

# Active Transportation for America



The Case for Increased Federal Investment in Bicycling and Walking

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**Bikes Belong Coalition** is the U.S. bicycle industry organization dedicated to putting more people on bicycles more often. Bikes Belong works to increase federal bike funding, awards grants to support innovative bike projects, promotes bicycling and its benefits, and backs crucial national efforts such as Safe Routes to School, Bicycle Friendly Communities, and the National Bike Summit. The affiliated Bikes Belong Foundation focuses on improving bicycle safety and enhancing children’s bike programs.

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*Active Transportation for America*



In this era of traffic congestion, high gas prices, climate change, an obesity epidemic, and fiscal constraints, federal transportation funding has reached a critical crossroads.

Decades of car-centered transportation policies have dead-ended in chronic congestion, crippling gas bills, and a highly inefficient transportation system that offers only one answer to most of our mobility needs—the car.

Investment now in a more diverse transportation system—one that provides viable choices to walk and bike, and use public transportation in addition to driving—will lead to a far more efficient use of transportation resources.

Active transportation is the missing piece in our transportation system.

Half of the trips in America can be completed within a 20-minute bike ride, and a quarter of trips are within a 20-minute walk. Yet, the vast majority of these short trips are taken by automobile. Bicycling and walking can also improve public transportation by providing fast and well-planned access to it. Given the availability of safe and convenient infrastructure, more people will choose bicycling or walking for short trips and in combination with public transportation for longer trips. Further, communities conducive to bicycling and walking promote a richer and denser mix of residences and businesses, leading to shorter trip distances, even for those who drive.

But the advantages of bicycling and walking reach beyond transportation alone. Savings in fuel costs, a smaller carbon foot print, and a practical way to achieve recommended levels of



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physical activity are among the benefits that make active transportation an irresistible all-in-one package.

This report quantifies, for the first time, the benefits that America can expect from elevating the priority of bicycling and walking in our nation's transportation system. This case statement for increased investment in bicycling and walking infrastructure evaluates benefits in the areas of transportation, oil dependence, climate change, and public health, and puts dollar estimates to the economic value of these benefits. Benefits from bicycling and walking are quantified for the status quo, and for prospective increases in bicycling and walking under a Modest Scenario and a Substantial Scenario for the future. The analysis concludes that modest increases in bicycling and walking could lead to an annual reduction of 70 billion miles of automobile travel. More substantial increases could lead to the avoidance of 200 billion miles per year (see textbox on page 5).

This volume of decreased auto travel is equivalent to cutting oil dependence and greenhouse gas emissions from passenger vehicles by 3 percent (Modest Scenario) to 8 percent (Substantial Scenario). For gas-electric hybrid cars to match this impact, their share in the U.S. passenger vehicle fleet would need to increase from currently less than 1 percent, to 8 percent under the Modest Scenario, or more than 20 percent under the Substantial Scenario.



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# Active Transportation

## EXECUTIVE SUMMARY



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Bicycling and walking also portend tremendous benefits for Americans' health. Because transportation is a routine in which we all engage, active transportation has great potential to increase our levels of physical activity and help reverse current obesity trends. Modest increases in bicycling and walking for short trips could provide enough exercise for 50 million inactive Americans to meet recommended activity levels, erasing a sizeable chunk of America's activity deficit.

The financial value of improved mobility, fuel savings, greenhouse gas reductions, and health care savings amounts to more than \$10 billion annually under our Modest Scenario. For the Substantial Scenario, benefits would add up to more than \$65 billion every year. These benefits dwarf historic spending for bicycling and walking which was \$453 million per year for 2005–2007 under SAFETEA-LU, and a mere \$4.5 billion cumulative federal investment in these modes since 1992, when bicycling and walking first received documentable federal funding.

This analysis does not include several less easily quantified, but undeniably valuable additional benefits derived from investment in bicycle and pedestrian infrastructure, such as increases in real estate values; economic stimulus from infrastructure construction and businesses profiting from pedestrians and bicyclists; time savings by pedestrians and cyclists, as well as drivers on less congested roads; increased productivity due to improved health, and general gains in quality of life and more livable communities.

For the price of a single mile of a four-lane urban highway, approximately \$50 million, hundreds of miles of bicycle and pedestrian infrastructure can be built, an investment that could complete an entire network of active transportation facilities for a mid-sized city.

Reliable estimates of the costs of investment to achieve a certain mode shift towards bicycling and walking nationwide are not available because tracking of spending and travel data has been insufficient. On a local level, however, there is ample quantitative

evidence from places like Portland, Ore.,<sup>(1)</sup> Minneapolis, Minn.,<sup>(2)</sup> and California,<sup>(3)</sup> as well as from Europe<sup>(4)</sup> and Australia<sup>(5)</sup> that investment in safe and convenient bicycle and pedestrian infrastructure results in increased bicycling and walking. Portland, Ore., for example, has seen steady increases in bicycling to levels now five times higher than in 1990.

The enormous benefits from bicycling and walking justify federal expenditures at least several times greater than the status quo. Investment in bicycle and pedestrian infrastructure is a highly cost-effective means for meeting a sizable portion of our transportation needs, while positively contributing to the solution of important problems—such as oil dependence, climate change, and the obesity epidemic—that have been exacerbated by past transportation policies.

Given the great return on investment from active transportation, fiscally responsible federal transportation policy must strive to maximize the amount that Americans bicycle and walk. Given all the measurable and immeasurable benefits of bicycling and walking for the nation as a whole, as well as the improvement of individual quality of life, it becomes indisputable that Americans deserve the option of active transportation. It is time to give each



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American the choice to bicycle or walk by providing safe and convenient infrastructure that connects the places where we live, work, shop, learn and play.

### Summary of the Benefits from Bicycling and Walking Quantified in this Report

This report provides quantitative assessments and an overall estimation of the monetary value of the benefits of current and future bicycling and walking in the United States. The main premise of these calculations is that short trips of three miles or less, which currently make for about half of all trips taken in the United States, can, to some extent, be shifted from driving to bicycling and walking. This report does not quantify the costs of investment necessary to achieve future increases in bicycling and walking nationwide, but based on ample local experience,<sup>(1-5)</sup> costs would be relatively low compared to the resulting benefits.

Benefits from bicycling and walking are quantified in the areas of transportation, oil dependence, climate change, and public health. Benefits are quantified for the Status Quo (Mode share 9.6 percent), and for prospective increases in bicycling and walking under a Modest Scenario (13 percent) and a Substantial Scenario (25 percent) for the future. The Status Quo is exclusively based on direct benefits from short bicycling and walking trips, while the future scenarios in addition include secondary benefits from increasing the bicycling and walking mode share relative to the Status Quo.

Calculations and assumptions appear in four "Do the Math" textboxes throughout the report and use the same format of the following table. All figures presented on a nationwide basis.

Factor of Interest	Status Quo	Modest Scenario	Substantial Scenario
Avoided driving (billion miles per year)	23	69	199
Fuel savings (billion gallons per year)	1.4	3.8	10.3
CO <sub>2</sub> emission reductions (million tons per year)	12	33	91
Physical activity (average daily minutes per person)	3	5	9
<b>Monetary value of the above benefits (\$ billion per year)</b>	<b>4.1</b>	<b>10.4</b>	<b>65.9</b>



*Active Transportation for America*





In its report “Transportation for Tomorrow,” the National Surface Transportation Policy and Revenue Study Commission called for a “renewed commitment to serving the American people’s need for a system that ensures unparalleled mobility, access, and safety.”<sup>(6)</sup> But the Commission tried to construct the puzzle for achieving this worthy goal with critical pieces missing. Bicycling and walking were overlooked in the otherwise exhaustive report despite their importance to any comprehensive transportation policy that addresses traffic congestion, relief from high gas prices, and the growing challenges of climate change, expanding waistlines and shrinking budgets.

Relatively small investments in bicycling and walking help to address all these transportation related problems. By making bicycling and walking—or “active transportation”—viable options for everyday travel, we can cost-effectively improve our mobility, protect our climate, enhance energy security and improve public health. Active transportation requires no technological breakthroughs—just federal investment at levels befitting its potential contribution to America’s well-being.

That potential is surprisingly substantial. This report broadly quantifies, for the first time, the benefits America can expect if bicycling and walking play more significant roles in our transportation system. It concludes that increases in federal investments to improve the convenience and safety of active transportation represent a highly cost-efficient use of public funds, producing a wide variety of benefits for all Americans.

There could not be a more a critical time for such a shift in federal transportation funding. For the past half-century, America has spent the overwhelming majority of its transportation resources building an extensive road system to facilitate travel by automobile. The resulting transportation system is so one-dimensional that it fails to meet all our mobility needs and creates major inefficiencies, such as an over-reliance on the automobile for even the shortest trips. Just as an ecosystem thrives on the interactions of a diverse web of life and a financial manager seeks a balanced portfolio of investments, transportation systems work best when there are multiple ways—or modes of transportation—to reach our destinations.

The unintended consequences of an automotive ‘monoculture’—such as global climate change, oil dependence, and an unprecedented obesity epidemic—are now far too serious to ignore when developing national transportation policy.

A more diverse transportation system that provides viable choices to walk, bike and use public transportation, in addition to driving, will lead to a far more efficient use of transportation resources. By



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providing people with safe, convenient and affordable options, we enable all Americans to choose the means of transportation that best meets their needs and abilities for any given trip. As a result, more people will choose biking or walking for short trips, and in combination with public transportation for longer trips.

Americans want and need these choices. When asked how they would allocate transportation spending, Americans indicated that they would spend 22 percent of transportation funding on biking and walking infrastructure—about 15 times what is currently spent (see page 18). The time for reevaluating our nation’s transportation system to support people’s needs and desires is now.

Provided there are viable alternatives to driving, Americans are willing to change their travel habits, as the dramatic increases in gas prices in 2008 have shown. Every day, more commuters switch to public transportation, bicycling and walking in places where prior infrastructure investments have made these options safe and convenient. In a 2006 survey, the federal Non-motorized Transportation Pilot Program found that 28 percent of trips in Minneapolis, Minn., involve bicycling or walking.<sup>(23)</sup> Prior investment in urban trails and public transportation created the conditions to make this impressive use of active transportation possible. The Nonmotorized Transportation Pilot Program and high gas prices have combined to build on this success. In the summer of 2008, automatic counts of bicyclists on the Minneapolis Midtown Greenway showed a 30 percent increase over the same months in the previous year.<sup>(2)</sup>

Earlier, in Portland, Ore., the number of bicyclists increased five-fold over 15 years in response to a program which encouraged



### *Do the Math*

#### How the Benefits from Bicycling and Walking are Quantified in this Report

In this report, benefits from bicycling and walking are quantified for the Status Quo, and for prospective increases in bicycling and walking under a Modest Scenario and a Substantial Scenario for the future. The Status Quo is based on trip length and travel mode data from the 2001 National Household Travel Survey.<sup>(7)</sup>

The nationwide mode share of bicycling and walking is currently about 10 percent. The Modest Scenario foresees that making bicycling and walking a higher priority in transportation policy will increase the mode share of bicycling and walking to 13 percent. Such a mode share is clearly below the levels of larger U.S. metropolitan areas with public transportation.<sup>(7)</sup> The Substantial Scenario assumes that bicycling and walking would receive substantially higher priority, eventually leading to a combined mode share of 25 percent. This mode share figure is clearly below the bicycle and pedestrian mode shares in several European countries, and comparable to those of select American cities. The Status Quo is exclusively based on direct benefits from short bicycling and walking trips, while the future scenarios also include secondary benefits from increasing bicycling and walking mode share relative to the Status Quo. The Modest Scenario also utilizes more conservative assumptions than the Substantial Scenario. For example, the Modest Scenario is based on the price of one gallon of gasoline of \$3, whereas the Substantial Scenario assumes this cost to be \$4.

The purpose of the scenario calculations is to demonstrate the benefits that would result from the mode share figures they are based on. As achieving these mode shares mainly depends on policy priorities, the scenarios do not lay out a timeline by which these levels of bicycling and walking would be reached.

Quantifications are on a per year basis nationwide. Calculations and assumptions appear in four “Do the Math” textboxes throughout the report and use the same format of the following table.

Factor of Interest	Status Quo	Modest Scenario	Substantial Scenario
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A comprehensive assessment of all the benefits of bicycling and walking would be beyond the scope of this analysis. The following table shows which beneficial factors are considered in the calculations, and which ones are not quantified in this report:

Factor of Interest	Included	Not included
Shifting automobile trips to bicycling and walking	Trips of 3 miles or less	Trips of more than 3 miles
Shifting automobile trips to public transportation	Trips of 1 mile to 15 miles	Trips of more than 15 miles
Reduced trip distances due to induced mixed use	Trips of 1 mile to 15 miles	Trips of more than 15 miles
Congestion relief	Resulting fuel savings	Resulting time savings
Fuel savings	Based on current fleet average fuel economy of 20 mpg	Future improvements of fuel economy
Vehicle emissions	CO <sub>2</sub> emissions (climate)	Other air emissions, such as fine particles, nitrogen oxides and other smog forming pollutants
Health benefits	Benefits from increased physical activity	Increased safety and avoided death and injury Benefits from reduced air pollution
Economic benefits	Monetary value of the above factors (see below)	Economic stimulus from construction Boost for local businesses Increase in real estate values
Monetary valuation	Fuel cost savings, excluding 15% tax  Future market based CO <sub>2</sub> reduction costs Health care savings among insufficiently active	Total costs of driving, including depreciation, insurance, and maintenance Reduced need for road capacity increase and maintenance Time savings from congestion relief Social costs of CO <sub>2</sub> beyond market price Health benefits among the sufficiently active, and beyond costs of health care (e.g., quality of life)

bicycling, and tripled the mileage of local trails and bikeways.<sup>(1)</sup> To choose the transportation mode that is most efficient for them, Americans need an attractive menu of transportation options.

Bicycling and walking should and will play a bigger role if we make it a priority to build active transportation systems, functional networks of bicycle lanes and boulevards, bicycle paths, shared-use trails and sidewalks, connecting the places where substantial numbers of people live, work, shop and play.

Half of the trips in America can be completed within a 20-minute bike ride, and a quarter of trips are within a 20-minute walk. Yet, the vast majority of these short trips are taken by automobile.<sup>(7)</sup> Active transportation offers a viable means to reduce driving—and associated congestion, oil dependence, air pollution, and greenhouse gas emissions—especially in synergy with public transportation and policies to encourage mixed-use development patterns. Bicycling and walking also offer a convenient and cost-effective way to integrate physical activity into daily routines, thereby helping Americans control their weight and improve their health.

For decades, governments have neglected the need for bicycle and pedestrian infrastructure. Further, the volume and speed of motorized traffic in many places has reached levels that make it difficult and dangerous to ride a bicycle or walk. But in those communities that provide access to convenient and safe facilities for bicycling and walking, people use them by the thousands.<sup>(1, 2, 8)</sup>

This report features numerous examples of how communities all over the country have, or plan to accommodate bicyclists and pedestrians. Portland, Ore., and Minneapolis, Minn., are referred to most often because in contrast to other places, these two cities have undertaken exceptional efforts to document their progress in the promotion of bicycling and walking.

This report is a call to action. The choice is clear. The time has come for a truly multi-modal transportation policy; a policy that recognizes that driving is not always the quickest, cheapest, cleanest, healthiest—or only—way to get from Point A to Point B. By investing in transportation systems that also offer the options of bicycling, walking and public transportation, we can meet our mobility needs while also reducing our oil dependence, greenhouse gas emissions and obesity rates.

But just as importantly, transportation systems should enhance our quality of life. There is great joy in a child learning to ride a bicycle or the independence of senior citizens taking a walk to run errands and see friends. We cannot lose sight of the fact that transportation should be about people and the places they live, not just the movement of vehicles.



## Bicycle and Pedestrian Infrastructure Examples

### Pedestrian Infrastructure

- Sidewalks and walkways
- Marked crosswalks and enhancements
- Street furniture/walking environment
- Pedestrian overpasses/underpasses
- Curb ramps
- Transit stop treatments
- Roadway lighting improvements

### Bicycling Infrastructure

- **On-Street Facilities**
  - Bike lanes
  - “Bicycle boulevards”
  - Wide outside lanes
  - Signed shared roadways
  - Paved shoulders
- **Off-Street Facilities**
  - Cycle-tracks, separate bike paths
  - Shared-use paths; trails
- **Signs and Markings**
  - Share lane markings, “Sharrows”
  - Advanced stop lines, “Bike Boxes”
  - Bicycle signal heads
  - Colored bike lanes
  - Bike route signs
- **Bicycle Parking**
  - Bike racks, bicycle lockers
  - Long term parking, “Bike stations”

### Bike Sharing Programs

### Intersection Designs

#### “Complete Streets”

#### Traffic Calming

- Partial closures, “Bicycle boulevards”
- Limit residential zone through-traffic
- Raised cross-walks
- Curb extensions

Source: Pedestrian and Bicycle Information Center

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*Active Transportation for America*



## THE MISSING PIECE IN OUR TRANSPORTATION SYSTEM

The average American motorist now drives about 15,000 miles a year. In recent decades, total miles driven (referred to as Vehicle Miles Traveled, or VMT, by planners) have increased three times faster than population growth, putting a severe strain on our roads.

As a consequence, the average traveler now wastes the equivalent of a full work week stuck in traffic every year.<sup>(9)</sup> During “Rush Hour” many larger cities suffer from congestion lasting several hours, with no one able to “rush” anywhere.

Improving current highway conditions and performance measures has been estimated to require annual investments exceeding \$200 billion. Current fuel tax revenue projections, however, suggest that the amount available will only be half of that.<sup>(6)</sup> It is now conventional wisdom that the dominant approach to enhancing mobility in post-war America—heavy investment in road infrastructure with little regard to alternatives—will only make congestion worse.

To significantly reduce traffic congestion during a period of fiscal constraint, our transportation system must meet two basic challenges: efficiently connecting people with their destinations and doing so in a cost-effective manner. One major strategy to

*Cleveland, Ohio*, seeks to develop an active transportation system that would ensure that all residents live within a 10-minute bike ride of a trail connecting to major employment and activity centers. The desired utilitarian system of spines and loops closely resembles urban road networks that were designed with similar mobility objectives in mind. A concentrated federal investment could strategically fill gaps in Cleveland’s system, linking hundreds of thousands of residences to jobs, providing the choice of safe and convenient travel on foot or by bicycle.



accomplish this is to encourage significant “mode shift;” reducing miles driven by shifting some automobile trips to bicycling, walking and public transportation.

Investments to encourage increased bicycling and walking can reduce miles driven in three ways:

- Because a majority of car trips are short, bicycling and walking can often be as fast and convenient as driving.
- More car trips can be shifted to public transportation when well-integrated networks of bicycle and pedestrian infrastructure provide convenient access to bus stops and rail stations.
- Investments to make communities conducive to bicycling and walking promote a richer and denser mix of residences, businesses and amenities, leading to shorter trip-distances even for those who drive.

### Over-Reliance on Driving is Inefficient

Since 1956 and the birth of the Interstate Highway System, automobiles have dominated our surface transportation system. Federal funding has overwhelmingly focused on accommodating cars and trucks. Road construction not only strived to keep up with existing traffic volumes, but also spurred new demand by creating an ever-increasing reliance on the car, most obvious in the nationwide development of sprawling suburbs.

Transportation has become a one-dimensional affair. Half of all trips we take are only three miles or less—yet we drive almost everywhere we need to go, even to the closest destinations.<sup>(7)</sup> Rates of car ownership in the United States are the highest in the world, and the number of cars per household now exceeds the number of drivers.<sup>(7)</sup> For most Americans, the predominance of the car and the lack of adequate infrastructure for bicycling and walking have basically eliminated all transportation options except for one—driving.



As with any monopolized market sector, our transportation system now offers a single brand of mobility developed without incentives to provide the best possible product, and without competition that would assure the best price. Compared to a truly multi-modal transportation system, our current system produces less mobility at an inflated price. The inefficiencies of this car-centered monopoly become more apparent every day: congested roads that cost us precious time, gasoline prices that shrink our disposable income, road infrastructure projects that place massive burdens on state and federal budgets, and an over-dependence on oil that leaves our economy at the mercy of the world oil market and its suppliers.

### Choices Will Make Our Transportation System More Efficient

Only a multi-modal transportation system allows an optimal use of limited resources, such as fuel, land, time, and money in the first place; and public health and the environment more broadly.

Providing Americans with transportation choices will allow us to select the transportation mode best suited for our needs: whether it is the fastest, the easiest, the cleanest, or the one that satisfies multiple needs at the lowest overall cost.

In all aspects of our lives, Americans expect a variety of options from which to choose. Consumer preference is a powerful tool to increase efficiency in any free market economy, and yet our transportation system makes no use of it, lacking viable choices.

For some trips, cars will always be the best option. However, keeping our transportation system efficient requires that drivers have adequate alternatives for those trips for which they would prefer to ride their bicycle or walk, and avoid high gas prices and endless congestion.

Because the downtown area of *Madison, Wis.*, lies on a narrow isthmus between two lakes, traffic congestion is a concern despite high rates of bicycling, walking and transit use. Going forward, Madison planners see further investment in bicycling and walking as the only practical congestion solution because there is not enough available land to accommodate other modes of travel.

With the availability of the necessary safe and convenient infrastructure, many drivers will shift some of their trips to bicycling and walking. By doing so they will not only improve the efficiency of their own travel experience, but America's transportation system overall.

### Universal Access to Mobility

Questions associated with mobility and transportation choice are not limited to issues of economic efficiency. We must also acknowledge that for many Americans driving is not an option.

More than 60 million Americans are not allowed to drive because they are too young.<sup>(10)</sup> Another 30 million adults are not licensed to drive for a variety of reasons including economics, age, disability and choice. Eight million Americans above the age of 60 do not have a driver's license,<sup>(11)</sup> and many more licensed drivers choose not to drive.

A surprising number of families, especially in urban areas, do not have access to an automobile. In Washington, D.C., 37 percent of households do not own an automobile.

Access to mobility is crucial to thrive economically, socially and physically. The transportation needs of these large segments of the American population need to be met with a mix of bicycling, walking and public transportation options. Transportation in America must be accessible for all Americans. Bicycling and walking are crucial in providing universal mobility.



## Bicycling and Walking Reduce Driving and Congestion

There are three different mechanisms through which bicycling and walking reduce miles driven. First, bicycling and walking can directly replace cars on short trips. Second, bicycling and walking increase the convenience of public transportation and, therefore, increase ridership. Lastly, public infrastructure investment that increases the numbers of bicyclists and pedestrians also stimulates local forms of compact, mixed-use development which results in destinations that are closer to each other, thereby shortening travel distances for all modes.

Currently, short bicycling and walking trips account for 23 billion miles traveled every year. Modest increases in bicycling and walking mode share for trips of three miles or less could double that figure, and more substantial increases could yield four times more miles bicycled or walked. Taking into account secondary effects from synergies with public transportation and mixed-use development, modest increases in active transportation could avoid 69 billion miles driven, and substantial increases could lead to 199 billion miles of avoided driving (See “Do the Math 1/4,” page 14).

Congestion is a direct result when increases in driving exceed the capacity of road infrastructure. Reducing miles driven therefore helps reduce congestion, in particular when driving is reduced during peak hours. Avoiding miles driven can be much more cost-effective than trying to reduce congestion by expanding highway infrastructure capacity to accommodate increased use.

## Shifting Short Trips to Bicycling and Walking

According to the 2001 National Household Travel Survey, 48 percent of all trips were three miles or less and 24 percent were one mile or less.<sup>(7)</sup>

*Hartford, Conn.,* aims to cut 17 million vehicle miles traveled annually by investing in their trail system and on-road bicycle and pedestrian facilities. Even assuming that the system were only used 120 days per year, this reduction in driving could be achieved by attracting 10,000 bicycle commuters and shifting one percent of auto trips under five miles to bicycling or walking. These figures are similar to the mode share in comparable cold-winter cities that have built solid bicycling networks, such as Boulder, Colo., Minneapolis, Minn., and Madison, Wis.



Riding a bicycle for three miles takes less than 20 minutes—an effort feasible for most ages and fitness levels. Nationwide, 29 percent of commuters travel less than five miles each way to work—a distance comfortably ridden in about half an hour—or about the same length of time as the average American commute.<sup>(12)</sup> Depending on traffic conditions and the available infrastructure for bicycling, travel times of drivers and bicyclists are comparable for surprisingly long trip distances. Parking in urban areas can put drivers at a time consuming and often costly disadvantage. Even walking can be surprisingly competitive for trips up to one mile, depending on availability of parking and the quality of pedestrian infrastructure.

During rush hour peaks, about half the drivers are commuters. In the vicinity of schools, parents dropping their kids off and picking them up clog neighborhood streets all around the nation. Local increases of 30 percent in morning traffic are typical during the school year.<sup>(13)</sup> The routine nature and typically short distance of trips to work or school makes them ideal for shifting to bicycling and walking.<sup>(9)</sup>

Modest shifts in short trips to bicycling and walking could reduce miles driven by 49 billion, and a more substantial shift could avoid more than 100 billion miles driven.

## Synergies between Bicycling, Walking and Public Transportation

Public transportation plays an important role in mitigating congestion because of its capacity to move large numbers of people swiftly over expansive distances, without requiring much land.<sup>(9)</sup> Transportation experts agree that public transportation will play an expanded role in our transportation system in the future.<sup>(6, 9, 14)</sup> However, the benefits of public transportation related to reducing congestion, fuel consumption, and highway infrastructure costs diminish when occupancy rates of trains and buses are low. Increasing total ridership and occupancy rates must therefore be a top priority to maximize return on existing and future infrastructure investments.

### *Do the Math (1/4)*

#### **Current and Potential Miles Driven Avoided by Bicycling and Walking**

Currently, only 31 percent of all trips of one mile or less are made by bicycling or walking, while two-thirds are made by car. Ninety percent of all trips between one and three miles are taken by car. These short trips account for 23 billion miles of active transportation every year.<sup>(7)</sup>

Increasing the bicycle and pedestrian share of trips of one mile or less from currently 31 percent to 40 percent under a Modest Scenario, and to 70 percent under a Substantial scenario would result in 28 billion or 49 billion miles driven avoided, respectively.

Increasing bicycle and pedestrian share of trips of one to three miles from the current level of 4 percent, to 10 percent (Modest) or 25 percent (Substantial) would avoid 21 billion or 52 billion miles of driving, respectively.

The analysis is conservatively limited to the effect of shifting short trips of three miles or less, ignoring the fact that experienced bicyclists routinely take trips of five miles or more.

Estimates of driving avoided due to the synergy between active transportation and public transportation are based on two key assumptions. First, the share of public transportation for trips of one to 15 miles in length is assumed to increase to 5 percent (Modest) or 15 percent (Substantial), from the current level of less than 2 percent. Second, improved transit access by bicycling and walking as outlined on page 15 will increase public transport ridership by 10 percent (Modest) to 30 percent (Substantial).

Based on these assumptions, the synergy between bicycling and walking and public transportation results in seven billion (Modest) or 66 billion (Substantial) miles driven avoided.

Assuming that increased density and more diverse land use patterns induced by bicycling and walking infrastructure will reduce the length of car trips of 15 miles or less by a mere 1 percent (Modest) to 3 percent (Substantial), the resulting driven miles avoided would amount to 21 billion and over 50 billion, respectively.

#### **Underlying Assumptions for Miles Driven Avoided Calculation**

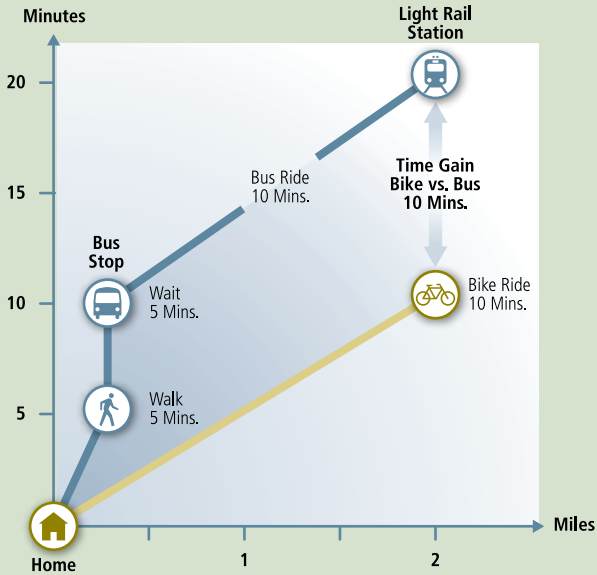
Factor	Status Quo	Modest Scenario	Substantial Scenario
Bicycling and Walking Mode Share			
Trips < 1 mile	31%	40%	70%
Trips 1–3 miles	4%	10%	25%
Public transportation Mode Share			
Trips 1–15 miles	2%	5%	15%
% increase because of bicycling and walking	unknown	10%	30%
Trip length reduction through induced mixed use (1–15 miles)	unknown	1%	3%

#### **Miles Driven Avoided Due to Bicycling and Walking (billions)**

Factor	Status Quo	Modest Scenario	Substantial Scenario
Trips < 1 mile	15	28	49
Trips 1–3 miles	8	21	52
Increase of public transportation ridership because of bicycling and walking	unknown	7	66
Trip length reduction through induced mixed use (1–15 miles)	unknown	13	32
<b>Totals</b>	<b>23</b>	<b>69</b>	<b>199</b>



## Bike vs. Bus: Comparative Times for Reaching a Transit Station



To be efficient, public transportation requires effective bicycle and pedestrian networks. Bicycling and walking provide the most convenient ways to access public transportation. Ninety percent of all public transportation trips start with walking. Seventy-five percent of people who walk to a bus or train walk for less than nine minutes, and 42 percent walk for less than four minutes.<sup>(7)</sup> If improvements for pedestrians in areas surrounding bus stops and train stations could encourage people to increase the time they are willing to walk by as little as two minutes, public transportation could serve twice as many people. Improvements that will make the walk to public transportation more pleasant and safe will also draw more people to public transportation.

**“No matter how technologically advanced, transit systems do not fulfill their roles if they are not readily accessible.”**

U.S. DOT Volpe National Transportation Systems Center

Bicycling in particular has great potential to allow more people to access public transportation conveniently. Accessing public transportation by bicycle can shorten travel times significantly. Because bicyclists travel about four times as fast as pedestrians, convenient access by bicycle can increase the geographic area served by one transit station 16-fold (see figure on page 16).



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These benefits are mutual: Public transportation is also ideal for bicyclists and pedestrians to extend the range of their trips.

Synergies between bicycling and walking, and public transportation could reduce miles driven by seven (Modest Scenario) to 66 billion (Substantial Scenario) annually.

Residents of the Edgewood and Eckington neighborhoods in *Washington, D.C.*, walk across an active freight rail line to access the Metro rail system. A new pedestrian bridge and completion of the Metropolitan Branch Rail-Trail will provide a safe and convenient direct route to the Rhode Island Avenue station.



© HEATHER DEUTSCH

## Bicycle and Pedestrian Infrastructure Reduce Travel Distances by Encouraging a Richer Mix of Development

Investments into bicycling and pedestrian infrastructure also lead to reduced driving by stimulating a richer more diverse type of development. Often referred to as “smart growth,” this pattern



DC Metro is easily accessible downtown, where most stations are within a 10-minute walk (light green circles). In the suburbs, convenient access by bicycle would tremendously increase service area (dark green area within 10 minutes bicycling distance of a metro station).

of compact, mixed-use development places destinations such as homes, workplaces, shopping and recreation closer together, while providing easy access by public transportation and infrastructure for bicycling and walking.

The availability of public transportation has been shown to increase the mix of residences, businesses and other amenities in communities.<sup>(15, 16)</sup> Similar effects have been described for bicycling and walking facilities, such as trails.<sup>(16-19)</sup>

Bicyclists and pedestrians are an important market segment for small, local business. Their tendency to travel for shorter distances, buy less at once and buy more frequently gives smaller businesses an edge over suburban mega-stores that cater to the motorized customer. The availability of local businesses can significantly reduce the amount people drive.

In such communities, a bicyclist has the choice of riding two miles to a local merchant instead of being required to drive to a mall several miles away to make the same purchases. In that case, two miles of bicycling may replace 10 miles of driving. Similarly, when pedestrians can safely walk the most direct route to their destination,

they can replace car trips that are actually of longer distance. Just as importantly, the compact nature of mixed-use neighborhoods also reduces trip distances for those residents who choose to drive, because they equally profit from the opportunities to work or run errands closer by.<sup>(20)</sup>

With the choice of businesses in *O'Fallon, Mo.*, it is possible that a resident can find everything they need within town. A multi-use trail system could thus create a self-contained community, achieving a degree of economic self-sufficiency. An active transportation web is key to the success of the city's campaign to "Shop, Dine, Stay and Play" in O'Fallon.

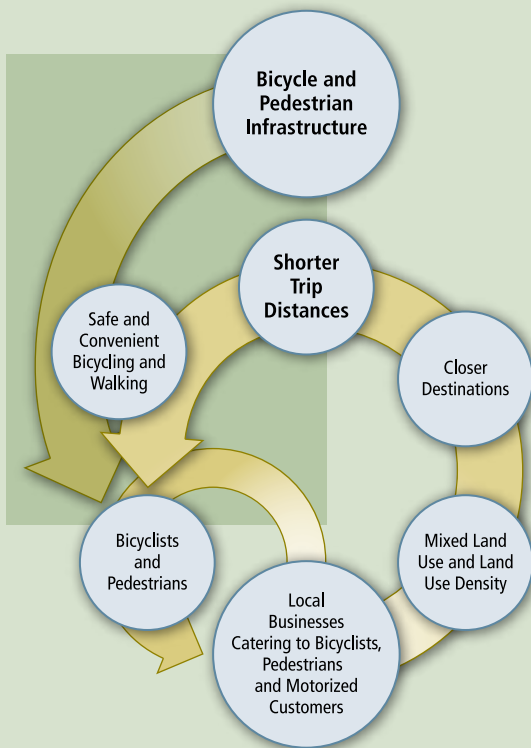
Americans living in more compact, mixed-use communities typically drive about 20 to 40 percent less than those in highly car dependent suburbs.<sup>(16, 21, 22)</sup> Assuming that increasingly mixed land use patterns induced by bicycle and pedestrian infrastructure will reduce the length of car trips of 15 miles or less by as little as 1 (Modest Scenario) to 3 percent (Substantial Scenario), the resulting driven miles avoided would amount to 13 to more than 30 billion, respectively.

## What It Takes to Shift Automobile Trips to Bicycling and Walking

Many factors influence mode choices, and accordingly, levels of bicycling and walking vary greatly between locations. Some factors, such as weather or terrain, cannot be changed, but others, such as the availability of infrastructure and the safety of bicyclists and pedestrians are direct results of transportation policies and funding priorities.



## How Bicycle and Pedestrian Infrastructure Leads to Shorter Trip Distances



Investments in **Bicycle and Pedestrian Infrastructure** provide **Bicyclists and Pedestrians** with a safe and convenient way to run errands. Their preference to shop locally offers an opportunity for small, **Local Businesses**. This initial economic stimulus attracts other customers, more businesses, and eventually residents to move to nearby. In the long run, a more **Mixed and Dense Land Use** pattern develops. Local, **Closer Destinations** reduce trip distances for all, including those who drive. The **Shorter Trip Distances** make **Bicycling and Walking** even more convenient, completing a positive feedback loop.

In several cities that have made the accommodation of bicycling and walking a priority of their planning process, those modes of transportation have become popular choices for many travelers.

In the 1990 Census, only 1.2 percent of all commuters in Portland, Ore., reported using their bike to get to work. Since then, the city invested about \$3.50 per resident annually on bicycling infrastructure and related programs. By 2007, 6 percent of commuters chose to bicycle to work; and as many as 12 percent do so in the downtown area.<sup>(1)</sup> Over 15 years, bicycle trips taken in Portland have increased five-fold.

In Minneapolis, Minn., 20 percent of all trips are taken by bicycling or walking alone, and another 8 percent involve transit.<sup>(23)</sup> Between the summer months of 2007 and 2008, automatic counters

recorded an increase of more than 30 percent in bicyclists riding on the Midtown Greenway.<sup>(2)</sup>

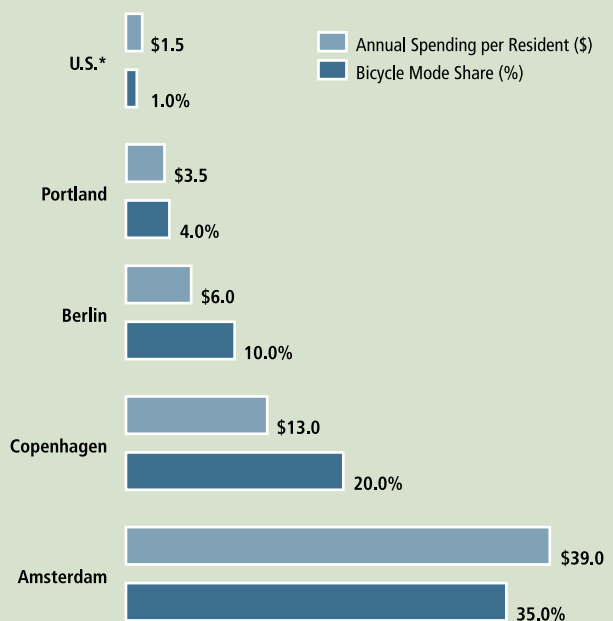
In Boulder, Colo., 14 percent of all trips are taken by bicycle, and, thanks to the federally funded Safe Routes to School Program, 75 percent of all children get to school by bicycling or walking.<sup>(24)</sup>

Two thirds of the residents of New York City, and half of those of Washington, D.C., do not use their car to commute.<sup>(10)</sup> This is only possible because in their cities, bicycling, walking and public transportation provide real alternatives to driving.

Traditionally, investment in bicycling and walking has been much higher in Europe, than in the United States. Every European city that has achieved high bicycling mode share has invested significantly into bicycle infrastructure, and cities with low bicycling rates have not.<sup>(25)</sup> In Dutch cities such as Groningen, where almost 40 percent of all trips are taken by bicycle, investment in bicycling alone is around \$16 per resident annually since at least 20 years.<sup>(25)</sup>

The recent success of the “Velib” bike-sharing program in Paris shows that even large cities suffering from notorious traffic problems hostile to bicycling can change. Within one year of the bike-share program’s inception, bicycle use in Paris increased by 24 percent.<sup>(26)</sup>

## Bicycle Funding and Mode Share



Comparison of annual per capita spending for bicycling and bicycle mode share between the U.S., Portland, Ore., and three European cities.<sup>(1, 25)</sup>

\*Spending data for the U.S. are for bicycling and walking combined.<sup>(74)</sup>

### Bicycle and Pedestrian Infrastructure is Inexpensive

Compared to increasing road capacity, investing in bicycling and walking infrastructure presents a highly cost-effective contribution to congestion mitigation. A single mile of a four-lane urban highway costs at least \$20 to \$80 million, but alleviating congestion

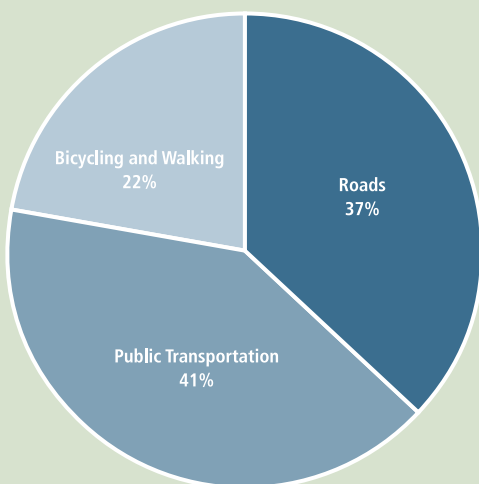


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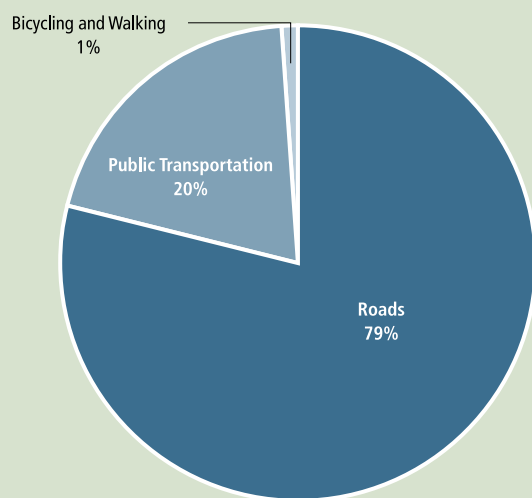
#### How Americans Would Allocate Transportation Funding

Eighty-one percent support "allocation of tax dollars toward the expansion and improvement of public transportation, sidewalks, and bike paths in your community." (Margin of error ± 3 percent)

#### How Respondents Would Allocate Transportation Funding



#### How Transportation Funding is Currently Allocated



National transportation poll commissioned by Transportation for America, designed by Collective Strength, and fielded by Harris Interactive from December 1–19, 2007.

in the worst bottlenecks of urban freeway systems often costs several times as much.<sup>(27)</sup> Bicycle and pedestrian infrastructure costs much less on a per traveler basis. Over the width of one traffic lane, bicycling and walking can move five to 10 times more people than driving,<sup>(28)</sup> and the costs of pedestrian and bicycle facilities range anywhere from a few thousand dollars per mile to rarely more than \$1 million, with great variability between types of infrastructure and local circumstances.<sup>(1, 29)</sup>

Comparing parking costs and space requirements provide the same picture. Bicycles use about 10 times less space, and costs can be anywhere in between 30 and 300 times lower than for car parking.<sup>(30)</sup>

### Bottom Line—Investment in Active Transportation Choices Will Move America!

Our car-focused transportation system is reaching its physical and financial limitations. Ever-expanding road networks have stimulated demand faster than they have increased capacity, creating congestion while leaving government treasuries empty.

It is time to give Americans back control over their mobility. If given a choice, Americans know which transportation mode is best suited for each trip they want to take. Millions will choose to walk or ride a bicycle if safe and convenient infrastructure is made available. Being able to choose the best-suited travel mode for each trip will introduce an unprecedented force for efficiency into our transportation system, saving our citizens billions of dollars in fuel costs and millions of hours of wasted time in congestion. In addition, investments in bicycle and pedestrian infrastructure will translate into direct savings for the federal highway trust fund by reducing the need for road capacity expansion projects, providing resources needed to repair and maintain our existing roads.

[ NOTES FROM THE FIELD ]

## *Eugene-Springfield, Ore.—Planning for Universal Mobility*

As a growing community, the Eugene-Springfield Metro Area recognizes it simply cannot build its way out of congestion through major road-capacity increasing projects. Community leaders and residents alike recognize that balancing transportation priorities will be critical to meet increasing mobility needs and offer real transportation choices to their community. Under business as usual, the metro area is forecasted to experience a 277 percent increase in congested miles of travel. The Eugene-Springfield Metro Area is one of many areas where strategic federal investments in active transportation would cost-effectively enhance mobility and mitigate congestion by shifting automobile trips to bicycling and walking. Such investments would also enable the community to offer universal mobility to all its residents, including 9.3 percent of urban households that do not own a vehicle.

The Eugene-Springfield Metro Area has a strong record of supporting active transportation with infrastructure and programs designed to encourage bicycling and walking. Its greater than national average share of bicycling, walking and transit trips reflects this long standing support. Approximately 4 percent of work trips are taken by bicycle (5.5 percent in Eugene), 4 percent by walking, and another 5 percent on transit. Focused investments in active transportation will further decrease the number of drive alone trips.

The region has developed coordinated plans to catalyze the growth of active transportation through strategic investments in infrastructure, programs and new planning tools. Inspiration for what might be possible with dedicated funding can be found in the many bicycle and pedestrian facilities in the Eugene-Springfield Metro Area. These include more than 40 miles of off-street shared use paths, five bicycle and pedestrian bridges spanning the Willamette River, and hundreds of miles of bicycle lanes and bicycle routes. High-priority bicycle and pedestrian projects include regionally significant shared-use path projects, additional bicycle and pedestrian bridges, and a bicycle boulevard system.



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*“Eugene has long been known for its commitment to active transportation modes such as bicycling and walking. Today with climate change, childhood obesity and high fuel prices, this commitment is more important than ever. Using wise investment in programs and facilities designed to encourage active transportation, our community will continue to provide national leadership in combating congestion, reducing the environmental impacts of motorized transportation, and in promoting healthy, safe and economical alternatives to driving.”*

—Eugene Mayor Kitty Piercy



## Active Transportation for America



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As gasoline prices topped \$4 per gallon in 2008 for the first time, our nation became painfully aware of the problems associated with our oil dependence. Americans' private cars and trucks burn 40 percent of the oil consumed in the United States, equivalent to 10 percent of world demand. The economic, national security and environmental implications of our oil dependence are enormous.

Among the top concerns, each gallon of gas burned produces 19.4 pounds of carbon dioxide (CO<sub>2</sub>), nearly a pound per mile driven. This heat-trapping gas is forming a blanket around the earth causing global climate change, which leads to extreme weather events, loss of harvests, spread of disease and numerous other problems. Automobiles are responsible for about 20 percent of the United States' CO<sub>2</sub> emissions and are the fastest growing major source of greenhouse gases.

There is no silver bullet that will make us independent from oil or neatly resolve the problem of climate change. However, every mile not driven reduces both oil dependence and greenhouse gas emissions. Reducing emissions enough to mitigate climate change

will require a diverse portfolio of measures, with each contributing a fraction of the overall reduction. As part of an integrated approach to provide alternatives to driving, bicycling and walking can help our nation address the twin challenges of oil dependence and climate change.

New transportation priorities are necessary to resolve the problems that past transportation policies helped create.

Since 1970, miles driven have tripled to more than three trillion per year, while over the same time period population only grew by 50 percent. Over the past decade, miles driven still grew twice as fast as the population (see figure on page 21). As a result, fuel savings and CO<sub>2</sub> reductions from increased fuel economy have been swamped by these dramatic increases in driving. This upward trend in driving is projected to continue in coming decades unless we chart a new direction in transportation policy focused on managing miles driven by providing a rich mix of bicycling, walking and public transportation options, coupled with smarter development patterns.<sup>(31)</sup>

### Determinants of CO<sub>2</sub> Emissions and Fuel Demand

$$\text{CO}_2 \text{ Emissions} = \text{Miles Driven} \times 1/\text{mpg} \times \text{CO}_2/\text{gallon}$$

$$\text{Fuel Demand} = \text{Miles Driven} \times 1/\text{mpg}$$

(mpg = vehicle fuel economy in miles per gallon)

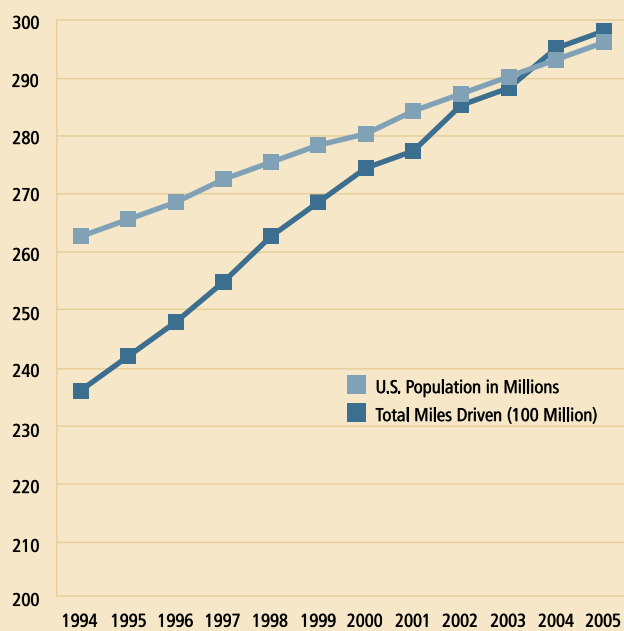
Reducing CO<sub>2</sub> emissions and fuel demand from automobiles requires simultaneously addressing the efficiency of vehicles, the life-cycle carbon content of fuel, and the total miles driven.

There are two main criteria to evaluate CO<sub>2</sub> reduction measures: quantity of reductions achieved, and cost per ton of CO<sub>2</sub> avoided.

### How Much Fuel and CO<sub>2</sub> Savings Can Bicycling and Walking Achieve?

Annual greenhouse gas emissions in the United States are projected to rise from 7.2 billion tons in 2005 to 9.7 billion tons in 2030.<sup>(32)</sup> Reducing emissions to 80 percent below 1990 levels, as scientists suggest is necessary, would require reducing annual emissions to 1.2 billion tons per year. Annually, personal transportation accounts for approximately 136 billion gallons of gasoline,<sup>(33)</sup> or 1.2 billion tons of CO<sub>2</sub>.

#### U.S. Population Growth and Increase in Miles Driven



In the past years, total miles driven increased at a much faster rate than the U.S. population (1.1 percent vs. 2.2 percent per year).<sup>(10, 56)</sup>



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The following illustrates fuel and CO<sub>2</sub> savings from reduced miles driven due to bicycling and walking, based on the mechanisms outlined previously, such as directly replacing cars on short trips; inducing increase in public transportation ridership; and shortening trip distances by spurring mixed-use development.

#### Fuel and CO<sub>2</sub> savings from shifting short car trips to bicycling and walking

The total savings that would result from shifting more short trips to bicycling or walking could amount to 2.4 billion gallons of fuel for the Modest Scenario, to five billion for the Substantial Scenario, and between 21 and 45 million tons of CO<sub>2</sub> a year, respectively.

#### Fuel and CO<sub>2</sub> savings from improving public transportation by bicycling and walking

Currently, U.S. public transportation is estimated to reduce CO<sub>2</sub> emissions by 3.9 million tons per year by displacing personal vehicle travel.<sup>(37)</sup> These figures are based on current performance, with 25 percent higher fuel efficiency than private vehicles, and a mode share of 2 percent of all trips. The total savings that would result from improving public transportation by bicycling or walking would amount to modest 100 million to substantial 1.6 billion gallons of fuel, and one million to 14 million tons of CO<sub>2</sub> a year.

#### Fuel and CO<sub>2</sub> savings from richer mix of residences, businesses, and amenities induced by the availability of pedestrian and bicycle infrastructure

The potential for CO<sub>2</sub> reductions from increasing the compactness of new development has been estimated to be 78 million tons annually.<sup>(21)</sup> Nationwide, the CO<sub>2</sub> savings from the density in development around public transportation have been estimated to be 30 million tons.<sup>(15)</sup>



## Do the Math (2/4)

### Current and Potential Fuel Savings and CO<sub>2</sub> Emission Reductions from Bicycling and Walking

Calculations are based on miles driven avoided from "Do the Math 1/4." Each mile driven is equivalent to 0.05 gallons and one pound of CO<sub>2</sub>, based on the approximate U.S. fleet average fuel economy of 20 miles per gallon.<sup>(34-36)</sup>

To estimate the fuel savings and CO<sub>2</sub> reduction resulting from the synergy between bicycling and walking and public transportation, we assume that future public transportation systems will use 30 percent (Modest Scenario) to 50 percent (Substantial Scenario) less fuel per passenger than cars—a range between current efficiency of U.S. public transportation (25 percent more efficient than cars)<sup>(37)</sup> and what some more efficient public transportation systems currently achieve (e.g., in Germany, 80 percent).

Assuming minimal reductions in travel distances of 1 to 3 percent due to increased mix of residences, businesses, and amenities induced by the availability of pedestrian and bicycle infrastructure results in 0.7 and 1.6 billion gallons of fuel, or 6 to 14 millions tons of CO<sub>2</sub> saved, for the Modest and Substantial Scenario, respectively.

According to data used by the Texas Transportation Institute to assess nationwide congestion, for every 1000 miles of driving avoided by public transportation, approximately 9 gallons of fuel and 0.08 tons of CO<sub>2</sub> were saved in 2005.<sup>(9)</sup> Assuming a similar benefit from miles driven avoided by bicycling and walking, the congestion relief from bicycling and walking would result in 0.6 to 2 billion gallons of fuel saved, and 5 to 18 million tons of CO<sub>2</sub> reductions.



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#### Underlying Assumptions for Fuel Savings and CO<sub>2</sub> Emission Reduction Calculations

Factor	Status Quo	Modest Scenario	Substantial Scenario
1 mile driven ~ 0.05 gallons ~ 1 pound of CO <sub>2</sub>			
Public transportation fuel use relative to cars (% of 20 mpg)	75%	70%	50%
Fuel savings from congestion relief (gallons per 1000 miles driven avoided)	9.6	8	10

#### Gallons of Fuel / Tons of CO<sub>2</sub> Saved Due to Bicycling and Walking

Factor	Fuel savings (million gallons per year)			CO <sub>2</sub> reductions (million tons per year)		
	Status Quo	Modest Scenario	Substantial Scenario	Status Quo	Modest Scenario	Substantial Scenario
Trips < 1 mile	768	1,404	2,458	7	12	22
Trips 1–3 miles	401	1,039	2,598	4	9	23
Increase of public transportation ridership because of bicycling and walking	unknown	110	1,643	unknown	1	14
Trip length reduction through induced mixed use (1–15 miles)	unknown	666	1,612	unknown	6	14
Savings from congestion relief	224	556	1,991	2	5	18
<b>Totals</b>	<b>1,394</b>	<b>3,775</b>	<b>10,301</b>	<b>12</b>	<b>33</b>	<b>91</b>



*Chicago, Ill.*, is tackling climate change and oil dependence by prioritizing walking and biking for short trips and access to transit. Chicago aims to shift 5 percent of all trips less than five miles onto bikes by 2015 and increase bicycles on transit by 10 percent each year.

Excerpt from Resolution to Support 21st Century Transportation for America, passed July 2008:

WHEREAS, The Mayor and the City Council of the City of Chicago value capital investment for transportation that contributes to dynamic and accessible communities where more residents can walk, bike or take transit to get where they need to go; and...that encourages reduction in global warming and smog forming pollution; now, therefore BE IT RESOLVED, That we, the Mayor and City Council of the City of Chicago, on behalf of the citizens of Chicago, urge members of the United States Congress and the Illinois State Legislature to support a transportation infrastructure investment plan that expands clean, efficient transportation choices for Americans.

## Fuel Savings and CO<sub>2</sub> Reduction from Commuting by Bicycle

A bicycle commuter who rides five miles to work, four days a week, avoids 2,000 miles of driving a year—the equivalent of 100 gallons of gasoline saved and 2,000 pounds of CO<sub>2</sub> emissions avoided. CO<sub>2</sub> savings of this magnitude reduce the average American's carbon footprint by about 5 percent.

To achieve equivalent CO<sub>2</sub> reductions by public transportation one would have to shift approximately 30 miles of daily commuting from car to transit.

A citizen who in addition lives in a community that allows him or her to run most errands by bicycling or walking can save about 500 gallons of fuel, or 10,000 pounds of CO<sub>2</sub> each year.

To achieve such savings otherwise, one would need to replace, for example, a Ford F150 pick-up truck with a Mini Cooper, or a mid-sized SUV, such as a Chrysler Pacifica, with a Toyota Prius.

(Calculations based on data from [www.fueleconomy.gov](http://www.fueleconomy.gov))

Increased mix of residences, businesses and amenities induced by the availability of pedestrian and bicycle infrastructure could result in 700 million gallons of fuel saved under modest assumptions, and 1.6 billion under more substantial assumptions, and six to 14 million tons of CO<sub>2</sub> saved, respectively.

The miles driven avoided through these three mechanisms are equivalent to fuel savings of three (Modest Scenario) to eight billion gallons (Substantial Scenario) and between 28 and 73 million tons of CO<sub>2</sub> avoided, respectively. To achieve equivalent fuel savings through vehicle efficiency improvements alone, between 19 million and more than 50 million drivers would need to trade in their vehicles for a highly efficient gas-electric hybrid version of the same model. To put this in perspective, there are about 250 million automobiles on America's streets and, despite rapidly growing sales, by the end of 2007 only about one million of them were hybrid vehicles.

### Fuel and CO<sub>2</sub> savings from congestion relief due to avoided driving

A secondary benefit from reducing miles driven is the improved performance of vehicles currently stuck in congestion. This effect could amount to 500 million to two billion gallons of fuel saved, and up to 18 million tons of CO<sub>2</sub> reductions.

Overall savings from increased bicycling and walking amount to between four and 10 billion gallons in fuel, and between 30 million and more than 90 million tons of CO<sub>2</sub> annually, for the Modest and Substantial Scenarios, respectively. As such, bicycling and

walking could offset between 3 percent and 8 percent of the effects of all U.S. cars and trucks.

The detailed assumptions and results of the calculations are provided in the textbox "Do the Math 2/4" (see page 22).



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© BRUCE HALL

### How Much Would It Cost?

In selecting the right portfolio of CO<sub>2</sub> reduction measures, overall cost and economic burdens need to be taken into consideration. Quite naturally, the most cost-effective measures should get some preference, especially if they create additional benefits and no other negative impacts. Such measures yield “no regrets” because they are positive investments beyond their contribution to CO<sub>2</sub> emission reductions.

Currently, there is no price on CO<sub>2</sub> emissions in place in the United States, but future attempts to curb greenhouse gas emissions will likely come at a cost. Some energy-saving measures, such as increasing vehicle fuel economy, have been identified to be cost neutral, or even result in net savings over their life span. Some of

#### *Seattle, Wash.*

In 2005, U.S. Conference of Mayors unanimously endorsed its Climate Protection Agreement, an initiative launched by Seattle Mayor Greg Nickels in which mayors commit to reduce greenhouse gas emissions in their cities to seven percent below 1990 levels by 2012. Since then more than 800 mayors committed to this goal, and the number continues to rise.

Active transportation features prominently in Seattle’s Climate Action Plan; “Significantly Expand Bicycling and Pedestrian Infrastructure” is the No. 2 action item in the list of 18 measures to curb greenhouse gas emissions.

the most prominently debated CO<sub>2</sub> reduction measures, however, such as capturing carbon from coal power plants, or shifting to solar or nuclear power, are expected to cost in the range of about \$10 to \$50 per ton of CO<sub>2</sub> avoided,<sup>(32)</sup> which eventually would be passed on to consumers in the form of higher energy prices. The future price per ton of CO<sub>2</sub> emissions has been estimated to be in the range of \$20 to \$80, with considerable uncertainties at both ends of the range.<sup>(35, 38)</sup>

At a cost of \$10 per ton of CO<sub>2</sub>, modest increases in bicycling and walking would justify investments into bicycle and pedestrian infrastructure of \$330 million annually for the purpose of CO<sub>2</sub> reductions alone. More substantial increases in bicycling and walking and a higher price of \$30 per ton of CO<sub>2</sub> would redeem annual investments of close to \$3 billion.

In addition to that, savings in fuel costs add up to between \$10 and \$35 billion annually, making investments in pedestrian and bicycle infrastructure one of the most cost-competitive greenhouse gas reduction strategies available.

### Bottom Line—Substantial Reductions in Fuel Use and CO<sub>2</sub> Emissions...at a Savings!

Climate change and oil dependence are among the biggest challenges we face. Some measures to overcome these problems could pose a serious burden on our economy and society as a whole. Others will offer great opportunities to improve our economic competitiveness and our overall quality of life.

Bicycling and walking can significantly contribute to reducing oil consumption and CO<sub>2</sub> emissions within the transportation sector. To minimize the economic costs of mitigating the impacts of climate change, it will be crucial to aggressively pursue the most cost-effective measures to reduce greenhouse gas emissions. Increased bicycling and walking are capable of achieving greenhouse gas reductions at no extra costs to the economy, because fuel savings alone will offset the investment costs, and additional benefits make it a “no regrets” strategy. Americans will demand a fiscally responsible approach to addressing climate change that achieves maximum results at minimal costs, which is why increasing bicycle and pedestrian use through investments in safe and convenient infrastructure should rank high on any list of measures we consider to reduce greenhouse gas emissions and our dependence on oil.

[ NOTES FROM THE FIELD ]

## *New Orleans, La.,—On the Path of Recovery*



© STACEY WARREN

Following Hurricane Katrina, New Orleans' citizens actively endorsed a vision for the city based on creating healthy, vital neighborhoods that are more conducive to bicycling and walking. Through strategic investments in active transportation infrastructure New Orleans is creating an integrated, green transportation system. The Unified New Orleans Plan, which guides recovery efforts, prioritizes active transportation by including more than 85 references to bicycle and pedestrian projects.

A large number of trips in New Orleans already occur without the use of a motor vehicle. In 2000, the city had a car-free mode share (bicycle, walking and public transportation) of 21 percent, slightly higher than the 20 percent in Portland, Ore., generally recognized as the best city for bicycling in the United States. After Hurricane Katrina, New Orleans' overall active transportation mode share has

dropped slightly, but significant efforts are underway to reverse that trend. Over the next two years, New Orleans plans to add 55 miles of on-street bicycle facilities and five miles of trails.

New Orleans' design makes active transportation a convenient alternative to driving. The historic street fabric laid out in a grid facilitates navigation, and mixed-use neighborhoods throughout the city provide destinations close to people. With a car-free population of more than 15 percent, strengthened active transportation infrastructure that links to public transportation will connect thousands of residents' employment centers. Investment in bicycle and pedestrian infrastructure will help create vibrant neighborhoods and contribute to New Orleans' economic recovery.

New Orleans is already improving and increasing bicycle and pedestrian facilities by passing a local \$4 million bond initiative, and utilizing Community Development Block Grant (CDBG) and road replacement funds. An infusion of federal resources would allow New Orleans to complete an interconnected network of bicycle and pedestrian facilities that would enable its residents to travel the city in an efficient, economical, and healthy manner, and helping to return to the city the vibrant life for which it is known.



© BILLY FIELDS

Lafitte Corridor, New Orleans: Residents are working to transform this former rail corridor into a trail to help revitalize a neighborhood where nearly half of commuters walk, bike or ride transit.



*Active Transportation for America*



Approximately 300,000 premature deaths per year in the United States are caused by being obese or overweight.<sup>(39)</sup> In 2005, more preventable diseases and deaths occurred from excessive weight than from cigarette smoking.<sup>(40)</sup> Our country has struggled for more than a decade to overcome the obesity epidemic, without notable success.

Simply put, obesity results from an imbalance between energy intake and energy output. We eat more calories than we burn through physical activity.

In 2007, less than half of all Americans met the Centers for Disease Control and Prevention's (CDC) recommendation of at least 30 minutes of modest physical activity on most days.

**For the first time in history,  
the current generation of youth will live  
shorter lives than their parents.**

America's car-focused transportation system is a major contributor to our sedentary life styles. Not only are cars now used for almost all trips, including the shortest, but the large volumes of motorized traffic combined with the lack of adequate infrastructure have made bicycling and walking difficult and dangerous in many communities.

Investing in bicycling and walking offers a unique opportunity to re-integrate physical activity into our daily routines.

## Obesity—An Epidemic of Unprecedented Dimensions

In recent decades we have consistently increased our calorie intake while decreasing our activity levels. In the 1990s the consequences became apparent in sharply increased obesity rates—the beginning of the obesity epidemic.<sup>(41, 42)</sup> Since then, we have seen the standardization of food labels to inform consumers about caloric and fat content; the rise of fat-free, low-calorie and diet products; multitudes of fad diets promising weight loss; sporadic bans of unhealthy foods; the development of pharmaceutical weight-loss drugs; gastric bypass surgery; and even lawsuits against fast food companies. However, none of these efforts have reduced obesity rates.

Today, 32 percent of American adults are obese, and 67 percent are overweight or obese. America's weight problem doesn't spare our youth either: 19 percent of all teenagers and 17 percent of all children between ages 6 and 11 are overweight.<sup>(43)</sup> The childhood

## Childhood Obesity is "a National Catastrophe."

How obese children suffer<sup>(45)</sup>

5 years shorter life expectancy

High cholesterol is 2–3 times more likely

Fatty liver disease occurs in 1/3

25% are at high risk to develop diabetes

Asthma occurs 2 times more often

Medical costs are 3 times higher

obesity rate has almost tripled since 1980 and the adolescent rate has more than quadrupled.<sup>(44)</sup>

The childhood obesity epidemic is "a national catastrophe," says acting U.S. Surgeon General Steven Galson. And "there's a huge burden of disease that we can anticipate from the growing obesity in kids," according to William H. Dietz, director of the Division of Nutrition, Physical Activity and Obesity at the federal CDC.<sup>(45)</sup>

The costs in medical expenses and loss of productive lives associated with the obesity epidemic place a heavy financial burden on our nation's future. The annual medical costs of physical inactivity have been estimated at \$76 billion,<sup>(46)</sup> or close to 10 percent of all medical expenses.<sup>(47, 48)</sup> The human burden is of no less relevance. Because obesity decreases life expectancy by several years, for the first time in history, the current generation of youth may not live as long as their parents.<sup>(49)</sup>



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Obesity is a major risk factor for many of our most deadly diseases. The number one cause of death is heart disease, and five of its six risk factors are associated with obesity: excessive weight, inactivity, high blood pressure, high cholesterol and diabetes. Diabetes is the sixth leading cause of death in the United States. More than 21 million Americans (7 percent of the population) have Type II diabetes. Obesity is the number one risk factor for this dramatically expanding disease which had 1.5 million new diagnoses in 2005.<sup>(50)</sup>

### Physical Activity—The Challenge of Bringing Movement into Sedentary Lifestyles

In 2007, less than half of all Americans met the CDC's recommendations for physical activity from work, transportation or leisure-time exercise, and 13.5 percent did not get any physical activity at all.<sup>(51)</sup>

## Safety in Numbers

### Infrastructure Improvements Lower Fatality Rates

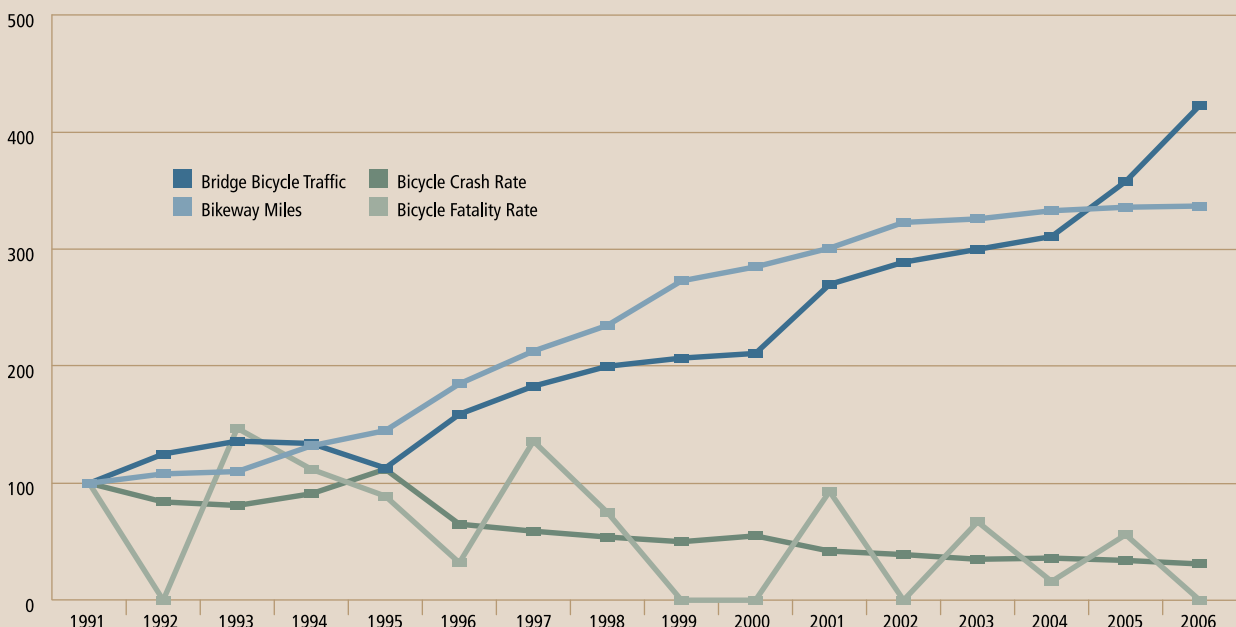
Designing communities to foster active transportation improves the safety of bicyclists and pedestrians. In 2006, more than 4,784 pedestrians and 771 bicyclists were killed on U.S. roads. Despite this disproportionate share of fatalities, federal funding to address bicycle and pedestrian safety has been sorely lacking.

In European countries that have invested considerably in bicycle and pedestrian infrastructure, such as Germany or the Netherlands, fatality rates for non-motorists are about 10 times lower than in the United States.<sup>(4, 25)</sup> Australian cities also report increased safety for bicyclists as a result of infrastructure investments and increased bicycling.<sup>(5)</sup>

Portland, Ore., is a prime example of how investment in bicycle infrastructure results in increased safety. Since 1991, Portland has steadily expanded its network of bicycle facilities, and observed a constant growth in bicycling, while crash and fatality rates among cyclists significantly decreased. Between 1991 and 2006, Portland was able to reduce the crash rate by more than 69 percent. In that time period, the number of bicyclists grew more than four fold, while the number of fatalities remained low, between zero and five per year.

Infrastructure investments are clearly an effective and necessary measure to increase the safety of cyclists and pedestrians. Additional measures, such as education of motorized and non-motorized traffic participants, and various forms of traffic regulations can further improve safety.

Safety of Bicycling in Portland (Trends indexed to 100 = 1991)



## CDC Recommendation for Physical Activity

"30 minutes of moderate exercise on most days"

Equivalent to: 1.5 miles of walking or

5 miles of bicycling or

1 less slice of pizza

During the past century, the benefits of an increasing standard of living were accompanied by ever-decreasing amounts of physical activity in all aspects of life. This reduction in physical activity was due to a reduction in manual labor on the job and the adoption of labor-saving devices in the home. Many Americans have benefited from this trend in the form of better paying jobs, safer and healthier work conditions and more leisure time. Unfortunately, much of this newly found leisure time is spent in sedentary activities such as watching television and increasingly using computers, or playing video games. Taken together, this trend away from physical activity at work, at home and at play has contributed to an imbalance between our energy intake and energy output.

Our modern lifestyles have also been characterized by a reduction in physical activity in the transportation sector. Decades of car-centered transportation planning have left us with a transportation system that requires very little physical effort to get around. We now make almost 90 percent of our trips in cars, and spend on average more than 30 miles driving every single day.<sup>(7, 52)</sup> Worse than that, many communities are designed in a way that renders bicycling and walking unfeasible, or even dangerous.



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In 1996 the Surgeon General published an alarming report on Physical Activity and Health. In it, medical professionals agreed that prevention of obesity requires not only healthier diets but, in addition, a substantial increase in physical activity.<sup>(54, 55)</sup>

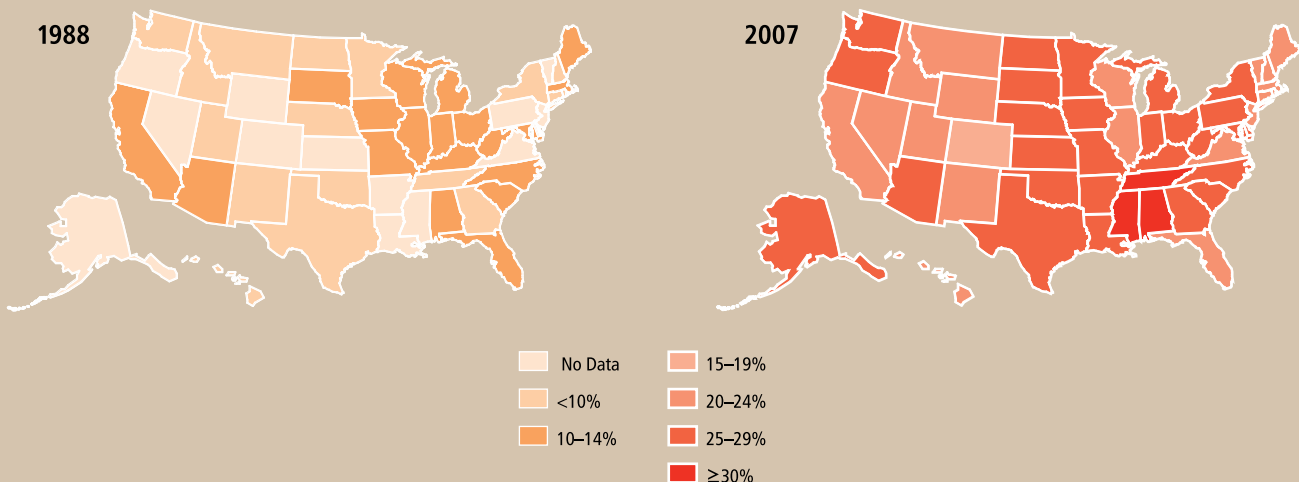
## Economic Effects of Obesity<sup>(53)</sup>

General Motors: \$286 million in medical expenses per year due to obesity

Medicare: 15 percent more expenses for obese beneficiaries

Absenteeism: Obese employees miss 12 times more work days than their normal weight colleagues

## Obesity Trend Among U.S. Adults (Body Mass Index $\geq 30$ )



Obesity rates among U.S. adults increased between 1988 and 2007 from 23 percent to over 32 percent.<sup>(43)</sup>



## Do the Math (3/4)

### Exercise Gains from Bicycling and Walking for Transportation

The following is based on average speed of 3 mph for walking and 10 mph for bicycling. Bicycle share among active transportation miles is assumed to increase from 20 (Status Quo) to 30 (Modest) and 50 percent (Substantial) across scenarios.

Per person averages are based on U.S. population of 300 million.

CDC recommendation is 30 minutes of moderate exercise on most days.

#### Underlying Assumptions for Health Benefits Calculations

Factor	Status Quo	Modest Scenario	Substantial Scenario
Percent of those bicycling or walking who do now not meet activity recommendations	0%	20%	50%
Bicycle share of total miles walked and biked	20%	30%	50%

#### Health Benefits from Bicycling and Walking (averaged over all Americans)

##### Daily Exercise Gain (minutes)

##### Daily Energy Burned (calories)

Factor	Status Quo	Modest Scenario	Substantial Scenario	Status Quo	Modest Scenario	Substantial Scenario
Trips < 1 mile	2	3	4	10	17	25
Trips 1–3 miles	1	2	4	5	12	26
<b>Totals</b>	<b>3</b>	<b>5</b>	<b>9</b>	<b>15</b>	<b>29</b>	<b>51</b>



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## Safe Routes to School Program



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*Marin County, Calif.*, was a Safe Routes to School pioneer. There is broad community involvement in planning and executing a comprehensive set of measures including education, encouragement, safety and infrastructure improvements. Seeded by a federal pilot project, Marin nearly doubled the percentage of children bicycling or walking to school in the first two years of their program and has extended the effort with State grants and local sales tax revenue.

Another Bay Area community, *Alameda County, Calif.*, concluded from a survey among school children from three different grades that 68 percent were not physically fit. The County has responded with plans to expand its Safe Routes to School program which currently targets 50 schools, to every school in the county, enabling more than 100,000 children at 226 schools to walk or bike to school.

*Burlington, Vt.* C.P. Smith Elementary School's walking school bus has operated since March 2005. Before the walking school bus began, approximately six children walked this route to school. Now on Walking Wednesdays there are between 25 and 40 children and the traffic congestion along the route has all but disappeared.

Physical activity provides additional health benefits independent of body weight, such as the prevention of cardio-vascular disease, osteoporosis, arthritis and mental disorders like anxiety and depression. In short, active people are likely to be healthier and happier people. Active workers are also more productive and have significantly lower health costs than their obese colleagues.<sup>(53)</sup>

To date, attempts to increase physical activity have mostly focused on leisure time activity for adults and physical education in school for children. Neither approach has succeeded with the majority of Americans.

## Burn Calories

Most American adults gain weight gradually, typically about two pounds a year. This is equivalent to an excess of only about 100 calories a day. Bicycling or walking for less than 30 minutes daily would be sufficient to burn this amount of excess energy and keep body weight stable.<sup>(59)</sup>

When we reduce physical activity to “exercise” that is separate and apart from our daily routines, we encounter obstacles related to time, money or motivation that make it difficult to maintain such activity over time. Reintroducing activity into daily routines is a practical way to overcome such obstacles.

Imagine a weight loss solution that requires little extra time, relatively small amounts of effort, no additional motivation, no major expenses, no specific skills and no particular qualifications.

Bicycling and walking offer a compellingly simple remedy. Take a routine we all engage in every day—getting from Place A to Place B, also known as transportation. By leaving the motor at home, one can get to a destination while being active at the same time. Active transportation drives active living.



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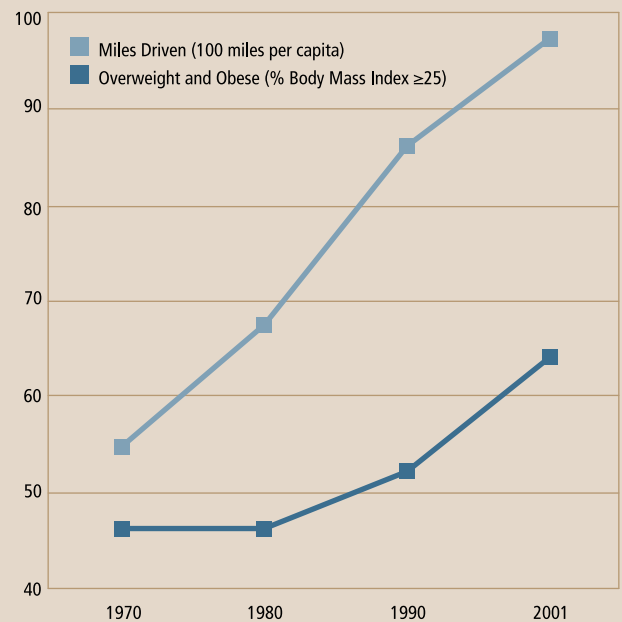
### How Much Activity Could Result from Cycling and Walking for Transportation?

Transportation offers opportunities to routinely engage in physical activity because many trips are short and ideal for bicycling and walking. About half of all trips taken in the United States are three miles or less.<sup>(7)</sup>

By replacing some of these short car trips with bicycling or walking, many Americans could significantly increase their activity levels. Using the CDC recommendation of 30 minutes of daily activity as a benchmark, it is a reasonable estimate that insufficiently active Americans would, on average, need to increase their daily level of activity by 15 minutes. Shifting some of these trips as outlined in our scenario calculations would result in an average of 5 (Modest Scenario) to 9 minutes (Substantial Scenario) of additional exercise for each American, every day or the recommended 30 minutes of daily exercise for 50 (Modest) to 90 million (Substantial) Americans.

Commuting two or three miles by bicycle takes only 15 minutes, and the complete round-trip satisfies the recommendations for daily physical activity.

#### Increase in Miles Driven and Obesity



In recent decades the amount Americans drive increased steadily. At the same time, the percentage of Americans that are overweight or obese increased dramatically, to now close to 70 percent.<sup>(43, 56)</sup>

Similarly, a two-mile, round-trip walk to run errands, access transit or take children to school provides the recommended 30 minutes of physical activity. Nearly two-thirds of all households say they have satisfactory shopping available within walking distance of their home.<sup>(57, 58)</sup> Fifty-seven percent of parents with children 13 years or younger live within one mile of a public elementary school.<sup>(58)</sup>

Bicycling and walking for short trips require little additional time, if any at all, fitting into very tight schedules because the activity occurs during time already allocated for transportation. The additional time needed for walking trips of less than a mile, compared to using a car, is at most minimal due to the short distance and elimination of the need for parking. Currently, two-thirds of these short trips are taken by car.<sup>(7)</sup>

Bicycling and walking are physical activities which require no training or preparation, and anyone can engage in them. Young

### *Billings, Mont.*

The Sneakers, Spokes and Sparkplug Challenge pits bicyclists, pedestrians and drivers against one another in completing a set of tasks around Billings, Mont. The bicyclists won, with pedestrians often finishing before the car drivers. This popular event is the lighter side of a set of serious local initiatives to improve public health by integrating physical activity into everyday activities. Connecting places where people live, work, shop and play with bicycle and pedestrian infrastructure is a key component of such efforts. Billings is using Health Impact Assessments to infuse health as a criterion for decision-making into community projects and plans. And a general obligation bond was passed to provide local funds to match federal funds invested in trails.



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children find great joy through bicycling and love this form of physical activity. For elderly people, bicycling and walking provide safe, low-impact exercise that helps maintain their health.<sup>(4)</sup>

A crucial advantage of bicycling and walking as transportation, rather than solely for exercise, is the motivation factor. For utilitarian trips, much less motivation and discipline are required to participate in it regularly because the person must make the trip anyway. For example, once the decision is made to commute to work by bike, this exercise easily becomes a routine. Bicycling and walking therefore offer an ideal opportunity to increase activity levels among those individuals who are not responsive to calls to increase leisure time activity.

Further, individuals who want to increase their leisure-time activity levels find an easy and low-cost opportunity to do so when

### Declining Activity Levels

1969: 50 percent of students walk to school.

2004: 14 percent of students walk to school.<sup>(60)</sup>

The average miles each American drives have more than doubled since 1960, to now almost 30 miles per day.<sup>(56)</sup>



appropriate bicycling and walking facilities are available to them. Children who live in safe places to bicycle and walk can transport themselves to outdoor activities without having to wait for someone who can drive them, making it more likely that they will engage in additional physical activities outdoors.

### Bottom Line—Transportation: First a Driver of the Problem, Now a Step toward the Solution!

In light of all the advantages of increasing physical activity in our daily routines, it is obvious that, from a public health perspective, current levels of bicycling and walking are much too low.

America is at a crucial crossroad in the battle against obesity. Only by providing Americans with routine opportunities to engage in physical activity are we likely to prevent this epidemic from putting an unfathomable burden on our society.

“Bicycling is a big part of the future. It has to be. There’s something wrong with a society that drives a car to work out in a gym.”

Bill Nye the Science Guy

Therefore it is important to think of our transportation system as more than just a means to get around. Transportation infrastructure defines the built environment we live in, and as such has a tremendous influence on our levels of activity and our general well being. For this reason, the impact of transportation projects on public health should be taken into consideration just as routinely as we evaluate the financial costs of a project or its effects on the environment.

For decades, car-focused transportation investment has contributed to a steady reduction in physical activity. To achieve an increase in physical activity through investments in transportation infrastructure, urban designers, city planners, medical professionals and

transportation engineers must realize the potential of routine bicycling and walking.<sup>(61, 62)</sup>

Once bicycling and walking are widely accepted and treated as legitimate, viable and healthy transportation modes, health professionals can recommend active transportation as an efficient and safe form of physical activity, allowing Americans to improve their health by bicycling and walking.

To assure the maximum health benefits for our society from bicycling and walking, transportation policy must be held accountable for its impact on public health, and make investing in bicycling and walking a priority.



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[ NOTES FROM THE FIELD ]

## Camden, N.J.—Trails to Revitalization

After years of economic, physical, and social isolation, Camden, N.J., has begun a renaissance premised on re-establishing itself as a critical transportation hub for the region and on reconnecting residents with local waterfronts. Railroads once emanated out in all directions from Camden, but they declined along with the city's manufacturing base. Going forward, Camden envisions developing six strategically located multi-use trails to create a network in and around Camden to reconnect suburbanites with the city, establish Camden as a gateway to and from Philadelphia, and connect city neighborhoods with jobs, schools, shops and services.

The network of multi-use trails promises to help transform Camden into a more sustainable, less car dependent city. Low incomes are one reason why 40 percent of Camden City residents do not own a car. More than 20 percent of city residents use public transportation to get to work and 6 percent walk. Others, however, struggle to reach employment opportunities, services, and amenities located in the New Jersey suburbs and in Philadelphia. A functional network of active transportation infrastructure would also provide greater access to regional public transportation, greatly expanding the mobility of people not using a car.

Improving linkages between residential communities and their waterfronts is a fundamental component of revitalization for the City of Camden. Ulysses S. Wiggins Park, a 1.4-mile greenway, has become the backbone for more than \$550 million of private and public investment into the downtown waterfront. The Camden waterfront now boasts more than 600 residents, 2,000 workers, and two million tourists annually. Federal investment in Camden's active transportation plans would help to provide universal mobility, connect redeveloped areas, and open up the waterfront to more neighborhoods to spur further economic development.



Camden Active Trail Network Plan

© COOPER'S FERRY DEVELOPMENT ASSOCIATION



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"Pedestrian and bicycling trails around the city are crucial to provide waterfront access in many neighborhoods in Camden," said Cooper's Ferry Development Association President and CEO Thomas Corcoran. "Greenways and parks with multi-use trails help boost economic development and provide crucial leverage to private investment in these neighborhoods."

Another motivation for Camden to develop an active transportation system is concern that over 63 percent of residents are overweight or obese due largely to sedentary lifestyles. Dr. Jeff Brenner of Robert Wood Johnson Medical School observed that "residents of Camden suffer high rates of preventable, obesity-related illness like diabetes and heart disease. A regional trail network would provide a safe and inexpensive prescription to fight this problem."



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In a time of fiscal constraints, transportation funding has reached a crucial crossroads. The revenue from the federal gas tax is no longer sufficient to fund highway construction at the current rate. Relying solely on increased road capacity to address today's transportation problems is a dead-end strategy.

Simply replacing some of the shortest car trips with bicycling and walking could lead to fuel savings of the magnitude of 2.4 to 5 billion gallons annually, based on our Modest and Substantial Scenarios, respectively. At a price of \$4 per gallon, this would result in saving \$8 billion to \$17 billion in fuel costs every year, not including fuel taxes. Currently, out of every dollar drivers spend on gasoline, at least \$0.35 flow into foreign economies.

Federal transportation spending did not support bicycle and pedestrian projects until the early 1990s, totaling only \$4.5 billion by 2007.<sup>(74)</sup> Not until the year 2000 did federal spending for bicycling and walking grow to more than \$1 per resident per year. For highways, in contrast, average federal spending was over \$100, and total spending nationwide over \$400 per resident every year for over 50 years, or a total of \$5 trillion (federal, state and local, in 2006 dollars).<sup>(63)</sup>

The \$4.5 billion dollars in federal funding to date for bicycling and walking, approximately one thousand times less than total nationwide highway funding over time, is far from sufficient to make up for the historic neglect of bicycling and walking. Just like the building of the interstate highway system, offering Americans the choice not to drive will require significant, sustained and focused investment in bicycle and pedestrian infrastructure.

It is in our national interest to fund our mobility needs in a manner that provides the greatest benefits to Americans for each tax dollar. Consequently, active transportation should be a higher federal priority for two reasons:

1. An increased share of federal transportation dollars devoted to bicycling and walking would achieve greater transportation benefits than spending the same dollars on highway infrastructure, and would maximize the return from our investment in public transportation by facilitating convenient access to trains and buses.
2. Federal dollars spent on active transportation will yield additional social benefits beyond mobility that will save taxpayers

millions of dollars and improve quality of life across the United States. Increased use of active transportation will result in substantial savings in health care expenditures, lessen our oil dependence and reduce climate emissions. Continued over-reliance on automobiles, on the other hand, would exacerbate these same problems.

## Valuing the Overall Benefits of Bicycling and Walking

Fuel savings are the most direct financial benefits from increased bicycling and walking. A simple calculation of the value of the anticipated fuel savings from replacing short car trips alone reveals savings of \$3.5 billion under the status quo, and in the range of an additional \$6 to \$17 billion for our future scenarios of increased bicycling and walking. The overall amount that could be saved on gasoline expenditure is in the range of \$10 to \$35 billion annually.

Estimating the value of CO<sub>2</sub> emission reductions requires making an assumption on the price of avoided CO<sub>2</sub>.

Under the Modest Scenario, a price of \$10 per ton of CO<sub>2</sub> results in cost savings of \$333 million annually. When assuming a price of \$30 per ton and more substantial contributions from bicycling and walking, these savings could approach \$3 billion annually.

Increasing the use of bicycling and walking for transportation provides tremendous potential to increase physical activity among Americans. Based on the health care costs alone, the benefits from increased bicycling and walking could add up to \$400 million assuming modest cost benefits, and up to \$28 billion annually assuming substantial cost benefits. These estimates do not include the benefits from increased productivity and other secondary benefits associated with physical activity.

Taken all together, the benefits of modest increases in bicycling and walking would amount to benefits worth more than \$10 billion annually, and more substantial increases in bicycling and walking would return benefits in the range of over \$65 billion annually.

These calculations do not include additional benefits from areas that we do not attempt to quantify, such as effects on real estate values; economic stimulus from infrastructure construction and businesses profiting from bicyclists and pedestrians; time savings by both bicyclists and pedestrians, as well as drivers on less congested roads; increased productivity due to improved health, and general gains in quality of life and more livable communities.

## Infrastructure Costs and Return on Investment

According to the Federal Highway Administration, the basic cost of a single mile of urban, four-lane highway is between \$20 million and \$80 million. In urban bottlenecks where congestion is the worst, common restrictions such as the high costs of right of ways and the needs to control high traffic volumes can boost that figure to \$290 million or more.<sup>(27)</sup>

By contrast, the costs of bicycle and pedestrian facilities range anywhere from a few thousand dollars per mile to rarely more than \$1 million, with great variability between types of infrastructure local circumstances.<sup>(29)</sup>

Portland, Ore., has developed a network of bicycle infrastructure at an average per mile cost of \$300,000, with bicycle boulevards and lanes at a fraction of that cost (\$30,000 to \$40,000 per mile). The cost of one mile of sidewalk is about \$100,000.<sup>(68)</sup>

Multi-use trails typically cost between \$50,000 and \$300,000 per mile, depending on acquisition costs of rights-of-way and the surface material used.<sup>(69, 70)</sup>

Similarly, the costs for a bike rack that parks two bikes, about \$200, is dwarfed next to the costs of car parking at \$3,500 to \$12,000 for each space of surface parking and \$10,000 to \$31,000 for each space of garage parking.<sup>(30)</sup>

That doesn't mean that we can stop investing in road infrastructure and only build bike paths instead. But it becomes clear how wasteful it is to focus almost exclusively on road infrastructure



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## Do the Math (4/4)

### Monetary Value of Benefits from Bicycling and Walking

Monetizing the benefits from bicycling and walking requires assumptions on the value of gasoline, CO<sub>2</sub> emission reduction, and increased physical activity.

Future costs of reducing CO<sub>2</sub> emissions have been estimated in the range of \$20 to \$80 per ton of CO<sub>2</sub>, with considerable uncertainties at both ends of the range.<sup>(35, 38)</sup> The scenario calculations conservatively assume a price of \$10 per ton of CO<sub>2</sub> for the Modest Scenario and \$30 for the Substantial Scenario.

Numerous studies have estimated annual health care costs to be between \$20 and \$330 higher in people who do not satisfy the CDC recommendation of 30 minutes of physical activity per day, compared to those who do.<sup>(29)</sup> This calculation uses the \$20 estimate for the Modest Scenario, and the \$330 estimate for the Substantial Scenario. Further, to fulfill the recommendation of daily activity the average insufficiently active person is assumed to need to increase his or her physical activity level by 15 minutes (midpoint between 0 and 30 minutes). Applying these numbers to the total population of 300 million Americans, an increase in one minute of the population average daily physical activity is worth \$400 million, using the modest cost estimate, and \$6.6 billion, using the substantially higher cost estimate. Including secondary costs from workers compensation, decrease in productivity, and inefficiencies from replacement workers would dramatically increase these estimates. One study estimated the costs of inactivity at more than \$1,000 per person and year, equivalent to \$18 billion in benefits from a one minute increase in population average of physical activity. Finally, this calculation conservatively values the increase in activity among insufficiently active people only, ignoring the fact that already active people will benefit from increased activity as well. The Modest Scenario assumes that only 20 percent of increases in bicycling and walking would stem from currently insufficiently active people, and under the Substantial Scenario, this figure would increase to 50 percent.

#### Underlying Assumptions for Monetary Value of Benefits

Factor	Status Quo	Modest Scenario	Substantial Scenario
Price of gasoline (\$/gallon) (incl. 15% federal and state tax)	\$3.50	\$3.00	\$4.00
Price of CO <sub>2</sub> emission avoided (\$/ton of CO <sub>2</sub> )	\$0	\$10	\$30
Health care savings of one minute increase of daily population average physical activity (million \$/minute)	unknown	\$400	\$6,600
Percent of those bicycling or walking who do not meet activity recommendations	0%	20%	50%

#### Monetary Value of Benefits from Bicycling and Walking (\$ millions per year)

Factor	Status Quo	Modest Scenario	Substantial Scenario
Fuel savings from shifting short car trips to bicycling or walking, excluding secondary savings from congestion relief (excl. gasoline tax)	\$3,478	\$6,231	\$17,188
Fuel savings from bicycling or walking and public transportation synergy (excl. gasoline tax)	unknown	\$279	\$5,586
Fuel savings from trip length reduction through induced mixed use (excl. gasoline tax)	unknown	\$1,697	\$5,481
Fuel savings from secondary savings from congestion relief (excl. gasoline tax)	\$668	\$1,417	\$6,768
CO <sub>2</sub> reduction from miles driven avoided, including congestion relief and trip length reduction through induced mixed use	unknown	\$333	\$2,726
Health cost reduction from increase in physical activity among those who do not currently meet recommended levels	unknown	\$420	\$28,127
<b>Totals</b>	<b>\$4,146</b>	<b>\$10,378</b>	<b>\$65,876</b>



when it would be much more cost-effective to meet some of our mobility needs through bike or pedestrian infrastructure.

Dozens of communities across the country are ready to start building or expanding their bicycle and pedestrian infrastructure. Investments comparable to the cost of a single mile of urban highway can significantly alter the landscape for bicycling and walking in a mid-sized city.

Portland’s investments in bicycling infrastructure of \$57 million in total have helped city residents drive less than average Americans, resulting in a savings of \$2.6 billion in travel and time and redirecting more than \$800 million to their local economy every year.<sup>(71)</sup>

Under modest assumptions about shifting trips to bicycling and walking, the resulting annual benefits will be worth close to 20 times the current level of federal funding for bicycling and walking. Even under current conditions, fuel savings from short bicycling and walking trips alone offset current expenditures more than six-fold, even if gas prices dropped back to \$3 per gallon.

### The Effect of Bicycle and Pedestrian Infrastructure on Real Estate Values

Trails are the top-ranking outdoor community asset according to the National Association of Home Builders which found that 57 percent of prospective homebuyers would like to see trails in their new community.<sup>(64)</sup>

In Marion County, Ind., greenways increased cumulative property values by hundreds of millions of dollars. Even where the value of one piece of property might only increase a small amount, so many pieces of property are adjacent to trails that the cumulative effects raise the entire community’s property values.<sup>(65)</sup>

In Apex, N.C., the developers of a housing development could sell homes with trail access for \$5,000 more than those without access.<sup>(66)</sup>

And a study that looked at major U.S. metropolitan housing markets “...found that while there is overall weakness in housing prices, price declines are generally far more severe in far-flung suburbs and metropolitan areas with weak central cities. The reason for this shift is rooted in the dramatic increase in gas prices over the past five years. Cities and neighborhoods that require lengthy commutes and provide few transportation alternatives to the private vehicle are falling in value more precipitously than more central, compact and accessible places,” the study shows.<sup>(67)</sup>

A single road project, the Springfield interchange in Virginia cost \$676 million to build; enough to develop effective active transportation systems in more than a dozen cities across the country.



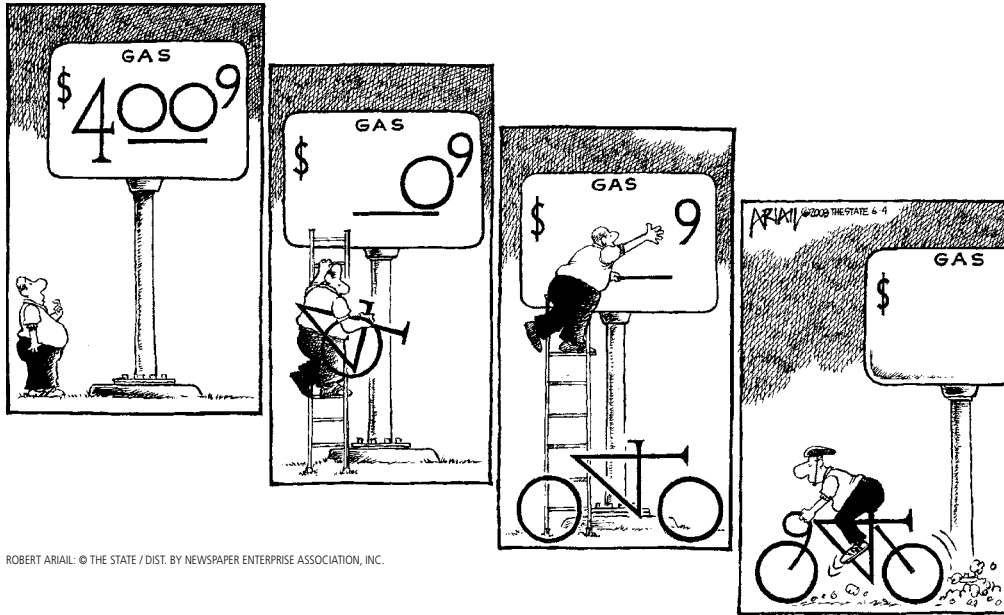
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Assuming substantially increased growth of bicycling and walking, similar to conditions already present in cities like Minneapolis, New York, or Portland, nationwide benefits from fuel savings, congestion relief, health cost reductions, and reduced CO<sub>2</sub> emissions would skyrocket to a magnitude approaching that of total federal surface transportation spending. Add to that the economic benefits in the form of increased real estate values and commercial activity, and it becomes apparent that federal investments in bicycle and pedestrian infrastructure and programs are one of the most cost-effective transportation policy interventions available.

As Americans struggle to cope with the high costs of driving, including increased gas prices, balancing various modes of transportation has become of great relevance on a personal level, too. Transportation is second to housing as a percentage of household budgets, and it is the top expense for many low-income families.

Transportation Costs by Mode	
Mode	Costs per Mile (cents)
Car	59
Transit	24
Bicycle	~5
Walking	0

(Sources: IRS, ATA, RTC)



ROBERT ARIAL: © THE STATE / DIST. BY NEWSPAPER ENTERPRISE ASSOCIATION, INC.

As gas prices continue to rise, news reports nationwide show that consumers are changing their transportation to meet these new economic conditions.<sup>(2, 73)</sup> The affordability of bicycling and walking begins to look more and more appealing.

### Bottom Line— Investing in Bicycling and Walking; Making the Most of Federal Funds!

Given the great return of investment from active transportation,

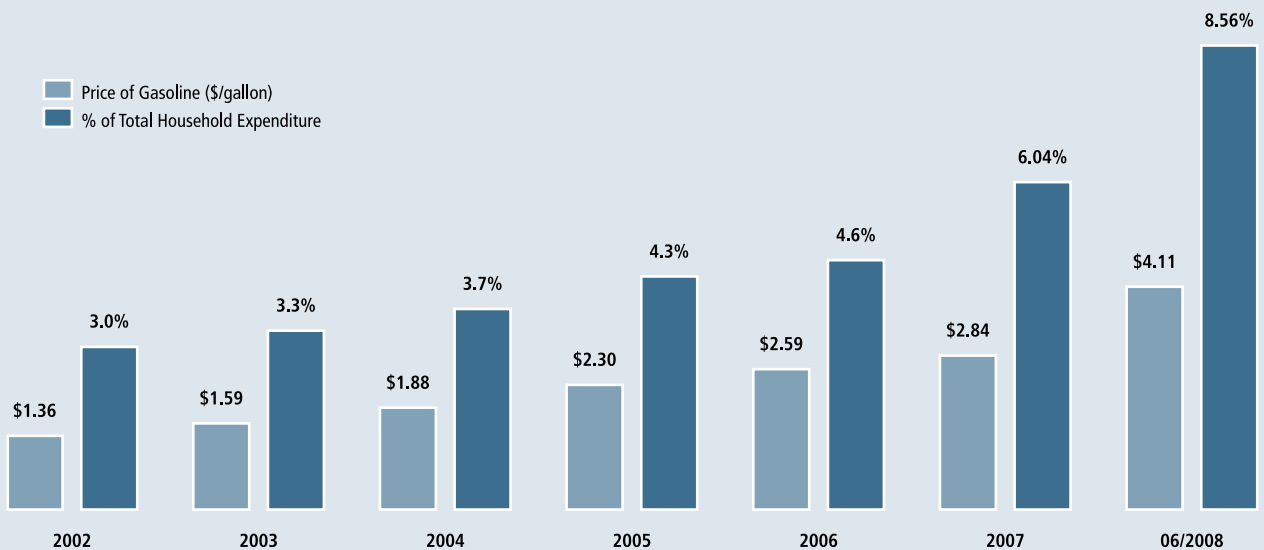
Gas expenditures as a portion of the average household budget, which averaged 3.4 percent from 1996 to 2006, were approaching 9 percent in the summer of 2008.<sup>(72)</sup> The number was even higher among low-income households.

For many of our daily trips, bicycling and walking are the most economical choice. During the course of a year, regular bicycle commuters that ride five miles to work, can save about \$500 on fuel and more than \$1,000 on other expenses related to driving. In addition, they may avoid a considerable amount of time stuck in traffic or in the gym.

fiscally responsible federal transportation policy must strive to maximize the amount that Americans bicycle and walk. Concentrated investments in bicycle and pedestrian infrastructure networks are needed to offer as many Americans as possible the choice to walk or bike. Once safe and convenient infrastructure connects the places where we live, work, shop, learn and play, the resulting changes in travel patterns will return benefits worth many times more than the initial investment costs.

Gas Price and Gas Expenses Relative to Total Household Expenses

Price of Gasoline (\$/gallon)  
% of Total Household Expenditure



Increasing costs of driving put a growing burden on many Americans household budgets.

[ NOTES FROM THE FIELD ]

## *Minneapolis, Minn.—A Pilot Community for Non-motorized (Active) Transportation*

Active transportation contributes heavily to mobility in Minneapolis because bicycling and walking have been a priority of city planners for many years. In Minneapolis, a 2006 study found that nearly 20 percent of all trips were made solely on foot or by bicycle, and another 8 percent of all trips involved bicycling or walking to public transportation.<sup>(23)</sup> In the last year alone, the number of bicyclists using the Midtown Greenway increased by 30 percent to an average of 3,620 riders daily in June 2008.

Minneapolis is one of four communities participating in the federally funded Nonmotorized Transportation Pilot Program (SAFETEA-LU sec. 1807). Over four years, the pilot program will fund more than \$21 million of investments in infrastructure and other measures to increase bicycling and walking. Infrastructure projects include “livable streets,” that accommodate pedestrians, bicyclists, residents, motorists, and customers of adjacent businesses; and “bicycle boulevards,” typically residential streets where traffic volume and speed are reduced to levels at which bicyclists, pedestrians, and motorists can comfortably share the road. Comprehensive planning efforts systematically address the needs of bicyclists and pedestrians, and assure the interconnectivity of the active transportation and the public transportation networks.

Levels of bicycling and walking are lower outside of the urban core, where many low-cost modifications of existing roadways remain to be done to match the connectivity of bicycle and pedestrian infrastructure in the downtown area. Minneapolis-St. Paul still has many pressing needs to nurture active transportation over the coming years including improved mapping, bike centers at key destinations, completion of bicycling and walking network across the metro area, more bicycle boulevards and greenways, access to bicycles for all users, significantly expanded bike parking, solutions to major physical barriers (rivers, railroads, and highways), education programs and expansion of facilities for families and less experienced cyclists.

The challenge for Minneapolis-St. Paul is beyond low-hanging fruit. To achieve a sustainable transportation system, Minneapolis-St. Paul also seeks to address subtler issues such as budget priorities, traffic enforcement, design standards and protocol, safety, and outreach to seniors, communities of color and new immigrants. Expanded federal investments will enable improvement at all levels, the type of change that will maximize the shift to bicycling and walking for everyday travel.



© COURTESY OF THE NONMOTORIZED TRANSPORTATION PILOT PROGRAM



*Active Transportation for America*



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Active transportation is unique in its promise to offer numerous benefits, without any of the trade-offs that so often come with other transportation policies. This report has made the case that bicycling and walking could and should play a far more prominent role in America's transportation system, and that federal investment in bicycling and walking infrastructure is a cost-effective means to help meet the mobility needs of more Americans. Offering a balanced set of ways to get around better fulfills our nation's transportation mission.

## Mission Statement of the U.S. Department of Transportation

“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”

The resulting fuel savings from shifting just some of the shortest car trips to bicycling and walking would result in cost savings far larger than the upfront costs of infrastructure investments.

In anticipation of expensive changes in our energy supply system and the challenges of reducing CO<sub>2</sub> emissions, active transportation offers a welcome contribution to greenhouse gas reductions at a net cost savings. On a human scale, the health benefits from increased investments in safe and convenient infrastructure for bicycling and walking may very well turn out to be the most valuable “side-effect” of shifting our transportation policies. By accommodating bicycling and walking, federal transportation policy can help reverse the devastating trends in obesity that were aggravated by development patterns tailored to the automobile.

In times of economic hardship and fiscal constraint, investing in infrastructure for active transportation offers a highly affordable opportunity to create an immediate and long-lasting stimulus for our economy. Savings at the gas pump and reduced oil dependence, higher productivity of healthier workers and lower health care expenses, flourishing businesses and more valuable real estate, shorter commutes and reduced needs for road expansions are among the many economic benefits for us individually and as a nation.

An increasing number of Americans have been voting with their feet to increase the use of active transportation. A quiet trend of

increased bicycling and walking has been building for years among those seeking an affordable, healthy, clean and enjoyable way to get around. This trend has rapidly accelerated in the past year in response to the high costs of driving. The trend has been most pronounced in communities that have already invested in systems to facilitate safe and convenient bicycling and walking.<sup>(1, 2)</sup> Because few communities have had sufficient resources to build truly functional active transportation systems, most Americans have been left standing on the sidelines looking for safer and more convenient ways to join this movement.

The pent-up demand for safe and convenient places to bicycle and walk will only be satisfied by concentrated federal investments in coherent networks of bicycle paths, trails, sidewalks and other facilities. Just as our nation invested in the interstate system and extensive road networks during the past half century, our current era of concern over oil dependence, traffic congestion, climate change, and rising obesity rates calls for creating a new balance in which mobility for every American is convenient, safe, affordable, and last but not least, enjoyable.

Those Americans privileged to live in communities that accommodate bicyclists and pedestrians appreciate their built environment. Health is improved; stress levels are reduced. Streets have become places where people meet on a human scale. Commutes create a relaxing end to workdays, and active transportation can save people the challenge of making time to stay fit.

While this report quantifies many of the benefits of active transportation, it is impossible to put a price tag on the increases in quality of life generated from the opportunity to ride a bicycle or walk. The only way to value this aspect of active transportation sufficiently is to provide all Americans with the opportunity to find out for themselves.



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