



Why Public Health and Transportation

Setting the Stage

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Transportation is an essential component of a functioning society. Transportation provides access to goods and services, offers opportunities for individual mobility and for better quality of life, and plays an important role in economic development. Because transportation systems and policies can facilitate or discourage healthy behaviors, public health professionals care about transportation. But health is not one of the primary purposes of transportation systems. Why then should transportation professionals care about the impacts of transportation on health?

Public health, as defined by C. E. A. Winslow in 1920, is the “science and art of preventing disease, prolonging life, and promoting health through the organized efforts and informed choices of society, organizations public and private, communities, and individuals” (1). Extensive research has documented

the impacts of transportation on health in terms of safety, air quality, physical activity, equitable access to opportunities, and noise. Reviewing the ways in which transportation affects health (2) reveals the reasons that public health professionals are interested in the decisions made by transportation professionals.

Tracing the Links

Safety

Safety is the most prominent link between transportation and health. Injuries—including motor vehicle–related injuries—are the leading cause of all deaths among children and adults ages 1 to 44 years in the United States (3). Motor vehicle–related injuries are the leading cause of injury deaths among children and young adults 5 to 24 years of age and the second leading cause of injury deaths for all ages combined (4). According to the World Health Orga-



PHOTO: DAV BUREN, WALKABLE & LIVABLE COMMUNITIES INSTITUTE

Road improvements that promote safety and walkability along Hamburg, New York's main street include wide sidewalks, curb extensions, well-marked crosswalks, on-street parking, and narrow travel lanes for cars.

nization, more than 1.2 million road traffic deaths occurred in 2010 worldwide (5).

In recent decades, transportation engineers and policy makers have implemented numerous successful interventions to reduce transportation-related injuries, including safer vehicles with airbags and rearview cameras, safer roads with improved traveler information systems and pedestrian signalization, and policies such as graduated licensure for teenage drivers and reduced tolerance for driving while intoxicated. Countermeasures to promote safety are particularly important for vulnerable road users such as pedestrians, bicyclists, children, and older adults.

Air Quality

Air quality is the second major link between transportation and health. Motor vehicle emissions are a major contributor to air pollutants such as particulate matter, nitrogen oxides, and carbon monoxide. Air pollution is a major contributor to lung and heart diseases, especially among children, the elderly, and persons with diseases such as asthma, bronchitis, and chronic obstructive pulmonary disease.

Substantial research has documented the adverse impacts of pollutant emissions on public health, leading to transportation policies that promote cleaner air by encouraging alternative-fuel vehicles, replacing older diesel buses, and restricting vehicle idling. For example, a recent study linked improvements in air quality over 13 years with significant positive effects on lung-function growth in children in Los Angeles, California (6).

The Clean Air Act of 1970 and the amendments in 1977 and 1990 acknowledged the links between motor vehicles and air pollution and made major contributions to improving air quality in the United States. The U.S. Environmental Protection Agency is responsible for establishing air quality standards and has raised the standards periodically in the past several decades to protect public health.

Physical Activity

Physical activity is the third major link between transportation and health and may be less commonly acknowledged by transportation professionals. People who are physically active tend to live longer and have a lower risk for heart disease, stroke, diabetes, depression, and some cancers (7).

Physical inactivity is one of the major contributors to obesity, along with nutrition and genetics. More than one-third of adults in the United States are obese and, as a result, have an elevated risk of heart disease, diabetes, some cancers, hypertension, elevated cholesterol, stroke, gall bladder disease, and osteoarthritis.



PHOTO: SVI AMBRO, FLICKR

An individual's physical activity depends on personal choices, and transportation system designs can offer major contributions to personal choices by making opportunities for walking and bicycling safe, convenient, and attractive. Active transportation infrastructure, such as well-designed and well-maintained sidewalks, bicycle paths, and street crossings, encourages walking and bicycling. The development of improved public transit systems also provides a cobenefit of encouraging physical activity, because most transit users walk to and from their train or bus trips (8).

A highway crash on the M4 Motorway in Sydney, Australia. More than 1.2 million road traffic deaths occurred worldwide in 2010, according to the World Health Organization.



PHOTO: STEVE REED, DALLAS AREA RAPID TRANSIT

A bicyclist boards a Dallas Area Rapid Transit light rail car. Infrastructure can encourage physical activity as part of travel.



PHOTO: DAN BURDEN, PEDESTRIAN AND BICYCLE INFORMATION CENTER

Accessible facilities allow people with physical disabilities to travel freely.

Equitable Access

A fourth link between transportation and health relates to equitable access to goods and services. A healthy life requires access to jobs, education, healthy food, medical care, recreation, and social interactions, all of which contribute to quality of life. A lack of safe and convenient alternatives to automobile travel disproportionately affects vulnerable populations, such as the poor, the elderly, persons with disabilities, and children, by limiting their access to opportunities and to goods and services.

Improvements to walking and bicycling facilities benefit current and new users, particularly those who are physically and economically disadvantaged, by providing access to essential services and activities (9). Increased use of the active travel modes influences the degree of urban accessibility and sustainability.

Noise

Finally, noise can contribute to adverse health effects, including sleep disturbance, hearing loss, and decreased performance. Projects and policies can be designed and implemented to reduce noise related to

airports and highways and to mitigate the health impacts of noise on nearby populations. Examples include constructing sound barriers around highways, using road surface materials that produce less noise, and changing airport runway use patterns, flight path locations, and hours of operation.

Mission and Policies

The health impacts of transportation system design are well documented. The U.S. Department of Transportation (DOT) has stated that its mission is to “serve the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future” (10). Although the mission statement does not explicitly include the word “health,” it includes several words that directly relate to health:

- ◆ *Safe.* The prevention of injuries, which have substantial human and financial costs, is an important component of a well-designed transportation system.

- ◆ *Efficient.* By reducing motor vehicle congestion, the provision of safe and convenient transit, walking, and bicycling infrastructures leads to a more efficient transportation system and, as a cobenefit, enhances health by promoting physical activity and reducing air pollution.

- ◆ *Accessible.* Transportation enhances the health and quality of life of vulnerable populations, including the young, the elderly, the disabled, and those with low incomes, by providing services that facilitate access to opportunity and to essential goods and services.

- ◆ *Quality of life.* A transportation system can enhance quality of life by offering a range of alternatives, so that people can opt out of spending hours in congested traffic daily.



PHOTO: MOLLY DIWORNIK, FLICKR

Highway sound barriers help mitigate excessive road noise, a health-related traffic concern.

Transportation professionals can make choices to fulfill this mission to create safe, efficient, and accessible systems, with the cobenefit of promoting public health, whether or not they consider promoting health a part of their job responsibilities.

In 2010, U.S. DOT issued a policy statement strongly supporting the inclusion of pedestrian and bicycling networks as part of transportation programs and facilities. The statement noted:

The establishment of well-connected walking and bicycling networks is an important component for livable communities, and their design should be a part of federal-aid project developments. Walking and bicycling foster safer, more livable, family-friendly communities; promote physical activity and health; and reduce vehicle emissions and fuel use. (11)

Considering Health Impacts

In addition to the goals and implications of the U.S. DOT mission and policy statements, transportation professionals have other reasons for considering the health impacts of their decisions:

1. **Funds spent on transportation systems that promote public health may reduce health care costs in the long term.** Although the savings in health care costs do not become directly available for transportation expenditures, federal and state budget decision makers are constrained by the total pool of available funds—savings in health care costs may become available indirectly for transportation expenditures.

2. **Recent trends suggest that the younger generations are choosing to drive less and to walk, bicycle, and use transit more.** Increased pedestrian activity and bicycle use offer numerous health benefits and have several impacts on the transportation system. These modes of travel reduce the number of short motor vehicle trips, improve congestion and air quality, and—with the appropriate infrastructure and facilities—can discourage the use of personal vehicles.

In one study, 39 percent of teenagers reported that they had delayed obtaining a driver's license because they “could get around without driving” (12). Another study indicated “a higher likelihood of workers to walk or bike when commuting by transit, probably due to the resulting access, egress, or transfer walk or bike time during the commute and their inherent lower tendency toward automobile use” (13). By acknowledging and responding to these changing preferences, transportation professionals



PHOTO: DAN BURDEN, PBLIC

are promoting health as a cobenefit whenever they make planning decisions that include walking, bicycling, and transit infrastructure.

3. **Transportation professionals are becoming increasingly aware of the impacts of climate change on the transportation system and its infrastructure** (14). Approximately one-third of the greenhouse gas emissions that contribute to climate change come from the transportation sector, which is the second largest source of carbon dioxide in the United States (15). Because mobile sources are the primary cause of air pollution in many urban areas, several governmental initiatives have addressed emissions impacts in long-range planning processes.

Transportation planning decisions to mitigate and adapt to the impacts of emissions and climate change offer the cobenefit of promoting health (16). In addition, with the increasing recognition of air quality impacts and the need to improve responses to the federal regulations, transportation professionals have an increased interest in understanding the health impacts of transportation actions. For example, a recent study provided “a well-established, evidence-based foundation for insights into both transportation and human health impacts resulting from the [federal Congestion Mitigation and Air Quality Improvement] program beyond vehicle emissions reductions” (17).

4. **Developing a balanced transportation system that includes transit, pedestrian, and bicycling facilities, as well as motor vehicle lanes, is more efficient and cost-effective than spending the majority of a transportation budget on roads for motor vehicles only.** The building or widening of new roads or

By reducing the cost of health care in the long term, funds spent on transportation systems that promote public health—for example, bicycling to school—may free up future resources.

Vehicle emissions regulations and long-range sustainability plans are increasing in importance to transportation officials; policy decisions often address health concerns related to air quality.



PHOTO: CAROL VINZANT, FLICKR



Infrastructure initiatives that promote walking, cycling, and transit find ready support from the public health community.

highways induces demand. Adding 1 mile of pedestrian sidewalk or bicycle lane is substantially less expensive than widening a mile of a roadway for motor vehicles. A well-designed multimodal transportation system provides solutions to many transportation problems, from safety to congestion, and improves health.

5. **Transportation professionals who choose to promote transit, pedestrian, and bicycling facilities will find powerful and credible voices of support from the public health community.** This support will help in gaining the resources to build health-promoting infrastructure. For example, the federal Centers for Disease Control and Prevention has issued *Recommendations for Improving Health Through Transportation Policy*, identifying policies that would reduce injuries associated with motor vehicle crashes, improve air quality, expand public transportation, promote active transportation, and encourage healthy community design (18).

Health-Enhancing Choices

In conclusion, transportation professionals and the general public benefit from the expansion of options that maximize the health-promoting aspects of transportation and mitigate its adverse health impacts. Integrating health-enhancing choices into transportation policy has the potential to save lives and money by preventing chronic diseases, reducing motor vehicle-related injury and deaths, and improving environmental health, while achieving the goals of stimulating economic development and ensuring access to opportunity and to goods and services for all.

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Glossary of Public Health Terms

Most of the definitions below are adapted from the glossary in *Making Healthy Places: Designing and Building for Health, Well-Being, and Sustainability*, edited by A. L. Dannenberg, H. Frumkin, and R. J. Jackson, and published by Island Press, Washington, D.C., in 2011.

Accessible. Easy for persons of all abilities to approach, enter, operate, participate in, and use safely and with dignity; for example, a site, facility, work environment, service, or program may be accessible.

Active living community. A community designed to provide opportunities for people of all ages and abilities to incorporate physical activity into their daily routines.

Active transportation or active travel. Physical activity primarily to move from one destination to another, usually by walking or bicycling.

Aging in place. Remaining and living independently in the same community while growing older and coping with changing needs.

Built environment. Settings designed, created, modified, and maintained by human efforts, such as homes, schools, workplaces, neighborhoods, parks, roadways, and transit systems.

Centers for Disease Control and Prevention (CDC). The federal agency responsible for protecting the health of the U.S. population.

Disability. A dynamic interaction between health conditions and contextual factors, such as community design, age, and legal and social structures, that may or may not lead to limitations of activity and restrictions of participation.

Disability-adjusted life year (DALY). A measure of disease burden; one DALY is one year of healthy life lost because of disability or poor health.

Epidemiology. The study of the distribution and determinants of health conditions or events among populations and the application of the findings to control health problems.

Gentrification. A sociocultural phenomenon in which older, declining neighborhoods are renovated, property taxes rise, and lower-income residents are displaced because they can no longer afford the higher costs.

Health. A state of complete physical, mental, and social well-being—not merely the absence of disease or infirmity.

Health disparities. Differences among specific population groups in their burden of adverse health conditions and their access to health protections.

Health impact assessment (HIA). A combination of procedures, methods, and tools that systematically judges the potential effects—sometimes unintended—of a policy, plan, program, or project on the health of a population, as well as the distribution of those effects within the population; an HIA identifies appropriate actions to manage the effects.

Health indicator. A measurable characteristic that describes the health of a population—such as life expectancy, mortality, or disease incidence or prevalence; or that serves as a determinant of health—such as health behaviors, health risk factors, physical environments, or socioeconomic environments.

Health outcome. A change in the health status of a population, group, or individual that is attributable to a policy or program or to a legal or environmental intervention, whether or not the intervention was intended to change health status. Health outcomes are usually assessed through health indicators.



PHOTO: LEE CANNON, FLICKR



PHOTO: PATRICK CASHIN, METROPOLITAN TRANSPORTATION AUTHORITY



PHOTO COURTESY TOOLE DESIGN GROUP

Incidence. The rate of onset of new cases of a disease per unit of time (see *prevalence*).

Injury. Unintentional or intentional damage to a body from acute exposure to a harmful agent.

Intentional injury (violence). Injury caused by a person with intent to do harm, such as homicide, assault, child maltreatment, elder abuse, or suicide.

Unintentional injury. Inadvertent injury from such events as motor vehicle crashes, falls, drowning, or poisoning.

Mental health. A state of well-being in which the individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to the community.

MPH. The most common graduate degree of public health professionals, the Master of Public Health typically includes training in biostatistics, epidemiology, health policy and management, and environmental health.

Obesity (obese). In adults, a body mass index (BMI) of 30 or greater, and in children and adolescents (2 to 19 years old), a BMI at or above the age- and sex-specific 95th percentile on CDC growth charts (see *overweight*). BMI is the ratio of weight (in kilograms) divided by height (in meters) squared.

Overweight. In adults, a BMI between 25 and 29.9, and in children and adolescents (2 to 19 years old), a BMI between the age- and sex-specific 85th and 95th percentiles on CDC growth charts (see *obesity*).

Physical activity. Any bodily movement produced by skeletal muscles that increases energy expenditure above the baseline level.

Prevalence. The proportion of a population suffering from a condition at a given point in time, defined as the number of cases of disease per unit of population (see *incidence*).

Prevention strategies

Primary prevention. Interventions to stop disease or injury from occurring.

Secondary prevention. Interventions to stop or delay the onset of adverse symptoms or effects once a disease has started or an injury is occurring.

Tertiary prevention. Reducing the adverse effects of a disease or providing rehabilitation after an injury to minimize the long-term consequences.

Public health. The science and art of promoting health and preventing disease in populations.

Quality of life. An individual's perceptions of his or her position in life in the context of the culture and value system, and in relation to goals, expectations, standards, and concerns.

Social capital. The interpersonal processes that establish networks, norms, and social trust and that facilitate coordination and cooperation for mutual benefit.

Social determinants of health. Life-enhancing resources, such as a food supply, housing, economic and social relationships, transportation, and health care; distribution of these resources across populations effectively determines the length and quality of life.

Surveillance. The ongoing systematic collection, analysis, and interpretation of data for the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of the data to prevent and control disease and injury.

Sustainability. The ability to meet present needs without compromising the ability of future generations to meet their needs.

Universal design. Design of products and environments to be usable by all without the need for adaptation or specialized design.

Vulnerable population. A group put at risk of adverse health effects by such factors as lack of income, place of residence, health, age, functional or developmental status, ability to communicate effectively, presence of chronic illness or disability, or personal characteristics.