rails-to-trails conservancy

Active Transportation Transforms America

The Case for Increased Public Investment in Walking and Biking Connectivity

October 2019

Acknowledgments

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Cover photo: Pedestrian-friendly intersection in New York City

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INTRODUCTION

More than half of all trips in the United States are within a 20-minute bike ride or less, and more than one in four trips are within a 20-minute walk or less, according to the 2017 National Household Travel Survey.[1] Even so, the majority of these short trips are taken by automobile. Across rural, suburban and urban America, there are opportunities to shift short trips from driving to walking and biking by creating safe active transportation networks. In the process, this mode shift can create remarkable economic returns and improve the quality of lives; in fact, the findings of this report reveal that the potential annual return on investment of connected active-transportation infrastructure could be as high as $73 billion+ in a modest scenario and $138 billion+ in a substantial scenario (Table 9, Table 10). Mode shift leads to fewer cars and light trucks on clogged roads, as well as less air and climate pollution, while also creating a transportation environment that favors physical activity.

BP Pedestrian Bridge in Chicago's Millennium Park

Accelerating Mode Shift

Increased walking and biking, for both utilitarian travel and recreation, are among the most effective ways to address America's crisis of physical inactivity. This crisis is a major factor in high and rising rates of chronic diseases that cost the U.S. health care system trillions of dollars each year, with many of those costs falling to taxpayers.

Business leaders looking for ways to attract employees and grow their enterprises, and local leaders aiming to increase tax revenue, support trail and active transportation networks—infrastructure proven to attract talented workers and tourists.[2] Leaders in rural mining and industrial towns that have lost employers and population are reinventing themselves as trail towns or recreational hot spots.

In short, the United States is facing a plethora of pressing issues that affect its citizens' quality of life—and wallets. The good news is that relatively small investments in walking and bicycling can help address these problems. Active transportation—that is, walking, biking, rolling or other means of mobility powered by human energy—can be a powerful part, albeit just one part, of the solution to address fossil fuel consumption, reduce health care costs via physical activity, and contribute to the economic well-being of local communities and individuals. However, to encourage more walking and biking, safe and protected facilities that seamlessly connect to each other must be built.

Just as roads take a car from one's driveway to a local street, then to an arterial street, and eventually onto the highway, which connects to more arterial and local streets, the opportunity exists to build a connected network of active transportation facilities that will allow anybody to make that 20-minute trip by walking or biking.

In a connected network, anyone from the ages of 8 to 80 years old is able to navigate his or her community using safe walking and biking infrastructure. For example, the person would have direct access to a sidewalk at the start of the trip and when approaching an intersection. That intersection has a highly visible, well-painted crosswalk, which this person can use to cross the street and turn onto the main four-lane road.

As this person walks along the street, cyclists nearby are using a protected bike lane to travel safely, separated from fast-moving traffic. Five minutes later, the bike lane and sidewalk intersect with a multiuse trail, which this person takes for another 10 minutes, removed from the stress of car traffic. Near the destination, the trail is met with more

Opposite: Indianapolis Cultural Trail

Atlanta BeltLine Trail

Safe Routes to Everywhere, for Everyone

Active transportation networks provide more people—such as children, seniors, those with disabilities and those without economic means—with inclusivity and connection to not only destinations and opportunities, but their communities and society at large. From elementary-age students to teens and preteens, the ability to walk or bike to school can provide a healthy means of transportation. For seniors, being able to walk or bike to a destination can help maintain a sense of independence and also keep them healthy through physical activity, while allowing them the opportunity to age in place.

For those with disabilities or from low-income households, the ability to walk to work can mean economic independence and preservation of their livelihood. Even for those who don't fall into any of these categories, active transportation facilities help communities become vibrant and thriving through social connections. In short, active transportation provides a safe means of connectivity and independence for everyone to access destinations, regardless of their age, ability or income.

sidewalks and protected bike lanes, creating a safe biking and walking experience from end to end.
While trips like these should be the norm, many Americans live in communities without sidewalks. Still more live in communities without any protected bike lanes or safe active transportation infrastructure. Shifting short car trips to walking and biking trips is achievable. Many of the trips Americans take are only 3 miles (a 20-minute bike ride) or less.

Shifting these short car trips to non-motorized ones, however, will take policy, behavior and perception change, which can only occur if connected networks of safe and protected walking and bicycling facilities are built all across the nation. That means sidewalks, rapid-flashing beacons at crosswalks, protected bike lanes, protected intersections, multiuse trails and more.

This report shows that these facilities provide an incredible return on investment in the form of benefits that:

1. **Enable more users to connect to their destinations by walking or biking**
2. **Improve people's health and reduce the cost of health care**
3. **Reduce greenhouse gases and oil dependence**
4. **Encourage economic investment in our communities**

All communities, no matter their size, may compete for federal investment in active transportation infrastructure, although the dollars available are vastly insufficient compared to the need. Smaller towns and rural areas, where rates of walking and biking are comparable to those of urban areas, are particularly dependent on federal resources to make necessary connections and safety improvements.[3] With a growing number of Americans who cannot or choose not to drive for some or all of their trips—including seniors, children and people with disabilities—today's transportation options must include safe routes to walk and roll.

Woman on e-scooter

The Age of Connectivity

American communities today are at a crossroads. For the past 70 years, the automobile has been the dominant mode of transportation and has received the lion's share of federal and state transportation investment. Engineers have prioritized maximum car throughput and free-flowing speed or level of service as markers of transportation efficiency and success.

Now, communities across America are looking for ways to strike a better balance so that residents might have more transportation choices and a higher quality of life. Multimodal transportation systems that prioritize human-centered mobility are in high demand.

In addition to fixing potholes and repairing rusted bridges, more and more Americans are asking their elected officials—from Congress to the statehouse to the town hall—to invest in walkable neighborhoods, safe and complete streets, and easy access to transit. Unlike America's Interstate Highway System, a comprehensive active-transportation system has yet to be built out. While more communities have individual trails, and some walking and biking infrastructure, many are now seeking to enhance connectivity by further completing trail and active transportation networks.

Communities are prioritizing how to maximize the number of people, not just cars, moving through a corridor. They are placing safety and reduction in traffic fatalities and injuries at the center of their transportation priorities. This shift in concern might mean reducing car speeds, providing separated paths for walking and rolling, or both.

Investing in walking and biking is a good deal for the American economy. Benefits of active transportation are enjoyed throughout society. This report quantifies those benefits to the public and to the government.

Individuals can benefit from improved health and cost savings, in addition to improved air quality and overall better quality of life. The private sector benefits from increased business opportunities, tourism and an overall vibrant urban environment that improves worker productivity. The government benefits from efficient transportation and land use, reduced health care costs, and a more inclusive and equitable society overall. But investing in active transportation is about much more than any of these benefits. It's about investing in people and the places in which they live—and giving all Americans the mobility options they need to thrive.


capital bikeshare
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Chapter One: Mobility for the 21st Century

The needs of a modern, 21st century transportation system look far different than they did just a few decades ago.

Mobility is at the center of what Americans need to navigate their daily lives—and numerous challenges stand in the way of efficient, effective mobility. For example, vehicle congestion and long commute times are persistent concerns, coupled with the expenses related to owning a car. In addition, concerns exist about the accessibility of the country's predominantly car-centric transportation system given challenges that some experience gaining access to a car—due to physical ability, age, disability and economic status. These problems are compounded by transit systems that are aging or delivering poor service. Furthermore, infrastructure that promotes walking and biking—trails, sidewalks and bike lanes—is often disconnected, and in some places, nonexistent. Together, these factors create a scenario where many people experience constrained mobility, a challenge that tends to most impact populations who have long experienced widespread disinvestment or systemic racism.

"Mobility is at the center of what Americans need to navigate their daily lives—and numerous challenges stand in the way of efficient, effective mobility."

Investments in walking and biking infrastructure have the potential to address several of the key concerns with today's transportation system, including accessibility, congestion and the cost of construction—while yielding an outsized return on investment when measured by economic, health and environmental gains. Strategically focusing public investments in projects that fill gaps in existing infrastructure and improve the connectivity of active transportation networks can multiply the return on investment by increasing the utility of this infrastructure.

Connectivity investments make better use of existing facilities while enabling more users to connect to their destinations by walking or biking. Throughout this report, quantitative evidence underscores the value that active transportation delivers and the power of every dollar invested in active transportation infrastructure.

Micromobility

The transportation landscape in American cities is changing with the advent of e-bikes, scooters, hoverboards and more—collectively dubbed "micromobility." These devices are attracting a wide range of users and expanding travel options. There are, however, growing concerns about injuries and conflicts with pedestrians and cars. Clarity is needed about where these devices belong. However, RTC offers treatment guidance for use of these devices on multiuse trails. More dedicated active transportation infrastructure is needed to ensure connected, low-stress routes that are inclusive, safe and inviting to all those seeking active and low-impact ways to get around.

Learn more: railstotrails.org/micromobility

Opposite: Capital Bikeshare station in Washington, D.C.

Woman in a wheelchair

Safe Routes to Everywhere, for Everyone: Accessibility (or Lack Thereof)

Central to the definition of 21st century mobility is creating a balanced transportation system that ensures all Americans, even those who cannot or choose not to drive a car, have effective, efficient, reliable mobility choices. According to the Federal Highway Administration, the total number of licensed drivers is 225.3 million, which is 85% of the drivable-age population.[4] That leaves out a significant portion of the U.S. population that does not drive.

For example, according to the 2017 American Community Survey, more than 41 million Americans cannot drive because they are under the age of 15.[5] In addition, many drivers from ages 15 to 18 are undergoing Graduated Driver Licensing programs with restrictions on when and where they can drive, potentially further reducing automobile mobility for an additional 32 million Americans.[6] For older Americans, an estimated 9 million residents over the age of 60 do not have a driver's license, and many more who are licensed choose not to drive. In fact, 8.9% of U.S. households, or an estimated 10.5 million households, do not own a car.[7]

People with disabilities also rely on active transportation to a greater degree than those without disabilities.[8] According to the 2017 National Household Travel Survey (NHTS), an estimated 25.5 million people reported that they had disabilities that made traveling outside the home difficult. An estimated 3.6 million people reported not leaving their homes due to their disability or housebound status. Moreover, 13% of workers with a disability reported they rely on walking to work, compared with only 9% of workers without a disability reporting the same. Along with improving vehicle access, improving sidewalk connectivity and providing safe, separated facilities for mobility aids such as wheelchairs is an important part of improving mobility for those with disabilities.[9]

Having access to strong mobility options equates to having access to opportunities like employment and education, which is critical for individual, economic, social and community success, not to mention physical and mental health. Public transit, walking and bicycling all provide strong mobility options for those who cannot drive due to disability, age, economics or personal preference—20%–40% of the population in most communities[10]—underscoring the importance of facilities for walking and biking to connect people to where they need to go.

With the advent of electric bikes (e-bikes), people with disabilities, older Americans and those with other physical health limitations or concerns are now able to ride longer distances than they would using a standard bicycle. This new mode of transportation allows for additional reduction in car travel and provides the option of shifting more car trips to bike trips while reducing congestion and emissions.

Table 1: Trips Replaced by E-Bike: Mode and Average Trip Length

	Automobile	Would Not Have Taken Trip
Commute (work or school)	45.8	1.1
Entertainment	8.9	3.5
Recreation or exercise	9.4	89.3
Personal errands	30.1	3.1
Visit friends/family	4.9	1.4
Other	0.8	1.5
n (# of trips)	1,778	987
Mileage/Trip	9.3	14.3

Table 2: E-Bike Used as Primary Mode by Cyclist Type

	Seldom/ Non-Cyclists	Frequent Cyclists
Commute (work or school)	27.3	37.1
Entertainment	11.5	18.4
Recreation	52.3	40.9
Personal errands	19.3	33.2
Visit friends/family	11.6	21.1

"Active transportation offers an alternative to building costly additional miles of highway, which does not reduce congestion."

Electric Bikes and Micromobility Extend Access to Active Transportation

When e-bikes are shared, the cost of owning, maintaining and providing these devices to the population rests with local governments, private mobility providers or some combination of the two. In places where they are available, shared devices tend to be more affordable, as well as quick and easy to operate. For many, e-bikes can help with the first or last mile. For a large section of the population, e-bikes help with longer-haul needs throughout the ride. These bikes also encourage non-bikers or those apprehensive of bike travel to try bicycling, thereby increasing the universe of active transportation users.

According to a recently published article, e-bike riders ride longer and gain similar physical activity benefits compared to cyclists. More importantly, replacing car trips with e-bikes leads to substantial gains of 550 Metabolic Equivalent Task (MET) minutes per week (comparable to 150 minutes per week of moderate-intensity physical exercise).[11]

Table 1 displays the percentage of trips that would have been taken by other modes if e-bikes were not available. It shows that nearly 46% of commuting trips and 30% of personal trips would have been made by car instead of e-bike. Another important point to note is that 89% of recreation/exercise trips would not have been made at all if e-bikes were not available.[12] The data points to the potential double positive impact of e-bikes: not only in reducing vehicle miles traveled, congestion and associated air pollution, but also in improving public health by encouraging more people to exercise.

In addition, Table 2 shows that 27% of e-bike users who use e-bikes to commute, and 52% of users who use them for recreation/exercise, are non-cyclists.[13] Another benefit of e-bikes, then, is that they can encourage a broader section of the society to take part and become interested in active transportation.

Since the mid-20th century, "mobility" has been virtually synonymous with the personal automobile. As a result, it is not surprising that 82.6% of all personal trips, whether for work, pleasure, errands, school or community activities, are taken in a private vehicle, according to the most recent NHTS.[14]

Woman commuting on Hawthorne bridge in Portland, Oregon

Return on Investment: Congestion

For commuters who drive, this means an average of a full work week, or 42 hours, is wasted while stuck in traffic every year.[15] This is estimated to cost each driving commuter $920 per year in wasted time and fuel.[16] No matter where you are—urban, suburban or rural—congestion can affect commute times to work. In a small town, the one main road may become backed up; in large urban areas, highways can quickly come to a crawl.

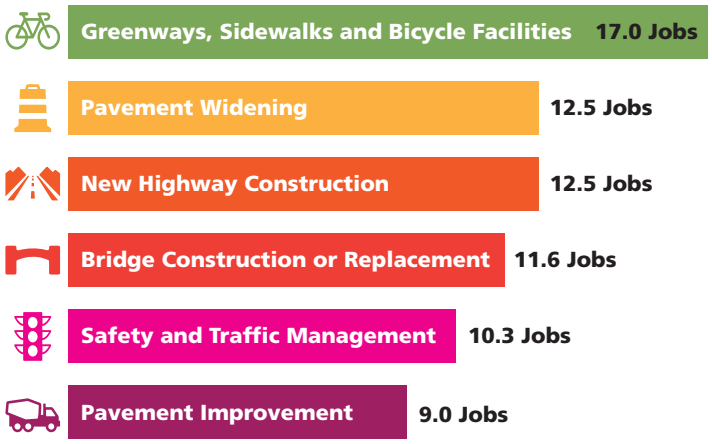
Relieving congestion by building more lanes of local roads or highways is one of the primary justifications for widening roads. However, this has been proven over and over again to be an ineffective means of addressing congestion, due to the "induced demand" effect. In other words, as more lanes are built, more travelers elect to go by car until travel time returns to pre-expansion levels.[17, 18] A 2014 report by traffic-analyzing firm INRIX looked at a 10-mile carpool lane constructed on the Los Angeles 405 Freeway. INRIX found that one year after construction, commute times were, on average, 1 minute worse than they had been before the lane was built.[19, 20]

Building connectivity for walking and bicycling infrastructure, on the other hand, can directly reduce congestion. In Madison, Wisconsin, the downtown area is located on a narrow isthmus between two lakes. Due to the physical lack of space for wider car travel lanes, the city's 2017 transportation master plan notes that it is "important to plan to provide alternative modes of transportation in the region."[21] As a result, the plan recommends conducting a "bicycle facility capacity evaluation and plan for the isthmus" to determine the best locations for bicycle facilities, which clearly take up less space than traffic lanes.[22]

Similarly, Portland, Oregon, has seen the addition of protected bike lanes prevent new congestion. The city considers four of its bridges—the Broadway, Burnside, Hawthorne and Steel bridges—to be key crossings for reaching the downtown area. According to a study by Portland Bicycle Planning Coordinator Roger Geller, between 1991 and 2010, the vehicular traffic on the bridges increased by 8%. The increase, however, was brought about almost exclusively by bicycles, which represent 12% of the bridges' total vehicle load.[23] In fact, automobile traffic showed a slight decrease of 4% in the same time frame.

Geller writes, "[h]ad the increase been—as it might be in most places—by automobiles, then the intersections at either ends of the bridge would likely have failed in their ability to effectively and efficiently move traffic."[24] Thus, mode shift from cars to bicycling was essential for accommodating a growing number of vehicles on the bridge crossings into downtown Portland.

Figure 1: Job Creation: Making a Case for Healthy Transportation Investments
Jobs Created Per Million Dollars Spent



Source: American Association of State Highway and Transportation Officials (AASHTO), Average Direct Jobs by Project Type (2012); jobs in terms of full-time equivalents (FTE)

Return on Investment: Construction Cost

In addition to congestion, the cost of building transportation infrastructure is at the top of today's mobility challenges. Furthermore, the solvency of the federal Highway Trust Fund looms over the transportation debate, as the federal gas tax, last raised in 1993, is at $0.18 per gallon and has not kept pace with inflation.

The anticipated shift to electric vehicles and improvement in fuel economy are likely to make it even harder—and eventually, impossible—for gas tax to pay for highways and transportation infrastructure.[25] While shoring up solvency of the Highway Trust Fund is beyond the scope of this report, active transportation offers an alternative to building costly additional miles of highway, which, as indicated earlier, does not reduce congestion.

Active transportation infrastructure is much cheaper to build than a highway on a per-mile basis. Reports also show that active transportation infrastructure creates more jobs per dollar than any other type of transportation.

The American Road and Transportation Builders Association estimates a ballpark figure for constructing a new, two-lane road at about $2 million–$3 million per mile in rural areas and about $3 million–$5 million per mile in urban areas.[26] By contrast, constructing a new multiuse trail costs about $200,000–$500,000 per mile in rural areas and about $1 million per mile in urban areas.[27] For more information about multiuse trail costs, refer to the report "Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public."[28]

Meanwhile, a 2012 study commissioned by the American Association of State Highway and Transportation Officials on jobs created by the American Recovery and Reinvestment Act found that transportation enhancement projects (i.e., walking and biking infrastructure projects including trails) created 17 jobs (design, engineering and construction) per $1 million spent, more than any other type of project.[29]

In sum, active transportation projects are cheaper to build and offer a higher job creation ratio than other transportation projects. In today's fiscally constrained world, these numbers make active transportation projects a viable solution for addressing mobility challenges. Walking trips alone constitute about 10.5% of all trips,[30] yet active transportation receives only about 1.8%, or $850 million, of transportation funding.[31]

"Active transportation projects are cheaper to build and offer a higher job creation ratio than other transportation projects."

The Case for Networks and Spines

Accelerated investment in active transportation connectivity is the first and foremost key to unlocking mode shift. Since the last time Rails-to-Trails Conservancy (RTC) published "Active Transportation for America" in 2008, America has advanced leaps and bounds in the number of trails, protected bike lanes, sidewalks, and other walking and biking facilities on the ground in communities across the country.[32]

However, in many places, trails are still only designed and built as recreational assets, whereby people must drive to trails before experiencing the safe off-road benefits they provide. Moreover, while these trails are present in many communities, they are not always connected. This lack of connectivity reduces the ability of non-driving residents to use these trails as a means of transportation that gets them from place to place.

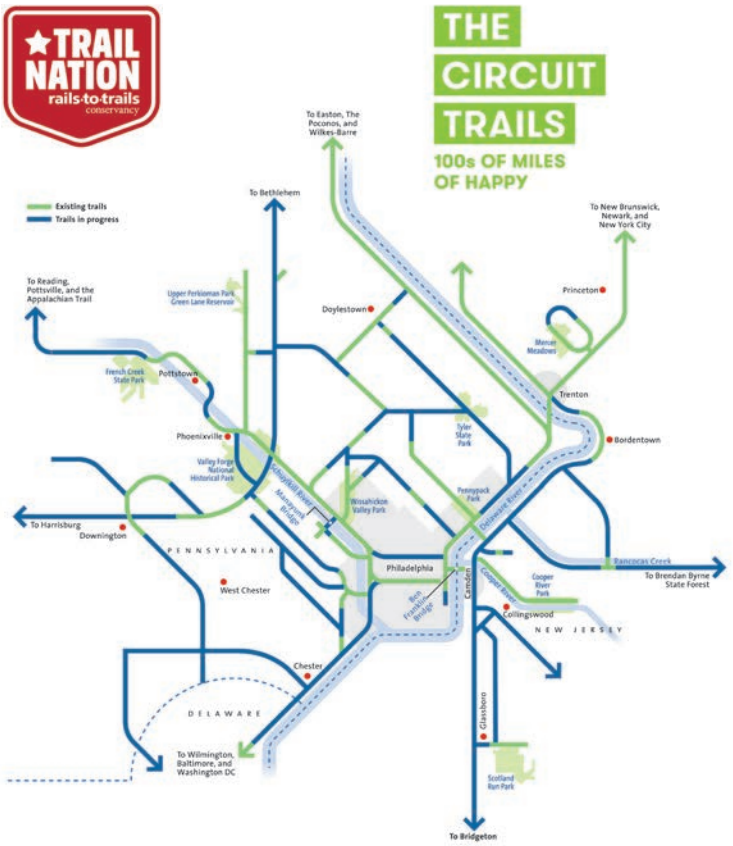
Linking trails to other safe walking and biking infrastructure eliminates stressful or dangerous gaps in a given route. Such connectivity ensures more users can travel from their residential areas to work, school and other community destinations via a low-stress network. For example, a 2018 analysis by RTC found that Cleveland's current bicycle infrastructure network gave only 55% of the city's residents access to a low-stress route from their residence to restaurants, parks, grocery stores, health care providers, banks, post offices and other everyday destinations.[33] Analyzing Cleveland's future bicycle network plan, the study found that with the full build-out, 85% of the city's residents would be able to access these destinations by a low-stress route.

For transportation between cities, or even states, spine trails facilitate connectivity. A prime example of this is the Great American Rail-Trail, an iconic cross-country multiuse trail project that will one day create a contiguous route from Washington, D.C., to Washington State.[34] The trail is currently more than 52% complete. Continued investment at the local, state and federal levels will link this 3,700-miles-plus trail across 12 states and the District of Columbia.

In this framework, spine trails act as the "interstate" of safe, off-road walking and biking infrastructure, where "off-ramps" connect to community trail networks the same way that America's coast-to-coast interstate system connects to local networks of streets. While the interstate highway system might be complete, the interstate trail system has barely begun. Federal investment will be key to accelerating completion of a new national transportation system.

There is also a practical need for more interstate spines for walking and bicycling. Of the 404 metropolitan planning organizations (MPOs) in America, only 42 MPOs—approximately 10%—cross two or more state lines. These aren't just major economic centers such as New York or Washington, D.C. They also represent mid-sized American cities and suburban centers. Several examples include Chattanooga, Tennessee, where the MPO extends into Georgia, and Sioux City, Iowa, where the MPO extends across Iowa, Nebraska and South Dakota.

Figure 2: Circuit Trails Map



Connectivity, Mode Shift and Related Benefits

Studies have shown that increasing investment in building walking/bicycling networks increases mode shift, improves connections to transit, supports urban development and demonstrates other positive societal benefits. From Wisconsin to Washington, D.C., to North Carolina and beyond, the research makes it clear that trail networks result in more walking/bicycling trips, mode shift, and gains for safety, the environment and local economies. Building out the nation's active transportation networks and connecting trail corridors as multi-county and state spines for walking and bicycling are key to transforming America's transportation infrastructure and delivering the mobility Americans want and need.

TrailNation™

Rails-to-Trails Conservancy's TrailNation program is the organization's signature trail-network building initiative designed to accelerate the development of connected trail systems nationwide while measuring the benefits that trail connectivity delivers in the form of social equity, transportation, health, environmental and economic gains. In eight places across the country—places that are diverse in their geography, culture, size and scope—RTC is investing in projects and partnerships that demonstrate what is possible when 21st-century trail networks are at the center of communities. Learn more at **TrailNation.org**.

Case Study: Nonmotorized Transportation Pilot Program

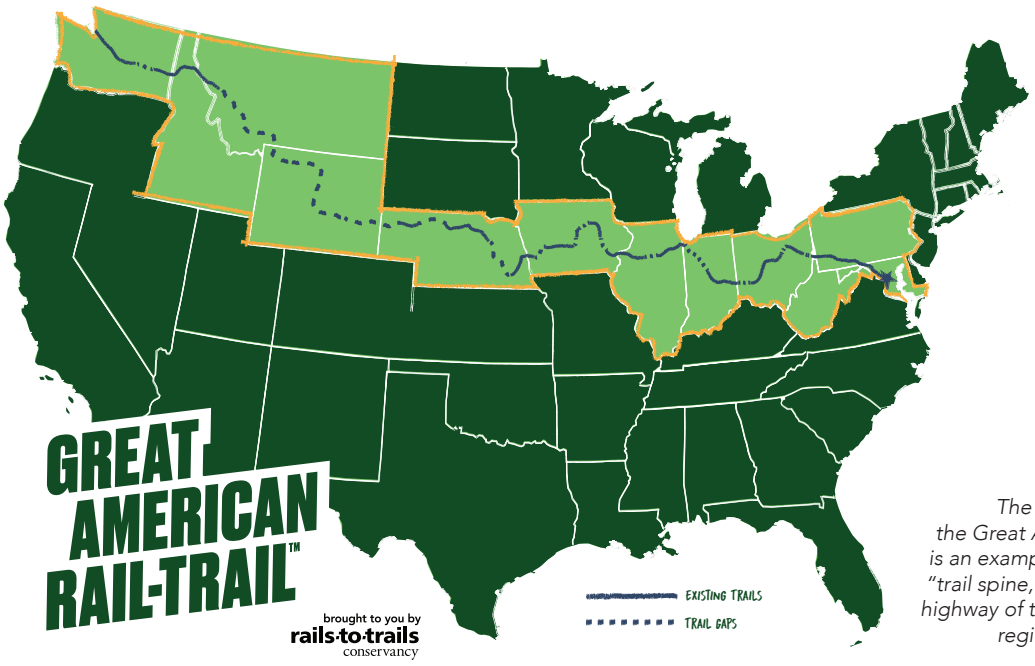
The Nonmotorized Transportation Pilot Program (NTPP) ran from fiscal years 2005 to 2010. The pilot program selected four communities—1) Columbia, Missouri; 2) Marin County, California; 3) Minneapolis, Minnesota; and 4) Sheboygan County, Wisconsin—to initially receive $25 million each, followed by an additional $3 million for a total for $28 million, to invest in their walking/bicycling networks. The pilot program investigated whether mode shift would occur when a community received a concentrated investment of dollars for walking and biking. Program results demonstrated that the answer was a resounding "yes."

The final report on the program found that between 2009 and 2013, 85.1 million vehicle miles traveled were avoided due to mode shift, relative to a 2007 baseline.[35] On average, the walking mode share increased by 15.8% and the bicycling mode share increased by 44%. The NTPP also saved an estimated 3.6 million gallons of gasoline in that time, averting 34,629 tons of carbon dioxide emissions.[36]

Of even more significance than mode shift in and of itself, the NTPP also increased access to jobs and housing among pilot communities. The NTPP expanded quarter-mile bicycle network access to 106,000 housing units and 102,000 jobs.[37]

The program also reduced pedestrian and bicycle fatalities. Communities observed a 20% decline in pedestrian fatalities and a 28.6% decline in bicycle fatalities. The number of pedestrian injuries also saw a decrease, with the pedestrian injury rate declining 17.9%–55.1% depending on the community.[38] In all four communities, the rate of bicycle injury declined between 8.6%–38.2%.[39] Of note is the fact that the total funding for this program was $112 million—equivalent to building approximately 10 miles of a four-lane highway,[40] which would, in turn, have made traffic, emissions, fatalities and injuries worse.[41]

Figure 3: Great American Rail-Trail Preferred Route Map



The preferred route of the Great American Rail-Trail is an example of an interstate "trail spine," like an interstate highway of trails that connects regional trail networks along the way.

"The ripple effect of filling in a trail gap is felt across the network—not just in the immediate vicinity of the new connection."

Case Study: Seville, Spain

Seville, Spain, offers a clear picture of the effects of bicycling networks. In 2006, the city had a total of 7 miles of protected bicycle lanes in four disconnected locations. In 2007, the city built 40 miles of protected bike lanes, creating a loose network throughout the city. The results for mode shift were striking.

From 2006 to 2007, Seville saw a jump in the number of bicycle trips, from 3 million to 6 million annually. From 2008 to 2013, the city built an additional 46 miles of protected lanes. In 2013, the number of bicycle trips rose to 16 million annually. Researchers concluded that the rise in number of trips from 2006 to 2013 was due to the additional miles of protected bike lanes.[42]

As an added benefit, the presence of safe, protected infrastructure reduced serious crashes in Seville. From 2006 to 2007, the number of accidents between a bicycle and a motor vehicle decreased from a rate of nearly 16 to 7 accidents per million bicycle trips. The Seville study concluded that the increase in safety was directly due to the fact that the new miles were part of a connected network.[43]

Case Study: Bike Share

In a 2016 report, the federal Bureau of Transportation Statistics found that 77% of America's then 3,378 bike-share stations were within 1 block of a transit station. According to the bureau, "[t]hese connections extend the transportation network by offering a means for reaching places with scheduled public transportation (e.g., heavy rail stations and local bus stops) and a means for reaching destinations not served by scheduled public transportation.[44]

Further, a study of the Capital Bikeshare system in Washington, D.C., revealed that building 0.62 miles of bike lane within a half-mile buffer of a Capital Bikeshare station is associated with an increase in use of the bike share of nearly 1%—even after controlling for population, retail destinations and the percentage of households without a car.[45]

Case Study: Closing Trail Gaps

In 2015, the Institute for Transportation Research and Education at North Carolina State University released a report on the effects of completing a critical link in the American Tobacco Trail in Durham, North Carolina. After a critical bridge was constructed, the number of trips taken on the trail increased by 133% and an additional $3.7 million was spent annually on goods and services by those using the trail.[46]

When connections are made between former trail gaps, usage increases at the immediate location, as might be expected. According to RTC's calculations (see Methodology statement in the back of this report), the usage percentage increase might vary 40%–80% depending on the significance of the trail gap. In the Central Ohio Greenways network, Figure 3, the Alum Creek Trail has seen a 40% increase in activity since having been connected to the network in 2014.[47]

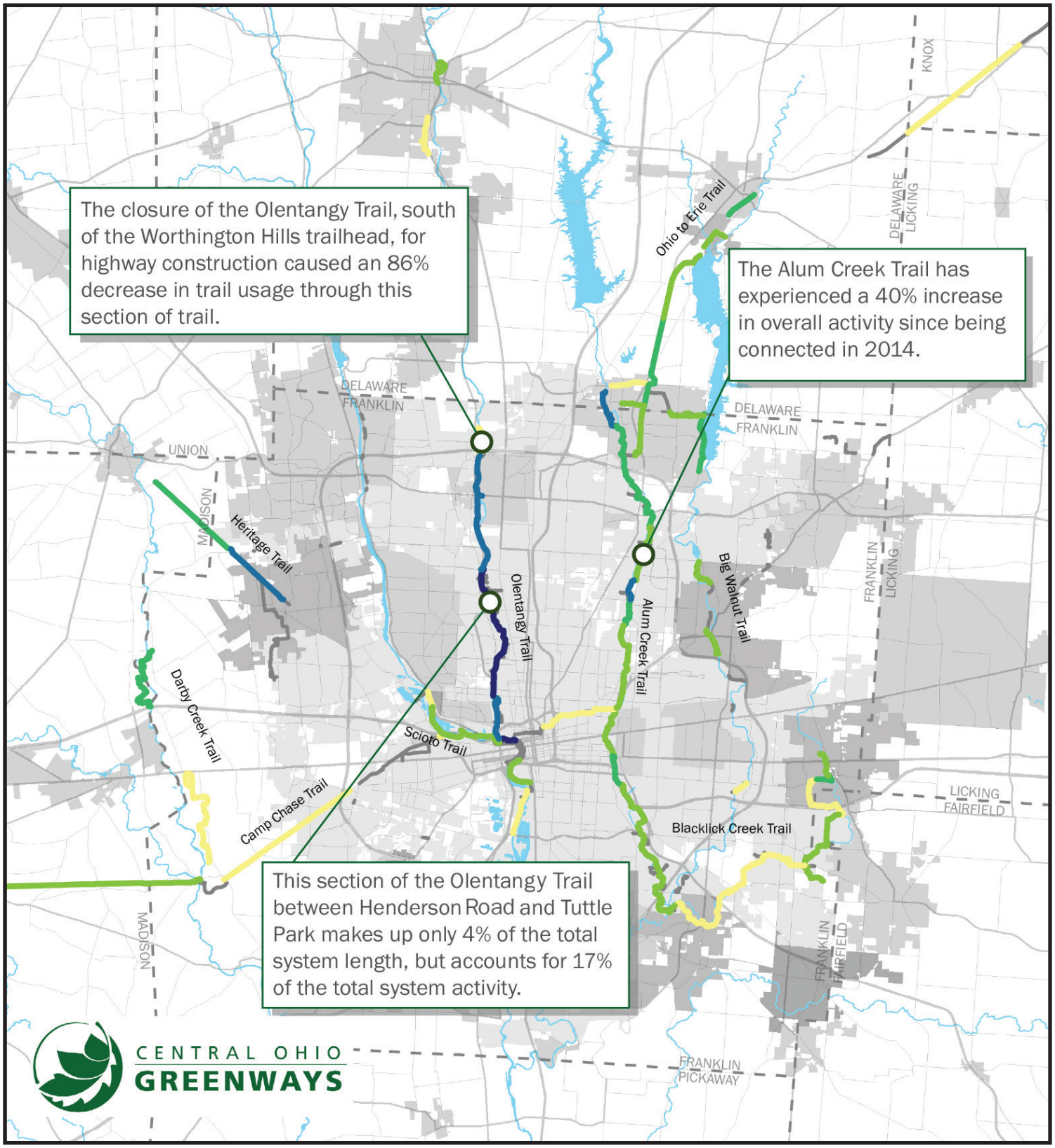
Conversely, trail gaps—when they remain unconnected—have a negative impact on usage and can result in decrease of trail usage at the immediate location (by as much as 75%), as well as at other sections of the trail network (from 4% to 12%). In the Central Ohio Greenways network, the closure of the Olentangy Trail for highway construction resulted in an 86% decrease in trail usage through this section of trail.[48]

The ripple effect of filling in a trail gap is felt across the network—not just in the immediate vicinity of the new connection. Creating a new trail connection can result in an increase of 2%–15% in other sections of the network.

However, the benefits of gap-closing are felt most closest to the original gap, and are felt less and less as you move farther from the gap. The greater the distance of a section from the gap, the lesser the impact of the gap closing/opening.

Another example of the impact of connectivity, major gap fillings and complete trail networks can be seen on the Cynwyd Heritage Trail in Lower Merion, Pennsylvania. After the Manayunk Bridge connection opened, the trail experienced an immediate increase in usage of 135%.[49]

Figure 3: : Central Ohio Greenways Analysis of Daily Trail Traffic

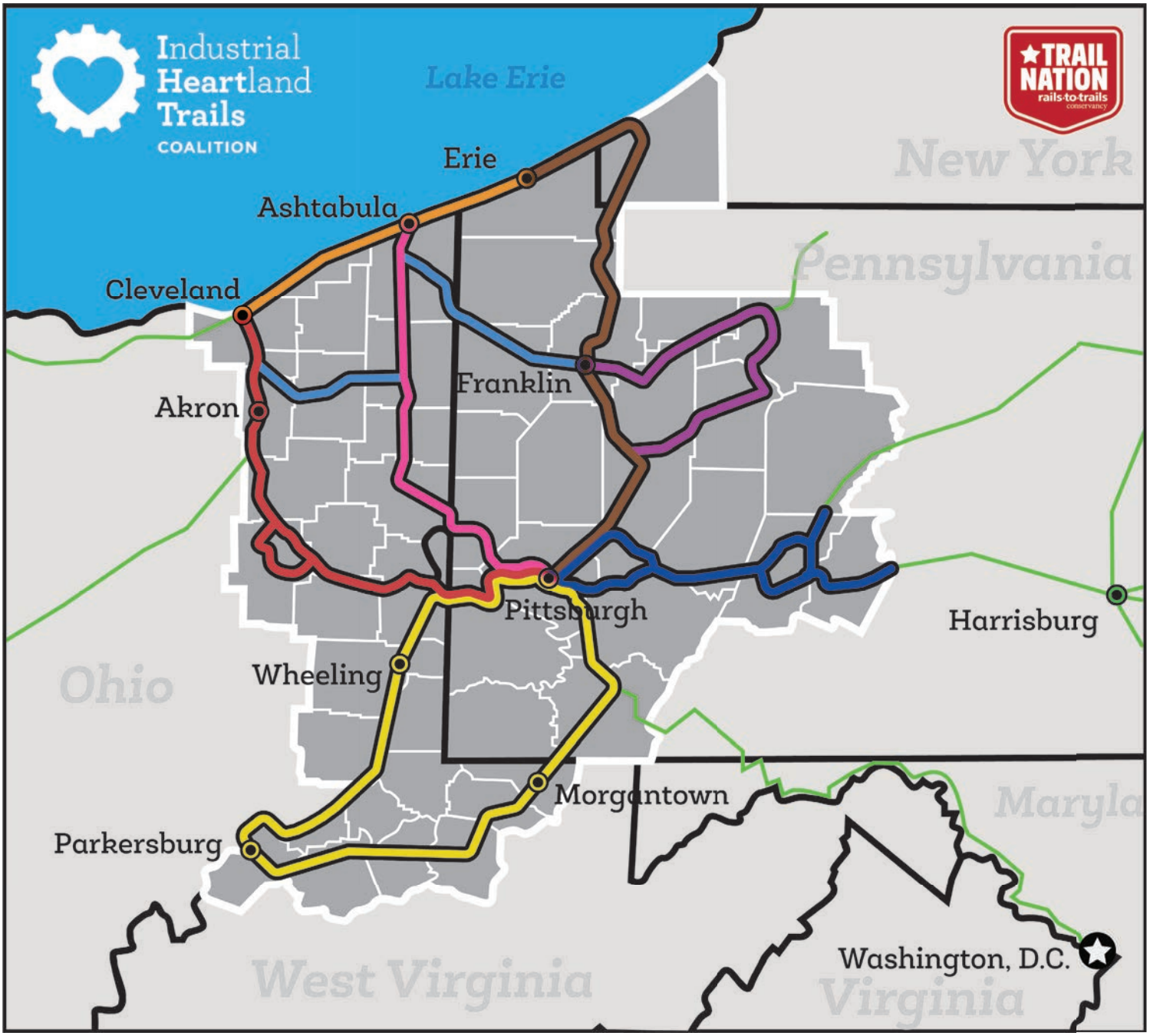


2016 - Average Annual Daily Trail Traffic (AADTT)

Variation in AADTT by trail segment (Central Ohio Greenways)

No Data | 15 - 115 | 116 - 250 | 251 - 450 | 451 - 850 | 851 - 1,300

Figure 4: Industrial Heartland Trails Coalition Map



Notes From the Field: Industrial Heartland Trails

The vision of the Industrial Heartland Trails Coalition (IHTC) is to establish the Industrial Heartland as a premier destination offering a 1,500-miles-plus multiuse trail network experience. The IHTC builds upon past efforts to organize the trails community, leverage the cultural heritage of the region into a leading trail destination, and harness and amplify the benefits of the region's trail systems. Such benefits include stimulating the regional economy through outdoor tourism and small business investment, as well as creating social equity and new health connections for underserved communities across the project footprint.

Great Miami River Trail in Ohio | Photo by Tom Bilcze

The IHTC network will stretch across 51 counties in four states—Pennsylvania, West Virginia, Ohio and New York—from the shores of Lake Erie to the confluence of the Three Rivers in Pittsburgh and on to the Ohio River and Appalachian foothills. Pittsburgh will serve as the IHTC network's hub, with trails radiating out of the metro area and connecting to Cleveland, Akron and Ashtabula in Ohio; Morgantown and Parkersburg in West Virginia; and Erie in Pennsylvania (Figure 4).

In the Industrial Heartland, approximately 3.5 million people living in 1.5 million households are located within 3 miles of a destination corridor. Of those 3.5 million, 85% are of employment age (i.e., older than 16). Of those living within 1 mile of a destination corridor who are employed, 89.1% commute by car; only 4.7% walk or bike to their jobs.

Filling in the trail network's 700 miles of gaps will provide hundreds of thousands of people with safe, off-road access to areas of commerce and places of employment in major cities and small communities across the route.

Completing the gaps in the trail network will provide increased access to safe active transportation routes and opportunities for physical activity to diverse populations throughout the project footprint. For example, in Pennsylvania, 40% of African Americans are obese as compared to 30% of whites and 32% of Latinos. The state has adopted healthy food financing funding and Complete Streets policies to encourage healthy eating and physical activity.[50] Changes to the built environment along the IHTC route will support the state's goals to increase physical activity and opportunities for health and wellness among populations in need, while simultaneously creating new connections to jobs and shopping centers and supporting healthier lifestyles.

The IHTC will spur a new wave of regional tourism, encouraging exploration of the small towns, major cities, historical sites, rivers and mountains that characterize America's first frontier and the heartbeat of the country's industrial revolution. The project is establishing a new collective identity for the communities along the route whose shared past and present—of innovation, steel, agriculture, manufacturing, boom, bust, reinvention and renewal—will become their shared future.

Schuylkill River Trail in Philadelphia, Pennsylvania

Do the Math: Current and Potential Driven Miles Avoided by Bicycling and Walking

Throughout this report, the "Do the Math" sections explain the calculations used to monetize the benefits of active transportation. While not exhaustive, only providing conservative estimates of benefits, these quantifications provide a starting point in understanding the enormous positive impact that active transportation has on the individuals, private and public sectors, environment, health and overall economy of the United States. This is especially true when comparing the high return on investment of active transportation infrastructure to that of other transportation sector investments like roads, bridges and highways.

Each "Do the Math" section presents three scenarios. The first is the status quo scenario, which represents present conditions. The two other scenarios are the modest and substantial ones, the former forecasting cost savings with modest improvement over the current conditions and the latter forecasting substantial cost savings with significant improvement over the current conditions. These additional scenarios provide a glimpse of possible cost savings to the individual and our collective society when more federal funding is available to encourage people to use active transportation infrastructure.

Analysis: Increasing the Bicycle and Pedestrian Share of Trips

At present, one-third of all trips less than 1 mile are made by walking and bicycling, while two-thirds of all trips less than 1 mile are made by cars, trucks and motorcycles. Eight percent of all 1- to 3-mile trips and 2% of all 3- to 5-mile trips are made by walking and bicycling (i.e., 10.6 billion and 3.5 billion miles of active transportation, respectively), while 88% of all 1- to 3-mile trips and 93% of all 3- to 5-mile trips are made by cars, trucks and motorcycles (8 billion miles).[51]

- Increasing the bicycle and pedestrian share of trips less than 1 mile from 33% to 50% under a modest scenario, and from 33% to 62% under a substantial scenario, would result in 21 billion and 26 billion driven miles avoided, respectively.
- Increasing the bicycle and pedestrian share of 1- to 3-mile trips from 8% to 10% under a modest scenario, and from 8% to 14% under a substantial scenario, would result in 18 billion and 26 billion driven miles avoided, respectively.
- Increasing the bicycle and pedestrian share of 3- to 5-mile trips from 2% to 3% under a modest scenario, and from 2% to 6% under a substantial scenario, would result in 5 billion or 11 billion driven miles avoided, respectively.

This analysis includes short trips of 3 miles and medium length trips of 3–5 miles to better reflect experienced and inexperienced bicyclists. Experienced bicyclists routinely travel 5 miles or more per trip, while inexperienced bicyclists generally travel 3 miles or less per trip.[52]

Estimates of modest and substantial scenarios for walking/bicycling trip length are based on the following assumptions:

- The modest scenario was calculated by averaging the top 25 states' (for walking and biking) percentages of walking/bicycling in that trip's mileage category.
- The substantial scenario was calculated by averaging the top five states' (for walking and biking) percentages of walking/bicycling in that trip's mileage category.

Analysis: Increasing Synergy Between Active Transportation and Public Transportation

Currently, 2.5% of all trips and 5% of work trips are made using public transportation.[53] Estimates of potential driven miles avoided due to the synergy between active transportation and public transportation are based on several assumptions (Table 3), including that:

- The share of public transportation trips 1–15 miles in length would increase from 1% to 4% in the modest scenario and from 1% to 10% in the substantial scenario.
- Improved transit access by walking/bicycling would increase public transportation ridership by 16% in the modest scenario and by 33% in the substantial scenario.
- Increased density and diversity of land use patterns (i.e., trail-oriented and transit-oriented development) induced by bicycling and walking infrastructure will reduce the number of car trips 15 miles or less by 1% in the modest scenario (i.e., 10 billion driven miles avoided) and 3% in the substantial scenario (i.e., 27 billion driven miles avoided).

Based on these assumptions, the synergy between bicycling, walking and public transportation would result in 8 billion driven miles avoided in the modest scenario and up to 37 billion driven miles avoided in the substantial scenario. In addition, changes in walking/bicycling infrastructure would result in 10 billion driven miles avoided in the modest scenario and 27 billion driven miles avoided in the substantial scenario (Table 4).

Table 3: Underlying Assumptions for Calculating Annual Driven Miles Avoided

Factor	Status Quo	Modest Scenario	Substantial Scenario
Walking and Bicycling Mode Share			
Trips < 1 mile	33%	50%	62%
Trips 1–3 miles	8%	10%	14%
Trips 3–5 miles	2%	3%	6%
Public Transportation Mode Share			
Trips 1–15 miles	1%	4%	10%
% increase because of walking and bicycling	unknown	16%	33%
Trip length reduction through induced mixed use (1–15 miles)	unknown	1%	3%

Table 4: Driven Miles Avoided Due to Walking and Bicycling Annually (Billions)

Factor	Status Quo	Modest Scenario	Substantial Scenario
Trips < 1 mile	11	21	26
Trips 1–3 miles	11	18	26
Trips 3–5 miles	3	5	11
Transit trips 1–15 miles*	15	50	112
Increase of public transportation ridership because of walking and bicycling	unknown	8	37
Trip length reduction through induced mixed use (1–15 miles)	unknown	10	27
Totals	**25**	**62**	**127**

**Transit trips 1–15 miles are not included in the total calculation, but were used to calculate increase of public transportation ridership because of walking and bicycling.*

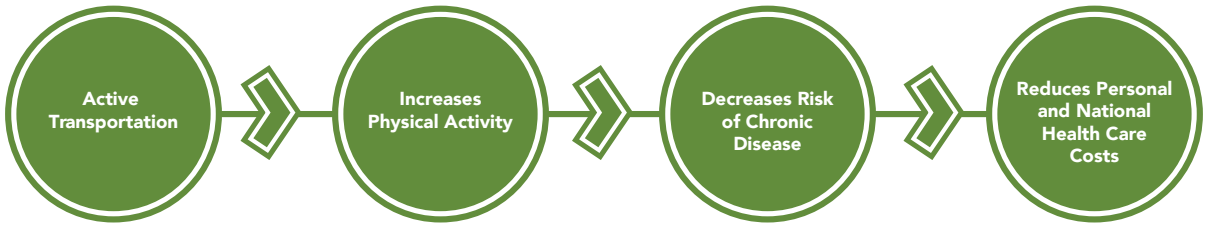
Chapter Two: Active Transportation, an Opportunity for Healthy Lifestyles

Only 50% of adults in the United States meet the U.S. Centers for Disease Control and Prevention's (CDC) recommended guidelines for physical activity: 150 minutes of moderate to vigorous exercise per week, or its equivalent.[54] Failure to get the recommended amount of exercise can lead to chronic disease and high financial costs. Six in 10 Americans, in fact, have a chronic disease, while four in 10 have two or more chronic diseases.[55]

More than 80% of all trips taken in the United States are by private vehicles, while 10.5% are by walking.[56] Furthermore, 77% of all trips 3 miles or less are taken by car, motorcycle or truck; only 20% are made by active transportation.[57] Compounding this discrepancy is a lack of safe infrastructure for walking and biking. Short trips of 3 miles or less can easily be taken by walking or bicycling, but only if there are safe facilities to do so, such as sidewalks, protected bike lanes, well-designed crosswalks, trails and more.

Active transportation incorporates physical activity into daily routines, making it easy to achieve the CDC's recommended guidelines for physical activity. By increasing physical activity along safe, protected routes, Americans can reduce their risk of chronic disease and, in the process, save themselves and the national health care system millions of dollars. In short, active transportation can address the widespread trend in America of sedentary lifestyles that lead to chronic disease and high health care costs by offering opportunities for frequent and routine physical activity.

Sedentary Lifestyles, Chronic Disease and the Benefits of Physical Activity



Physical inactivity and sedentary lifestyles can lead to chronic disease and weight gain, which in turn can lead to shorter life spans, significantly reduced quality of life, increased risk of diseases (e.g., cardiovascular disease, diabetes, cancer and depression) and large health care expenditures.[58]

The good news is that, just as physical inactivity can lead to chronic disease, meeting the CDC's recommended weekly amount of physical activity can prevent the development of new chronic diseases or the progression of existing health conditions. The CDC's 2018 "Physical Activity Guidelines for Americans" states that the health benefits for individuals who do not meet the physical activity recommendations but begin to increase their physical activity are greater than the health benefits for individuals who are already active. The report also states that any amount of physical activity, no matter the threshold, can provide health benefits.

Along with reducing the risk of disease, physical activity has also been shown to improve individuals' sleep, functioning and overall wellness.[59] A single instance of physical activity can decrease blood pressure and anxiety symptoms while improving sleep, insulin sensitivity and cognition throughout the day the activity is performed.[60] The impact of the physical activity is strengthened with each subsequent workout completed on a regular basis.[61] The reduction of disease risk and improvements of physical functioning will develop within days or weeks of beginning a physical activity regimen.[62]

The CDC physical activity guidelines also include methods of promoting physical activity among individuals. These include interventions at individual, school-based and communitywide levels. Enacting policy changes, improving access to places, modifying the built environment to support physical activity, breaking down barriers and making it easy to be physically active all have a positive impact on promoting physical activity. Increasing awareness through information, communication and social media can also promote regular physical activity.

Following are summaries of the impact of physical activity and inactivity on common chronic diseases and mental health.

Opposite: Barton Creek Footbridge in Austin, Texas

Arthritis

Osteoarthritis, the most prevalent form of arthritis, affects more than 30 million adults in the United States.[63] Studies have shown that physical inactivity is linked to arthritis. Conversely, physical activity can help prevent or treat this disease. In an age-adjusted study, those who engaged in the recommended amount of physical activity were less likely to have arthritis (18.1%) than those who had lower levels of physical activity (23.1%) or no physical activity (23.6%).[64] For those already experiencing osteoarthritis, research shows that engaging in physical activity can result in decreased pain as well as improved functioning abilities.[65]

Asthma

In 2010, asthma-related incidents accounted for 3,404 deaths, 439,400 hospitalizations, 1.8 million emergency room visits and 14.2 million physician office visits.[66] According to the CDC's National Center for Health Statistics, asthma has a higher prevalence in adults with obesity (11.1%) compared with adults in normal weight (7.1%) and overweight (7.8%) groups.[67] Fortunately, studies have demonstrated that an increase in both intensity and volume of physical activity can alter the severity of asthma as well as improve symptoms and quality of life.[68]

Cardiovascular Disease

Four recent meta-analyses—i.e., studies that analyze multiple studies—determined that physical inactivity significantly increased the risk of cardiovascular disease.[69] One study determined that an increase of 2,000 steps per day was correlated with a 10% decrease in cardiovascular events (e.g., heart attacks).[70]

Another study demonstrated that healthy or prehypertension individuals who engage in moderate-to-vigorous physical activity decrease their likelihood of developing hypertension, or progression from prehypertension.[71] According to this study, the risk of cardiovascular disease, stroke and heart failure will continue to decrease as the exposure to physical activity increases, with no limit to potential benefit noted.[72]

Diabetes

A clear, inverse relationship between physical activity and type 2 diabetes has been established in the scientific literature. The less routine physical activity a person undertakes, the more prevalent the incidence of type 2 diabetes. Conversely, the more routine physical activity a person undertakes, the less prevalent the incidence of type 2 diabetes. In fact, a systematic review of physical activity outcomes conducted in Canada found that all of the 20 studies between 1991 and 2007 showed an inverse relationship between the two, showing physical activity as key to diabetes prevention.[73]

Cancer

Data from the Medical Expenditure Panel Survey estimates that all medical costs, direct and indirect, for cancer within the United States in 2011 was $8.3 billion.[74] According to a calculator instituted by the CDC, the state-specific median medical cost of cancer is more than $1.97 billion.[75] While the associated costs of cancer are high, there is strong evidence that physical activity reduces risk of multiple cancers, including bladder cancer, breast cancer, colon cancer, endometrial cancer, esophageal cancer, gastric cancer and renal cancer. Research also points to a moderately significant relationship between physical activity and the development of lung and thyroid cancers.[76]

Mental Health

Physical activity offers benefits beyond the physiological, including a reduction in clinical depression, depressive indicators and the severity of symptoms associated with depression. Researchers also note a dose-related response. The greater the frequency, volume or intensity of physical activity, the greater the reduction in symptoms of depression.[77, 78]

Individuals suffering from acute anxiety showed a small yet significant decrease in anxiety symptoms following a single instance of physical activity, with the greatest improvements apparent in women, people older than 25 and sedentary individuals.[79] A meta-analysis of multiple studies showed that physical activity was as good—if not better, in some situations—as standard anxiety treatment, including psychotherapy and medication.[80, 81]

There is also evidence that physical activity improves mental cognition in a number of ways. When members of the general population repeated instances of moderate-to-vigorous physical activity over time, they saw a moderate amount of improved cognition, performance on academic achievement tests and improved "neuropsychological performance" in memory, executive function and processing speed.[82] For individuals with cognition disorders such as dementia, attention deficit hyperactivity disorder, schizophrenia, multiple sclerosis and Parkinson's disease, research shows that physical activity can improve cognition abilities.[83]

Ann and Roy Butler Hike and Bike Trail in Austin, Texas

Absenteeism and Presenteeism

The chronic diseases discussed above result in not only the loss of billions spent on health care, but also the loss of economic value from absenteeism and presenteeism, both of which are discussed below.

- **Absenteeism:** This can result from workers needing time off to treat their chronic disease or feeling too poorly to work due to their chronic disease. Absenteeism encompasses both physical pain from a chronic disease as well as mental health issues that arise from the pain or treatment of a chronic disease.
- **Presenteeism:** Also known as working while sick, this, too, can cause an economic loss in productivity due to workers being unable to perform at their full capacity. Presenteeism could be due to physical symptoms caused by a chronic disease or mental health issues that result from a chronic disease.

Mental health conditions are a significant source of absenteeism and presenteeism. Estimates show that 3.7 million adults and 3.1 million adolescents (10.9% and 12.8%, respectively) have had an episode of depression—specifically, major depressive disorder (MDD)—within the last year.[84] Of those, 1.6 million adults and 1.2 million adolescents (44.1% and 40.9%, respectively) received treatment.[85]

According to one study, the economic burden of MDD is approximately $210.5 billion per year.[86] About half of these costs are associated with absenteeism and presenteeism. Presenteeism is exceptionally taxing, making up 77% of MDD's costs in the workplace and 37% of the overall economic burden of MDD. This is equivalent to 32 incremental workdays lost per year by the average individual with MDD.[87] Another 45%–47% of the economic burden of MDD is attributable to direct medical costs paid by the employer, employee and society.[88] The remaining 5% consists of expenses related to suicide.[89]

The Cost of Physical Inactivity

According to the Centers for Medicare & Medicaid Services (CMS), the National Health Expenditure increased by 3.9% in 2017, bringing the total to $3.5 trillion (or $10,739 per person), making up 17.9% of the country's Gross Domestic Product. The largest shares of total health spending were paid by the federal government (28%) and households (28%). Private businesses paid for 20% of total health care spending, state and local governments paid for 17%, and other private revenues paid for 7%.[90]

When considering the staggering costs of chronic disease due to physical inactivity in America, the financial gain of the health benefits related to trail use outweigh the cost of building and operating trails.[91] For example, in Lincoln, Nebraska, one dollar invested in trails saved $2.94 in direct medical costs.[92] Taken at a national scale, more physical activity could put billions more in the pockets of Americans. Finally, employers also benefit from increased physical activity among their workers in the form of increased productivity, reduced absenteeism and reduced presenteeism, benefits that are not calculated in this report.

"A 15-minute walk or bike ride to work for a total of 30 minutes a day would be sufficient to meet the CDC's recommended physical activity guidelines."

Increasing Physical Activity Through Active Transportation

Meeting the CDC's guidelines for physical activity can reduce the prevalence of chronic disease and risk of early mortality. How do trails, bike lanes and sidewalks help people lead more healthy, active lifestyles?

While walking and bicycling are far from the only means of achieving physical activity, for many, they have an advantage over the gym or specialized sports because they are the most cost-effective and time-effective means of incorporating physical activity into daily life, making active travel a realistic and appealing way to stay healthy and active.[93]

Walking on a sidewalk and bicycling on a trail or protected bicycle lane are free activities, compared with buying a gym membership or paying to use specialized courts or equipment for organized sports events. This saves Americans personal dollars they can spend elsewhere and addresses the need for physical activity in low-income communities. In addition, building active transportation infrastructure offers a safe alternative to running or biking in the road or on a street without a sidewalk. Having dedicated facilities for each user type ensures a safe and pleasant experience for all.

Finally, and perhaps most significantly, walking and biking can be easily incorporated to everyday routines. A 15-minute walk or bike ride to work for a total of 30 minutes a day would be sufficient to meet the CDC's recommended physical activity guidelines. In today's fast-paced world, finding time to hit the gym or play sports is increasingly difficult. By adding physical activity to everyday routines—e.g., commuting to work or school, running errands in town or heading to see a friend—active transportation is a time-efficient means of staying active and healthy.

The presence of high-quality sidewalks is associated with adults having higher rates of walking, meeting physical activity recommendations and having a lower likelihood of being overweight. A survey of more than 11,500 participants in 11 countries found that residents of neighborhoods with sidewalks on most of the streets were 47% more likely than residents of neighborhoods with minimal sidewalks to achieve moderate-to-vigorous physical activity at least five days per week for at least 30 minutes each day.[94] Another review of 16 studies found that people who reported having access to sidewalks were 20% more likely to be physically active than those reporting no access to sidewalks.[95]

Similarly, the presence of bicycle lanes and paths is associated with higher rates of cycling and meeting physical activity recommendations. Cities that invest in bicycle facilities exhibit higher levels of bicycle commuting. One study of 35 large U.S. cities estimated that for every additional mile of bicycle lane there was a 1% increase in bicycle commuters.[96] Studies conducted in Minneapolis, Minnesota, and Portland, Oregon, showed that bicyclists were willing to travel farther than they would normally in order to use safe bicycle infrastructure.[97, 98, 99] Ultimately, people are willing to add distance and time to their trips if it means they can use safer routes.

In addition to bicycle lanes, building multiuse trails can also lead to short- and long-term increases in walking and bicycling, especially on urban trails and those that connect origins like population centers to destinations, such as schools, grocery stores or workplaces.[100] Research has shown that trails can promote physical activity among groups that are at a high risk of physical inactivity, especially women and people in lower socioeconomic groups.[101]

Proximity to trails is associated with people being 50% more likely to meet physical activity guidelines[102, 103] and 73% to 80% more likely to use a bicycle.[104] Research indicates that people who say they use trails at least once a week are twice as likely to meet physical activity recommendations as those who report using trails rarely or never.[105]

The Schuylkill River Trail is an important corridor in the Philadelphia region's Circuit Trails network, one of RTC's TrailNation projects.

Proven Healthy Outcomes From Active Transportation

The use of active transportation has been shown to have a direct relationship to meeting physical activity guidelines within the United States.[106, 107, 108, 109] Studies also have linked active transportation to a more than 40% decrease in mortality rates.[110, 111]

One meta-analysis demonstrated that walking and bicycling reduced risk of all-cause mortality (an indicator of population health that measures the total number of deaths due to any cause), after adjusting for other physical activity. The meta-analysis also showed that walking and bicycling had the greatest effect on the risk for all-cause mortality among those with the lowest levels of active behaviors as compared with those with some level of physical activity. In other words, any public health approach that increased walking and bicycling levels in groups with the lowest levels of such behaviors would have great impact.[112]

One of the largest studies conducted on active transportation and health analyzed data from more than 260,000 participants ages 40–69 who walked or cycled to work in the United Kingdom. The study followed their health outcomes for five years and found that cycling was associated with lower mortality rates in general, along with lower instances of cardiovascular disease and cancer. Walking was associated with lower instances of cardiovascular disease and cancer. The study also found that "mixed mode" commuting that included cycling (e.g., transit and cycling) also resulted in lower mortality rates in general and lower cancer outcomes.[113]

A study on the American Tobacco Trail in Durham, North Carolina, showed that completing a critical missing bridge segment in the trail had a significant impact on the number of people using the trail for physical activity. After the bridge was installed, connecting two trail segments formerly divided by a highway, researchers found the total number of trips on the trail increased from 217,900 to 508,100—a 133% increase—in one year. In addition, the average amount of physical activity on the trail increased from 138 minutes to 162 minutes per week, which is above the CDC guidelines of 150 minutes.[114] This study demonstrates two significant benefits of investing in networks and spines that link disconnected segments: 1) increased numbers of people walking and biking, and 2) increased rates of physical activity for those trail users.

The research showing the link between active transportation and improved health has been robustly demonstrated time and again. For example, one meta-analysis examining 28 studies found that when there was a mode shift to active transportation, the results included reductions in all-cause mortality, cardiovascular disease, type 2 diabetes, obesity, cancer and mental health disorders.[115] Because of the strength of the research, the CDC recommends the combination of transport and land use interventions as an effective way of increasing physical activity.[116]

Safe Routes to Everywhere, for Everyone: Safe Routes to School

The federal Safe Routes to School (SRTS) program provides funding for infrastructure and programming to encourage more children K–12 to use active transportation to get to and from school, which has been shown to benefit their physical health, cognitive abilities and more.

In the 1969 NHTS, 42% of children walked or biked to school, compared with only 10.4% in the 2017 survey.[117] At the same time, rates of childhood obesity and physical inactivity have risen. Today, only 24% of children ages 6–17 meet CDC's recommended guidelines for physical activity, and 18.5% are considered obese.[118]

Active transportation can be part of the solution to increase physical activity in children. Research has shown that children who walk or bike to school have higher daily levels of physical activity and a lower body mass index (BMI) than children who do not. Specific to SRTS, programs such as a "walking school bus" or bicycle trail have been found to improve rates of students walking to school and to improve physical activity among participants.[119]

In addition to increasing physical activity, one review of multiple studies found that active transportation also allowed children to observe and explore their environment, developing more spatial awareness and improving their cognitive well-being. Active transportation also allowed children to have more time for social interactions. The only negative impact of active transportation on their well-being was traffic.[120]

Finally, SRTS interventions have been shown to increase safety for children. Using federal data, researchers found that Safe Routes to School was associated with a 23% reduction in pedestrian and bicyclist injuries and a 20% decrease in pedestrian and bicyclist fatalities in school-age children.[121]

Analysis at the local level found similar results. In a study of New York City, SRTS intervention census tracts revealed a 44% decrease in pedestrian injuries to school-age children during morning and afternoon school commute hours, as compared to census tracts without an intervention.[122] In locations where interventions were implemented, the number of injuries decreased by nearly half—from 8.0 injuries per 10,000 students pre-intervention to 4.4 injuries per 10,000 students post-intervention.[123]

Overall, the SRTS program increases physical activity in children, reduces their BMI, contributes positively to their cognitive well-being, and increases walking and biking safety. In short, federal funding to facilitate walking and biking to school has proven effective at addressing health concerns in children today. Unfortunately, in spite of the overwhelming evidence and success of SRTS, it no longer exists as a stand-alone federal program.

Children walking to school

Notes From the Field: CDC Community Guide

Through its research, the CDC has found enough evidence to recommend active transportation as a means of achieving greater levels of physical activity. The CDC's Guide to Community Preventive Services, better known as the Community Guide, is a collection of evidence-based findings from scientific studies to determine whether an intervention approach works and is cost-effective. The Community Guide also helps communities choose intervention approaches to change behaviors, prevent diseases and create environmental change across more than 22 health topics.[124] The Community Guide is produced by a non-federal, independent task force composed of public health and prevention experts, allowing for an objective, medically and scientifically sound approach to health recommendations for the nation.

On the subject of active transportation and physical activity, the Community Guide recommends combining "Pedestrian, Bicycle and Transit Transportation Systems" and "Land Use and Environmental Design" intervention components to increase physical activity. This multipronged strategy is based on evidence from a systematic review of 90 studies indicating that combining these two approaches resulted in greater physical activity.[125]

To be more specific, the Community Guide Task Force found that "physical activity increased among individuals in communities with new or improved projects or policies combining transportation (e.g., pedestrian or cycling paths) with land use and design components." The Task Force also found that "combinations of activity-supportive built environment characteristics were associated with higher levels of transportation-related physical activity, recreational physical activity and total walking among exposed individuals."[126]

Examples of the Community Guide's "Pedestrian, Bicycle and Transit Transportation Systems" interventions include:

- Designing an easily connected street pattern (e.g., grid instead of cul-de-sac)
- Installing pedestrian or bicycle infrastructure
- Constructing public transportation infrastructure or access to transit (e.g., bike lanes and sidewalks to transit)

Examples of the Community Guide's "Land Use and Environmental Design" interventions include:

- Increasing residential density
- Keeping residences in close proximity to community facilities
- Allowing residential and commercial spaces to coexist on the same block or in the same building (e.g., ground-floor retail with second-floor living space)

The CDC presents several examples of urban and rural locations in diverse parts of the country that have combined built environment intervention approaches.

In the village of Cuba, New Mexico (pop. 748), the mayor and more than 100 community volunteers built 9.5 miles of new or improved trails, adding shade trees, benches, parking areas and signage. Each trail attracts different users and two trails connect the village to the Santa Fe National Forest.[127] In Houghton, Michigan (pop. 7,888), the city utilized land along the shoreline and replaced old industrial sites with parks, marinas and multiuse walking/bicycling trails that connect to the city center, residential areas and other parks.[128] Finally, the Atlanta (pop. 486,290) BeltLine trail is spurring growth of high-density residential and commercial buildings while providing a linear park and trail that connects 45 neighborhoods.[129]

These approaches to health are systemwide, just as the magnitude of America's physical inactivity and chronic disease challenges requires a systemwide response. Individuals are responsible for the health choices they make, but the way in which communities are designed is also responsible for a population's health outcomes. Designing communities with active transportation facilities while increasing access to parks (perhaps in rural areas) or promoting density (perhaps in suburban areas) are strategies proven to increase physical activity as shown in Table 5 below.

Table 5: Built Environment Approaches in Combination by Intervention Type

Pedestrian, Bicycle and Transit Transportation Systems Intervention Component	Land Use and Environmental Design Intervention Component
Street pattern design and connectivity	Mixed land use
Pedestrian infrastructure	Increased residential density
Bicycle infrastructure	Proximity to community or neighborhood destinations
Public transit infrastructure and access	Parks and recreational facility access

The floating bus stop and protected bike lanes in Seattle's Capitol Hill provide examples of public transportation being designed with active transportation in mind. | Photo courtesy Green Lane Project

Do the Math

According to recent research on health care costs avoided due to physical activity, healthy and active people save an average of $537 (or $630 in 2019 dollars), compared with those who are inactive or insufficiently active. In a substantial scenario, they would save an average of $1,313 (or $1,437 in 2019 dollars) (Table 6).[130]

About 9% of Americans walk and/or bike for at least 30 minutes a day—thus meeting the CDC's recommendations for physical activity.[131] This translates to 29 million people meeting the recommendations for physical activity by active transportation. The number of people meeting the physical activity recommendations by active transportation is forecasted to increase from 9% to 13% in the modest scenario and from 9% to 18% in the substantial scenario.

According to the U.S. Census Bureau, an estimated 7.5 million workers over the age of 16 use public transportation to commute to work.[132] A study based on the 2001 NHTS showed that transit users spend an average of 19 minutes per day accessing transit, and about 29% of transit riders meet the recommended physical activity guidelines by walking to and from transit stations, which translates to 2.25 million people.[133] The number of transit riders who meet the recommended physical activity guidelines by walking to and from transit stations is forecasted to increase from 29% to 32% in the modest scenario and from 29% to 35% in the substantial scenario.

About 32 million people, or 10% of the U.S. population, meet the recommended physical activity guidelines due to active transportation by walking or biking to transit. This percentage is forecasted to increase from 10% to 15% in the modest scenario and from 10% to 20% in the substantial scenario. This assumption is on the conservative side of health benefits, due to the exclusion of those who engage in walking and biking but do not meet the CDC guidelines of 150 minutes of physical activity per week. Currently, 16% of the population engage in some amount of walking and 1.5% do the same for biking, but are not included in the calculations.[134]

Table 6: Underlying Assumptions for Health Benefit Calculations

Factor	Status Quo	Modest Scenario	Substantial Scenario
Percentage of U.S. population who walk and/or bike for at least 30 minutes a day	9%	13%	18%
Number of people commuting using public transportation	7,500,000	7,725,000	8,100,000
Percentage of transit users who walk for at least 30 minutes a day	29%	32%	35%
Percentage of U.S. population who meet physical activity recommendations using active transportation (e.g., walking, bicycling, walking to public transportation)	10%	15%	20%
Average annual health care cost savings per capita for active adults compared to insufficiently active or inactive adults (in 2019 dollars)	$630	$1,000	$1,437

Chapter Three: Active Transportation as a "No Regrets" Climate Solution

The transportation sector is the largest contributor to greenhouse gas (GHG) emissions, emitting 1,854 Million Metric Tons (MMT) of carbon dioxide equivalents into the atmosphere, or 29% of all U.S. GHG emissions in America.[135] By reducing the number of miles driven by cars, especially in single-occupancy vehicles, the United States can significantly reduce its GHG emissions.

Since more than 80% of the U.S. population live in cities, efforts to fight climate change have to start there. In Chicago, which has more than 200 miles of bike lanes and many miles of trails, plans are underway for a 645-mile bike network.[136] In the suburbs of Seattle, officials are using 21st century computer mapping tools to model new trails that provide maximum user access and help take cars off the highways.[137]

Due to the urgency of this threat, and to ensure the survival of our planet, prompt actions need to be implemented in mitigating the impacts of and adapting to climate change. Since transportation is the largest contributor to climate emissions, it is a priority to reduce the pollution load from this sector. Significant increases in active transportation; mode shift from cars to public transportation, walking and biking; reduced car travel; and increased bike share and micromobility travel options are all ways in which we can reduce the environmental impact of transportation.[138]

When planning for active transportation, greater attention needs to be paid to building infrastructure that is protected, accessible and safe for all users. Trails and greenways are of significant value in this regard. According to the California Adaptation Planning Guide, well-established planning methods need to be tailored to trail design and maintenance. In places where surface trails are not feasible, water trails should be encouraged.[139]

The CDC has identified how climate change is impacting human health, where existing threats will increase and where new threats will emerge. The impacts of these climate-related threats will be disproportionately borne by the most vulnerable sections of the population, including older individuals, low-income populations and those living in locations close to water bodies or that are more prone to flooding, drought and wildfires. Threats include increased prevalence of respiratory and cardiovascular diseases, injuries, premature deaths, food- and water-borne illnesses, infectious diseases, and deterioration of mental health.

Trails and greenways serve as carbon-free alternatives to travel, connecting residents to each other in and between communities, and to opportunities along the trails. Trails that have tree cover and water-smart landscaping (landscapes designed with native plants to save water and benefit the environment)[140] reduce both urban heat island[141] effects (built-up areas that are hotter than surrounding rural areas) and flooding, and also improve air quality. Well-designed and -constructed trails can serve as green infrastructure facilities that also address climate benefits. Single-use trails, those dedicated to a single recreational use like hiking, mountain biking or horseback riding, have health benefits, and lining single-use trails with trees provides some climate change protection. However, multiuse trails that are located and designed to serve both recreation and transportation purposes directly reduce driving and associated carbon emissions, thus providing a higher return on investment than single-use trails.

Trails have the capacity to serve as social infrastructure by connecting people to each other and their destinations. Trail development and programming can play a big role in building up social cohesion and neighborhood resilience—environmentally, socially and economically. A community can rebound and is more resilient when there is strong social cohesion among its residents. Trail development that includes and involves the community at the grassroots level provides for a collaborative environment rather than a top-down one, eventually helping to build more climate-resilient communities.

Bloomberg Philanthropies' American Cities Climate Challenge will help 25 cities to design and build bicycle and transit projects to result in measurable emissions reductions by the end of 2020.[142] The $70 million program will support these cities in implementing their short-term climate goals. The challenge is focusing on cities, as they account for about 75% of global carbon emissions. Efforts to mitigate climate impacts should start by focusing on transportation and buildings within cities. Atlanta and Boston, two of the cities included in the challenge, have plans to expand bike lanes and sidewalks and provide their residents with safe and sustainable mobility options.

The Intergovernmental Panel on Climate Change (IPCC) points out that mode shift to low-carbon transportation systems like walking, bicycling and public transit can mitigate the impact of climate change.[143] Land-use changes like increased density and mixed-use development that facilitate the use of walking, bicycling and public transit can also have a significant positive impact on emissions reduction.

Opposite: Woman commuting by bike

Detroit | Photo by Joe Gall

The Possibilities of Connectivity for Mode Shift

According to the 2017 NHTS, 53% of all trips taken are within 3 miles or less, and 28% of all trips taken are within 1 mile or less.[144] Three miles is equivalent to a 20-minute bike ride for an average adult, and 1 mile is equivalent to a 20-minute walk for an average adult. These results from the NHTS alone demonstrate that it is possible to shift many of these short trips, which are taken by car, to walking or biking.

While many Americans are interested in cycling, the primary reason they are cautious to switch to it for their trips is due to real and perceived safety risks, primarily associated with a lack of off-road or protected facilities.[145] Secondary reasons for caution around bicycling include a lack of network connectivity, which again is related to infrastructure safety. Even when parts of a route are protected or off-road, if any part of the trip is considered to be high-stress—meaning individuals will interact with traffic in higher-speed scenarios—many will choose not to walk or bike at all.[146]

As for walking, while many neighborhoods and communities can boast well-maintained sidewalks, many others cannot. For example, Los Angeles' sidewalks are in such a poor state of disrepair that a disability rights class action lawsuit in 2015 led to a $1.4 billion settlement, with the city committing to using those funds to repair its sidewalks.[147] In the Nashville-Davidson County region of Tennessee, only 19% of streets have sidewalks and another 1,900 miles of sidewalk are missing, according to the 2017 WalkNBike plan by local government entity Metro Nashville.[148]

In short, Americans prefer more mobility choices, including the choice to walk or bike, but only if the facilities are connected to safe, protected and even off-road networks. Americans overwhelmingly support increased public investment in walking and biking facilities if it means they will have safe options for getting around.

Getting to Connectivity and Mode Shift

Three important factors are involved in achieving mode shift: investment in connected active transportation networks and spines, synergies with public transportation, and smart growth development feedback loops.

First, communities should make a concentrated investment in building active transportation networks and spines as demonstrated throughout this report. Second, improving the connections between active transportation facilities and public transportation induces more transit trips, accelerating mode shift away from cars. Finally, investing in connected walking and biking facilities leads to smart growth and density-oriented development that, in turn, make it easier to walk or bicycle to one's destination.

Synergies With Public Transportation

Public transportation plays a pivotal role in accessibility for those who cannot or choose not to drive. It is an essential factor in mitigating congestion—which resulted in 8.8 billion hours of wasted time and more than $166 billion in wasted money in the United States in 2017.[149] Public transportation also lowers fuel consumption due to its ability to quickly transport large groups of people over extensive distances without requiring much land, in comparison to a six- or eight-lane highway.[150, 151] However, these benefits of public transportation diminish when the occupancy rates of trains and buses are low. Increasing total ridership and occupancy rates, therefore, must be a top priority to maximize the return on public transportation infrastructure investments.

Access to transit is an essential factor to achieving and sustaining a well-functioning public transportation system with high ridership levels. The mobility choices for reaching transit include walking, bicycling and driving. Driving to transit diminishes the fuel consumption benefits, while parking at transit stations is often a major concern. If parking can be found at all, monthly parking passes can be costly for commuters.[152]

Walking or bicycling to a transit station or stop is, in many cases, a more convenient way to access public transportation. As shown in Figure 5, it might be even more efficient to walk or bike to rail transit stations in congested urban areas or rural areas with poor transit service.

In places like Washington, D.C., extensive transportation services, coupled with walking/bicycling infrastructure and bike-share options, encourage residents to utilize active transportation at a higher rate than other places where supportive infrastructure is absent.

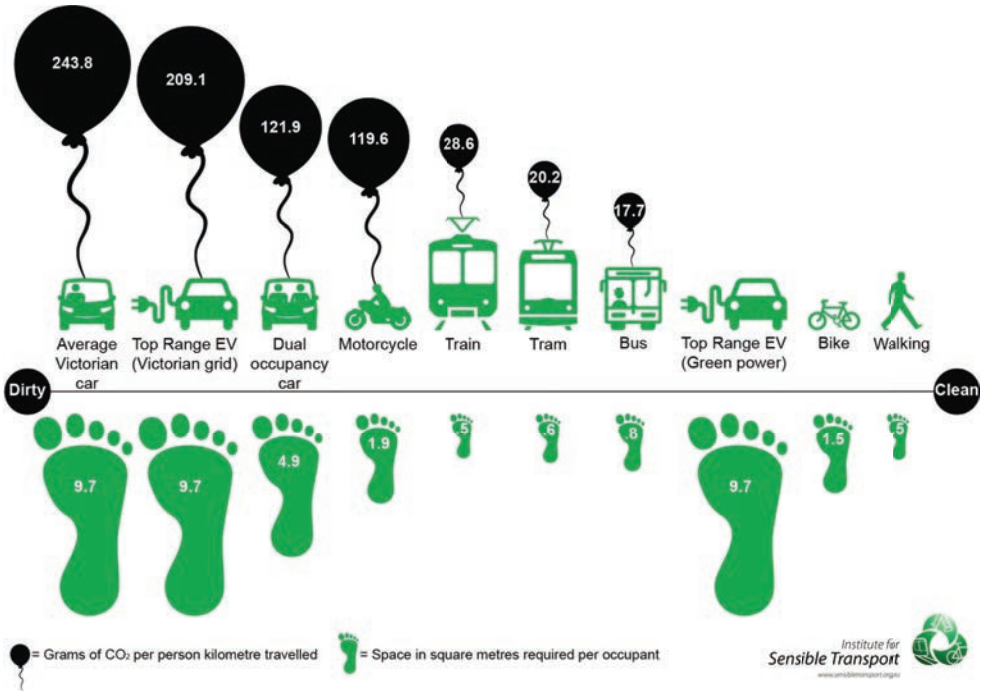
Similarly, providing safe and convenient networks for bicycling enables more people to bike to transit stations by shortening travel times significantly (as compared with walking). Bicyclists travel three times faster than pedestrians. Because of this, increasing safe networks for bicycling by building off-road trails and protected bike lanes makes it safe and convenient to bike to a transit station. Creating safe active-transportation networks can generate a nine-fold increase in the geographic area served by one transit station within a 10-minute bike ride (1.5 miles) relative to a 10-minute walk (0.5 mile).

In this manner, improving networks for walking and bicycling allows more people to use these networks as their first- and last-mile methods of getting to and from a transit station, ultimately improving connectivity.

Figure 5: Metro Transit Catchment Area, Washington, D.C.

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

Figure 6: Pounds of Carbon Dioxide per Person-Mile Traveled and Space Occupied in Square Feet per Occupant for Modes of Transportation



Used with permission. From the city of Melbourne, Australia's "Transport Strategy Refresh" report. Published April 2018.

Smart Growth Development Feedback Loops

Investments in bicycling and pedestrian infrastructure can also stimulate "smart growth" development along a corridor or in close proximity to a corridor's facilities. This development encourages more walking and bicycling, which can in turn spur the need for more connected networks of active transportation. Smart growth development can also address accessibility needs for those who don't drive and reduce congestion by making it easier to walk or bike to a given destination.

Smart growth development is characterized by compact, mixed-use land types, placing destinations such as homes, workplaces, shopping centers and recreation facilities closer together, thereby providing easy walking, bicycling and public transportation access. In traditional suburban developments, residential and commercial parcels are separated due to single-use zoning laws. This separation of uses essentially enforces car use for all travel.

By contrast, a quintessential mixed-use building might have a grocery store on the ground floor and six floors above that are part of a residential condominium complex. Another building may contain retail shops and offices on the floors above, with many more destinations nearby. In mixed-use land types, many destinations can be reached most conveniently by walking or biking.

Transportation facilities have the power to shape the places where Americans work and play.[153] Transit-oriented development occurs when compact, walkable neighborhoods of mixed use are centered around transit stations. Similarly, trail-oriented development occurs as trails attract retail businesses, increase surrounding land values and encourage smart growth, thus combining the health and environmental benefits with the economic development potential of trails.

The obvious accessibility benefit of mixed-use neighborhoods is the ability to travel from home to businesses—grocery stores, retail shops, eateries, etc.—without the need for a car. The travel distances in a transit- or trail-oriented development are much shorter, often less than 3 miles, rendering a car unnecessary. This also means that localized automobile traffic can be reduced or relieved because walking or biking to destinations is a practical and viable option. Figure 6, from the Australian Institute for Sensible Transport, shows that an average car emits the largest amount of carbon dioxide and uses public road space inefficiently compared to public transit, walking and bicycling. It is important to note that even electric vehicles, though they perform well on the carbon emissions front, still contribute to increased congestion due to inefficient use of road space.

Notes From the Field: Climate and Active Transportation

St. Louis, Missouri

In the city and county of St. Louis, flooding is a common occurrence due to its location near the Missouri, Mississippi and Meramec rivers. In 2000, voters approved a sales tax to fund the Great Rivers Greenway. In 2013, voters once again funded conservation efforts and continued greenway work with another sales tax. Of these funds, 60% are used to restore, maintain and improve trails and parks.

With a $20 million revenue, the Great Rivers Greenway District oversees the planning and execution of trail networks and open spaces to connect rivers, parks and communities. This natural infrastructure lowers the possibility of flood damage, thereby building climate resilience. The "River Ring" plan, developed by the Great Rivers Greenway District in 2003, identifies more than 600 miles of trails and greenways to be used as green infrastructure encircling the counties along river and stream paths as buffers between rivers and residential and commercial development. These greenways also serve as urban heat sinks to reduce the city's heat island impact.

A cross-jurisdictional agency with available funding, such as the Great Rivers Greenway District, can make a region nimble in using investment tools to encourage resilience while at the same time providing recreational and conservational benefits. Such a model could be adopted by other industrial cities that have experienced population and job loss in the recent past. Many of these cities are working toward rebuilding and repurposing urban land and attracting talent by providing a better quality of life and employment opportunities.

Katy Trail State Park in Missouri | Photo courtesy Missouri State Parks

Oakland, California

The East Bay Regional Park District in Oakland, California, has 31 inter-park trails connecting 73 regional parks, recreation areas, wilderness areas, shorelines, preserves and land bank areas. A special property tax funds acquisition of land. The East Bay Regional Park District faces challenges including: 1) maintaining these inter-park connections and green spaces to adapt to rising sea levels, and 2) mitigating the wildfire hazards that are common in this area.

Mixed-Use Developments

Research shows that a reduction of 5%–15% of vehicle miles at neighborhood levels, and 20%–30% of vehicle miles in dense and diverse developments, can reduce GHG emissions significantly.[154–156] Denser developments create more walkable urban places where people can live, work and play using active transportation modes like walking, bicycling and public transit. These types of land use changes combat climate change impacts by reducing emissions. They also lead to healthier populations by encouraging active transportation. In addition to climate and health impacts, mixed-use developments also have an appeal and demand that translates into marketable real estate product.[157]

Building Resilience Against Climate Effects (BRACE) Framework

The CDC's BRACE framework includes a five-step process for health professionals to develop strategies to help neighborhoods and communities address the impact of climate change.[158] The framework's basic idea involves using atmospheric and epidemiological data to develop an informed response to climate change impacts on community health.

Oak Leaf Trail in Milwaukee, Wisconsin | Photo by David Schlabowske, courtesy Wisconsin Bike Fed

Do the Math

Each mile driven is equivalent to 0.05 gallons or 1 pound of carbon dioxide ($C0_2$),[159] based on the approximate U.S. average vehicle fuel economy of 25 miles per gallon.[160]

To estimate the fuel savings and carbon dioxide reduction resulting from the synergy between bicycling/walking and public transportation, this analysis assumes that future public transportation will be more fuel-efficient than cars and use 68% (modest) to 52% (substantial) less fuel per passenger than cars (Table 7). These estimates consider the current efficiency of U.S. public transportation (20% more efficient than cars) as well as achievements in public transportation efficiency in other countries.

Table 7: Underlying Assumptions for Fuel Savings and CO_2 Emission Reduction Calculations*

Factor	Status Quo	Modest Scenario	Substantial Scenario
Public transportation fuel use relative to cars (% of 21.7 mpg)	80%	68%	52%
Fuel savings from congestion relief (gallons per 1,000 driven miles avoided)	4.2	5	5

**Calculations assume that 1 mile of driving burns 0.05 gallon of gas, which releases 1 pound of CO_2.*

Table 8: Gallons of Fuel and Tons of CO_2 Saved Annually Due to Walking and Bicycling

	Fuel Savings (Million Gallons)			CO_2 Reductions (Million Tons)		
Factor	**Status Quo**	**Modest Scenario**	**Substantial Scenario**	**Status Quo**	**Modest Scenario**	**Substantial Scenario**
Trips < 1 mile	531	1,055	1,291	5	9	11
Trips 1–3 miles	529	922	1,311	5	8	12
Trips 3–5 miles	174	270	558	2	2	5
Increase of public transportation ridership because of walking and bicycling	unknown	131	873	unknown	1	8
Trip length reduction of 1%-3% through induced mixed use (1–15 miles)	unknown	507	1,360	unknown	4	12
Savings from congestion relief	103	292	644	1	3	6
Totals	**1,337**	**3,177**	**6,037**	**13**	**27**	**54**

Minimal reductions (1%–3%) in travel distances—due to the increased mix of residences, businesses and amenities induced by the availability of pedestrian and bicycle infrastructure—could result in fuel savings of over 500 million gallons (modest) and 1.36 billion gallons (substantial), and carbon dioxide savings of 4 million tons (modest) and 12 million tons (substantial) annually in the United States.

According to the American Public Transportation Association's calculations, approximately 4.2 billion gallons of fuel and 37 million metric tons of carbon dioxide were saved in 2018.[161] Assuming a similar benefit from vehicle miles avoided by bicycling and walking, the congestion relief would result in fuel savings of 0.3 billion gallons (modest) to 0.6 billion gallons (substantial), and carbon dioxide reductions of 3 million tons (modest) to 6 million tons (substantial) per year (Table 8).

Cyclist in bike lane of The Brooklyn Bridge in New York


DET OIT
AEROSPOKE

Chapter Four: Active Transportation as a Strong Economic Driver

As demonstrated throughout this report, active transportation networks and spines generate a tangible return on investment—from taking cars off the road to providing transportation options for all ages and abilities, and from significantly reducing the national health care burden to reducing the national carbon output. Yet these broader social benefits are the added economic value; active transportation offers significant traditional and direct economic benefits to communities large and small by bolstering retail sales, attracting new businesses and welcoming visitors to vibrant walking- and biking-centric destinations.

Whether urban, suburban or rural, active transportation benefits local economies. In urban and suburban areas where businesses are situated near active transportation facilities, retail sales have been shown to increase. Meanwhile, in small-town and rural areas, active transportation networks and spines serve as generators of tourism, bringing economic vitality through the number of visitors seeking outdoor recreation adventures. Towns of all sizes rely on active transportation as a contributor to quality of life and livability, both of which attract growing businesses—and educated talent to work for them. Large or small, active transportation networks and spines can benefit every local economy.

Good for Urban and Suburban Economies and Local Businesses

Designing for active transportation has been shown to have notable economic benefits for local businesses. For example, a study in Portland, Oregon, found that visitors who arrive at a local shop by bike spend more at the shop per month than visitors who arrive by car. Bicyclists will spend less per trip at an average of $10.66, compared with drivers' $13.70, but they make trips more frequently. Bicyclists spend an average of $75.66 per month, compared with drivers' $61.03—that's 24% more than drivers.[162, 163]

Similarly, in New York City, when a protected bike lane was installed and other safety improvements (i.e., signalization and crosswalks) were made on Eighth and Ninth avenues from approximately 23rd to 31st streets, local businesses saw up to a 49% increase in retail sales.[164] Other studies have shown similar effects in New Zealand and Toronto, Canada.[165, 166]

In addition to increased retail sales, active transportation is used as a key strategy to attract new corporate businesses looking to relocate and attract young, talented workers. The Louisville Loop is a vision for a 100-miles-plus loop path system. More than that, it has been identified by the community as an essential component for the economic growth and prosperity of the entire surrounding region of Louisville, Kentucky. The trail is 49 miles at present, with another 26 miles planned. The master plan for the Louisville Loop sets economic prosperity as one of the key goals for the trail.

Louisville endeavors to model itself after other urban livable cities such as Denver; Indianapolis; Portland, Oregon; and Raleigh, North Carolina. The goal is that the trail "will distinguish Louisville as one of the nation's most livable cities through the use of green infrastructure, shared-use trails, active transportation systems, and safe and vibrant neighborhood districts."[167]

Lincoln, Nebraska, also sees its local trails—including the future 14.5-mile Prairie Corridor Trail—as assets to economic development, both for tourism and to address Lincoln's labor supply issues. While jobs are available in Lincoln, there is, at the time of this writing, a shortage of skilled workers to fill them. Doug Ganz, vice president of Pinnacle Bank in Lincoln and a supporter of the trail, said, "These types of amenities are really helpful when recruiters are talking to people about what you can do in Lincoln."[168, 169]

In short, studies of connected active transportation infrastructure have shown that it benefits local retail businesses not only in terms of the value of goods sold but also by contributing to livable communities and providing an amenity that can attract young, talented and skilled workers to relocate and work for them. Finally, property values increase as a direct result of proximity to a trail or other active transportation facility. Active transportation contributes to not only the livability of communities, but also their economic well-being.

Opposite: Detroit | Photo by Joe Gall

Camp Chase Trail in Columbus, Ohio

Good for Rural Economies and Tourism

Across the country, destination trails are helping small towns and villages boost their economic productivity by driving recreational and outdoor tourism. Study after study shows that trails attract visitors and bring revenue to small-town and rural America.

A classic example of this is the Great Allegheny Passage (gaptrail.org). This 150-mile trail runs through nine former industrial towns from Pittsburgh, Pennsylvania, to Cumberland, Maryland, many of which have a population of just a few thousand people. The trail receives an estimated 940,000 visits per year.

A 2008 study of the Great Allegheny Passage estimated $40 million in trail-attributed revenue and $7.5 million in wages distributed by trail-facing businesses. The average day guest spends $18 and the average overnight guest spends $124. From 2007 to 2015, trail towns along the Great Allegheny Passage saw a net gain of 65 new businesses, leading to more than 270 jobs created. In 2014, the most recent year for which data is available, an estimated 40% of sales were related to trail traffic.[170]

In the Rocky Mountains, the 42-mile Whitefish Trail in Whitefish, Montana (pop. 6,357), generates significant economic revenue for the small town and its surrounding area. The trail sees more than 73,000 visitors each year, with about 70% being locals. Locals who visited the trail spent, on average, twice as much as locals who did not visit the trail in the previous year of the study. All told, the trail generates nearly $3.6 million in spending on accommodations, restaurants, groceries, retail, gas, transportation, licenses and entrance fees, outfitters/guides and farmers markets, in that order, from 22,000 visitors. This revenue supports 68 jobs and generates $1.9 million in total economic impact.[171]

On the East Coast, the 227-mile Erie Canalway Trail in upstate New York sees more than 1.6 million visits each year. Non-local visitors (defined as those not living in one of the 35 counties surrounding the trail) who stay for at least one night spend an average of $531.47 per trip. While non-locals make up only 2.5% of visitors, they account for 21% of spending, at $55.8 million each year, and 731 new jobs.[172]

Finally, northwest Arkansas is home to an extensive trail system centered around the 36-mile Razorback Regional Greenway. As a result, the impact of bicycling on the economy is estimated at $137 million annually through local spending, visitor spending and health benefits.[173] Of that amount, $27 million is attributed to visitor spending through tourism.[174]

These studies are but a few examples from dozens that show the economic power of trails and active transportation infrastructure to create local tourism industries and generate revenue. Time and again, active transportation shows its economic might.

Figure 7: Comparison of Connectivity in Milwaukee, Wisconsin

An illustration of improvements in bicycle connectivity that adding several trail segments to the Route of the Badger trail network, one of RTC's TrailNation Projects, would provide to neighborhoods experiencing inequality in Milwaukee

Safe Routes to Everywhere, for Everyone: Connecting Communities Experiencing Inequality

In many parts of America, owning a car is considered essential to get to work; not owning a car can mean the difference between having a job and not having a job. However, car ownership can be expensive. According to AAA, the average annual cost of owning and operating a new car is $8,849, which accounts for fuel, maintenance, repairs, insurance, registration, etc.[175] Of U.S. households, an estimated 8.9%—10.5 million households—do not own a car.[176]

Active transportation routes are an issue of transportation justice, with the potential to provide safe, affordable transportation options that connect people to jobs, education, health care and all aspects of daily life. A 2018 GIS (geographic information system)-based analysis of Cleveland by Rails-to-Trails Conservancy (RTC) analyzed current and potential bicycle connectivity for residents located in communities experiencing inequality, defined as U.S. Census Bureau Block Groups that meet three or more of the following criteria:

1. Non-white (75% African American or 30% Hispanic)
2. No high school diploma (20% or more)
3. Unemployment rate (30% or more)
4. Automobile ownership (60% or less)
5. Poverty rate (30% or more)

The GIS analysis showed how close people living in these neighborhoods were to everyday destinations such as schools, day care centers, restaurants, parks, grocery stores, health care providers, banks and post offices—yet they lacked consistent access to active transportation networks to safely provide walking and biking routes to these destinations. Presently, 63% of residents in these neighborhoods are connected to key destinations via low-stress bicycling routes. At full build-out of the planned bike network, low-stress connectivity will extend to approximately 90% of residents living in Cleveland's neighborhoods experiencing inequality.[177]

In a methodologically similar study by RTC in Milwaukee, investing in new trail connections was shown to drastically improve connectivity for all residents, including those living in neighborhoods experiencing inequality.

Based on the 2017 analysis, 59% of Milwaukee residents were connected through low-stress biking routes to a majority of key destinations within 2 miles, and 40% of residents were connected through a low-stress biking route to at least one employment center within 2 miles. However, across Milwaukee, access to trails is unequal. Only 8% of all residents are within walking distance, and 24% live within biking distance, of a trail. In Milwaukee neighborhoods experiencing inequality, only 3% are within walking distance, and 8% within biking distance, of a trail.[178]

The Milwaukee analysis found that adding just two trail facilities—along the 30th Street Corridor and Kinnickinnic River Trail—would significantly increase walking and biking access to trails. Across the city, walking access would increase to 14% and biking access to 59%.[179] In neighborhoods experiencing inequality, walking access would increase to 11% and biking access would increase to 66%—creating new access to trails for nearly 200,000 residents (Figure 7).[180]

If all Americans are to have safe, convenient and affordable options to access work, school and other major destinations vital for their survival and well-being, more will need to be done to expand transportation options beyond the personal automobile. Public transit will undoubtedly need to become part of the solution, as will walking and biking. As these studies show, connecting communities that experience inequality and those that are historically underserved to ladders of opportunity is well within the capabilities of a robust, built-out system of active transportation routes.

Putting It All Together

In addition to the economic value generated by trails from retail sales, tourism, property value increases and the attractiveness for companies to do business, the monetary value of the benefits calculated in this report are substantial. Altogether, these monetary benefits—for savings associated with health, climate and economic outcomes—total up to $34 billion in the current scenario, and are forecasted to increase to $74 billion per year in the modest scenario and to $138 billion per year in the substantial scenario (tables 9, 10).

The monetary benefits of moving from a transportation system dependent on cars to one that is balanced and prioritizes walking, biking and transit are striking, but it's important to remember that they don't stop there. The intangible benefits of reducing the number of cars on the road, of saving our environment from a changing climate, and of saving ourselves and our personal health are worth more than just dollars. They are quality of life benefits that can make us, our families and our communities happier and healthier—and that's priceless.

Notes From the Field: Active Transportation

Indianapolis Cultural Trail

The Indianapolis Cultural Trail is an innovative and forward-thinking example of an active transportation spine; an illustration of the utilization of federal, state, local and private funds; and a success story for commercial and retail businesses near the trail in Indianapolis.

In 1999, Indianapolis designated six cultural districts within the city limits and formed a Cultural Development Commission to create a plan that would promote these districts. A member of the commission, Brian Payne, who was also president of the Central Indiana Community Foundation, took inspiration from the nearby 23-mile Monon Trail and decided that an urban version of this popular rural trail would be the ribbon to connect all six cultural districts.[181]

Between 2001 and 2004, the city went forward with the planning studies and initial design concepts for the project, raising $4 million to complete this work. At the same time, Indianapolis also cleared another hurdle, allowing for city-owned right-of-way to be used for the trail's construction. The design and engineering work was started in 2005 while the city of Indianapolis, by now a champion of the trail project, sought funds to begin construction.[182]

In an unexpected turn of events, Indiana philanthropists Eugene and Marilyn Glick donated $15 million as the first gift raised for the trail project. With their donation, the trail broke ground in 2007.[183] The Glicks' generous gift, however, was merely the spark to attract needed but too-scarce federal dollars. Thus, the trail was also awarded a $20.5 million TIGER (Transportation Investment Generating Economic Recovery) grant in 2010 to continue the work.

Throughout the next three years, private donors gave another $12.5 million to the project, and federal funding through programs such as Transportation Enhancements & Alternatives and others contributed another $15.5 million to build the trail.[184] Construction was completed in 2012, with the trail officially opening in May 2013.

The Indianapolis Cultural Trail's successes are marked in terms of trail users, community engagement and—of course—economic impact. A study of the trail in 2015 conducted trail counts and found that it receives between 47,000 and 214,000 visits per year, depending on the location of the counter. In addition, the trail significantly boosted nearby property values. For residential, commercial and lodging establishments within 500 feet of the trail, the estimated total assessed value of these properties increased by $1 billion between 2008 and 2014.[185]

In another part of the study, business owners responding to a survey reported a total of nearly 50 full-time and 50 part-time positions having been added due to increased customer traffic and revenue. The average planned or expected expenditure by trail users was $53 per day, with hotel and restaurant spending accounting for much of this spending. In total, the average estimated economic impact of each of the six segments was between $1.2 million for local residents and $1.9 million for tourists annually.[186]

The Indianapolis Cultural Trail is just one example among many of the benefits that communities can reap when they invest in active transportation infrastructure. By working to obtain funds from all levels of government and engage the private sector, the city and the Cultural Development Commission created a trail for transportation and community engagement. The economic impacts of this trail have rippled throughout the communities where the trail is located.

BBWA Canal Trail in Billings, Montana | Photo by TrailLink user gravedigger8

Billings—"Montana's Trailhead"

The Billings, Montana, Chamber of Commerce knows that trails are good for business. In fact, a 2018 article ranked Billings No. 8 in a list of the best places to launch a small business,[187] and in 2009 *Fortune* magazine ranked it the No. 1 small city to start a business.[188] According to Billings Chamber of Commerce CEO John Brewer, "talented people move to Billings in large part because of our trail system that creates the quality of life they are expecting. A healthy trail system is vital to a healthy community." The focus on quality of life—including trails—has led the Chamber of Commerce to brand the city of Billings as "Montana's Trailhead."

Property Values

Living close to a trail has significant benefits for property values. In southwestern Ohio, the Little Miami Scenic Valley Trail is associated with higher property values—for urban, suburban and rural areas.[189] The closer to the trail, the greater the benefits; properties directly adjacent to the trail sold for 9% more than properties a half-mile from the trail. Similarly, in Dallas, since the opening of the Katy Trail in 2006, property values have increased by 80%.[190] These increases are associated with increases in property tax revenue for the cities that build the trails. High-profile trails like New York City's High Line, Chicago's 606 and Atlanta's BeltLine tend to have a much higher positive impact on surrounding property values compared to most trails.[191] The type of trail and the trail's surrounding demographics have varying impact on property values.[192]

Trail Town Program

The economic success of the Great Allegheny Passage (gaptrail.org) can be credited in part to the Trail Town Program, created by The Progress Fund. The program helps communities in Pennsylvania, Maryland and West Virginia capitalize on trail tourism in their towns. The Progress Fund is a nonprofit community development financial institution that also provides loans of up to $1 million, which come with business coaching, to help entrepreneurs succeed.

The free Trail Towns Guide[193] and the Allegheny Trail Alliance publication, *Trail Towns: Capturing Trail-Based Tourism* (available at gaptrail.org), share lessons that can be applied to any community in America that wants to develop as a trail town.

Vibrant Communities and Families

Active transportation infrastructure has been shown to help communities thrive and develop a sense of togetherness. Many who have observed a busy downtown complete with wide sidewalks, outdoor seating and bike lanes would attest to its vibrancy, but the proof is both qualitative and quantitative. Research shows that trails and other walking and biking infrastructure serve a direct role in encouraging physical activity and improving social cohesion by fostering trust within a community, promoting equity, building social interactions and developing a shared sense of identity among the people who live there.

One way is that this infrastructure creates a physical sense of community—or social cohesion—by encouraging physical activity and active transportation, and—in turn—social interaction. Having areas with walkable or bikeable facilities increases the opportunity for both planned and unplanned social interactions.[194] According to one study, green spaces and walking areas in a neighborhood contribute to a sense of community, support between residents and social interactions.[195] What's more, a 2018 report found that when people living in a community were less likely to know each other, they also experienced high traffic volumes and speeds.[196]

Another study found that improvements in health, overall well-being and quality of life can provide support, esteem, a feeling of belonging and the facilitation of social interaction—in other words, strong social ties.[197] In that study, one woman commented on the effect of a short walk: "When I'm at home I get really stressed with the kids. I'll leave the house and I'm totally stressed, but I'll walk round to school, I see a couple of people [on the way], say hello, they smile, and it just all goes. By the time I go back home, I'm a very chilled, different person."[198] Another woman discussed the importance of casual encounters experienced when walking and biking: "Because people have such busy lives now, you have to go out of your way to see other people. But if you see people all around your area, you're seeing them day to day. It makes you feel good because you've known them for a long time."[199]

Equity

Another benefit of walking and biking infrastructure is that it increases equity—both horizontally (i.e., the notion that all people should be treated equally and allotted equal opportunities) and vertically (i.e., the premise that society should provide extra support for those who are experiencing inequality such as a lack of investment, poverty, racism and discrimination, and lack of access to social resources).[200]

Increasing opportunities for active travel promote fair distribution of public resources for those who do not drive, an increase in financial savings and opportunity for lower-income individuals, and improved mobility options for those who do not have adequate access to transportation. For example, through the increase of walkability in neighborhoods and communities, especially when those paths connect to public transportation, there is a proven decrease in what is called "transport poverty."[201]

Gentrification

Despite the benefits that active transportation can deliver to people and places, concerns exist about gentrification and displacement associated with investment in active transportation infrastructure.[202] Reports of gentrification associated with high-profile trail and active transportation projects have inspired strategies for equitable trail and active transportation planning.

Several studies have looked at the relationship between community infrastructure investment and gentrification, though there is no conclusive evidence on the causal nature of the relationship. More research is needed in this area. Due to the fear of displacement associated with increased rents and property values, especially among historically marginalized populations, there needs to be a conscious and coordinated effort to promote equitable trail and other active transportation infrastructure development.

In Washington, D.C., the 11th Street Bridge Park project is an example of how community-empowered public space planning needs to be cognizant of, and proactively mitigate, the potential negative impacts of redevelopment on the local residents.[203, 204] Two years before any development had begun on the 11th Street Bridge Park, a robust community engagement effort took place. Through more than 200 neighborhood meetings, park planners were able to define priority outcomes and discuss the park's benefits with its adjoining neighbors (who are being encouraged to remain). As the project continues to be built out, with construction anticipated to start in 2021, it is being held up as a national model for thoughtful community planning.

Dangerous by Design 2019

Between 2008 and 2017, more than 49,000 individuals were struck and killed while walking on streets in the United States. Those numbers equate to 13 individuals per day, or one person killed every hour and 46 minutes.[205] These rates are up 35% from a decade ago, with 2016 and 2017 having the highest count since 1990.[206] Smart Growth America's 2019

Woman riding in bike lane

"Dangerous by Design" report reveals a trend: American streets are becoming more dangerous for pedestrians, with higher risks of harm for older adults, individuals of color, and people walking in low-income communities. Even if the population is weighted to control for differences in population size, composition and walking frequency, the same populations are still disproportionately at risk.

Despite a 6.1% decrease in traffic fatalities among motor vehicle occupants over the past decade, pedestrian fatalities have steadily increased by 35%.[207] The "Dangerous by Design" report points to poor investment in infrastructure as the main culprit in pedestrian fatalities. The results of a recently published study by researchers at the University of Colorado Denver and the University of New Mexico found that cities that invested in protected and separated bicycle infrastructure experienced the highest reduction in fatalities for all users, due to the traffic-calming effects of these facilities.[208]

To prevent pedestrian injuries and fatalities, public funding priorities need to be balanced, with greater investment in active transportation along with policies to ensure safe street design. Much of the responsibility for reversing this trend lies with the federal government and its need to prioritize pedestrian safety.

Ulysses Wiggins Waterfront Park Promenade in Camden, New Jersey | Photo by Thom Carroll

Do the Math

Measuring the economic benefits of active transportation requires an analysis of the direct economic return on investment, as well as the economic benefits associated with mode shift, related environmental benefits and health cost savings (Table 9, Table 10).

1. **Mode shift and environmental benefits:** The value of fuel savings from shifting short car trips to walking and bicycling trips, using walking and bicycling to access public transit, inducing mixed use, and reducing congestion is $3.3 billion today. In the modest scenario, this increases to $10 billion; in the substantial scenario, to $22 billion. For climate change, the carbon dioxide reduction from driven miles avoided is $900 million in the modest scenario and $3.7 billion in the substantial scenario.

2. **Calculations of economic impact:** This report uses local spending along trails, rather than the total economic impact of trails on the local economy. RTC has been conducting local spending and direct economic impact surveys of trails for more than 20 years. The results of these surveys point to an average spending of $5 million–$7 million along most trails.[209] Open rail-trails in RTC's comprehensive trails database is 2,128 trails. Using these numbers for the status quo, and 2,500 and 3,000 open rail-trails for the modest and substantial scenarios, the local spending impact is $10.6 billion in the status quo, $15 billion in the modest scenario and $21 billion in the substantial scenario.

3. **Health cost savings:** Health cost savings from increased physical activity due to active transportation range from $20 billion in the status quo to $48 billion in the modest scenario and $92 billion in the substantial scenario.

Table 9: Underlying Assumptions for Monetary Value of Benefits

Factor	Status Quo	Modest Scenario	Substantial Scenario
Price of gasoline ($/gallon), incl. 15% federal and state tax	$2.91	$3.67	$4.25
Price of CO_2 emission avoided (dollars/ton of CO_2 removed)	$13	$35	$77
Average annual health care cost savings per capita for active adults compared to insufficiently active or inactive adults	$630	$1,000	$1,437
Percentage of population who meet physical activity recommendations	53%	55%	60%
Percentage of population who meet physical activity recommendations using active transportation (i.e., walking or biking to transit)	10%	15%	20%
Local spending impacts of trails (in millions per trail)	$5	$6	$7
Number of rail-trails	2,128	2,500	3,000

Table 10: Annual Monetary Value of Benefits From Walking and Bicycling ($ billions)

Factor	Status Quo	Modest Scenario	Substantial Scenario
Fuel savings from shifting short car trips to walking and bicycling, excluding secondary savings from congestion relief*	3.05	7	11.42
Fuel savings from walking/bicycling and public transportation synergy*	unknown	0.41	3.16
Fuel savings from trip length reduction through induced mixed use*	unknown	1.58	4.92
Fuel savings from secondary savings from congestion relief*	0.25	0.91	2.33
CO_2 reduction from driven miles avoided, including congestion relief and trip length reduction through induced mixed use	unknown	0.9	3.7
Net spending impact of rail-trails	10.64	15	21
Health cost reduction from increase in physical activity among those who do not meet recommended levels	20.16	48	91.97
Totals ** Excluding gasoline tax*	**34.1**	**73.8**	**138.5**

Conclusion

Active transportation is transforming America. Its benefits are far-reaching and bring powerful outcomes to every type of community, including connecting people to jobs and other opportunities, creating opportunities for people to be physically active and outdoors, and revitalizing economies and communities.

A modest public investment in completing trail and active transportation networks within and between communities will deliver myriad benefits to individuals and society and an annual economic return to the tune of $73.8 billion. These benefits include access to safe and seamless walking and biking routes; improved health and social connectivity; new opportunities for economic growth; and access to jobs, education and culture. In the substantial scenario, economic benefits nearly double to more than $138.5 billion annually.

We have a unique opportunity to realize these benefits while addressing pressing issues related to public health and chronic disease, climate change, and economic development through the lens of transportation justice and social equity. As shown in this report, over half of all trips taken in the United States are suitable for a short bike ride, and more than one in four are suitable for a short walk, making walking and biking both realistic and feasible transportation options. Americans are demanding safe places to walk and bike on a broad scale. Re-prioritizing local, state and federal policies in response to that demand will deliver an outsized return on investment by changing how Americans get around and facilitating vital communities and healthy people.

"Public investment in active transportation systems at the federal, state and local levels will allow these benefits to be shared by all communities, not just a select few."

Designing communities with low-stress, routine active transportation in mind can help address the national problem of sedentary lifestyles leading to chronic disease. With safe networks of walking and biking in place everywhere across the country, communities can substantially curb carbon emissions while benefitting from better air quality. Investing in active transportation facilities will also produce a positive fiscal return on investment by generating more jobs, consumer spending and tourism while attracting and retaining a skilled workforce with community design that prioritizes the walkable, bikeable features that are hallmarks of good places to live.

The range of benefits from active transportation may seem too good to be true, but the evidence is there—as this report demonstrates. Active transportation is a cost-effective strategy for delivering multimodal options that serve a changing transportation landscape. All decision-makers need to do now is prioritize active transportation funding and focus that investment on strategically connecting trails, sidewalks and bike paths into a nationwide active transportation network.

As America continues full-steam ahead into the 21st century, its aging, last-century transportation system needs to catch up. The last reform-minded federal transportation bill, the Intermodal Surface Transportation Efficiency Act, was passed in 1991. Nearly 30 years later, Congress, as well as state and local governments, now must put forth a vision of a balanced transportation system that meets the rapidly changing needs of today and tomorrow.

That vision must include robust investment in connected active transportation networks within regions and longer trails as spines connecting communities and states.

In the 19th century, the government substantially invested federal dollars in the national railroad system, culminating famously in the golden spike being ceremoniously driven into the railroad ties to join the Central Pacific and Union Pacific railroads in 1869. In the 20th century, the government substantially invested federal dollars into the Interstate Highway System, connecting East and West, North and South, along intertwining, fast-moving highways meant exclusively for the automobile. In the 21st century, Congress must now invest federal dollars in a national active transportation system so every American might realize the transformative benefits this infrastructure can bring. States and localities also have critical roles to play—and many excellent models to follow—in planning, designing and investing in the active transportation networks of the future.

Some Americans are fortunate to live in communities where trail, walking and biking networks are emerging. Connectivity efforts are changing their communities—urban, suburban and rural—for the better. Now is the time to elevate these case studies and the powerful outcomes they can deliver. Public investment in active transportation systems at the federal, state and local levels will allow these benefits to be shared by all communities, not just a select few. With the same strength of vision that built the railroads and the Interstate, America can provide the benefits of safe, connected active-transportation networks and spines everywhere, for everyone.

Opposite: Cyclist riding in bike lane at night

Appendix: Methodology

Walking and Biking Mode Share for Trips < 1 Mile

Status Quo
The sum of walking and biking trips less than 1 mile divided by total trips less than 1 mile (NHTS 2017 weighted by WTTRDFIN):

Walking and Biking Trips < 1 Mile/Total Trips < 1 Mile

Modest Scenario
Average percentage of states with top 25 walking and biking trips < 1 mile (NHTS 2017 weighted by WTTRDFIN):

Top 25 Walking and Biking Trips < 1 Mile/Total Trips of Top 25 < 1 Mile

Substantial Scenario
Average percentage of states with top 5 walking and biking trips < 1 mile (NHTS 2017 weighted by WTTRDFIN):

Top 5 Walking and Biking Trips < 1 Mile/Total Trips of Top 5 < 1 Mile

LEGEND

NHTS = National Household Travel Survey
WTTRDFIN = Weight Variable
MPG = Miles Per Gallon
PMPGGE = Passenger Miles Per Gallon of Gasoline Equivalent
PMT = Passenger Miles Traveled
VMT = Vehicle Miles Traveled

Walking and Biking Mode Share for Trips 1–3 Miles

Status Quo
The sum of walking and biking trips 1 mile to less than 3 miles divided by total trips 1 mile to less than 3 miles (NHTS 2017 weighted by WTTRDFIN):

Walking and Biking Trips 1 mile–< 3 Miles/Total Trips 1 mile–< 3 Miles

Modest Scenario
Average percentage of states with top 25 walking and biking trips 1 mile to less than 3 miles (NHTS 2017 weighted by WTTRDFIN):

Top 25 walking and biking trips 1 mile–< 3 Miles/ Total Trips of Top 25 1 mile–< 3 Miles

Substantial Scenario
Average percentage of states with top 5 walking and biking trips 1 mile to less than < 3 miles (NHTS 2017 weighted by WTTRDFIN):

Top 5 Walking and Biking Trips 1 mile–< 3 Miles/Total Trips of Top 5 1 mile–< 3 Miles

Walking and Biking Mode Share for Trips 3–5 Miles

Status Quo
The sum of walking and biking trips 3–5 miles divided by total trips 3–5 miles (NHTS 2017 weighted by WTTRDFIN):

Walking and Biking Trips 3–5 Miles/Total Trips 3–5 Miles

Modest Scenario
Average percentage of states with top 25 walking and biking trips 3–5 miles (NHTS 2017 weighted by WTTRDFIN):

Top 25 Walking and Biking Trips 3–5 Miles/Total Trips of Top 25 3–5 Miles

Substantial Scenario
Average percentage of states with top 5 walking and biking trips 3–5 miles (NHTS 2017 weighted by WTTRDFIN):

Top 5 Walking and Biking Trips 3–5 Miles/Total Trips of Top 5 3–5 Miles

Opposite: Cedar River Trail in Washington | Photo courtesy King County Parks

Public Transportation Mode Share for Trips 1–15 Miles

Status Quo
The sum of public transit (public/commuter, city-to-city, Amtrak, subway, ferry) trips 1–15 miles divided by total trips 1–15 miles (NHTS 2017 weighted by WTTRDFIN):

Public Transit 1–15 Miles/Total Trips 1–15 Miles

Modest Scenario
Average percentage of states with top 25 public transportation trips 1–15 miles (NHTS 2017 weighted by WTTRDFIN):

Top 25 Public Transit 1–15 Miles/Total Trips of Public Transportation Top 25 1–15 Miles

Substantial Scenario
Average percentage of states with top 5 public transportation trips 1–15 miles (NHTS 2017 weighted by WTTRDFIN):

Top 5 Public Transit Trips 1–15 Miles/Total Trips of Public Transportation Top 5 1–15 Miles

Increase of Transit Ridership Because of Walking and Biking

Status Quo
UNKNOWN

Modest and Substantial Scenarios
With the assumption that 43% of people with a destination within 10 minutes will walk when they feel safe, the frequency of trips 10 minutes or less (≤ 10 minutes) was calculated. The percentage of total walkable trips under 10 minutes was calculated based on the percentage of walking trips from the total amount of trips. That number of walking trips under 10 minutes was subtracted from the total trips under 10 minutes to determine the count of possible transit trips. The number of those feeling unsafe was also subtracted from the total to accurately meet the assumption that people are more likely to walk if a trip takes 10 minutes or less and is on infrastructure that is perceived as safe. The percentage of possible walking trips from the entire field of possible trips to transportation was determined. Finally, half of the 43% from the assumption of the computed percentage increase was used as the "modest scenario."[1] The full 43% was used as the "substantial scenario."[2]

Trip Length Reduction Through Induced Mixed Use (1–15 Miles)

Status Quo
UNKNOWN

Modest and Substantial Scenarios
The modest scenario is calculated assuming that a 10% increase in entropy or dissimilarity index reduces average VMT 0.2% to 01.1%.[3] The substantial scenario is calculated based on evidence that increasing land use mix from the 25th percentile to the 75th percentile level reduces total VMT 2.7%.[4]

Public-Transportation Fuel Use Relative to Cars (% of 21.7 MPG)

Status Quo
Current percentage of public transportation PMPGGE lower than Passenger Vehicle PMPGGE.[5] Car PMPGGE was calculated to be 36.2 and public transit was 45.4; 36.2/45.4 yielded 0.80.[6]

Modest and Substantial Scenarios
Added percentage based on EPA MPG report. Percentage change based on 2010–2017 MPG increase for modest and 2000-2017 MPG for substantial.

Fuel Savings From Congestion Relief (Gallons per 1000 Miles Driven Avoided)

Status Quo
This number was calculated using PMT figures from the 2017 Public Transportation Fact Book[7] and converting the PMT numbers to VMTs avoided. Using values derived from the 2019 Urban Mobility Report[8], there were fuel savings of 4.2 gallons per 1,000 vehicles miles avoided. This number was then multiplied by the total miles driven avoided to calculate the total fuel savings from congestion relief.[9]

Modest and Substantial Scenarios
In the modest and substantial scenarios, fuel savings from congestion relief are calculated by determining the total miles driven avoided due to walking and bicycling (sum of all walking and biking trips less than or equal to 5 miles,

increase in public transit ridership and trip length reduction) multiplied by the fuel savings from congestion relief based on the status quo. Increase in public transportation and trip length not available for status quo and is assumed for the modest and substantial scenarios.

CO_2 Reduction From Congestion Relief (tCO_2 per 1,000 VMTs Avoided)

The computed figure for fuel savings attributed to congestion relief is multiplied by the CO_2 equivalent per gallon of gasoline and then divided by the amount of VMTs avoided. The fuel savings varies by scenario—4.2 gallons in the status quo scenario, 4.6 in the modest scenario, and 5 in the substantial scenario per 1,000 VMTs avoided. VMTs avoided is 25 in the status quo scenario, 62 in the modest scenario and 127 in the substantial scenario.

Price of Gasoline ($/gallon) (Incl. 15% Federal and State Tax)

The total gallons of fuel saved due to walking and biking was calculated as the sum of walk/bike trips less than or equal to 5 miles, which was 25 for the status quo scenario, 44 for the modest scenario and 63 for the substantial scenario. That total was calculated by multiplying the price of gasoline by 0.85 to exclude the federal and state tax for the fuel savings from mode shift. Similarly, the figure for fuel savings was calculated using the increase in public transportation ridership due to walking or bicycling, mixed use development, and/or congestion relief, and then multiplied by the price of gasoline (excluding gas tax). The price is $2.91 in the status quo, $3.67 in the modest and $4.25 in the substantial scenario. The price of gasoline is cited from the U.S. Energy Information Administration for 2017.[10]

Health-Care Costs

Current CDC research shows a cost savings of $537 when those who are insufficiently active become active and a savings of $1,313 when those who are inactive become active (2014 dollars). To calculate the net health cost savings of active transportation, these figures were adjusted for inflation to $630 and $1,437 in 2019 dollars, and $1,000 was defined as the approximate average to calculate the modest scenario.

Assumptions about increases in physical activity, defined as meeting the CDC's recommendation for physical activity due to walking and biking, are measured against baseline NHTS data[11] that indicates 10% of the population meets physical activity guidelines through walking and biking. Therefore, 10% was used to calculate the cost savings for the status quo scenario. Percentage increases for the modest and substantial scenarios were calculated by comparing walking, and bicycling commuting rates in the top five states with the bottom five states; a 5% difference exists between the top and bottom performing states. Therefore, a 5% increase was assumed for the modest scenario (total 15% of population) and another 5% increase for the substantial scenario (total 20% of population).

Local Spending Impact

RTC has conducted localized trail-spending studies for over 15 years, and the results of those studies have revealed people spend between $5 million and $7 million at trail-oriented and trail-adjacent businesses. RTC maintains a database of open rail-trails, which includes 2,128 records at the time of this report: $5 million multiplied over 2,128 yields the current local spending estimate associated with trails; $6 million projected over 2,500 open rail-trails and $7 million projected over 3,000 open rail-trails provide the modest and substantial scenario estimates respectively.

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