



## Social Determinants of Health in Multnomah County



# Transportation and Health

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Transportation is critical for connecting residents to employment, goods, and services and can facilitate civic engagement opportunities. The transportation system is a complex network of roads, highways, bridges, public transit, and bike lanes, sidewalks, and off-road paths and trails. Transportation planning directly and indirectly affects human health by influencing a wide range of physical, environmental, and social factors. Examples include opportunities for physical activity, air quality and respiratory health, motor vehicle accidents, social cohesion, and environmental impacts related to fuel emissions and climate change. The accessibility and availability of transportation systems also determine employment and housing patterns which in turn have a significant influence on health.

Traffic congestion, worsening air quality, low levels of physical activity, and rates of obesity are of increasing concern as a majority of commuters continue to travel by automobile. Car exhaust contains particulates that inflame asthma, toxic gases that cause cancer, and organic compounds that contribute to global warming. Driving also contributes to rising obesity. With over half of the adult population at risk for health problems related to being overweight, Multnomah County is far from the national Healthy People 2010 objective of 60% of adults at a healthy weight.

In particular, of increasing concern is the issue of whether all Multnomah County residents have equal access to a safe, connected transportation network for all modes of travel. The current transportation system can be transformed into a system more conducive to improving public health and safety. This report documents what is known about the relationship between transportation and health and presents promising policy directions based on public health, transportation, urban planning, and public policy research.

## Transportation Systems and Health in Multnomah County

The Portland metropolitan area consistently receives high ratings for its quality of life in part because of good urban planning. The Urban Growth Boundary reduces sprawl, preserves open space, encourages mixed land uses and a variety of transportation and housing choices, and promotes community cohesion. Portland, with a rank of 8, is among the least sprawling metropolitan areas in the U.S. Multnomah County has the lowest degree of sprawl compared to neighboring Yamhill, Clackamas, Clark, and Washington Counties.

<b>Urban Sprawl Index</b>	
Multnomah County	131.41
Washington County	108.29
Clark County, WA	103.44
Clackamas County	98.45
Yamhill County	98.23

A lower number indicates a higher degree of sprawl. The mean score on the county sprawl index is 100. Source: Smart Growth American and the Surface Transportation Policy Project.

In the Portland area 30% of residents work within three miles of the central business district, a measure of job sprawl. In Portland, 19% work more than ten miles from the city center, compared to an average of 35% across the largest 100 metropolitan areas.<sup>1</sup> Portland ranks the 10<sup>th</sup> most walkable of 40 U.S. cities and in the top 2 of best cities for biking. The Portland Metro per capita carbon footprint from transportation and residential energy use decreased between 2000 and 2005. The metro area ranked 3<sup>rd</sup> lowest in carbon emissions from transportation and residential energy combined.<sup>2</sup>

Policies that promote healthful urban and transportation planning have made it easier to adopt a healthier life-style in many, but not all, Portland neighborhoods. There are, however, transportation related health concerns that need to be addressed in areas such as active transportation and mixed use community design, air quality, opportunities for physical activity, exposure to noise, and motor vehicle and pedestrian safety. Addressing issues of health, environmental quality, and the efficiency and equity of a transportation system will require a range of policies and programs. Roads and highways are an integral component of a transportation system but a system which promotes public health must be multi-modal and include alternatives to the car such as transit, biking, and walking.

*A national poll by AARP found that while many Americans ages 50 and older are trying to move away from driving as a result of high gas prices, they are challenged by inadequate sidewalks and bike lanes, as well as insufficient public transportation options.*

**Table 1. Selected transportation and health indicators in Multnomah County**

<b>% of people living within 1/4 mile of a transit stop (Metro region):</b>	58%
<b>Number of air toxics above recommended levels where motor vehicles are a significant contributor (Portland Area):</b>	3
<b>% of commuters who use active transportation to work (County) (walking, bicycling, public transit):</b>	19% (10% nationally)
<b>% of commuters who drive to work (County):</b>	75% (86% nationally)
<b>Per capita carbon emissions from transportation (Metro region):</b>	1.053 tons (US average 1.44 tons)
<b>Motor vehicle-related mortality rate (County):</b>	15.2 deaths per 100,000 population (15.2 nationally)

## Social determinants of health

Health problems have traditionally been addressed with either medical treatment or by asking individuals to change their health-related behavior. However, there is mounting evidence indicating that the root causes of poor health go beyond the choices made by an individual.

A person's health status is the result of the interaction between factors related to the physical and social environment, the individual's behavior and, to a lesser degree, inherited health characteristics. Such factors are called determinants of health. ***Social determinants of health*** are a subset of these health regulating factors and include income and social status, employment, education, housing, the built environment, social support networks and discrimination (Figure 1).

In recent decades, health researchers have found that these social determinants exert a more significant influence on our health than individual behavior or genetics. By extension, public health strategies to improve our community's health must include efforts to support changes in our social and built environment.

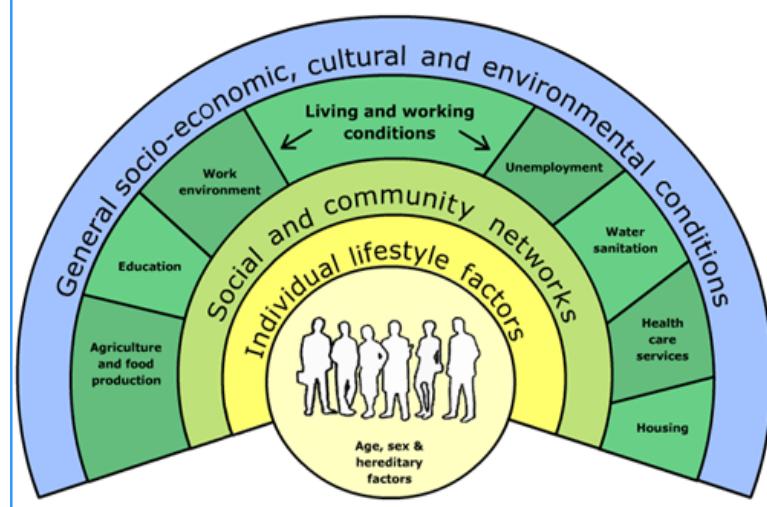
For example, significant health benefits can be achieved through moderate forms of physical activity.

Therefore, dedicating more resources to providing walking and bicycling supportive environments can increase daily levels of walking and bicycling by individuals, an important approach to fostering optimal health.

Social determinants of our health are typically influences that are the furthest away or "upstream" from health outcomes like disease or death. They set in motion a series of interconnected events and situations that ultimately shape our health status. These powerful upstream influences are typically not thought of as traditional public health concerns. Addressing these upstream or root causes of health status will require comprehensive, interdisciplinary, and innovative strategies with traditional and newer public health partners.

This report is part of a series that presents an overview of social determinants of health in Multnomah County including the economy, education, transportation, and neighborhood conditions. The information in this series, together with data on birth, death and disease occurrence in the county, provide a fuller understanding of the broader public health concerns facing Multnomah County.

**Figure 1. The Determinants of Health**



Source: Dahlgren G & Whitehead M. Policies and strategies to promote social equity in health. Stockholm: Institute of Future Studies, 1991.

## Active Transportation and Mixed Use Community Design

The health benefits of active transport, walking and biking, are clear. The design of the built environment determines the ease of walking and biking and affects the amount of physical activity in which people of all ages engage. One of the best ways to get people to walk or bike more is to build bike and pedestrian-friendly places with a mix of uses, where people can walk, bike, or take transit from their homes to offices, schools, restaurants, and shopping.<sup>3,4,5,6</sup> Neighborhood attributes positively associated with walking sufficiently to meet health recommendations include higher residential density and smaller street-blocks around homes, and shorter distances to food and daily retail facilities from home.<sup>7</sup> Up to twice as many people may walk or bicycle in neighborhoods that are transit-oriented than in neighborhoods that are auto-oriented.<sup>8</sup>

Despite these benefits, the positive health impacts of walking and biking can be outweighed by the threat of injury. Pedestrians and cyclists must have safe environments including sidewalks, street crossings with signals, slower traffic, narrower streets at crossings, and security.

While Portland is known for being walkable and bikable, the overwhelmingly favored means of commuting continues to be driving to work (73%), with most people driving alone (62%).<sup>9</sup> For Multnomah County, 75% of commuters drive to work and 64% drive alone. Portland ranks first for bicycling to work among the 50 largest U.S. cities at 3.5%. Access to transit is an important element of active transportation. In the Metro region (Multnomah, Clackamas, Washington and Clark Counties) 58% of people live within 1/4 mile of a transit stop.<sup>10</sup> In Portland, 13% of commuters used public transportation, fewer commuters than in Seattle or Oakland (17%) but more than Los Angeles (10%) or Houston (5%).<sup>9</sup> In Multnomah County 19% of commuters use active transportation to get to work.

Sidewalk coverage is an important factor that supports active transportation. There is growing evidence that increased time spent traveling in a car is associated with increased obesity.<sup>11,12</sup> Among primary school-aged children, walking to school is associated with higher levels of overall physical activity and lower levels of obesity as compared with those who travel to school by motorized transport.<sup>13,14</sup> Elementary and middle schools in inner northeast, north, and inner southeast Multnomah County have a greater percent of sidewalk coverage compared to mid and east Multnomah County.

Physical activity is an important component of weight control. Obesity has been associated with many health problems, including cardiovascular disease, diabetes, some cancers, depression and arthritis. The prevalence of obesity has been rising in Multnomah County since the early 1990s. The 2005-06 Oregon Healthy Teen survey, indicates that 10% of Multnomah County 8<sup>th</sup> grade and 11<sup>th</sup> grade students were overweight. An additional 15% of 8<sup>th</sup> graders and 13% of 11<sup>th</sup> graders were at risk for becoming overweight.<sup>15</sup> In 2006, 21% of adults in the county were obese and 32% were overweight.

In walkable communities, people have a chance to interact with neighbors, learn about their neighborhoods and become involved in community affairs. [See Neighborhood Context Report] Studies have shown that people living in walkable, mixed-use neighborhoods have higher levels of social capital compared with those living in car-oriented suburbs. Social capital, refers to the level of social connectedness and trust within a community and has been consistently shown to be associated with improved physical and mental health. Higher levels of social capital are associated with lower levels of morbidity and mortality.<sup>16</sup> People living in walkable neighborhoods were more likely to know their neighbors, participate politically, trust others, feel a sense of community and be socially engaged.<sup>17,18,19</sup>

## Air Pollution and Health

There is a significant body of literature demonstrating that air pollution due to vehicle emissions harms people's health. These studies link traffic-related air pollution to health problems such as asthma, cancer, premature birth, low birth weight, cardiovascular disease, and a generally higher risk of death among people who live near high traffic areas.<sup>20,21,22</sup> Two dozen studies over the past two decades show that driving in tightly packed traffic leads to pollution concentrations inside vehicles that are up to 10 times higher than those in ambient city air.<sup>23</sup>

Vehicle exhaust contains air pollutants such as carbon monoxide, nitrogen oxides, and small traces of volatile organic compounds. These compounds produce ground level ozone, a main component of smog, which can cause respiratory problems, aggravation of asthma and cardiovascular diseases, lung damage and disease. In Multnomah County, motor vehicles are the largest sources of cancer-causing (56%) and non-cancer causing (73%) air pollutants.<sup>24</sup>

A Department of Environmental Quality (DEQ) air quality modeling study in 2006 shows the importance of motor vehicles, diesel particulate matter, and burning as sources of air toxics in Portland. It confirms national estimates that individuals in Portland are exposed to various air toxics above levels of concern.

The top three air toxics, or hazardous air pollutants, with adverse health effects and cancer risk within the Portland area are diesel, benzene, and formaldehyde all with on-road engines as an important source. Data show that higher concentrations of air toxics

and elevated cancers risks from air toxics align with major traffic corridors.<sup>25</sup>

Reducing vehicle emissions is a key factor in improving air quality. The Oregon DEQ inspects vehicle emissions when registering or renewing a vehicle registration. DEQ estimates that the average vehicle failing emissions testing produces four times the pollution of the average passing vehicle and that the average fuel economy benefit after repair is  $\frac{1}{2}$  mile per gallon.

*The top three air toxics with adverse health effects and cancer risk in the Portland area are diesel, benzene, and formaldehyde.*



## Carbon Emissions and Climate Change

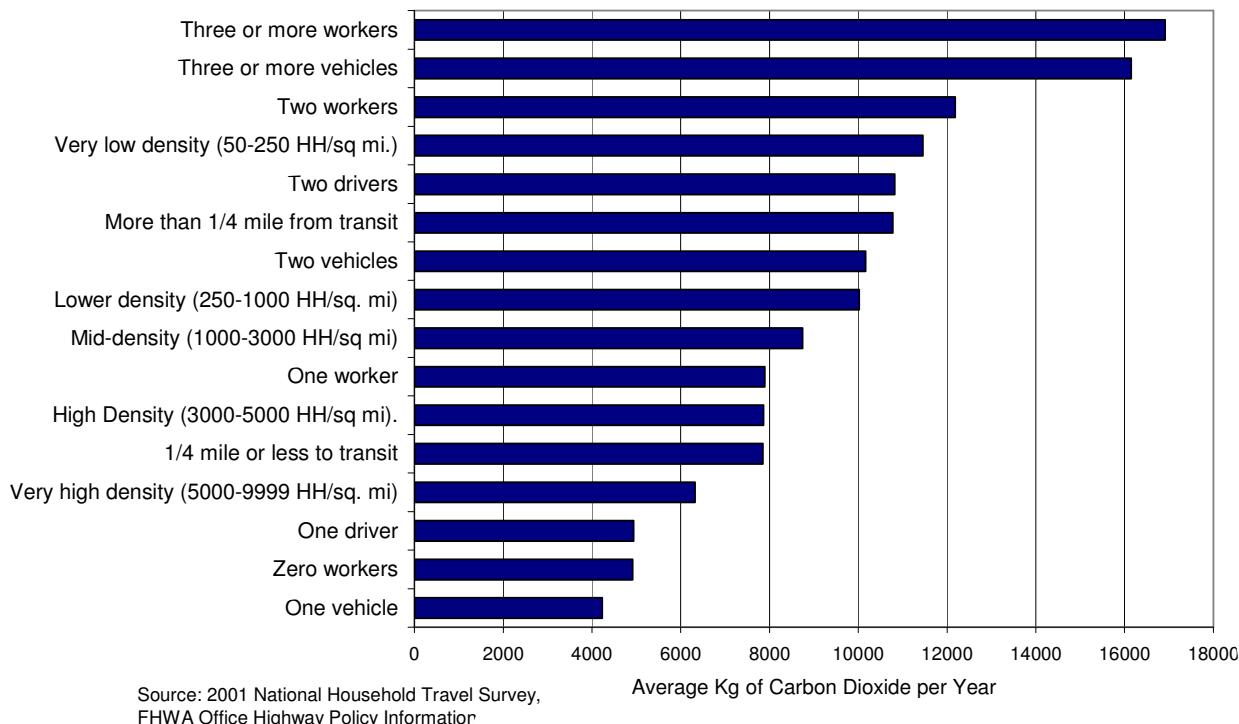
Transportation systems contribute approximately one third of the total annual CO<sub>2</sub> emissions in the U.S.

The average Portland metro resident is responsible for the emission of 1.053 tons of carbon from highway transportation, ranking 10<sup>th</sup> among the 100 largest metropolitan areas in 2005.<sup>2</sup>

Carbon emissions from human activities affect the climate. Effects of climate change are likely to include more variable weather, heat waves, heavy precipitation events, flooding, droughts, more intense storms such as hurricanes, rising sea levels, and air pollution. Each of these changes has the potential to negatively affect health including heat stress, vector-borne disease, food-borne disease, water-borne disease, injuries, and respiratory disease exacerbations.<sup>26</sup>

A recent National Household Travel Survey news brief shows household density and distance to travel for all purposes are related to carbon emissions. Households in very high density neighborhoods have about half the CO<sub>2</sub> emissions relative to households in very low density neighborhoods, and households very close to transit lines produce about one-quarter less CO<sub>2</sub> than households not near transit. The chart below (figure 2) shows that households with more workers and more vehicles travel more miles, and emit more CO<sub>2</sub>, than households with fewer vehicles and fewer workers.<sup>27</sup> With integrated walking, biking and transit options, reliance on automobile use can be reduced. Currently, twenty-five percent of all trips made are less than one mile, but 75% of these trips are made by car.<sup>28</sup>

**Figure 2:**  
**U.S. Household Characteristics and Est. Annual CO<sub>2</sub> Emissions from Travel**



## Noise exposure is a health risk

Exposure to noise constitutes a health risk. At very high levels, excessive noise results in hearing loss. There is concern that hearing loss may not only result from occupational exposure but may also result from exposure to noise in the living environment.<sup>29</sup> Transportation noise is the main source of environmental noise pollution, including road traffic, rail traffic, and air traffic.

Noise levels that commonly occur in neighborhoods may result in sleep disturbances, hypertension and ischemic heart disease, decreased school performance, increased annoyance responses, and adverse social behavior.<sup>29,30</sup> Exposure to noise disproportionately affects low-income children and is likely caused by poor urban planning that places homes adjacent to airports, railroad yards, highways, and other sources of noise. World Health Organization (WHO) Guidelines for Community Noise reports that “These health effects, in turn, can lead to social handicap, reduced productivity, decreased performance in learning, absenteeism in the workplace and school, increased drug use, and accidents.”<sup>31</sup>

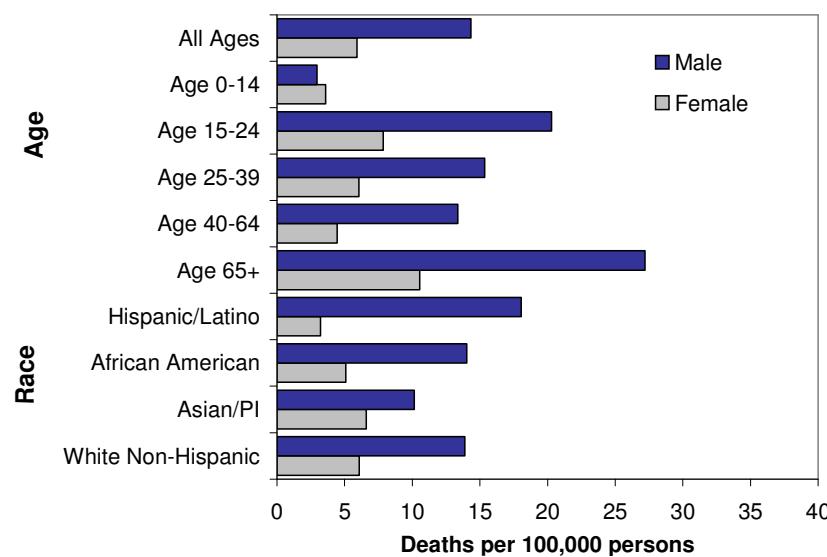
## Motor vehicle-related mortality

Past public health efforts to prevent motor vehicle injury and mortality such as increased use of safety belts, and enforcement of laws regarding speeding and driving under the influence of alcohol, have been highly successful. In Multnomah County, motor vehicles continue to be a leading contributor to unintentional injury deaths.

In Multnomah County, the motor vehicle related mortality rate declined between 1990 and 2005 and is lower than the national rate. Mortality rates have decreased for all racial and ethnic groups with significant decreases among African Americans and White non-Hispanics. Among race/ethnic groups, the highest motor vehicle related mortality rate is among Hispanic/Latino males. By age group, the motor vehicle related mortality is greatest among males age 65 and older and males age 15-24 years (figure 3).

The rate of pedestrian fatality in Multnomah County is typically at or above the state average and slightly higher than the national objective for pedestrian deaths (1 death per 100,000 population).

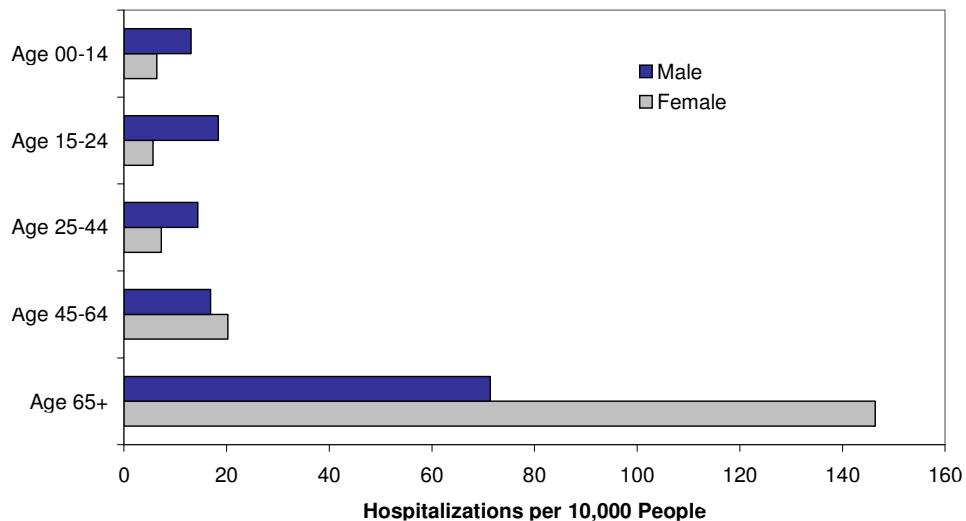
**Figure 3: Motor Vehicle Related Mortality,  
Multnomah County,  
Ten Year Average 1996-2005**



## Motor vehicle-related hospitalizations

In Multnomah County, motor vehicle related deaths are greatest among older males and motor vehicle related hospitalizations are greatest among older females (figure 4). The increased risk of death and injury in this age group is primarily due to the higher fragility of older adults who are more easily injured and less likely to survive a motor vehicle crash. For older drivers, age-related decreases in vision, cognitive function and other physical impairments may affect driving abilities. However, in terms of protective factors, older adults are more likely to wear seatbelts, less likely to drink and drive, tend to drive when conditions are safest, and drive fewer miles than younger drivers.

**Figure 4: Motor Vehicle Related Hospitalization Rate by Age and Gender, Multnomah County, Five Year Average 2003-2007**



## Other social determinants of health

### Economy

An important consideration when looking at a transportation system is the cost of transportation for individuals. The poorest one-fifth of Americans spend 42% of their annual household budget on the purchase, operation, and maintenance of automobiles, more than twice as much as the national average.<sup>32</sup> Low income people typically have older cars and unexpected repair costs. Transportation is the second largest household expenditure after housing and Portlanders spend almost as much on transportation as is spent on food and health care combined.

### Workforce Participation

A study of the degree to which labor participation is affected by increases in public transportation availability in Portland, Oregon and Atlanta, Georgia has shown that transit access is a significant factor in determining average rates of labor participation within the two cities.<sup>33</sup> The study also found that vehicle ownership remains a key factor in job accessibility and labor participation.

## Policy Strategies

Good transportation and land use decisions can promote health, and poor decisions can cause harm. A greater recognition of the link between public health and transportation can help build healthy, equitable communities in Multnomah County. Below are some policy strategies to improve public health.

### Health Impact Assessments

- Conduct health impact assessments on transportation projects to assure informed decision-making.

### Opportunities for Active Transportation

- Invest in bicycle and sidewalk infrastructure to increase opportunities for physical activity and the development of social capital.
- Increase the number of safe and attractive walking and biking connections to transit stops to increase physical activity.

### Increase Public Transit

- Increase the percentage of federal, state, and local transportation funding spent on public transit and alternative transportation modes.
- Increase funding for transit and transit oriented development projects in low-income communities and communities that have not received investments in transportation.

### Improve Air Quality

- Support policies that reduce air pollution, particularly in high traffic volume corridors near residential areas.

### Reduce Noise Exposure

- Recognize community noise as an important public health issue and include noise in health and environmental impact assessments.
- Consider community noise reduction standards and policies an integral part of public health and environmental protection policy.

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