

Walking, Bicycling, and Health

ch. 4

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ABSTRACT >> *Walking and bicycling are efficient modes of travel and effective forms of exercise. Starting with the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the federal government has provided various forms of financial support for non-motorized transportation, but increasing walking and bicycling without increasing fatalities and injuries requires more than the limited federal resources to date. State, regional, and local policies determine the extent to which communities capitalize on the federal programs to expand walking and bicycling and help close the gap in health disparities between low-income communities and their more affluent neighbors. To increase non-motorized modes of travel—travel by walking and bicycling—safely, the authorization of the next federal transportation bill should:*

- *Assist: by providing state, regional, and local governments with the tools they need to plan for non-motorized travel*

- *Enable: by making it easier for state, regional, and local governments to spend federal funding on non-motorized modes*

- *Encourage: by providing incentives for state, regional, and local governments to pay more attention to non-motorized modes*

- *Require: by putting in place policies that compel state, regional, and local governments to improve conditions for non-motorized modes*

Increased walking and bicycling would yield many health benefits and reduce disparities in health for low-income communities and others. The federal transportation bill can establish policies that will help to achieve the goal of increasing walking and bicycling safely.

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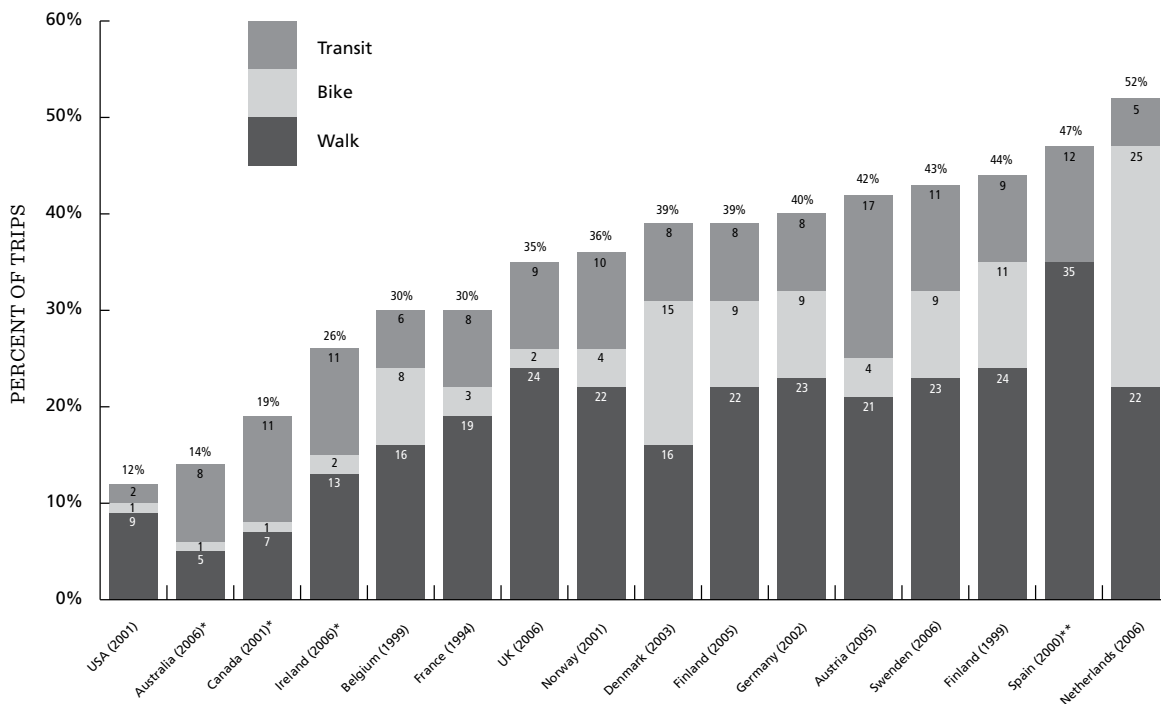
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Introduction

Walking and bicycling as modes of transportation—known as “non-motorized” or, more recently, “active” travel—are low-cost, low-polluting, calorie-burning, health-improving alternatives to driving. Despite these advantages, non-motorized modes represent a small share of all travel in the United States, or fewer than 10 percent of all daily trips in urban areas as of 2001.¹ Increasing this number, without a congruent increase in fatalities and injuries, would yield considerable benefits, especially among low-income communities and people of color, the young and older adults, by helping to close wide gaps in health in this country. But what policies would achieve this aim?

For guidance, we can look to other developed countries, where rates of walking and bicycling are significantly higher than in the United States, particularly in Denmark, Germany, and the Netherlands (figure 1). We can also look to communities in the United States, where bicycle commuting is significantly more common than the national average of less than one percent of workers (figure 2). Common to these places is a supportive environment combined with a population motivated to walk and bicycle. These conditions have not come about by chance; they are the outcome of aggressive policies that address both environment and motivation.³

Figure 1. *Share of Trips by Walking, Bicycling, and Transit, by Country* ²



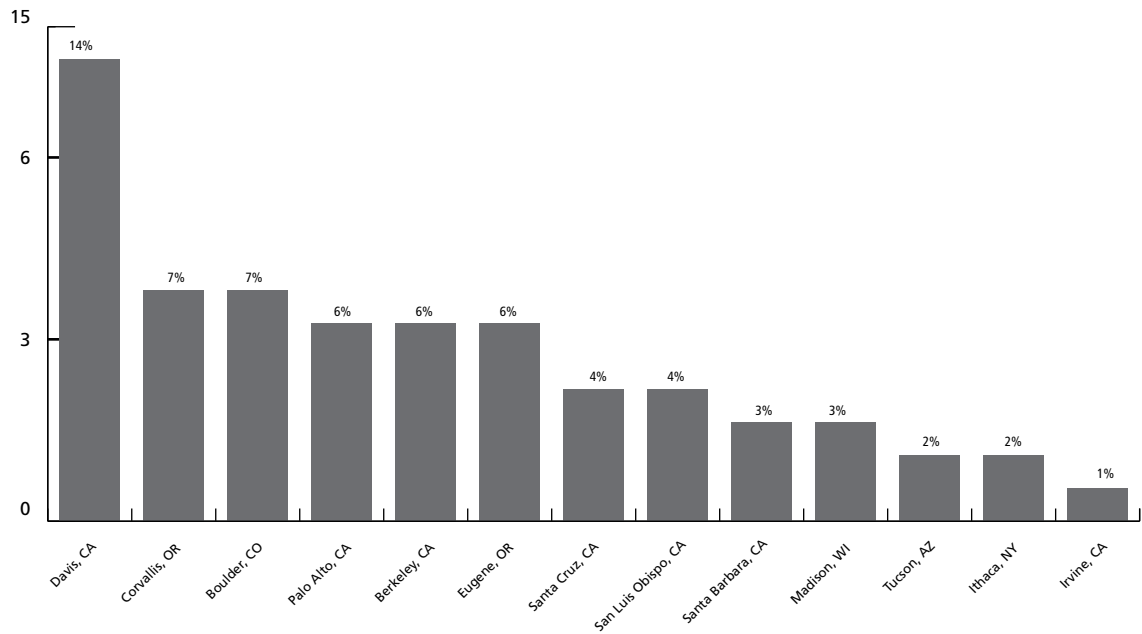
*work trips only

**walk and bike combined for Spain

Source: D. Bassett et al., “Walking, Cycling, and Obesity Rates in Europe, North America, and Australia,” 2008.

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Figure 2. *Percent Usually Bicycling to Work in Selected U.S. Cities, 2000*



Source: 2000 U.S. Census, as compiled by the author.

A concerted and sustained effort is required to motivate people to walk and bike more and make their environment more conducive to doing so. The quality of the pedestrian and bicycle environment depends on several elements (see table 1), including land use patterns, network configuration, and facility design, all of which play an important role and are shaped by public investments and development policies over time. Natural features, particularly weather and topography, are also important, though obviously beyond the direct reach of policy. Motivation to

walk or bicycle also depends on personal characteristics—ability, comfort, confidence, habits, and perceptions—that can evolve over one’s lifespan but may also be modified by targeted intervention programs. Community norms also affect individual motivation but may be difficult to shift. Despite the challenges, a growing number of cities have demonstrated that it is possible to assemble a cost-effective package of policies, projects, and programs addressing both environment and motivation that significantly increases non-motorized travel.⁴

Table 1. **Factors Influencing Non-motorized Travel**

Category	Factor	Definition	Importance
Environmental	Land use patterns	The arrangement of land uses such as housing, shops, offices, etc., across the community	Determines the straight-line distance among different activities, such as housing, shopping, and offices
	Network structure	The layout of streets and trails throughout the community	Determines how direct the connections from one place to another are and thus influences the travel distance
	Facility quality	Characteristics of streets, including presence of sidewalks and bike lanes, widths, pavement conditions, crosswalks, signals, etc.	Influences how comfortable, safe, and attractive it is to walk or bicycle that route
	Natural features	Topography, weather, scenery	Influences the energy needed to walk or bicycle as well as comfort and enjoyment
Motivational	Individual factors	Ability, experience, comfort level, confidence, preferences, habits, etc.	Influences the willingness and desire of an individual to walk or bike
	Community norms	Social acceptability of bicycling, dominant attitude toward bicycling, bicycling culture	Influences the willingness and desire of an individual to walk or bike

Two converging forces make this the right time to elevate non-motorized modes of travel. First, with health, economic, and environmental concerns on the rise, there seems to be a renewed interest in bicycling as evidenced by increased attention in the popular media. Second, Congress is now considering the authorization of the federal transportation bill, the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users*, or *SAFETEA-LU*, which will set policy and dictate

funding levels for surface transportation well into the next decade. These forces together create an unprecedented opportunity to work toward the goal of increasing safe non-motorized travel.

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Health And Non-Motorized Transportation

Whether for transportation or recreation, walking and bicycling are important forms of physical activity. Federal guidelines categorize brisk walking and bicycling on level ground as moderate physical activity, while bicycling at more than 10 miles per hour qualifies as rigorous physical activity. The U.S. Department of Health and Human Services (DHHS) recommends that children engage in 60 minutes of physical activity each day and that adults engage in two hours and 30 minutes of moderate physical activity per week,⁵ a standard that more than one-third of all adults nationwide fail to meet.⁶ A 15-minute non-motorized commute twice a day for five days a week is enough to meet the adult recommendations. The DHHS identifies walking and biking as effective measures for increasing overall physical activity and notes that non-motorized commuting has a low risk of injury compared to many other forms of physical activity. Walking, in particular, has been described by health researchers as “near perfect exercise”⁷ and “a popular, familiar, convenient, and free form of exercise that can be incorporated into everyday life and sustained into old age.”⁸ The health benefits of achieving the recommended levels of physical activity are numerous: prevention of weight gain; improved cardio respiratory and muscular fitness; and lower risk of type 2 diabetes, heart disease, stroke, and other unhealthy conditions.

From an equity standpoint, non-motorized transportation presents both challenges and opportunities. Non-motorized modes can improve access to jobs, healthcare, and shopping for households with limited access to cars. Additionally, walking and bicycling reduce health disparities between low-income and more affluent communities. Safety, however, remains a significant concern: in 2007, there were 4,654 pedestrian and 698 bicyclist fatalities in the United States, with combined

injuries of more than 100,000.⁹ Indeed, public officials often use safety concerns to beat back arguments to do more to encourage walking and bicycling. The challenge is to increase non-motorized modes safely, primarily because the population groups that could most benefit from increased walking and bicycling are also the most vulnerable to traffic dangers.

Low-income and minority populations fall into this category. Ample evidence indicates that physical activity levels are lower among low-income and minority populations,¹⁰ despite the fact that only 73.5 percent of low-income households own cars and are more dependent on walking and public transit. That number compares with 91.7 percent of all U.S. households. Forty percent of the lowest-income transit users meet the recommended levels of physical activity solely from walking to and from transit.¹¹ Without this, their total physical activity would be far less. However, the quality of non-motorized infrastructure is often lower in low-income and minority communities, contributing to higher pedestrian fatality rates.¹² The confluence of these circumstances underscores the importance of improving walking and bicycling conditions in these communities.

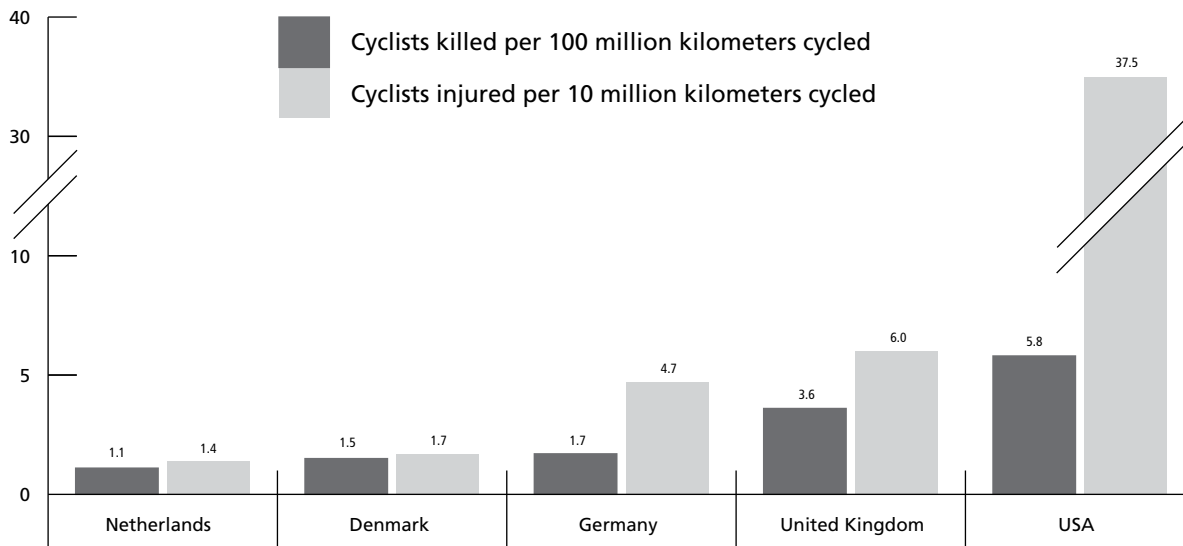
Youth are also vulnerable. Across the country, adolescents depend on parents and other adults to drive them to school and other activities.¹³ If children were able to walk or bike more, they would get more physical activity and their parents (predominantly mothers) would have less need to drive them. Again, however, safety is a concern: rates of pedestrian and bicyclist fatalities and injuries per capita are highest for those under the age of 15.¹⁴ Parental fears about traffic as well as fear of abductions help explain why children now walk and bike less than in the past. Consequently, increasing walking and bicycling for children means removing threats—actual and perceived—to their safety.

Older adults, too, could benefit from increased walking and bicycling, but safety, once again, is an issue. One in five adults ages 65 years and

older does not drive, and more than 50 percent of the nondrivers stay home on any given day because they lack transportation options.¹⁵ For nondrivers, walking, bicycling, and transit can provide an important means of getting to the doctor's office, the store, or a friend's house. However, the decline in physical and mental abilities that make driving no longer safe can also make walking and bicycling less safe. Uneven sidewalks, for instance, can pose a perilous hazard to frail older adults. The highest rate of pedestrian fatalities per capita is for those over age 70.¹⁶ Where safe conditions exist, increased walking and bicycling can improve physical and mental health.¹⁷

The good news is that safety is likely to improve for low-income households, children, older adults, and others as more people walk and bicycle. Countries with high levels of non-motorized travel also have fewer fatalities and injuries per mile than does the United States (figure 3). In part, this difference is explained by better infrastructure, particularly the separation of pedestrians and bicyclists from motor vehicles. But the higher number of pedestrians and bicyclists using thoroughfares itself improves safety by heightening driver awareness and attentiveness.¹⁹ Larger numbers of pedestrians and bicyclists also spur elected officials to invest more in better, safer infrastructure, which, in turn, helps to encourage more walking and bicycling.

Figure 3. **Cyclist Fatality and Injury Rates, by Country**¹⁸



Note: The symbol // in the graph represents a break in the consecutive numbering of the Y-axis.
 Source: Pucher and Buehler, "Making Cycling Irresistible," 2008.

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The potential economic benefits of increased walking and bicycling are numerous. Improved health as a result of increased physical activity can reduce healthcare costs. Cheaper modes of travel can reduce household spending on transportation: the typical household in this country spent an average of \$7,896 to own and drive their cars in 2005.²⁰ Making walking and bicycling more viable, particularly in conjunction with improvements to transit, could increase access to jobs. Improvements to walking and bicycling facilities can contribute to economic development efforts by, for example, encouraging stores to locate within walking distance of residential areas, particularly in low-income areas.

The potential environmental benefits of non-motorized modes are also abundant and include reductions in air pollution, water pollution, noise, and greenhouse gas emissions. However, these benefits accrue only if the increase in the use of non-motorized modes comes with a reduction in the use of motorized modes. A substantial share of walking and bicycling in the United States is for recreation rather than for transportation, and even some non-motorized trips to destinations are made in addition to, rather than instead of, driving trips.²¹ Walking and bicycling trips that do not replace driving trips do not have a direct environmental benefit, though they still have important health benefits.

Transportation Goals

The goal for non-motorized modes is straightforward: increase walking and bicycling without increasing fatalities and injuries, particularly for low-income households, communities of color, the young, and older adults. But what is a realistic increase to aim for? Although walking and bicycling have virtually boundless potential as forms of recreational physical activity, their potential as modes of transportation are limited by practical constraints. Given the low levels of use in this country, significant increases as a percentage of

all travel may be possible even if they remain a relatively small share of all trips. The potential for the two modes is likely different: walking is possible for more people because it requires no equipment and less confidence and skill, but it is considerably slower than bicycling; bicycling is at least theoretically possible for more trips because it is considerably faster than walking, but it requires equipment as well as skills and confidence that many lack. Given the low-density patterns of development in the United States, which put destinations beyond walking distance in most places, bicycling seems to offer greater potential for expansion.

Strategic Targets

In aiming to increase safe non-motorized modes of transit, particularly among those with the greatest needs but also the greatest vulnerabilities, it makes sense to take a strategic approach and target the following: types of travel most conducive to non-motorized modes, communities with greater potential for change, and communities with greater potential benefits from change.

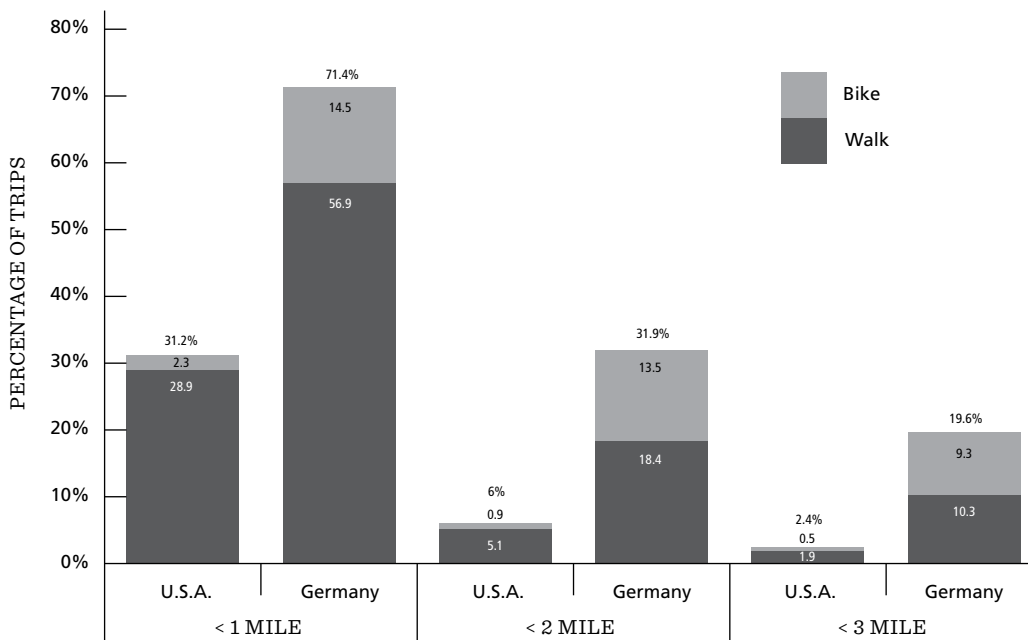
Short trips are an obvious target. According to the 2001 National Household Transportation Survey, 28 percent of all trips are less than one mile, a reasonable distance for walking, and 41 percent of trips are less than two miles, a distance that is reasonable for biking.²² The shares of these short-distance trips that are made by non-motorized modes are much lower in the United States than in European countries: 71.4 percent of trips shorter than one mile are by walking or bicycling in Germany versus 31.2 percent in America (figure 4). In other words, while trip distances are longer on average in the United States than in Europe, distance is not the only issue; environmental and motivational factors must explain differences in non-motorized rates at these short distances.

School trips are another obvious target and, indeed, the federal Centers for Disease Control and Prevention has set a goal of increasing

walking to school. This makes sense from a practical standpoint, given that these are frequent trips with regular routes and fixed destinations. Walking to school dropped from 40.7 percent of all school trips in 1969 to 12.9 percent in 2001, while bicycling remained roughly constant at around one percent (figure 5). Increasing walking and biking to school is generally a good starting point for increasing physical activity in children. For example, it could contribute to an increase in non-motorized travel to other destinations, as skills and habits change. Current efforts fall into two categories: changes in where schools are located to put more children within walking distances of school, and Safe Routes to School programs, which aim to improve safety around schools for walkers and bicyclists.

Some communities have greater potential for change than others. One target should be areas where walking and bicycling are already significant. For example, Davis, CA, has high levels of bicycling, but levels could clearly be even higher. The environment there supports bicycling, but not all residents take advantage of the opportunity: over three-fourths of children are driven to their Saturday morning soccer games.²⁵ Motivational rather than environmental barriers are often the issue—habit, perceptions, confidence, etc. A second target should be places where land use patterns put destinations within walkable or bikeable distances of homes, that is, areas with higher densities and mixed land uses. In these places, the quality of sidewalks and other facilities may be a problem

Figure 4. *Percent Walk and Bike Trips by Trip Length, Germany vs. United States*²³



Source: R. Buehler, "Transport Policies, Travel Behavior, and Sustainability," 2008.

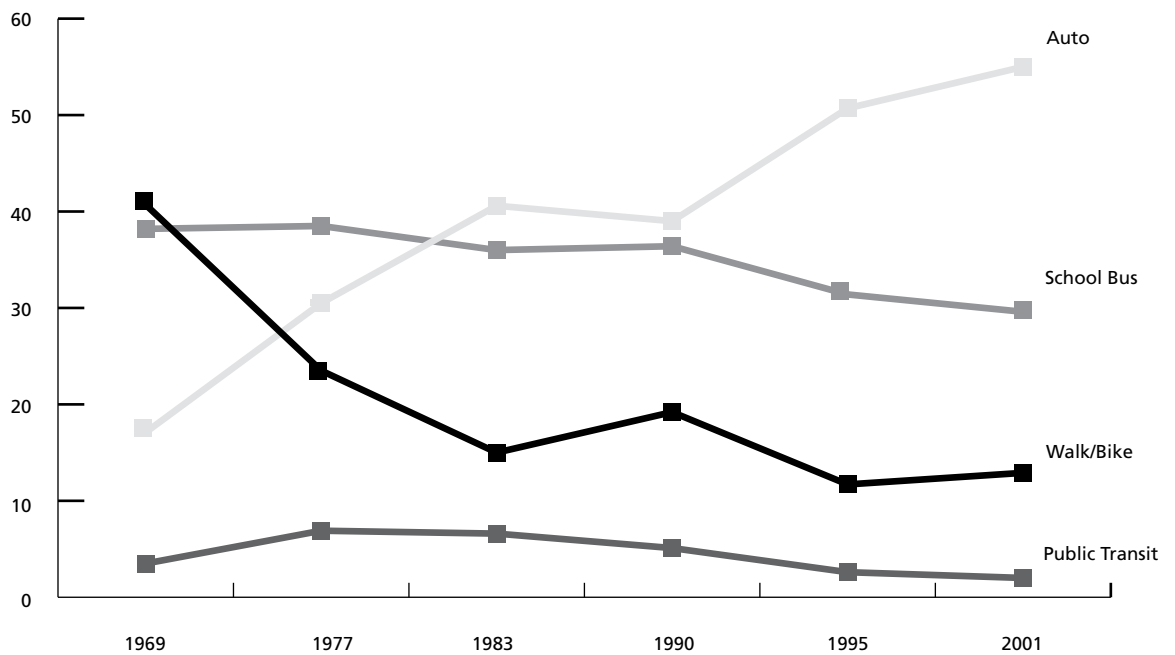
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in addition to motivational barriers.

Of lower priority, because they are harder to change, are low-density areas with limited walking and bicycling infrastructure, particularly rural areas. In these areas, however, it is still important to look for specific opportunities to reduce environmental barriers, e.g., by improving the shoulders of rural roads or through a trail project that connects rural residents to the town center. Finding such opportunities should be more of a priority in areas where residents have limited access to cars and where transit service is sparse or nonexistent.

Potential benefits from increases in non-motorized travel are greater in some areas than others. Increases are most important in low-income and minority communities, where efforts are needed to improve safety when residents of these communities do walk and bicycle and to make more places accessible by these modes. Bicycling, in particular, offers a way to fill the gap between places accessible by foot and those accessible by bus. Anecdotal evidence suggests that bicycles are an important mode for recent Hispanic immigrants in California, though bicycling often occurs in environments not designed for it.²⁶ Hispanics walk and bike to work in greater shares than

Figure 5. *Trends in Mode of Travel to School in United States, 1969–2001*²⁴



Source: N. C. McDonald, "Active Transportation to School," 2007.

other Americans; not surprisingly, their rates of pedestrian and bicycle fatalities are also higher.²⁷ Environmental improvements are essential in these communities.

Retirement communities, formal or informal, are another important target. It used to be that those who aged in place lived mostly in older communities that were designed for walking. Increasingly older adults now live in suburban environments that are not designed for walking. Improving the walking environment in these areas is not easy, though strategic projects coupled with programs to encourage walking or even bicycling could make a difference. In so-called active retirement communities, bicycling could be encouraged over golf carts as a way to get around within the community.

Measuring Progress

Achieving the goal of an increase in walking and biking safely requires development of new performance measures, both to assess current conditions and to monitor the effectiveness of new policies. Traditional transportation performance measures focus on vehicle traffic in support of the goal of maximizing vehicle flow and to the detriment of walking and bicycling. Without performance measures for non-motorized travel, policies are likely to continue to favor cars over pedestrians and bicyclists; transportation goals for which performance is not measured will get less attention in the planning process.²⁸

Admittedly, developing such measures is difficult. If the goal—the desired outcome—is to increase walking and bicycling without increasing fatalities and injuries, then these factors are what should be measured. But increases in non-motorized travel are hard to measure.²⁹ The best available data come from travel surveys, conducted at the regional or national level. Yet non-motorized trips have historically been undercounted in these surveys, which have primarily been concerned with driving trips. The surveys are also not frequent

enough to be useful for annual monitoring (the national survey occurs every five to seven years, while regional surveys are typically separated by 10 years or more). Although data on fatalities and injuries are arguably better than data on the amount of walking and bicycling, without the latter, it is impossible to adequately gauge the former. For example, the numbers of pedestrian and bicyclist fatalities and injuries have been going down on a per capita basis,³⁰ but this likely reflects a decline in the use of these modes rather than a decline in danger. Improved data collection is needed.

As an alternative to measuring increases in non-motorized travel, performance measurement might focus on what might be called *inputs* rather than *outcomes*. One input is funding for bicycle and pedestrian projects. Another is the adoption of policies to promote non-motorized transportation, such as changes in zoning designed to bring about mixed-use land use patterns that reduce walking distances, or complete street policies that ensure that bicycles and pedestrians are given consideration in the design of all thoroughfares. Unfortunately, these inputs do not guarantee favorable changes in the environment, let alone the desired outcome of an increase in safe walking and biking. The input option for performance measures is the easiest to implement but the least effective in showing progress toward the goal.

An option that is better than measuring inputs but more feasible than measuring outcomes is to focus on *outputs*, that is, on changes in the environment that are expected to lead to increases in non-motorized travel, rather than changes in non-motorized travel that are difficult to measure. Outputs could be measured as projects actually constructed. However, non-motorized projects are not well tracked; categorizing such projects can be difficult, and bicycle and pedestrian improvements are often incorporated into larger road projects.³¹ Another option is to measure changes in the “walkability” or “bikeability” of a community. Many tools for measuring walkability and

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bikeability have already been developed,³² with increasingly frequent implementation in the transportation planning process. However, collecting data to calculate walkability and bikeability at a community scale can be labor intensive.

Transportation Policy: Opportunities And Barriers

The next authorization of the federal transportation bill offers a tremendous opportunity for non-motorized transportation. For almost two decades, federal policy has contributed to an expansion of investments in walking and bicycling infrastructure. However, many barriers have hindered progress toward the goal of increased walking and bicycling, including federal policy itself. The new transportation bill could overcome many of these barriers by putting in place stronger federal policy toward non-motorized modes.

Starting with the passage of the *Intermodal Surface Transportation Efficiency Act (ISTEA)* in 1991, the federal government has provided support for non-motorized transportation through a number of policies. Most importantly, federal transportation funding can be used for bicycle and pedestrian projects through the Transportation Enhancements (TE) Program, the CMAQ (Congestion Management and Air Quality) Program, the Surface Transportation Program (STP), the Safe Routes to School (SRTS) Program, the Non-Motorized Transportation Pilot Program, and several others, including the Highway Safety Improvement Program (HSIP).³³

Other policies also support non-motorized modes. Federal policy specifies seven “planning factors” that must be considered in the development of long-range transportation plans at state and regional levels. These factors include increased safety and security for non-motorized users, increased mobility and

accessibility options, and increased integration of the transportation system across modes. States are also now required to have bicycle coordinators. Finally, the Federal Highway Administration has pushed the concept of context sensitive design, which has increased attention to bicycle and pedestrian needs.

Under current policies, however, the availability of federal funds is insufficient to ensure improvements to the walking and bicycling environment. State, regional, and local policy decisions determine the degree to which communities take advantage of the federal programs for bicycling and walking facilities. For example, through the regional transportation planning process, metropolitan planning organizations evaluate and prioritize regional needs and decide what share of federal funding in these categories will go to non-motorized projects. The availability of federal funds for bicycle and pedestrian facilities has created an important opportunity, but one that only some states and regions have taken advantage of. Indeed, spending on non-motorized projects has varied significantly across the major metropolitan regions, ranging from \$0.20 per capita in Los Angeles to \$2.32 per capita in Providence, RI, from 1992 through 2006.³⁴

At the same time, many federal programs and policies hinder rather than support efforts to increase non-motorized travel.³⁵ The TE program as administered by the states can present insurmountable bureaucratic hurdles, particularly for communities with limited resources. The CMAQ program requires proof of air quality benefits, yet the models used to forecast emissions are not usually sensitive to bicycle and pedestrian improvements. Most significantly, an overarching concern with congestion at the federal level as well as at state and local levels undervalues non-motorized projects relative to highway projects in the planning process. The current focus on job creation and economic stimulus also threatens to perpetuate the top priority given to highway projects.



One of the most intractable barriers to improving the walking and bicycling environment on a wide scale is local control of land use planning, a long-standing tradition throughout the country.³⁶ The viability of non-motorized modes depends on land use patterns that put potential destinations within walking and bicycling distances of home. Similarly, transit viability increases as population and employment densities increase. These environmental characteristics are shaped by local policies such as zoning and subdivision ordinances. Investments in non-motorized infrastructure will be of little benefit without concomitant changes in local land use policies. Although land use planning authority is likely to remain at the local level for the foreseeable future, federal policy can and does influence the decisions of local governments, and this influence can be channeled toward the support of non-motorized modes.

Thus, federal policy alone will not bring about the needed changes, but it can help to expand non-motorized transportation by assisting, enabling, encouraging, or requiring agencies at the state, regional, and local levels to both improve the environment and

motivate people. To safely increase walking and bicycling, the upcoming authorization of the federal transportation bill should include the following policies, focusing on types of travel most conducive to non-motorized modes, communities with greater potential for change, and communities with greater potential benefits from change (see also table 2).

Assist: provide state, regional, and local governments with the tools they need to plan for non-motorized modes. Funding for more frequent and standardized travel surveys and for development of survey methods that collect more accurate and more comprehensive information on non-motorized modes would provide for better monitoring of progress. Such data could also provide a means of calibrating improved travel forecasting models that incorporate non-motorized modes. Resources should especially be directed towards low-income communities that may have a greater need for planning assistance.

Enable: make it easier for state, regional, and local governments to spend federal funding on non-motorized modes. Reducing bureaucratic barriers in current programs, particularly in the TE program, would likely increase the use of these funds for non-motorized projects, such as sidewalks and bicycle paths, particularly in low-income communities with fewer resources available for overcoming these barriers. Further increasing flexibility in federal programs would enable communities to give greater priority to non-motorized modes. In addition to infrastructure projects, educational and promotional programs should be eligible for funding.

Encourage: provide incentives to state, regional, and local governments to pay more attention to non-motorized modes. Specialized funding programs, such as Safe Routes to School, encourage spending on non-motorized modes. Targeted incentives, such as supplemental grants, could encourage attention to pedestrian and bicyclist needs, with

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Table 2. *Recommendations for Federal Policy on Walking and Bicycling*

Assist	Help provide state, regional, and local governments with the tools they need to plan for non-motorized modes: fund travel surveys; support development of improved planning tools
Enable	Make it easier for state, regional, and local governments to spend federal funding on non-motorized modes: reduce bureaucratic barriers; increase funding flexibility; expand eligibility of promotional programs
Encourage	Provide incentives for state, regional, and local governments to pay more attention to non-motorized modes: continue and expand specialized funding programs; target incentives for prioritizing bicycle and pedestrian projects and for supportive land use policies
Require	Put in place policies that compel improvements in conditions for non-motorized modes on the part of state, regional, and local governments: adopt federal complete streets policy; tie funding to performance requirements; tie funding to supportive land use policies

priority given to low-income areas. Incentives that encourage coordination of land use and transportation planning could also enhance the viability of non-motorized modes; for example, jurisdictions that adopt land use policies promoting greater densities and mixed land uses might earn bonus funding for bicycle and pedestrian projects.

Require: put in place policies that compel state, regional, and local governments to improve conditions for non-motorized modes. A federal complete streets policy would require that the needs of bicyclists and pedestrians are considered in all federally-funded projects. Federal transportation funding could be allocated based on the degree to which jurisdictions meet performance requirements for non-motorized modes. These

requirements could use the performance measures described earlier, such as increases in safe walkability and bikeability, with extra weight given to performance in lower-income areas and for key segments of the population. Performance standards could also be set with respect to land use policies; for example, jurisdictions might be eligible for funding only if they have adopted land use policies that are supportive of non-motorized modes.

As outlined, these approaches progress from least to most forceful; some combination of all four would have the best chance at success. But they must be accompanied by a shift in the focus of the federal program away from congestion reduction to goals related to health, equity, economic, and environmental benefits. Tying federal funding to demonstration of

progress toward these goals would ensure that the shift in focus is not just rhetorical. Such an approach could provide a powerful mechanism for improving walking and bicycling conditions.

Convergence Opportunities

Credit for the existence of federal policies supporting non-motorized modes goes to a strong coalition of bicycle and pedestrian advocacy groups operating at the national level. This coalition is increasingly working in partnership with other interest groups, including those focused on public health, social equity, and environment issues, reflecting the broad benefits of non-motorized travel in all these realms, as described previously. This effective coalition is well positioned to influence the authorization of the upcoming federal transportation bill, though it must



continue to battle the traditional focus on congestion reduction and the new emphasis on highway investments as a way to stimulate the economy. Making the case that bicycle and pedestrian projects create jobs, too, while also helping to reduce our economically detrimental dependence on fossil fuels will be important for this coalition.

Because federal policy alone does not determine improvements to the bicycle and pedestrian environment, effective coalitions are also needed at the state, regional, and local levels. The local scale is especially important but also especially challenging, and the potential for building the needed partnerships varies from community to community. The Active Living by Design program, among others, has helped to foster such partnerships in communities throughout the country, including many low-income communities.³⁷ The evaluation of this program should yield important lessons for other communities in their efforts to build partnerships in support of improvements to the bicycle and pedestrian environment.

Conclusion

A “perfect storm” of higher gas prices, strained household budgets, and declining public resources, coupled with emerging mandates to reduce greenhouse gas emissions and deepening concerns about the growing obesity epidemic, could produce a surge in interest in non-motorized travel modes. Indeed, recent media reports suggest that a new bicycling culture has begun to take hold. Surveys also suggest a growing interest nationwide in walkable communities.³⁸ If federal, state, regional, and local lawmakers follow the public’s lead, walking and bicycling could move the United States toward a healthier, more equitable future.

- ⁴⁸ Dan Emerine and Eric Feldman, *Active Living and Social Equity: Creating Healthy Communities for All Residents*, International City/County Management Association, 2005, <http://bookstore.icma.org>.
- ⁴⁹ *Active Living Research* (<http://www.activelivingresearch.org>).
- ⁵⁰ VTPI, "Financing Options," *Online TDM Encyclopedia*, 2008, <http://www.vtpi.org/tdm/tdm119.htm>.
- ⁵¹ Center for Neighborhood Technology, *Housing + Transportation Affordability Index*, 2008, <http://htaindex.cnt.org>.
- ⁵² Congress for the New Urbanism, *Parking Requirements and Affordable Housing*, 2008, <http://www.cnu.org/node/2241>.

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- ¹ J. Pucher and R. Buehler, "Making Cycling Irresistible: Lessons from the Netherlands, Denmark, and Germany," *Transport Reviews* 28 (2008): 495–528.
- ² David Bassett et al., "Walking, Cycling, and Obesity Rates in Europe, North America, and Australia," *Journal of Physical Activity and Health* 5, no. 6 (November 2008): 795–814, <http://www.humankinetics.com/jpah/journalAbout.cfm>.
- ³ Ibid.
- ⁴ J. Pucher, J. Dill, and S. Handy et al., "Infrastructure, Programs, and Policies to Increase Bicycling: An International Review," *Preventative Medicine*. Vol 48, No. 2, February 2010.
- ⁵ U.S. Department of Health and Human Services, "2008 Physical Activity Guidelines for Americans," <http://www.health.gov/PAGuidelines/pdf/paguide.pdf> (accessed March 27, 2009).
- ⁶ Centers for Disease Control and Prevention (CDC), "Prevalence of Regular Physical Activity among Adults – United States, 2001 and 2005," *Morbidity and Mortality Weekly Report* 56 (2007): 1209–12.
- ⁷ J. N. Morris and A. E. Hardman, "Walking to Health," *Sports Medicine* 23 (1997): 306–32.
- ⁸ D. Ogilvie et al., "Interventions to Promote Walking: Systematic Review," *British Medical Journal* 334 (June 2007): 1204.
- ⁹ National Highway Traffic Safety Administration (NHTSA), "Traffic Safety Facts 2007 Data: Pedestrians," 2008, http://www.nhtsa.dot.gov/portal/nhtsa_static_file_downloader.jsp?file=/staticfiles/DOT/NHTSA/NCSA/Content/TSF/2007/810994.pdf (accessed March 27, 2009); and NHTSA, "Traffic Safety Facts 2007 Data: Bicyclists and Other Cyclists," 2008, www.nhtsa.dot.gov/portal/nhtsa_static_file_downloader.jsp?file=/staticfiles/DOT/NHTSA/NCSA/Content/TSF/2007/810986.pdf (accessed March 27, 2009).
- ¹⁰ C. Gidelow et al., "A Systematic Review of the Relationship between Socio-economic Position and Physical Activity," *Health Education Journal* 65 (2007): 338–67; and CDC, "Prevalence of Regular Physical Activity among Adults – United States, 2001 and 2005," *Morbidity and Mortality Weekly Report* 56 (2007): 1209–12.
- ¹¹ L. M. Besser and A. L. Dannenberg, "Walking

Notes

to Transit: Steps to Help Meet Physical Activity Recommendations," *American Journal of Preventive Medicine* 29 (2005): 273–80.

- ¹² J. Pucher and J. L. Renne, "Socioeconomics of Urban Travel: Evidence from the 2001 NHTSA"; and Besser and Dannenberg, "Walking to Transit" (see endnote 11).
- ¹³ N. C. McDonald, "Exploratory Analysis of Children's Travel Patterns," *Transportation Research Record* 1977 (2006): 1–7.
- ¹⁴ NHTSA, "Traffic Safety Facts 2007 Data: Pedestrians" (see endnote 9, citation 1); and NHTSA, "Traffic Safety Facts 2007 Data: Bicyclists and Other Cyclists" (see endnote 9, citation 2).
- ¹⁵ L. Bailey, "Aging Americans: Stranded without Options," 2004, http://www.transact.org/library/reports_html/seniors/aging_exec_summ.pdf (accessed March 27, 2009).
- ¹⁶ NHTSA, "Traffic Safety Facts 2007 Data: Pedestrians" (see endnote 9, citation 1).
- ¹⁷ U.S. Department of Health and Human Services, "2008 Physical Activity Guidelines for Americans" (see endnote 5).
- ¹⁸ J. Pucher and R. Buehler, "Making Cycling Irresistible: Lessons from the Netherlands, Denmark, and Germany," *Transport Reviews* 28 (2008): 495–528. J. Pucher and L. Dijkstra, "Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany," *American Journal of Public Health* 93 (2003): 1509–16.
- ¹⁹ P. L. Jacobsen, "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling," *Injury Prevention* 9 (2003): 205–09.
- ²⁰ Bureau of Transportation Statistics, "Transportation Statistics Annual Report," 2007, http://www.bts.gov/publications/transportation_statistics_annual_report/2007/pdf/entire.pdf (accessed May 7, 2009).
- ²¹ S. Handy and K. Clifton, "Local Shopping as a Strategy for Reducing Automobile Travel," *Transportation* 28 (2001): 317–46.
- ²² Pucher and Dijkstra, "Promoting Safe Walking and Cycling" (see endnote 18).
- ²³ R. Buehler, "Transport Policies, Travel Behavior and Sustainability: A Comparison of Germany and the U.S." 2008, unpublished dissertation.
- ²⁴ N. C. McDonald, "Active Transportation to School: Trends among U.S. Schoolchildren, 1969–2001," *American Journal of Preventive Medicine* 32 (2007): 509–16.
- ²⁵ G. Tal and S. Handy, "Children's Biking for Non-school Purposes: Getting to Soccer Games in Davis, CA," *Transportation Research Record* 2074 (2008): 40–45.
- ²⁶ E. Gaona, "Oxnard Plan Focuses on Bicycle Commuters," *Los Angeles Times*, August 19, 2002, B-3.
- ²⁷ R. L. Knoblauch et al., "The Pedestrian and Bicyclist Highway Safety Problem as It Relates to the Hispanic Population in the United States," 2004, http://safety.fhwa.dot.gov/ped_bike/docs/03p00324/050329.pdf (accessed March 27, 2009).
- ²⁸ S. Handy, "Regional Transportation Planning in the U.S.: An Examination of Changes in Technical Aspects of the Planning Process in Response to Changing Goals," *Transport Policy* 15 (2008): 113–26.
- ²⁹ K. Krizek et al., "Explaining Changes in Walking and Bicycling Behavior:

The Transportation Researcher's Full Employment Act," *Environment and Planning* (forthcoming).

- ³⁰ NHTSA, "Traffic Safety Facts 2007 Data: Pedestrians" (see endnote 9); and NHTSA, "Traffic Safety Facts 2007 Data: Bicyclists and Other Cyclists" (see endnote 9).
- ³¹ S. Handy et al., "The Regional Response to Federal Funding for Bicycle and Pedestrian Projects," 2009, Institute of Transportation Studies, University of California – Davis, working paper.
- ³² See, for example, <http://www.walkinginfo.org>, and <http://www.bicycleinfo.org>.
- ³³ Handy et al., "The Regional Response to Federal Funding" (see endnote 31).
- ³⁴ Ibid.
- ³⁵ Ibid.
- ³⁶ Land use planning powers have not explicitly been taken by the federal government and so are left to states, according to the reserved powers doctrine of the U.S. Constitution; most states have chosen to delegate this power to local governments, with some variation in the degree to which states have chosen to exert influence over local planning.
- ³⁷ See <http://www.activelivingbydesign.org>.
- ³⁸ S. Handy et al., "Is support for traditionally designed communities growing? Evidence from two national surveys," *Journal of the American Planning Association* 74 (2008): 209–21.

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- ¹ Federal Highway Administration (FHWA), "National Household Travel Survey" (NHTS), Online Analysis Tool, 2001, <http://nhts.ornl.gov/tables/ae/TableDesigner.aspx> (accessed March 10, 2009).
- ² Fatality Analysis Reporting System Encyclopedia, n.d., <http://www-fars.nhtsa.dot.gov/Main/index.aspx> (accessed October 7, 2008).
- ³ Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS), <http://www.cdc.gov/injury/wisqars/index.html> (accessed June 16, 2009).
- ⁴ Task Force on Community Preventive Services, "Motor-Vehicle Occupant Injury: Strategies for Increasing Use of Child Safety Seats, Increasing Use of Safety Belts, and Reducing Alcohol-Impaired Driving," *Morbidity and Mortality Weekly Report* 50 (RR07) (2001): 1–13.
- ⁵ U.S. Department of Transportation (DOT), HS 811 017, "A Brief Statistical Summary August 2008 Traffic Safety Facts – Crash Stats: 2007 Traffic Safety Annual Assessment – Highlights."
- ⁶ FHWA, "National Household Travel Survey," Online Analysis Tool, 2001, <http://nhts.ornl.gov/tables/ae/TableDesigner.aspx> (accessed March 11, 2009).
- ⁷ FHWA, "Making the Case for Transportation Safety – Ideas for Decision Makers," FHWA-HEP-08-017, 2008.
- ⁸ H. G. Garrison and C. E. Crump, "Commentary: Race, Ethnicity and Motor Vehicle Crashes," *Annals of Emergency Medicine* 49, no. 2 (2007): 219–20.