Interdisciplinary Perspective

Integrating Public Health Objectives in Transportation Decision-Making

Todd Litman

Synopsis

This perspective explores how transportation decision-making can better support public health objectives, including reduced crashes and pollution emissions and increased physical activity. Conventional transportation planning tends to overlook negative health impacts resulting from increased motor vehicle travel and potential health benefits from shifts to alternative modes. Raising the priority of health objectives supports planning reforms that result in a more balanced transportation system. Integrating health objectives into transportation planning may be a cost-effective way to improve public health. (Am J Health Promot 2003;18[1]:103–108.)

INTRODUCTION

Conventional public decision-making tends to be ''reductionist''; that is, individual problems are assigned to a specialized organization with narrowly defined responsibilities.[1] For example, transportation agencies are responsible for solving traffic problems and health agencies are responsible for improving public health. This approach can lead to agencies implementing solutions to problems within their mandate that exacerbate problems outside their mandate. By focusing on a narrow set of objectives, planners tend to undervalue solutions that provide additional benefits. For example, a transportation agency may undervalue a congestion reduction strategy that increases nonmotorized travel by ignoring health benefits, whereas a public health agency may undervalue a program that increases walking and cycling by ignoring congestion reduction benefits.

Reductionist decision-making often causes transportation planners to overlook indirect health impacts. This editorial explores how transportation decisions affect public health and how planning practices might change if transportation agencies gave greater consideration to public health objectives.

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TRANSPORTATION HEALTH IMPACTS

Transportation planning decisions impact public health in three main ways: through traffic crashes, vehicle pollution, and physical activity.[2] Of the 10 most common causes of death in the United States, seven are affected by transportation in these three ways, as illustrated in Figure 1. (Of course, these do not indicate the degree to which transportation affects each of the health risks: motor vehicle air pollution is only one of many contributors to respiratory illnesses, and nonmotorized travel is just one physical fitness strategy.) Figure 2 compares the 10 main causes of years of potential life lost (YPLL), which takes into account age at death, and so ranks traffic crashes high because they tend to kill younger people compared with illnesses associated with sedentary lifestyle and pollution.

These three transportation-related health impacts are discussed individually below.

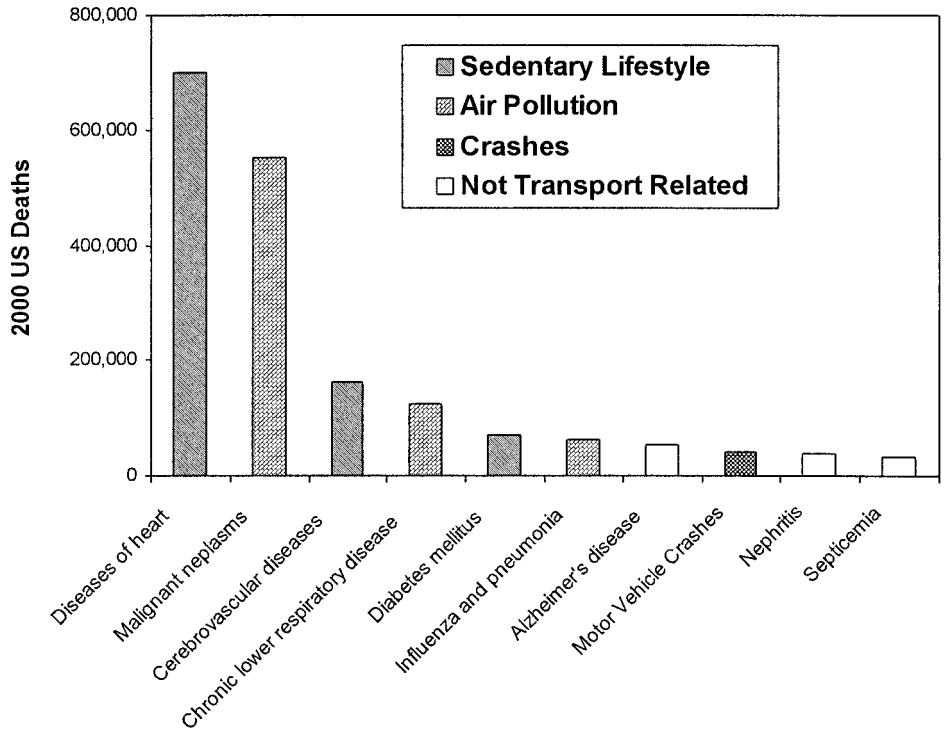
Traffic Crashes

Transportation professionals give considerable attention to traffic safety, but they usually evaluate this risk per unit of vehicle travel (i.e., injuries and fatalities per 100 million vehicle-miles or vehicle-kilometers). Measured in this way, U.S. crash rates have declined by more than two thirds over the last 4 decades, indicating that current traffic safety strategies are successful and should be continued. But per capita vehicle mileage has more than doubled over the last 40 years, which has largely offset the decline in per-mile crash rates. When fatalities and injuries are measured per capita (e.g., per 10,000 population) as with other public health risks, there has been relatively little improvement. Figure 3 compares these two different ways of measuring traffic crash risk.

Many safety strategies were implemented during this period, including safer road and vehicle designs; improved vehicle occupant protection (seat belts, child seats, air bags, etc.); reductions in drunk driving; and improvements in emergency response and trauma care.[3] Taking these factors into account, much greater casualty reductions should have been achieved. For example, the increase in seat belt use over this period, from close to zero in 1960 up to 75% in 2002, by itself should have reduced fatalities by about 34%, yet per capita traffic deaths only declined by about 25%.[4]

Figure 1

Ten Leading Causes of U.S. Deaths



Source: National Center of Health Statistics. Deaths: Preliminary Data for 2001. *National Vital Statistics Reports.* Vol. 51, No 5. Center for Disease Control and Prevention (www.cdc.gov/nchs). Accessed March 14, 2003.

Traffic crashes continue to be the greatest single cause of death and disabilities for Americans 1 to 44 years of age.[5] Although the United States has one of the lowest traffic fatality rates *per vehicle-mile,* it has one of the highest traffic fatality rates *per capita.* From this perspective, traffic safety continues to be a major problem: current safety efforts are ineffective, and new approaches are justified to improve road safety.

When road risk is measured per vehicle-mile, increased mileage is not considered a risk factor and traffic reductions are not considered a safety strategy. From this perspective, an increase in total crashes is not a problem provided that there is a comparable increase in vehicle travel. By emphasizing per-mile crash rates, conventional transportation planning undervalues the potential safety benefits of strategies that reduce total vehicle mileage.

Vehicle Pollution

Vehicle pollution is a second category of transport-related health impacts. Motor vehicles produce a variety of air pollutants, including carbon monoxide, particulates, toxins, and ozone precursors, which contribute to a variety of diseases, including cancer, respiratory diseases, and heart failure. The total health impacts of motor vehicle pollution are difficult to calculate since there are so many different pollutants causing a variety of diseases, and most pollutants have other sources besides motor vehicles. The number of premature deaths from motor vehicle pollution appears to be similar in magnitude to the number of deaths resulting from traffic crashes,[6,7] although the exact amount is difficult to determine (see Table 11.7-3B in McCubbin and Delucchi[7]). As stated earlier, such deaths tend to involve older people compared with those killed in traffic crashes, and therefore cause smaller reductions in YPLL.

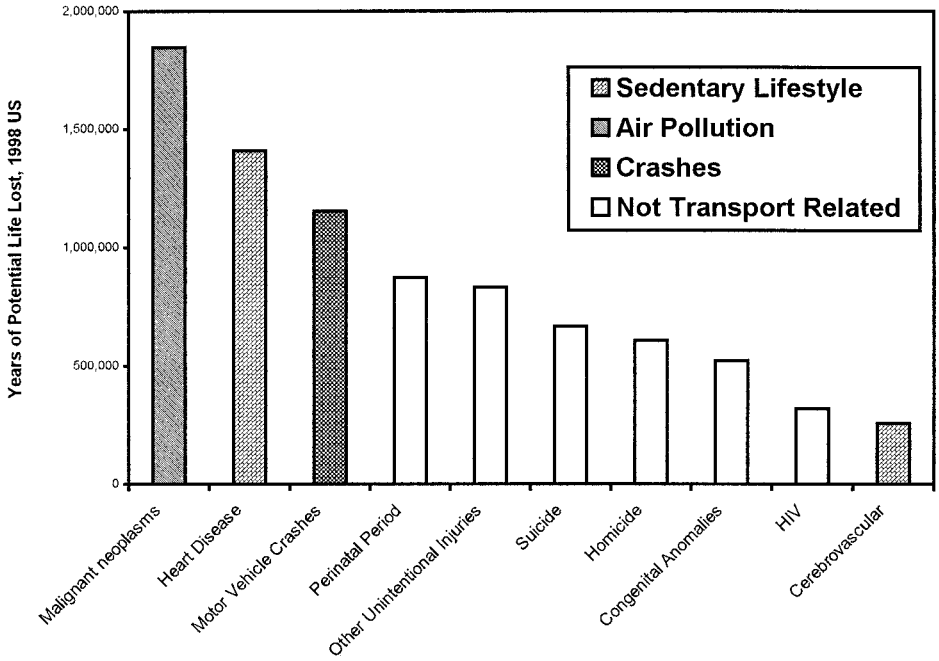
It is common to hear claims that vehicle emissions have declined 90% or more as the result of vehicle emission control technologies such as electronic ignition and catalysts, but this is an exaggeration. Such declines only apply to certain tailpipe emissions measured by standard tests. Tests do not reflect real driving conditions (they underestimate out-of-tune engines and hard accelerations), and vehicles produce additional harmful emissions not measured in these tests, such as toxics and particulates from road dust, tires, and break linings.[8] Increased vehicle mileage has offset much of the reduction in per-mile emissions. Automobile emissions continue to be a major pollution source, and reductions in vehicle traffic can provide measurable respiratory health benefits.[9]

Physical Activity and Fitness

The third category of health impacts concerns the effects transportation policy has on physical fitness. Public health officials are increasingly alarmed at the reduction

Figure 2

Ten Leading Causes of Years of Potential Life Lost



Source: National Center for Injury Prevention and Control. *Web-based Injury Statistics Query and Reporting System: Years of Potential Life Lost (YPLL).* National Center for Disease Control and Prevention (www.cdc.gov/ncipc/wisqars). Accessed March 17, 2003.

in physical activity among the general population and increases in diseases associated with a sedentary lifestyle.[10] There are many ways to be physically active, but few are suitable for lifetime participation by the general population. Walking, running, and cycling are practical ways to maintain fitness.[11] Transportation planning decisions have a major effect on the amount of nonmotorized travel that occurs in a community.[12]

Although it is difficult to predict how a particular transportation planning decision affects physical fitness, total impacts are likely to be large. Diseases associated with inadequate physical fitness cause an order of magnitude of more deaths, and more YPLL, than road crashes.[13] Even modest reductions in these illnesses could provide significant health benefits.

POTENTIAL SOLUTIONS

Mobility management (also called transportation demand management, or TDM) refers to various strategies that encourage travelers to drive less and shift to other travel modes.[14,15] These include the following:

- Facility investment and design features that improve walking, cycling, and public transit (e.g., improved sidewalks, crosswalks and paths, and roadway traffic calming).
- Programs to encourage use of alternative modes (such as walking, cycling, ride sharing, public transit, and telework), such as employee trip reduction programs at worksites and campus transportation management programs at colleges.
- Financial incentives such as road and parking pricing, pay-as-you-drive vehicle insurance, and Parking Cash Out, which reduce motor vehicle traffic.
- ''Smart growth'' land use policies (i.e., more compact, mixed, multimodal land use patterns) that help create more accessible and walkable communities.

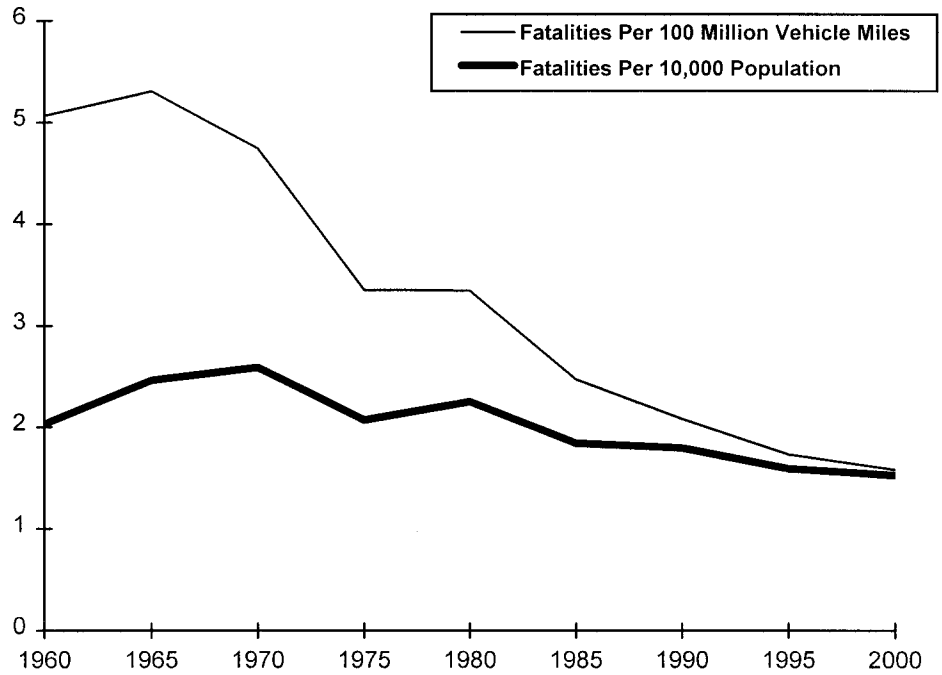
Table 1 lists various categories of mobility management strategies.

Conventional transportation planning does not ignore mobility management, but tends to consider it a last resort for extreme urban traffic problems. It is not usually considered a safety or health strategy. When transportation agencies evaluate options for reducing congestion or crashes, mobility management strategies often rank low because their individual impacts appear modest, typically affecting just a few percent of total vehicle travel. But these impacts are cumulative. A comprehensive mobility management program that includes a complementary set of strategies can reduce vehicle traffic by 10% to 30%, or even more.[16]

Conventional transportation planning practices are biased in ways that encourage automobile use and undervalue mobility management strategies.[17] For example, a major portion of transportation budgets are dedicated to road projects and cannot be used for public transit or

Figure 3

U.S. Traffic Fatalities



This figure illustrates traffic fatality trends over 4 decades. Per mile crash rates declined substantially, but per capita crash rates declined little despite significant traffic safety efforts.
Source: Bureau of Transportation Statistics. *National Transportation Statistics 2002.* Bureau of Transportation Statistics, US Department of Transportation (www.bts.gov/publications/nts/2002/index.html). January 2002. Accessed June 5, 2003.

Table 1

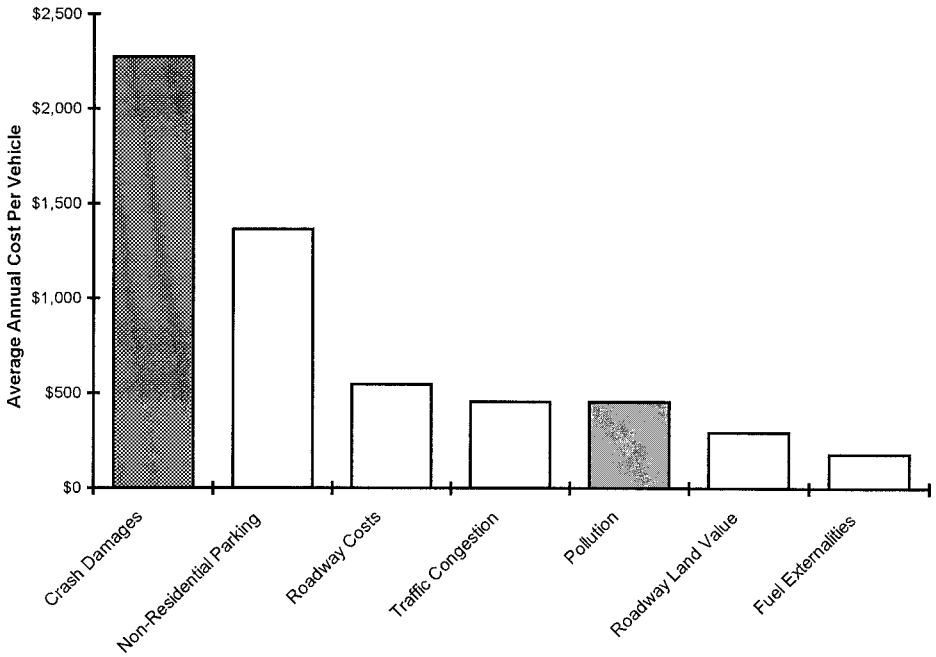
Examples of Mobility Management Strategies†

Improved Transport Choice	Incentives to Shift Mode	Land Use Management	Policy and Institutional Reforms	Programs and Program Support
Address security concerns of alternative mode users	Bicycle and pedestrian encouragement	Car-free districts	Car-free planning	Access management
Alternative work schedules	Congestion pricing	Clustered land use	Comprehensive transportation market reforms	Campus transportation management
Bicycle improvements	Distance-based pricing	Location-efficient development	Institutional reforms	Data collection and surveys
Bike/transit integration	Commuter financial incentives	New urbanism	Least cost planning	Commute trip reduction
Car sharing	Fuel tax increases	Parking management	Regulatory reform	Freight transportation management
Guaranteed ride home	High occupant vehicle (HOV) preference	Smart growth		School trip management
Park and ride	Pay-as-you-drive insurance	Transit-oriented development (TOD)		Special event management
Pedestrian improvements	Parking pricing	Traffic calming		Transportation demand management marketing
Ride sharing	Road pricing			Transportation demand management programs
Shuttle services	Vehicle use restrictions			Tourist transport management
Taxi service improvements				
Telework				
Transit improvements				

† VTPU. *Online TEM Encyclopedia.* Victoria Transport Policy Institute, Victoria, BC, 2002. Available at http://www.vtpi.org/tdm. Accessed March 19, 2003.

Figure 4

Estimated Costs of Automobile Use in the United States



This figure illustrates the estimated magnitude of various external costs of vehicle use. Crash damages are one of the largest costs, far greater than traffic congestion or pollution costs.[19,21]

nonmotorized facilities, and most zoning codes mandate generous amounts of parking at any new building or public facility. Similarly, current public policies tend to underprice driving: motorists do not pay directly for many of the costs their vehicle use imposes on society.[18,19]

Although individually policies and planning practices that favor motor vehicle use may appear modest and justifiable, they tend to create automobile-dependent transportation systems and land-use patterns that increase per capita driving and reduce nonmotorized travel, with negative health impacts.[20] Put more positively, policy and planning reforms that correct transportation market distortions can provide health benefits, in addition to other economic, social, and environmental benefits. Transportation professionals categorize such reforms as mobility management strategies.

COMPARING TRANSPORTATION OBJECTIVES

Figure 4 compares the estimated magnitude of various costs that automobile use imposes on society. It indicates that crash damages are the largest categories of these costs due to the large number of people killed and injured in the prime of life, as well as associated property damages.[21] As mentioned earlier, pollution probably causes a similar number of premature deaths, but these generally involve older people and therefore cause fewer YPLL. The health costs of reduced physical activity due to reduced walking and cycling are difficult to quantify, but a plausible guess is that they are at least as great as the costs of air pollution and may exceed crash costs.

These cost estimates have important implications for transportation planning. They indicate that a congestion reduction strategy is probably not worthwhile if it causes even modest increases in crashes and pollution emissions, or reductions in nonmotorized travel. For example, if roadway capacity expansion reduces congestion costs by 10% but increases total crash costs by 2% due to additional vehicle travel and higher traffic speeds, it is probably not worthwhile overall since crash costs are approximately five times greater in magnitude than congestion costs, and therefore a 1% increase in total crashes costs offsets a 5% reduction in total congestion costs.[22] However, a congestion reduction strategy provides far greater total benefits if it causes even small reductions in crashes, pollution, or sedentary lifestyles in a community.

CONCLUSIONS

Transportation decisions have major impacts on public health through impacts on crash risk, pollution emissions, and physical fitness. All three health risks tend to increase with motor vehicle use. Although mitigation strategies can reduce some negative health impacts, all else being equal, increased motor vehicle travel and reduced nonmotorized travel tends to harm public health.

Conventional transportation planning gives relatively little consideration to indirect health impacts caused by

increased motor vehicle travel. As a result, planners tend to understate the health costs of decisions that favor automobile travel. Giving health a higher priority in transportation planning would increase emphasis on mobility management strategies, particularly those that increase nonmotorized travel. Many mobility management strategies are justified by direct economic benefits such as congestion reduction, facility cost savings, and vehicle cost savings, and therefore can provide ''free'' health benefits. Integrating health objectives into transportation planning may be one of the most cost-effective ways to improve public health.

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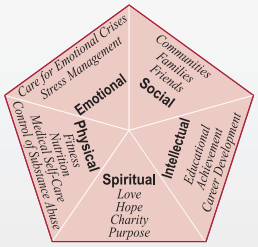

DIMENSIONS OF OPTIMAL HEALTH

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(O'Donnell, *American Journal of Health Promotion,* 1989, 3(3):5.)

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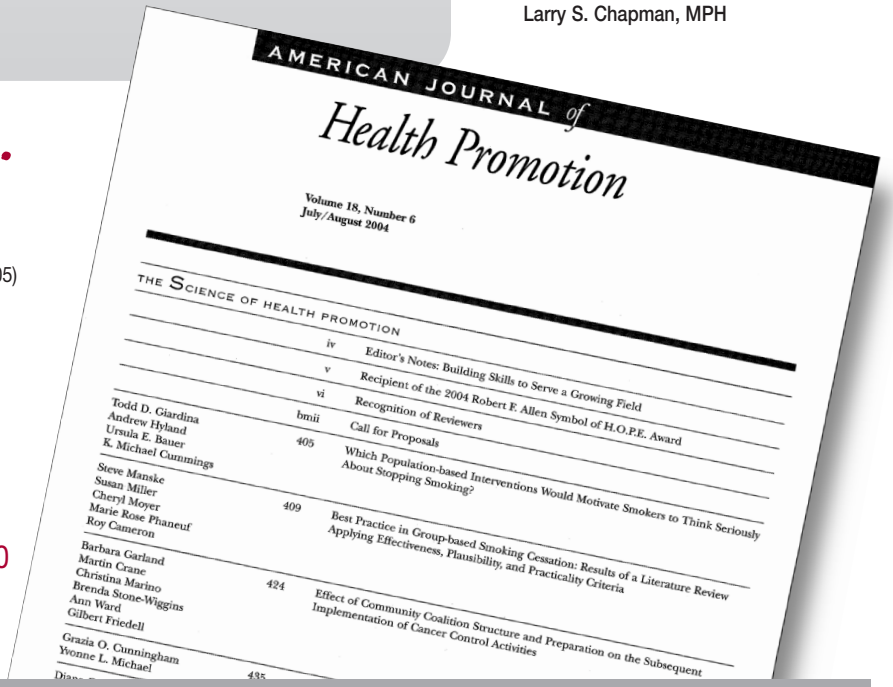
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