.[236] Education can also impact health because it provides individuals with knowledge and life skills which can aid them in accessing health promoting information and resources.[237]

Unlike employment, people usually achieve all of their education before age-related health problems would impact their educational attainment.[238] As a result, education has a somewhat clearer casual impact on health than employment.[239] Still, there are some potential ways in which health can impact education. For example, children with chronic conditions such as ADHD, asthma, diabetes, or mental health problems could miss more days of school which could ultimately negatively impact their educational achievement.[240]

Education and employment

In Hennepin County, those who do not have a high-school diploma or equivalent are approximately 3.6 times more likely to be unemployed than those with a bachelor's degree or higher (see Figure 31).

Figure 31: Estimated unemployment rate by educational attainment among ages 25 to 64 in Hennepin County, 2011



Source: 2007-2011 American Community Survey 5-Year Estimates

Impact Analysis

The Bottineau Transitway could increase access to higher education in two primary ways:

1. **Better transit service to education opportunities** - Through increased transit service in the Bottineau Corridor, the transitway could connect people to higher education opportunities, particularly for those who have limited vehicle access.

2. **Decreased transportation costs** - Increased transit service to higher education institutions could help to reduce transportation cost burdens for students and potential students and, as a result, help to make the cost of attending college more affordable.

Better transit service to education opportunities

While there are many factors that impact the level of education one attains, one potential barrier to secondary education in the Bottineau Corridor, particularly in the suburban areas, is transportation. Without access to a vehicle many prospective students may not be able to attend college and the cost burden of car ownership for potential lower-income students may limit their ability to pay for tuition.

There is limited data on the impact of transportation on educational attainment in the Bottineau Corridor. However, evidence from North Hennepin Community College (NHCC) in Brooklyn Park suggests that transportation costs currently place a barrier to accessing educational opportunities. Serving over 10,000 credit-earning students in 2012,[241] NHCC is the "community college of choice" in

I live 11 miles from the college and with my old vehicle it costs me almost $8 a day in gasoline. There are no transit options that will serve my area and having a car is the only reason I am able to attend the college. – NHCC Student

the northwest suburbs of the Twin Cities.[242] From 2002 to 2012 fulltime equivalent enrollment at the college grew by 40 percent.[243] NHCC offers general education coursework and pre-professional programs for transfer to baccalaureate programs.[244] The college is an important educational institution for low-income, minority, and immigrant students. In 2012, 40 percent were students of color, 45 percent were low income and 61 percent were first generation students.[245] The Bottineau Transitway would provide direct, high frequency access to the NHCC campus for Bottineau LRT riders.

In May 2012, NHCC conducted an internal needs assessment and found that for an estimated 12 percent of current students, transportation was one of the factors that influenced their decision on the number of credits they enrolled in each semester.[246] In March 2013, members of the NHCC Student Senate surveyed NHCC students with open-ended questions about the impact of transportation costs and currently available transportation mode options on their education at the college.[247]

Based on survey findings, NHCC Student Senate members report that many students rely on driving a car to get to classes. Students with low income and no public transit options can experience longer days and uncertainty due to the need to ride share or borrow a car and sometimes miss classes as a result. Overall, survey responses indicate that transportation expenses are a common burden for the students. As one student respondent explained:

> *I live 11 miles from the college and with my old vehicle it costs me almost $8 a day in gasoline. There are no transit options that will serve my area and having a car is the only reason I am able to attend the college.*

Another student responded:

> *It makes it difficult to afford tuition when spending hundreds of dollars a month on gas for the car.*

Currently, transit service for the college is very limited. Three bus routes serve the campus but provide very limited hours of service and include few other stops. The new LRT will provide greatly increased transit service to the community college. The 85th Avenue Station of the Bottineau Transitway will be located immediately adjacent to the North Hennepin Community College campus. By 2030, NHCC is projected to serve 4,663 full-time students and 9,467 part-time students and to employ 150 full-time staff and 377 part-time staff.[248] **The improvement in transit service and the prominence of NHCC in providing education to people in the northwest suburbs suggest the transitway will improve education access in the Bottineau Corridor.** In addition, by increasing the level of transit service, the Bottineau LRT will offer a time competitive, more cost-effective mode option for students who have access to the transitway.

The Bottineau Transitway will also increase transit service to Summit Academy OIC (Opportunities Industrialization Center). Summit Academy is located in the Heritage Park neighborhood of north Minneapolis at the intersection of the proposed Van White Station location and is the only community-based vocational training and job placement program in north Minneapolis.[249] In its fiscal year 2008-2009, the school enrolled 452 students and placed 120 students in jobs.[250] By increasing transit service to Summit Academy, the new LRT may help to link more prospective students to vocational training and job placement services, which could help them to expand their employment opportunities. [251]

By connecting to the greater regional transit system, the Bottineau LRT could also connect prospective students to colleges and universities outside of the Bottineau Corridor such as Minneapolis Community and Technical College (MCTC) and the University of Minnesota Twin Cities, among others throughout the Twin Cities metro. MCTC is a public two-year college located in downtown Minneapolis, and enrolls nearly 15,000 credit-earning students annually.[252] While the college is more than a half mile from the Interchange (the downtown station location), the high level of transit service in downtown Minneapolis would serve to connect Bottineau LRT riders to the college. Similarly, the Bottineau LRT will connect with the Central Corridor LRT which will provide high-frequency service to the University's Minneapolis campus.

Overall, there is no data available to predict how many potential students would have improved access to these educational institutions as a result of the transitway. However the Bottineau Transitway will increase transit service which could help to reduce the transportation barriers for prospective students with limited vehicle access.

Equity Considerations

Decreased transportation costs

In general, assessment findings indicate the education access impacts of the Bottineau Transitway are likely to be positive for the populations who either have access to the line and/or live in station areas. Currently, a large percentage of the populations living the Bottineau Corridor cities are minority populations or low-income – populations that are currently experiencing disparate health outcomes and unemployment rates in the county. Improved transit connectivity in to higher education in the Bottineau Corridor and the region could represent better education access for these populations. In particular, lower-income populations and those with limited vehicle access could benefit greatly by being able to access education opportunities with a reduced transportation cost burden. However, there is currently not enough available evidence to determine whether and to what degree the new transitway will improve educational attainment for vulnerable populations. Numerous, complex factors impact the level of education people achieve and more information is needed on how transportation factors into education as compared to other barriers to education.

Assessment: Traffic Safety

This section describes how transportation modes and land uses impact traffic-related injuries and fatalities and provides an examination of the ways the Bottineau Transitway could impact traffic-related injuries and fatalities.

Summary

Existing Conditions

- Traffic crashes cause deaths and injuries and are the leading cause of death of people ages 34 and under.

- During 2011 in Minnesota there were more than 72,000 motor vehicle crashes resulting in 368 deaths, including 40 pedestrian deaths, and 30,295 injuries. From 2001 to 2011 the total lives lost to traffic collisions amounted to 5,094. In the Bottineau Corridor cities there were 5,089 traffic-related injuries in 2011.

- Pedestrians represent a significant portion of traffic fatalities. Between 2000 and 2009, 415 pedestrians were killed in Minnesota.

Projected Impacts

- While the magnitude of the impact is uncertain, overall the Bottineau Transitway is likely to have a positive impact on traffic safety for the general population and vulnerable populations through three pathways:

    1. **Increased transit ridership:** Forecasts show the Bottineau LRT will result in more people riding transit and a decrease in vehicles miles travelled. This represents an increase in people using a safer mode of transportations and decreased exposure to traffic accidents.

    2. **Improved environments for walking and biking:** Enhancements to the pedestrian and bicycling infrastructure connecting to the Bottineau LRT station areas would likely reduce the risk of traffic-related fatalities and injuries for pedestrians and cyclists. While such enhancements are likely, the pedestrian and bicycling infrastructure plans have not yet been developed.

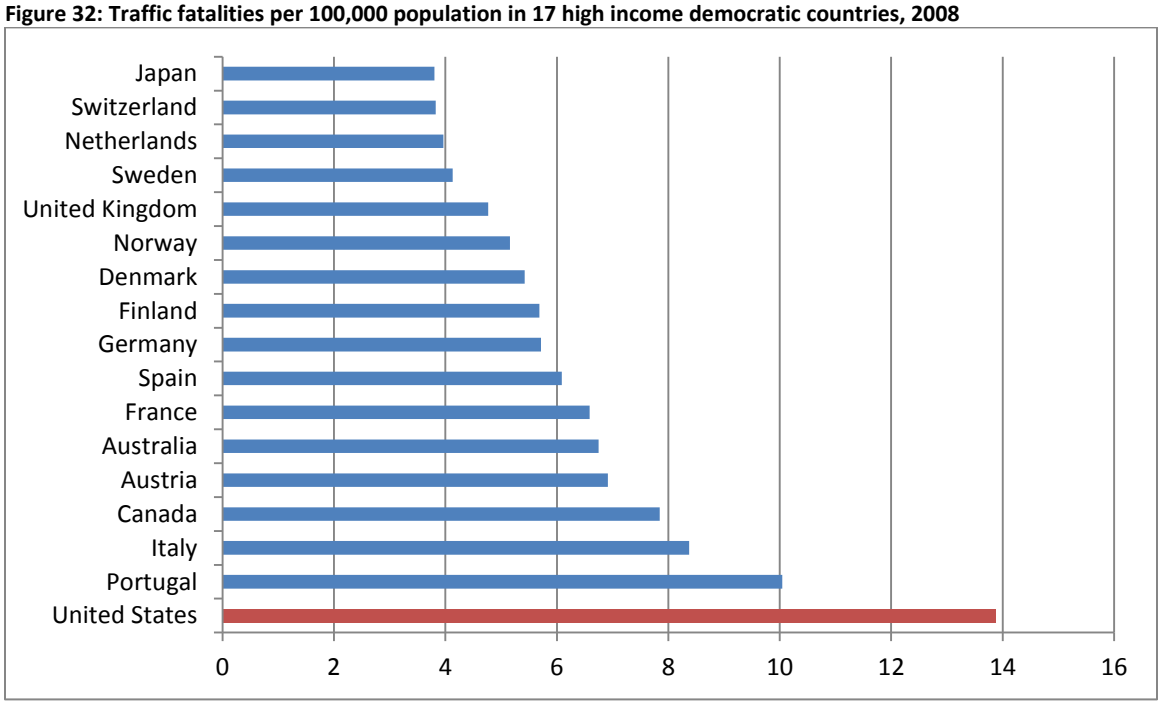
    3. **Increased pedestrian and bicyclist volumes:** Increased numbers of pedestrians and cyclists are shown to correlate with decreased rates of traffic collisions involving pedestrians and cyclists. Both pedestrian and bicycling infrastructure and TOD land uses are shown to increase walking and biking, signifying an increase in the presence of cyclists and pedestrians and, as a result, reduce traffic-related injuries and fatalities. While some TOD land uses and infrastructure enhancements are likely, they have not yet been planned limiting an assessment of the magnitude of impact.

- Youth, senior, low-income, and minority populations experience the highest rates of traffic related pedestrian injuries and fatalities. Improvements in traffic safety for these populations, particularly pedestrian safety, could represent an improvement in health equity.

Traffic Safety and Public Health

Over the past century, the automobile has become the American way life, shaping the environments we live in and providing mobility for many. However, our reliance on cars comes at a significant social and economic cost in the form of fatalities and injuries. Every year approximately 33,000 people die in traffic collisions in the United States. With a rate of 11 deaths per 100,000 population in 2011, motor vehicle crashes are among the leading causes of death in the United States,[253] amounting to nearly 90 people killed every day on America's streets and highways.[254] A comparison of traffic fatalities with 16 comparable high-income democracies or "peer" countries shows that the United States has the highest rate of death by car accident (see Figure 32).[255] In 2011, 32,367 people died in motor vehicle traffic crashes in the United States - the lowest number since 1949.[256] Despite the apparent downward trend, preliminary data shows a concerning 7.1 percent uptick in fatalities in 2012 from 2011.[257]

Figure 32: Traffic fatalities per 100,000 population in 17 high income democratic countries, 2008



Source: U.S. Health in International Perspective: Shorter Lives, Poorer Health, The National Academies Press, 2013

In 2010, with over 2.7 million people treated in emergency rooms for unintentional injury as an occupant in a motor vehicle crash, vehicle crashes account for the fourth leading cause of non-fatal injuries treated in emergency rooms across the U.S.[258] Injuries received as a result of motor vehicle crashes can impact quality of life for those involved, and exact considerable costs to the individuals and families involved as well as to society. Costs include lost workplace and household productivity, present and future medical costs, property damage, and costs to critically injured survivors. [259] Annual costs to society from motor vehicle crashes in the U.S. average more than $230 billion.

During 2011 in Minnesota there were more than 72,000 motor vehicle crashes resulting in 368 deaths, including 40 pedestrian deaths, and 30,295 injuries.[260] From 2001 to 2011 the total lives lost to traffic collisions amounted to 5,094.[261] Pedestrians represent a significant portion of traffic fatalities. Between 2000 and 2009, 415 pedestrians were killed in Minnesota.[262]

While the overall trend for traffic fatalities and injuries in Minnesota has been declining, with the lowest number of traffic fatalities since 1944 recorded in 2011, preliminary data for 2012 in Minnesota also show an increase in traffic fatalities to 378.[263] In 2011 there were a total of 26 traffic fatalities and 5,089 injuries as a result of motor vehicle crashes within the Bottineau Corridor cities (see Table 7). The estimated annual economic cost of traffic crashes in Minnesota ranges from $1.5 to $3.07 billion dollars.[264,265] These deaths and injuries constitute a significant *preventable* public health concern.

Table 7: Traffic fatalities and injuries in the Bottineau Corridor 2011

Location	Fatality	Injury
Minnesota	**368**	**30,295**
Hennepin County	**45**	**8,338**
Minneapolis	21	3,881
Golden Valley	0	184
Robbinsdale	0	73
Crystal	0	124
Brooklyn Center	5	332
Brooklyn Park	0	427
New Hope	0	68
Total Corridor cities	26	5,089

Source: Minnesota Department of Public Safety

Traffic Safety and Transit

Numerous factors influence the frequency and severity of traffic crashes. These factors range from environmental characteristics and conditions to individual behavior including speed and mass of vehicles, type of road, mode share, weather conditions, time of day, distracted driving, drunk driving, sleep deprivation, and failure to obey traffic laws.[266] Characteristics of an area such as high levels of vehicle miles traveled per capita are also correlated with impact collision and injury rates.[267] The National Safety Council reports that distracted driving is the leading cause of motor vehicle crashes and that use of mobile phones while driving is the leading cause of distracted driving. Drivers who use cell phones are four times more likely to be involved in a crash than those who do not.[268] Additionally, each year, drunk driving-related crashes account for more than one-third of Minnesota's total death count. In 2011, there were 111 drunk driving-related deaths.[269]

For crashes involving pedestrians, unsafe road design, vehicle speed, lack of pedestrian infrastructure, and low volumes of pedestrians also contribute to the frequency, severity, and outcome of the crashes.[270] A Minneapolis Public Works Department analysis of 2,973 bicyclist-motorist crash records from 2000-2010 found that most crashes occur due to operator behavior and that among the crashes analyzed, most occurred at intersections at major arterial roads. [271]

Factors related to transit are also among the wide range of variables that affect the frequency and outcomes of traffic collisions. The Bottineau Transitway has the potential to play a role in traffic safety in the Bottineau Corridor through three interrelated primary pathways:

1. **Increased transit ridership** - Transit is a much safer mode of transportation than private vehicle use. As people switch to transit, they lower their chances of getting hurt. The new LRT could impact traffic safety by increasing the number of people using this safer form of travel.

2. **Improved environments for walking and biking –** As described in the Physical Activity assessment section of this HIA, the Bottineau LRT has the potential to improve built environments for walking and bicycling through enhancements to pedestrian and bicyclist infrastructure and through Transit-oriented development. These development and infrastructure changes could improve safety conditions for pedestrians and bicyclists.

3. **Increased pedestrian and bicyclist volumes** – The Physical Activity assessment shows that through increasing transit ridership and walkability, the LRT is likely to increase pedestrian and bicyclist activity. Studies show that as the presence of pedestrians and bicyclists increase, the rate of traffic accidents involving pedestrians and bicyclists decrease. By increasing pedestrian and bicyclist volumes, the new transit project could improve traffic safety.

Impact Analysis

The following section provides a qualitative assessment of the Bottineau LRT's potential to improve traffic safety in the Bottineau Corridor and the metro area based on the three pathways of 1) increased transit ridership, 2) improved walkability, and 3) increased pedestrian and bicyclist volumes. Because of the numerous variables impacting traffic safety, this assessment will not attempt to quantitatively predict changes in injuries and fatalities.

Increased public transportation ridership

Transit is one of the safest forms of transportation available.[272] In general, buses and trains[273] have much lower death rates than light duty vehicles[274] when the risk is expressed as passenger[275] deaths per passenger mile of travel. In 2009, the passenger death rate in light duty vehicles was 0.53 per 100 million passenger-miles. The rates for buses and trains were 0.04 and 0.02 respectively.[276] In other words, for every mile an individual travels in car, he or she is 13.25 times more likely to die than if he or she was travelling on a bus (see Table 8). As people shift the trips they take from cars to transit they are reducing their exposure to the greater risks of injury and death associated with driving or riding in a car.

Table 8: Fatalities per 100 million passenger miles by mode, 2009

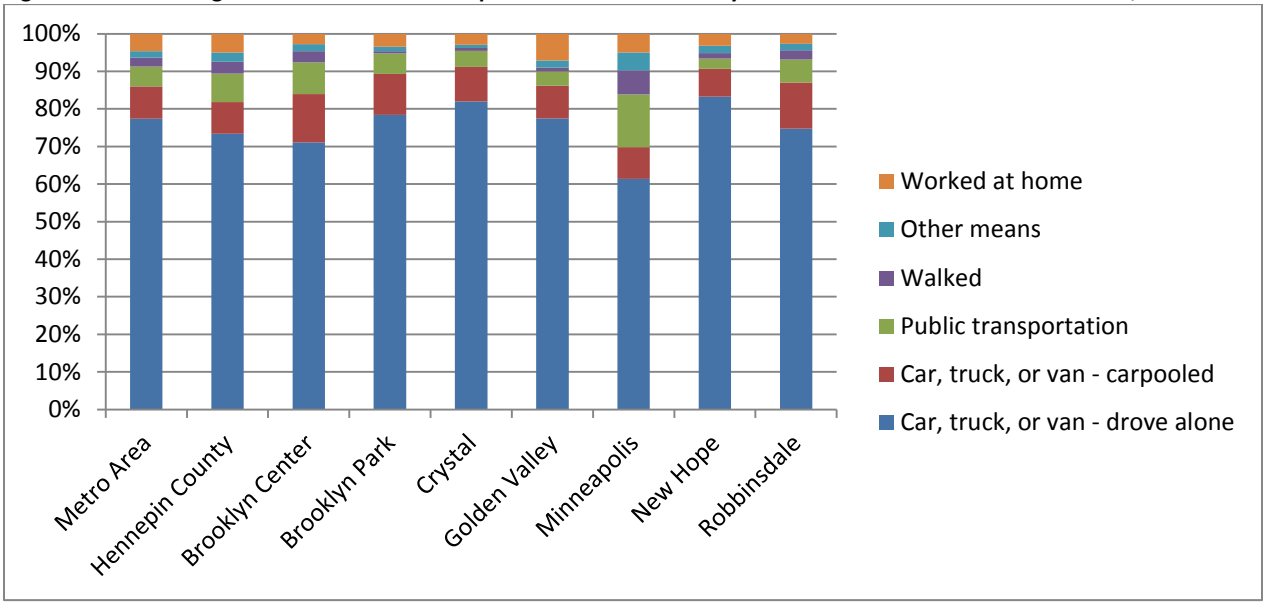
	Light-duty vehicle (passenger car, light truck, van, and sports utility vehicle)	**Bus**	**Train** (Amtrak and commuter train)
Fatalities	.53	.04	.02

Source: National Safety Council

There are, however, risks associated with Light Rail transit as well. Researchers in Boston evaluated light rail safety among 17 transit authorities across the United States. Their findings show that from 2002 through 2008 there were 7,171 incidents resulting in 4,450 injuries and 17 fatalities.[277] Importantly, the researchers noted that safety varied widely across the 17 transit authorities suggesting that safety measures are not implemented equally or necessarily with fidelity to known critical features that protect the general public. Both human error and design limitations figure prominently in the numbers of light rail safety incidents. Human error includes behavior such as jaywalking and trespassing; inattention and confusion; illegal turns, traffic control violations, gate violations; and risky behavior due to purposeful noncompliance. Those related to design error include safe station access, signal clearance, provision of traffic signal pre-emption, and platform footing hazards. Yet, even with these potential hazards, it remains that all transit, including light rail, has a considerably safer record than transportation by automobile.

Despite the risks of driving, there is currently a heavy reliance on cars for transportation within the Bottineau Corridor cities, as in Hennepin County and seven-county metro area overall. Five year estimates between 2007 and 2011 show that the vast majority of workers age 16 years and older commuted to work driving alone in their own car truck or van, and only a small percentage used public transportation (see Figure 33).

Figure 33: Commuting to work – modes of transportation for workers 16 years and over in the Bottineau Corridor, 2007-2011



Source: American Community Survey 5-Year Estimate 2007-2011

As demonstrated in the Physical Activity Assessment section of the report, forecasts for horizon year 2030 based on the Twin Cities Metropolitan Area Regional Travel Demand Forecast Model developed by the Metropolitan Council show the Bottineau Transitway will lead to an additional estimated 3,050 people riding transit per day (a 14 percent increase) in the region in comparison to the No-Build scenario. While the data does not show what form of transportation these new transit riders would use for these trips in the No-Build scenario, we know that driving alone in a personal vehicle is the primary mode of transportation in the region and corridor and that these new transit users will be choosing a mode of transportation that is shown to be far safer than riding or driving in a car. As a result, the Bottineau Transitway has the potential to decrease the traffic collision risk for this population, representing an improvement in traffic safety.

Improved environments for walking and bicycling

Numerous studies reveal that the built environment, including road design and pedestrian and bicycling infrastructure, greatly impacts traffic safety for cyclists and pedestrians. [278,279,280,281] Indeed, it is on poorly designed, wide, high-speed, and high capacity roads where 52 percent of pedestrian fatalities nationwide occur.[282] These roads are engineered to connect major destinations within an urban or rural area but many are not designed to accommodate pedestrians and some completely lack sidewalks. However, people often do not have a choice but to walk in these dangerous environments as these are the environments where they live, work, and shop. Over the past 50 years, the emphasis of moving the most cars as rapidly as possible has resulted in the shifting of daily activities from Main Streets to high speed arterials drawing shopping centers, eateries, apartment complexes, and office parks.[283]

Complete Streets policies and changes in the land use patterns and road design have the ability to improve conditions in the built environment for pedestrians and cyclists, thus reducing risks of death and injury from collisions. Complete Streets policies ensure that road projects take into account the needs of users of all abilities and ages and often feature sidewalks, frequent pedestrian crossings, median islands, and pedestrian signals.[284]

Traffic calming and street design techniques can enhance safety through narrower streets, reduced number of lanes, intersections that include features such as pedestrian refuge medians, better road geometry, and improved crossing signal timing. Evidence suggests that vehicle operating speeds decline somewhat as individual lanes and street sections are narrowed. Beyond lower speeds, drivers seem to behave less aggressively and more cautiously on narrow streets, running fewer traffic signals[285] and a smaller number of lanes on a street is associated fewer crashes.[286]

While there are variations in characteristics and conditions of the walking and bicycling environments in the Bottineau Corridor, currently, much of the corridor, as in the Twin Cities overall, is defined by lower density land uses designed for automobile transportation. A study by the Brookings Institution found that the Twin Cities region ranked below average in the number of regionally significant walkable urban places compared to other American cities.[287]

As demonstrated in the Physical Activity Assessment section of this HIA, the Bottineau LRT is likely to result in improvements in the walking conditions of the built environment in the Bottineau Corridor through Transit -oriented development (TOD) and enhancements to pedestrian and bicycle infrastructure. As of the preparation of this HIA, the plans for TOD and pedestrian and bicycle infrastructure have not yet been developed. However, preliminary station area planning and project planning indicate that the new transitway will lead to some improvements for walking and biking conditions. Depending on the level of improvements made, the Bottineau LRT has the potential to improve traffic safety for pedestrians and cyclists.

Increased pedestrian and bicyclist volumes

Improving conditions for walking and bicycling in the Bottineau Corridor can also support traffic safety by leading to increases in pedestrian and cyclist activity. In one study, men and women who reported positive changes in the convenience of walking were more than twice as likely to increase their walking.[288] Conversely, conditions that make the pedestrian environment unsafe, such as high traffic volumes and speeds, degraded sidewalks, poorly connected streets, and a lack of lighting, are likely to reduce walking on residential streets.[289,290,291] Studies show that volumes of pedestrians are associated with improved safety for cyclists and pedestrians.[292,293] The suggested explanation for this relationship

between traffic safety and increased pedestrian and cyclist volumes is that motorists adjust their behavior in the presence of people walking and bicycling.[294]

While most people walk for at least some portion of their day, even if it is just from their car in the parking lot to their place of work, data suggests an overall low frequency of walking as a means of transportation in the Twin Cities and Bottineau Corridor. As shown in Figure 33 (page 91), only 5 percent of workers age 16 and older in the corridor cities[295] report walking to work. Results from the SHAPE 2010 survey show that approximately half of the residents in north Minneapolis and 38 percent of residents living in the remaining cities of the Bottineau corridor walk at least one day for the purpose of going to a destination during an average week when weather permits.[296]

Beyond improvements to the built environment for pedestrians and cyclists, the Bottineau Transitway has the potential to increase the volume of pedestrians by increasing transit ridership. As noted above, the new transit project is expected to lead to an increase of 3,050 people per weekday using the transit system in 2030 who would not otherwise. Studies demonstrate that where light rail transit has been implemented, regions may see associated increases in both bicycle and pedestrian traffic. **By spurring an increase in pedestrian and cyclist volumes through increased transit ridership, the Bottineau Transitway has the potential to positively impact traffic safety.** However, the magnitude of this impact is also dependent upon the supporting infrastructure and land use planning.

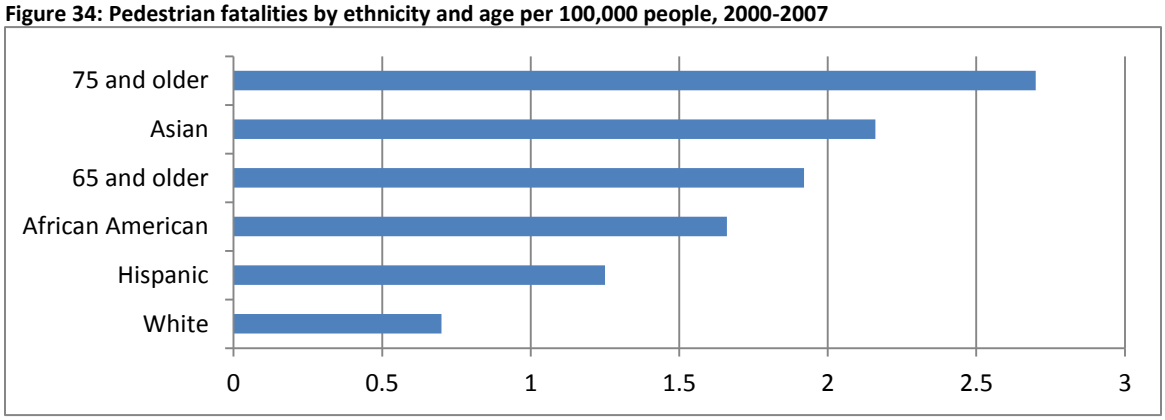
Equity Considerations

Traffic safety affects everyone. However it is also a health equity issue. Walking is critical for populations who do not have the choice to drive. This population includes people with disabilities, children and young adolescents, older populations who can no longer drive, and low-income populations. These populations are even more at risk for pedestrian fatalities and injuries.

Children, young adults, seniors (age 65 and over), and minority populations are disproportionately impacted by traffic crashes. In the United States, motor vehicle crashes are the leading cause of death for populations ages 4 and ages 11 to 25. An average of 3 children, age 14 and younger, were killed and 469 were injured every day in the United States in motor vehicle crashes during 2010.[297,298]

In Minnesota and across the country, racial and ethnic minorities are disproportionately at risk for pedestrian fatalities, and Minnesota's youngest (under the age of 15) and oldest (over the age of 65) residents are additionally most likely to be victims of pedestrian traffic fatalities. [299] From 2000 to 2007, in comparison with non-Hispanic Whites in Minnesota, the fatality rate was 71 percent higher for Hispanics and 127 percent higher for African-Americans (0.7 as compared to 1.3 and 1.7 per 100,000 population respectively – see Figure 34, page 94).[300] The higher rates of injuries and fatalities among these populations are relevant to traffic safety concerns in the Bottineau Corridor given Hennepin County's overall aging population and the disproportionately young and minority populations in sections of the Bottineau Corridor, particularly in north Minneapolis.

Figure 34: Pedestrian fatalities by ethnicity and age per 100,000 people, 2000-2007



Source: Transportation for America: Dangerous by Design Minnesota
http://t4america.org/resources/dangerousbydesign2011/states/?state=mn

Data also demonstrates that low-income populations face a greater risk of pedestrian fatalities. Nationally, the pedestrian fatality rate is 2.91 per 100,000 population in counties where more than 20 percent of households have incomes below the poverty level.[301]

Pedestrians and cyclists involved in motor vehicle crashes are more vulnerable to fatality and injury than vehicle occupants.[302] Pedestrians only have a 15 percent chance of surviving a crash with a car travelling 40 mph. Among 51 major U.S. cities, 27 percent of traffic fatalities were pedestrians even though walking accounted for only 12.7 percent of trips and 3.1 percent of fatalities were bicyclists though bicycling accounted for only 1.1 percent of trips.[303]

By supporting improved safety conditions for these populations, the Bottineau LRT, along with accompanying TOD and pedestrian and bicycle infrastructure enhancements, has the potential to reduce the risks of traffic fatalities and injuries for these populations that are currently disproportionately impacted by traffic collisions.

Assessment: Healthy Food Access

This section describes the relationship between healthy food access, food deserts, and diet quality and provides an examination of the ways the Bottineau Transitway could impact access to healthy foods.

Summary Findings

Existing Conditions

- While Hennepin County residents understand that fruits and vegetables are important to a healthy diet, data show that only a little more than 30 percent of north Minneapolis residents and 32 percent of residents living in the inner ring suburbs along the Bottineau Corridor consume adequate amounts of fruits and vegetables.

- Low income Hennepin County residents are less likely to consume adequate amounts of fruits and vegetables than those with incomes at or above 200 percent the Federal Poverty Level (FPL).

- Vehicle access in Hennepin County and the Bottineau Corridor cities factors strongly into residents' access to healthy foods. Studies and stakeholder input indicate that the absence of healthy food options is a concern for populations without vehicle access in both urban and suburban areas of Hennepin County.

- The presence or absence of healthy food vendors is one of many factors impacting food access. The cost of healthy foods, such as high-quality fresh fruits and vegetables, also presents a barrier for low income households. Food insecurity, particularly in north Minneapolis households, may be a more prominent factor affecting diet quality than physical access to healthy foods.

Projected Impacts

- While vehicle transportation helps people reach supermarkets, more research and evidence is needed to determine whether and how increased transit service as a result of the Bottineau Transitway could increase healthy food access. Incentives to increase the number and density of food outlets selling affordable healthy foods within low income communities may better address gaps in healthy food availability than transit service.

- One potential way the Bottineau Transitway could improve food access for transit dependent populations could be transit-oriented development (TOD) that encourages types of locations attractive to healthy food vendors.

- Through a combination of increased transit service and TOD, the Bottineau Transitway could help households decrease their transportation costs, freeing up more of their incomes for nutritious foods along with other prerequisites for health.

Healthy Food Access and Health

Good nutrition is vital to health, disease prevention, and childhood development. As the prevalence of dietary-related health problems, such as obesity, heart disease, and diabetes, sharply increased over the past several decades, intervention strategies often centered on changing individual behavior through educating the public on nutrition and the importance of making healthy food choices.[304] Such efforts presume that nutritious foods are accessible to everyone.

A growing body of research provides evidence that numerous environmental and socioeconomic factors beyond the personal level all interact to influence food choices and diet quality. These factors include food prices, food assistance programs, financial constraints, community characteristics, cultural preferences, and the availability or absence of healthy foods within neighborhoods.[305,306] Much of the research examining environmental factors has focused on this last factor and, in particular, on neighborhoods with limited healthy food options, known as "food deserts". The basic concept behind food deserts is that a lack of healthy, locally available foods negatively influences the diet quality of residents and results in undesirable health outcomes.

This assessment section examines the potential relationship between the Bottineau Transitway and concerns regarding healthy food access, or food deserts, in Bottineau Corridor cities by 1) reviewing research on food environments and healthy food access; 2) reviewing the factors influencing food access, including transportation; and 3) examining food access conditions near the Bottineau Corridor based on available data from existing studies.

Food deserts

Food deserts emerged in urban settings as large grocers migrated away from densely populated urban centers to newer suburban developments in response to multiple pressures including the need for large parking lots for automobile-dependent populations, decreased spending power in economically deprived neighborhoods, and smaller households in the urban centers.[307] This left corner stores with limited selections and higher prices as the main source of groceries in urban areas.[308,309] The absence of grocery stores has implications for healthy food availability because grocery stores tend to sell higher quality and more affordable fresh fruits and vegetables and fresh products than fast food restaurants or convenience stores which commonly sell processed, energy-dense food ("empty calorie" food).[310,311,312]

The evidence is mixed when examining the complex relationship between food deserts, diet quality, and health outcomes. Some studies have shown a relationship between access to healthy foods and better health outcomes such as lower Body Mass Index (BMI) and a decreased prevalence of obesity,[313,314] while other studies did not find a significant relationship between health outcomes and food access or involved mitigating factors that likely limit the validity of the results.[315,316]

Other food access and diet quality factors

Limited healthy food options within a neighborhood, or food deserts, is one of many potential barriers to a quality diet. Food prices, food assistance programs, financial constraints, community characteristics, cultural food norms, taste preference, and the availability or absence of healthy foods within neighborhoods are all influencing factors that research has identified.[317,318,319 ,320,321] A recent study shows that food is often purchased while traveling from locations other than home,[322] which indicates that the food environments where people live is only one factor influencing their food access and that other environments, such as where people work and go to school may also influence healthy food access and diet quality. That such a wide range of interrelated factors impact food access and diet quality may explain why some studies show that increasing access to healthy and nutritious foods does not necessarily lead to improved diet quality.[323] In sum, while research is beginning to document the complexity of interacting socioeconomic and food environment factors, more is needed to identify causal relationships and effective policy solutions.[324]

Existing Conditions

Stakeholder and Advisory Committee input during this HIA in addition to earlier studies and surveys point to concerns regarding food deserts and a desire for better access to healthy foods in areas of the Bottineau Corridor cities.[325,326,327,328] Overall, studies and stakeholder input primarily center on healthy food access limitations in north Minneapolis but there is some evidence that healthy food access is a concern in the suburban cities along the Bottineau Transitway as well. Much of the evidence on food access and dietary quality are only available at the county, multi-city, or city level. Data on food access issues, priorities, and diet quality specific to the populations within a half mile or a mile and a half of the Bottineau Transitways are not available.

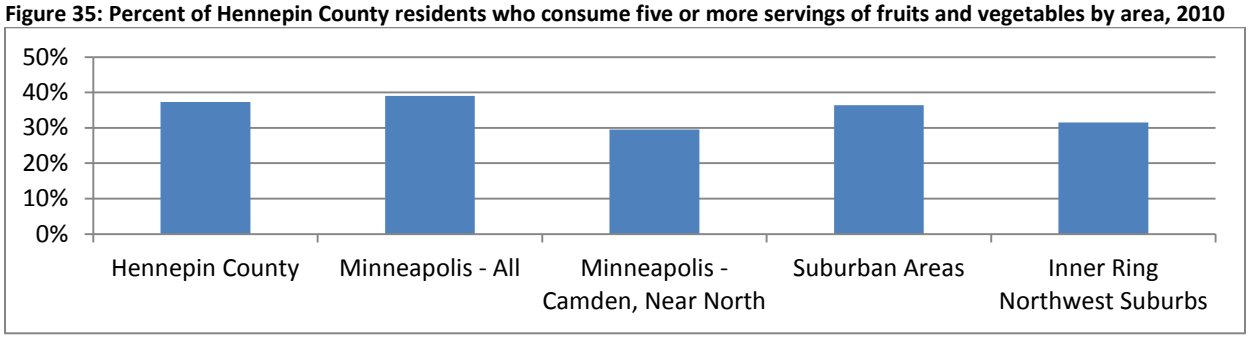
High quality, affordable fresh fruits and vegetables are difficult to obtain for low income communities in Hennepin County[329] as a whole and particularly in north Minneapolis.[330,331] Barriers include no access to a vehicle, limited transit access, a lack of supermarkets nearby their homes, and the cost of healthy foods.[332,333] A study by the Innovation Group of NorthPoint Health and Wellness Center, shows that north Minneapolis residents gave low ratings to the availability and quality of fresh produce at corner and convenience stores – the locations they reported easiest to access.[334]

Diet quality: fruits and vegetables

The number of fruits and vegetable servings people consume per day serves as an indicator of diet quality because fruit and vegetables are an essential part of a healthy diet. A diet that includes five or more servings of fruits and vegetables per day may reduce the risk of several chronic diseases[335,336] and prevent some cancer deaths.[337]

As shown in Figure 35 (page 98), data from the Hennepin County 2010 Survey of the Health of All the Population and the Environment (SHAPE) show that slightly more than one-third (37 percent) of Hennepin County residents consume adequate amounts of fruits and vegetables.[338] In north Minneapolis and the inner ring northwest suburbs of Hennepin County this percentage is even lower (30 and 32 percent respectively).[339] Inner ring northwest suburbs include all of the Bottineau Corridor cities except for Brooklyn Park. The Near North and Camden neighborhoods comprise north Minneapolis. NorthPoint's survey[340] of 434 residents found that less than 45 percent of respondents reported eating fresh fruits and vegetables at least every day.[341]

Figure 35: Percent of Hennepin County residents who consume five or more servings of fruits and vegetables by area, 2010



Source: Hennepin County 2010 SHAPE

Note: The Camden and Near North neighborhoods comprise north Minneapolis. The Inner Ring Northwest Suburbs include five of the six suburban cities along the Bottineau Corridor: Brooklyn Center, Crystal, Golden Valley, New Hope, and Robbinsdale.

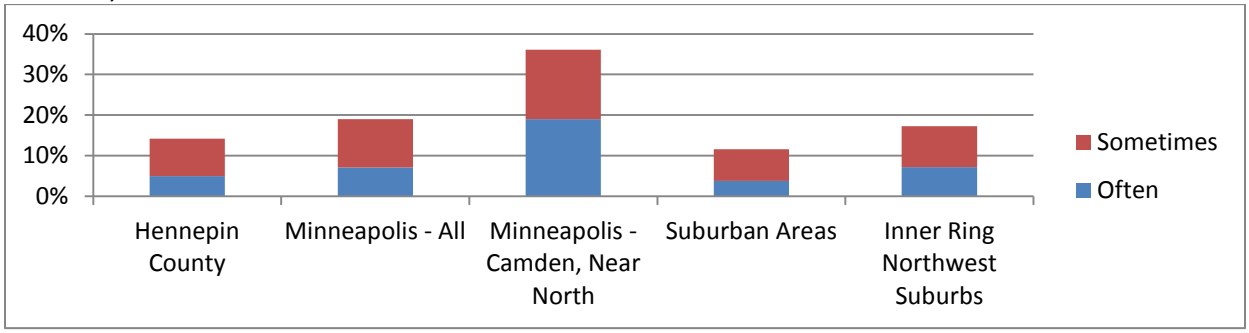
Barriers to healthy foods: availability and cost

Despite these low rates of consuming adequate amounts of fruits and vegetables, both the Hennepin County and NorthPoint food assessments indicate that residents understand the importance of fruits and vegetables for overall health[342] and want to eat more fruits and vegetables.[343] The cost and the lack of available healthy foods appear to be two barriers for low income residents in Hennepin County and specifically north Minneapolis. Both food assessments indicate that residents would consume more servings if quality fruits and vegetables were more affordable and available.

Hennepin County's Community Food Assessment supports the concept that limited access to healthy foods is associated with a poor diet. Hennepin County found that areas with the lowest percentage of adults consuming five or more fruits and vegetables daily are also the areas with the least access to full-service grocery stores. SHAPE data indicates that income is associated with the number of fruit and vegetables county residents consume. Twenty-eight percent of county residents with incomes below 200 percent of the Federal Poverty Level (FPL) consume the recommended servings as compared with 40 percent of residents at or above 200 percent FPL.

For many residents in north Minneapolis, food security and the affordability of healthy foods may be more pressing issues than proximity of grocery stores. SHAPE data shows that in 2010, an estimated 36 percent of north Minneapolis residents often or sometimes worried they would run out of food before they had money to buy more during the previous 12 months (see Figure 36).

Figure 36: Percent of residents who worried they would run out of food before they had money to buy more during the past 12 months, 2010.



Source: Hennepin County 2010 SHAPE

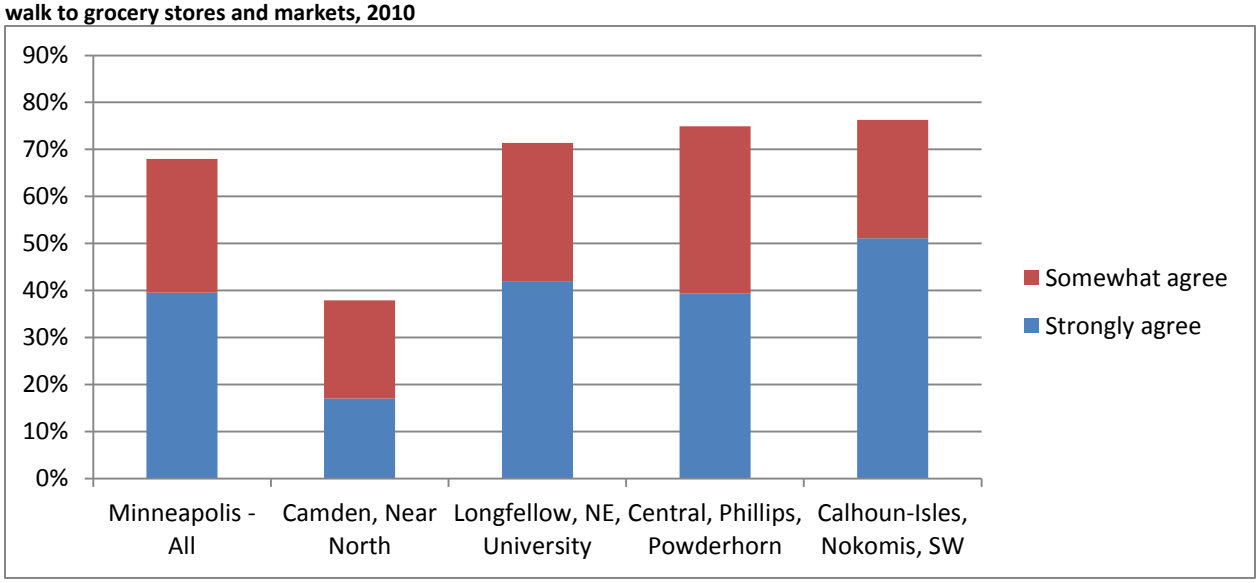
Note: The Camden and Near North neighborhoods comprise north Minneapolis. The Inner Ring Northwest Suburbs include five of the six suburban cities along the Bottineau Corridor: Brooklyn Center, Crystal, Golden Valley, New Hope, and Robbinsdale.

Transportation and food access

Distance plays a role in access because closer food outlet destinations are more attractive for saving time and money on travel.[344] For low income residents who do not own a vehicle, the lack of nearby grocery stores offering a variety of nutritious foods poses a food access challenge. These residents must either rely on mass transit to complete their shopping or shop at nearby convenience stores with less healthy food at higher prices.[345]

Hennepin County's Community Food Assessment supports that this pattern is true for Minneapolis residents without access to a vehicle and finds that because of the complications involved in getting to grocery stores, these residents have a greater incentive to walk to corner stores despite typically limited selections and higher prices. Hennepin County's 2010 SHAPE survey shows that 38 percent of north Minneapolis residents somewhat or strongly agree that residents in their neighborhood can walk to grocery stores or markets as compared with between 71 and 76 percent of SHAPE respondents from the rest of Minneapolis (see Figure 37).[346]

Figure 37: Percent of Minneapolis residents who strongly or somewhat agree that most residents in their neighborhood can walk to grocery stores and markets, 2010



Source: Hennepin County 2010 SHAPE
Note: The Camden and Near North neighborhoods comprise north Minneapolis.

The NorthPoint Health and Wellness food assessment also shows that transportation remains a barrier to accessing fresh produce. Slightly more than 40 percent of respondents in the study reported getting to grocery stores by driving and only 30 percent reported getting to convenience stores by driving.[347] Similarly, the county's food assessment finds that suburban residents without access to a car identify transportation as a major factor in their food purchasing behavior and report that bus routes are not convenient.

However, while access to a personal vehicle may expand one's access to large grocers, it does not necessarily follow that transit service is the solution for addressing diet quality and limited access to healthy foods. For areas along the Bottineau Transitway, addressing the problem of grocer distance may be better mitigated by incentivizing grocery stores to locate in neighborhoods characterized as "food deserts". More research on the role of transit and healthy food access is needed.

Impact Analysis

Based on input from the Bottineau HIA Advisory Committee and a breadth of research on food environments, food security, and household expenditures (covered in the Location Affordability section) there are two primary ways identified in which the Bottineau Transitway could most likely improve healthy food access and related health outcomes:

1. **Transit-oriented development (TOD)** – TOD surrounding station areas could potentially include an increase in the number of grocery stores and other healthy food vendors.

2. **Improved location affordability and decreased transportation costs** - Improved location affordability and decreased household transportation costs could increase households' purchasing power and ability to afford healthy foods.

Transit-oriented development (TOD)

As described in other sections of this HIA, the Bottineau Transitway has the potential to complement and facilitate TOD in areas surrounding the station locations. The Bottineau HIA Advisory Committee identified TOD as an opportunity for attracting more healthy food outlets near the station areas. Healthy food outlets could range from supermarkets to produce vendors and farmers' markets.

In such a scenario, TOD could increase not only the number and density of healthy food outlets but also make healthy foods more easily accessible by improving the surrounding built environment. A variety of TOD characteristics can improve food outlet proximity such more gridded street network patterns and retail-residential land-use mix that support shorter trips and more travel by walking and cycling.[348] Station areas characterized by more compact, mixed residential land-use mix could additionally make trips to healthy food outlets more convenient for transit riders and residents by enabling them to combine grocery trips with other trips, such as commuting to work. However, as noted in other sections, station area planning is in a preliminary stage. The likelihood that the new LRT project will result in such changes in TOD is unclear at this point and contingent upon many factors.

Location affordability

While the absence of the food outlets offering quality foods may present a barrier to low income, transit-dependent populations, the affordability of healthy foods also presents a barrier for low income populations. The Location Affordability section of this HIA explains how the burden of combined transportation and housing costs may limit the remaining income households have for nutritious foods and other pre-requisites for good health. Often low and moderate income households make difficult trade-offs in their budgets between housing and transportation costs and this heavy burden can lead to food insecurity. By improving location affordability through decreased transportation costs and increased location efficiency, households could save on transportation costs and have more of their incomes available for purchasing healthy foods. While the new LRT will likely reduce transportation costs, it is too early at this stage in the transitway planning to determine the degree to which populations facing barriers of food costs will benefit.

Additional Health Impacts

There are many additional ways the Bottineau LRT could impact health, however the resources and timeline for this HIA did not allow for a full analysis of every potential health determinant. The following health determinants were identified during the HIA Scoping phase through stakeholder engagement and literature review. They are only briefly covered below because of resource and time limitations and because they were not selected as priority issues based on the selection criteria (described in the Scoping section of this HIA).

Air Quality

Air pollution and health

Air pollution is linked to increased risks of many health problems including respiratory illness, strokes, heart attacks, cancer and premature death.[349, 350] Children, the elderly, and people with respiratory illnesses or heart problems are more sensitive to air pollution.[351] Air pollutants, especially carbon monoxide and fine particles from vehicles and other sources, can worsen existing breathing problems such as asthma. Studies show that long-term residence near major roadways is associated with a higher risk of asthma.[352]

Air pollution and transportation

Transportation infrastructure plays a crucial role in our air quality because cars and trucks are responsible for a large share of air pollutants.[353] In Minnesota, motor vehicles are responsible for more than half of all carbon monoxide and hydrocarbon emissions and[354] transportation accounts for roughly 25 percent of greenhouse gas emissions.[355]

Motor vehicles emit many pollutants including hydrocarbons, carbon monoxide, nitrogen oxides, sulfur oxides, particulate matter[356] and mobile source air toxics (MSATs). MSATs are compounds that are known or suspected to cause cancer or other serious health and environmental effects. [357] Mobile sources are responsible for direct emissions of air toxics and contribute to precursor emissions which react to form secondary pollutants.[358] Examples of mobile source air toxics include benzene, formaldehyde, acetaldehyde, acrolein, polycyclic organic matter (POM), naphthalene, and diesel particulate matter.[359]

Air quality impacts

The Bottineau Transitway represents an opportunity to improve air quality in the region by decreasing vehicular emissions through increased transit usage and decreased traffic volumes. As shown in the Location Affordability section of this report, forecasts show the Bottineau Transitway will result in an estimated reduction of 27,123 Vehicle Miles Travelled (VMT) traveled per weekday in the region in 2030. The decrease in VMT suggests that the Bottineau Transitway could lead to reductions in on-road emissions of criteria and toxic pollutants, as well as near-road pollutant concentration. Additionally, the new transitway could encourage changes in land uses that are more transit-oriented and walkable which could further reduce VMT. The data does not show how the VMT reductions will be distributed in the region and which populations would benefit.

However, many other factors in the transportation system other than VMT also affect air quality. Air quality is not simply a function of the number of miles that vehicles are driven in the region. Traffic volumes, the age of the fleet, travel patterns, roadway locations, and wind patterns all affect the levels

of vehicular emissions. Given this complex set of factors, the degree to which this level of VMT reductions will impact air quality and where air quality improvements will occur in the region is unclear at this stage in the project development.

The DEIS will cover the transitway's impact on air quality. The primary focus in the DEIS is whether the transitway will cause National Ambient Air Quality Standards (NAAQS) criteria air pollutants to exceed Environmental Protection Agency (EPA) thresholds at high-traffic intersections in the Bottineau Corridor. Currently, Minnesota meets the standards established by the NAAQS for criteria pollutants. The DEIS will also include a qualitative evaluation on the project's impact on MSATs and a discussion of potential air quality effects during construction, including the possibility of increased dust and emissions from construction equipment.

Crime and Personal Safety

Input from stakeholders in public comments during DEIS scoping, public comments during the HIA comment period, and stakeholder engagement activities point to concerns regarding crime and personal safety related to transit. Some public comments and stakeholder input brought up concerns about personal safety while waiting at stations, walking to and from stations alone, and about gang activity in cities along the Bottineau Corridor. Others expressed concerns that the transitway would bring crime to their neighborhoods. Crime and lack of personal safety can impact health both directly in the form of injury and death, and indirectly through inhibiting residents from participating in physical activity outdoors and riding transit.

There is limited evidence from previous studies that public transit alone serves to decrease or increase crime and personal safety. However existing actual and perceived crime levels may inhibit some potential would-be transit riders from using and benefiting from the new transitway. Safety features, such as lighting, security cameras, emergency telephones, increased ridership, and high frequency of the transit service, could serve to mitigate crime and increase personal safety.

Noise and Vibration

Public comments submitted during both the HIA public comment period and the DEIS scoping period indicate that some residents in the Bottineau Corridor cities are concerned about the noise and vibration impacts from the Bottineau Transitway. Noise is an often overlooked health determinant associated with not only mental stress but also hearing loss and hypertension, and can have disproportionate impacts on children and low-income communities. [360,361,362]

The Bottineau Transitway could have both positive and negative noise and vibration impacts on health. By encouraging more residents to use transit it could reduce traffic - a major source of noise pollution. [363] In some locations it could increase noise for the residents whose houses are close to the train tracks. Because noise and vibration can impact health, it is important for the health of communities living near the transitway that the transitway design includes steps to reduce, prevent, and mitigate increases in noise and vibration. This HIA did not cover noise and vibration impacts in detail because the DEIS will provide an extensive technical analysis of noise and vibration impacts.

Social Cohesion

Social cohesion is among the many terms used describe the quality of social relationships and interactions, and the presence of trust, mutual obligations and respect between individuals within

communities or among communities within wider society.[364] Social cohesion is also referred to as social capital, social connectedness, social support, and social integration. [365]

Research demonstrates that social cohesion has a variety of health impacts, ranging from reducing stress, increasing a person's lifespan, supplying access to emotional and physical resources, and reducing neighborhood crime.[366,367,368] Evidence demonstrates that public transit and land use patterns can facilitate neighborhood interaction and improve social cohesion, while car-dependency can lead to social isolation.[369,370] The Bottineau Transitway also has the potential to positively impact social cohesion in the Bottineau Corridor through higher volumes of pedestrians walking to transit and by connecting transit-dependent populations to other parts of the region.

Representatives of the Harrison Neighborhood in north Minneapolis provided input that social cohesion is among the neighborhood priorities and point to concerns of social cohesion impacts due to the physical barrier that the Bottineau Transitway could add to Olson Memorial Highway.

Recommendations

The Bottineau Transitway and the land use changes that it could spark present a valuable opportunity to address health challenges in this corridor. Based on the Bottineau HIA findings, Hennepin County staff and the Bottineau HIA Advisory Committee developed a set of recommended actions to advance the new transitway's positive impacts on health.

The agencies and governing bodies listed next to recommendations are those that could potentially implement or support such recommendations. Some of the recommendations may already be incorporated into planned efforts. In this case, these recommendations may be regarded as support for such initiatives. The neighborhoods along the transitway are unique and have very different characteristics; therefore, each will have different needs. For this reason, not all recommendations or solutions will apply to every neighborhood.

Recommendation to:
Metropolitan Council and
Hennepin County

1. Conduct additional analysis to determine transit-dependent, low-income, minority, immigrant, non-English speaking, disabled, senior, and youth populations in the Bottineau Corridor cities who live outside the Bottineau Station Areas but for whom a connector route service could efficiently connect them to the Bottineau Transitway.

Rationale: The HIA findings show that these populations are experiencing health disparities and that the Bottineau Transitway is likely to offer many positive health benefits. Ensuring these populations will have access to the Bottineau Transitway means connecting them to the transitway's wide range of health-related benefits.

Recommendation to:
Metropolitan Council, Hennepin County, and Bottineau Corridor cities with support from Metropolitan Council and Hennepin County

2. Continue to engage populations living in the Bottineau Corridor during the Bottineau Transitway Project Development and Bottineau station area land use planning processes and incorporate engagement strategies to reach traditionally underrepresented groups such as low-income, minority, immigrant, and non-English speaking populations. The Bottineau Transitway HIA Advisory Committee suggested the following strategies:

- Partnering with community organizations that could serve as liaisons to residents with limited English proficiency - these organizations could help not only translate materials but also interpret unfamiliar content and aid residents in providing feedback;
- Providing material in Braille;
- Training community leaders to present findings to their communities;
- Working with schools to communicate findings to youth and collect their feedback; and
- Making reports and report summaries more reader-friendly to a wide audience by including visual aids.

Rationale: The HIA findings show that these populations are experiencing health disparities. Meaningful participation from these populations could result in both the light rail line and station areas better serving their needs and creating better access for them.

Recommendation to: Bottineau Corridor cities with support from Metropolitan Council and Hennepin County	**3. Focus Bottineau Corridor cities' residential and commercial growth in the station areas and implement zoning, parking requirements, and building codes that encourage higher density, mixed-use development and benefit existing communities.** **Rationale**: Targeting growth in these areas will help increase transit-accessible employment opportunities and could improve location affordability. A large body of research shows that employment and lower housing and transportation costs for households can have numerous health benefits. Higher-density, mixed-use development is more accessible for transit-dependent populations, requires less driving and can also result in better environments for walking.
Recommendation to: Hennepin County and Bottineau Corridor cities	**4. Incorporate pedestrian and bicycle infrastructure improvements into station area plans to improve traffic safety and facilitate access to the transit stations by foot and bike. Strategies might include:** • Pedestrian scale lighting • Nice Ride bike sharing facilities at station locations **Rationale**: This will improve traffic safety and facilitate bike and pedestrian access to the transit stations, thereby increasing the opportunity for physical activity. Facilitating bike and pedestrian access can also improve economic growth for surrounding businesses.
Recommendation to: Hennepin County and Bottineau Corridor cities	**5. Preserve existing affordable housing and support the development of affordable and mixed-income housing near transit locations using strategies that have been successful for other transit-related investments throughout the U.S.** **Rationale**: This could also help ensure more transit-dependent, minority and low-income populations have access to the new light rail line's wide range of health-related benefits.
Recommendation to: Bottineau Corridor cities	**6. Collect information on existing small and minority-owned business in the Bottineau Corridor to monitor their stability during the construction and operation of the Bottineau Transitway. Incorporate strategies to preserve and assist existing small and minority-owned businesses in station areas.** **Rationale**: Encouraging small and minority-owned businesses could help to maintain and promote employment opportunities for Bottineau Corridor residents.
Recommendation to: Metropolitan Council	**7. In recruiting and hiring for construction, operation, and maintenance jobs utilize programs that target populations experiencing higher rates of unemployment such as minority populations and those living in the Bottineau Corridor.** **Rationale**: This could help to preserve and promote employment opportunities for communities of color and other residents living in the Bottineau Corridor.

Recommendation to: Metropolitan Council and Metro Transit	**8. Promote and advertise public transit services to educational institutions, including North Hennepin Community College, Summit Academy, University of Minnesota, and Minneapolis Community and Technical College to populations in the Bottineau Corridor.** **Rationale**: Such strategies could help increase student ridership and help prospective students recognize the opportunity to access higher education opportunities via transit. This strategy could also increase ridership for the new LRT.
Recommendation to: Metropolitan Council, Metro Transit, The City of Golden Valley, and Minneapolis Park and Recreation Board	**9. Integrate considerations of health impacts and park access for the vulnerable populations described in this report into the station option selection for Theodore Wirth Park, the supporting station area planning, and park master plan.** **Rationale**: Parks provide an important public space for physical activity. The 2008 Regional Parks Visitor Study found that racial-ethnic minorities underuse the Metropolitan Regional Park and Trail system. If transitway encourages access to the park for vulnerable populations it could represent an opportunity to improve health outcomes.
Recommendation to: Metropolitan Council and Metro Transit	**10. Promote and advertise public transit services access to Theodore Wirth Park, the regional trails network, and other parks along the Bottineau Transitway and target promotions to transit-dependent, low-income and minority populations.** **Rationale**: Parks provide an important public space for physical activity. The 2008 Regional Parks Visitor Study found that racial-ethnic minorities underuse the Metropolitan Regional Park and Trail system. If transitway encourages access to the park for vulnerable populations it could represent an opportunity to improve health outcomes. This strategy could also increase ridership for the new LRT.
Recommendation to: Metropolitan Council	**11. Assess the language needs of the populations living in the Bottineau station areas and consider these needs in the development of communications related to transit schedules and the LRT construction.** **Rationale**: A growing percentage of the population over 5 years of age in the Bottineau Corridor has limited English proficiency. In Brooklyn Center and Brooklyn Park more than 10 percent of the population over 5 speaks English less than "very well". This strategy could also increase ridership for the new LRT.
Recommendation to: Bottineau Corridor cities	**12. Encourage healthy food establishments near transit stations such as:** • Full-scale grocery stores; • Farmer's markets; and • Grocery stores that offer foods relevant to the diverse cultural preferences of the Bottineau Corridor residents **Rationale**: Less than one-third of residents living in cities along the Bottineau Transitway eat recommended amounts of fruits and vegetables. When people have access to healthy food options they are better able to include healthy food in their diets.

Reporting and Public Review

Hennepin County HIA staff worked with the Bottineau Transitway HIA Advisory Committee members to develop a plan for reporting the HIA findings and collecting feedback from the public.

Reporting of HIA Findings

The HIA findings are available in three formats: (1) this full report, (2) a report summary, and (3) presentation slides. Additionally, county staff presented findings to the public at a community meeting held November 21, 2013 in north Minneapolis at Urban Research and Outreach-Engagement Center (UROC).

This full report and the report summary are available online on Hennepin County's website at http://www.hennepin.us/bottineauhia. Hard copies are available at the following Hennepin County library locations: Brooklyn Park, Brookdale, Sumner, Rockford Road, and Golden Valley.

Publicizing report availability

To publicize the availability of this report Hennepin County staff provided a press release to local newspapers and emailed the final report and report summary to a network of stakeholders and community members. These documents were also emailed to those who participated in interviews and focus groups as well as the Bottineau Transitway Policy Advisory Committee (PAC), Community Advisory Committee (CAC), and Advise, Review, and Communicate Committee (ARCC).

Languages

The draft report summary was translated into Somali, Spanish, Hmong, and Laotian. Translated versions were available online and in hard copy at most of the locations where the draft reports were available during the public review period (see below).

Public Review

This draft of the Bottineau Transitway HIA report was available for public review from July 15, 2013 to September 27, 2013.

Report availability during the public review period

The full draft report and draft report summary were available online on Hennepin County's website. A brief description and link to these documents were also posted on the following websites: Bottineau Transitway, African Career, Education & Resource Inc., Northside Fresh Facebook Page, Northwest Hennepin Human Services Council (NWHHSC), and in the online newspaper, Africa Paper.

Physical copies of this full draft report and the report summary were available for review at the following Hennepin County library locations: Brooklyn Park, Brookdale, Sumner, Rockford Road, and Golden Valley. The drafts were also available at Harrison Neighborhood Association, Heritage Park Neighborhood Association, Urban Research and Outreach-Engagement Center (UROC), NorthPoint Health and Wellness Center (computer lab), North Hennepin Community College (Student Life Office, Campus Center Room 116), and the Community Development Department at the Golden Valley, Robbinsdale, Crystal, and Brooklyn Park City Halls.

Public feedback methods

The public had the option to provide feedback on the contents of the draft report in the following ways:

1. Online survey.
2. Written survey at the above listed libraries and neighborhood associations where physical copies of the report and summary were available.
3. By phone or email.

Evaluation of public comments

The HIA team reviewed all comments and made changes to the final Bottineau Transitway HIA Report wherever possible. Comments were not responded to individually. The HIA team prepared a public comment report to summarize comments, provide responses to comments and questions, and describe changes made to the final HIA documents as a result of public input. The public comment report is available at http://www.hennepin.us/bottineauhia.

Outreach methods

Publicizing the availability of this report will involve the following key strategies:

1. Hennepin County provided a press release to local newspapers;
2. Hennepin County emailed the draft report and report summary to a network of stakeholders including those who have participated in interviews and focus groups as well as the Bottineau Transitway Policy Advisory Committee (PAC), Community Advisory Committee (CAC), and Advise, Review, and Communicate Committee (ARCC);
3. The Bottineau Transitway HIA Advisory Committee members emailed the draft report and report summary to their networks of community members and stakeholders;
4. Bulletin board notifications and instructions were placed at libraries where the HIA reports were available in hard copy; and
5. NWHHSC presented findings to focus group participants and the North Hennepin Community College Student Senate.

Other methods not included in this HIA process

The Advisory Committee recommended several other strategies for making this report more accessible that were not incorporated into this HIA process due to time and resource constraints. However, these strategies could potentially be integrated into later phases of the transitway development and land use planning. These strategies are listed in the HIA recommendations and include the following:

1. Partnering with community organizations that could serve as liaisons to residents with limited English proficiency - these organizations could help not only translate materials but also interpret unfamiliar content and aid residents in providing feedback;
2. Providing material in Braille;
3. Training community leaders to present findings to their communities;
4. Working with schools to communicate findings to youth and collect their feedback; and
5. Making reports and report summaries more reader-friendly to a wide audience by including visual aids.

Conclusion

Our transportation systems and the characteristics of our neighborhoods have an enormous impact on our health. The Bottineau Transitway will bring light rail transit to the northwest area of the Twin Cities. Because it will shape the transportation system and neighborhoods in the Bottineau Corridor, it could also influence community health. Based on this premise, Hennepin County conducted an HIA to assess the potential effects of the Bottineau Transitway on the health of populations living near the Bottineau Transitway and in the region. The Bottineau HIA process followed leading standards, frameworks, and practices in the HIA field. The findings and recommendations are based on literature review, stakeholder input, employment and transit ridership forecasts, and a review of existing health, demographic, and built environment characteristics in the project area.

Overall, the HIA findings show the Bottineau Transitway offers real potential to improve health for communities living near the transit stations. People accessing the light rail line who live elsewhere in the region could also benefit. The degree to which these health promoting benefits reach populations experiencing health disparities, such as minority and low-income populations, will depend on measures to enhance their access to the transitway. From a public health perspective, the findings support the construction of the Bottineau Transitway.

Capital improvements, such as improvements to pedestrian and bicycle facilities, and transit-oriented development (TOD) could serve to greatly advance the new transitway's impact on health through improving walkability, improving location affordability, spurring job growth, reducing pedestrian and bicycle traffic fatalities and injuries, and encouraging the placement of full-scale grocery stores and vendors of healthy, affordable food. While the Bottineau Transitway is likely to positively impact health, there are additional measures that can be taken to advance health outcomes for communities along the corridor. This HIA provides Recommendations for such measures.

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