Completing Sidewalk Networks: Benefits and Costs

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Word Count: 3,594 words + 2 tables (250 words per table) = 4,094 words

TRB Annual Meeting Paper TRBAM-S-23-07012
Submitted 1 August 2023

ABSTRACT

This study examines the benefits and costs of completing urban sidewalk networks. Most communities have incomplete sidewalk networks: many streets lack sidewalks, and many of those that do exist are inadequate and fail to meet universal design standards. This is unfair to people who want to walk, and increases various costs by suppressing non-auto travel and increasing motor vehicle traffic. Recent case studies provide estimates of sidewalk expenditures and the additional investments needed to complete sidewalk networks. This indicates that typical North American communities spend $30 to $60 annually per capita on sidewalks, and would need to double or triple these spending levels to complete their networks. This is a large increase compared with current pedestrian spending but small compared with what governments and businesses spend on roads and parking facilities, and what motorists spend on their vehicles. Sidewalk funding increases are justified to satisfy ethical and legal requirements, and to achieve various economic, social and environmental goals. There are several possible ways to finance sidewalk improvements. These usually repay their costs through savings and benefits.

Keywords: Walkability, Pedestrian Planning, Sidewalks

INTRODUCTION

Walking (including variants such as wheelchair, scooter and handcart use) is the most basic and universal travel mode. Even astronauts walk in space and on the moon. Improving walking conditions can provide many benefits, and incurs various costs, as summarized in Table 1. Because of its importance and efficiency, a sustainable transportation hierarchy prioritizes walking above all other modes (1).

Table 1 **Walkability Improvement Benefits and Costs** (2)

	Improved Walking Conditions	More Walking Activity	Reduced Automobile Travel	More Compact Communities
Benefits	• Improved user convenience, comfort and safety • Improved accessibility for non-drivers, which supports equity objectives • Higher property values • Improved public realm (more attractive streets) • Improved public transit access	• User enjoyment • Improved public fitness and health • More local economic activity • Increased community cohesion (positive interactions among neighbors) • More neighborhood security ("eyes on the street")	• Reduced traffic congestion • Road and parking facility cost savings • Consumer savings • Reduced chauffeuring burdens • Increased traffic safety • Energy conservation • Pollution reductions • Economic development	• Improved accessibility, particularly for non-drivers • Transport cost savings • Reduced sprawl costs • Openspace preservation • More livable communities • Higher property values • Increased security
Costs	• Facility costs • Lower traffic speeds	• Equipment costs (shoes) • Increased crash risk	• Slower travel	• Increases some development costs

Walkability improvements can provide numerous benefits and incur some costs.

Sidewalks are the most basic form of walking infrastructure. Virtually everybody uses them including transit passengers when accessing stops and stations, plus motorists and bicyclists when travelling between parked vehicles and destinations. However, unlike other transportation infrastructure, sidewalks often lack basic data, planning and funding. In most communities, sidewalk networks are developed ad hoc, built as part of new developments with no mechanism for filling in gaps, correcting mistakes or improving to current design standards, and there is often little enforcement of maintenance requirements. As a result, most communities have incomplete and inadequate sidewalk networks.

This is inequitable and inefficient. Inadequate sidewalks are unfair to travellers who rely on walking, or would like to, which includes many disadvantaged groups such as people with disabilities and low incomes (3). In recent years, disability advocates have successfully sued local governments to enforce universal design requirements (often called *Americans with Disabilities Act* or *ADA* standards), due to this inequity (4). It is also inefficient because inadequate walking conditions increases crash risk, suppresses walking, and increases driving and associated costs. Motorist benefit if more complete sidewalk networks reduce their chauffeuring burdens, by allowing non-drivers to independently access nearby destinations.

This paper investigates these issues. It uses recent case studies to estimate current sidewalk spending levels and the additional investments needed to complete sidewalk networks, and discusses the benefits that would result. It describes some funding options. This information should be useful to pedestrian advocates, transport practitioners and anybody interested in improving walking conditions.

SIDEWALK COST STUDIES

Some recent data sources and case studies provide information on sidewalk construction costs.

- According to popular sources such as the Home Advisor (5) and How Much (6), a typical concrete walkway costs $6 to $12 per square foot, with higher costs for additional prep work, thickness, design and finish. This totals $1,200 to $2,400 for a typical 5-foot walkway on a 40-foot urban frontage or $2,400 to $5,000 for an 80-foot suburban frontage. Assuming that sidewalks have a 20-year average operating life and homes have 2.5 occupants, these facilities cost $24 to $100 annually per resident.
- Table 2 summarizes costs of various active transportation facilities.

Table 2 **Active Transportation Facility Costs** (7, 8, 9)

Measure	Typical Costs (2023 U.S. Dollars)
Sidewalks (5-foot width)	$25-85 per linear foot
Marked crosswalk	$200-400 for painted crosswalks, $5,000 for patterned concrete.
Pedestrian refuge island	$10,000-15,000, depending on materials and conditions.
Path (5-foot asphalt)	$50-70 per linear foot
Path (12-foot concrete)	$140-200 per linear foot
Bike lanes	$15,000-80,000 per mile to modify existing roadway (no new construction)
Bicycle parking	$200-800 per bicycle for racks, and $3,000 per locker
Center medians	$200-300 per linear foot
Curb bulbs	$15,000-35,000 per bulb
Curb ramps	$2,500 per ramp.
Chokers	$12,000 for landscaped choker on asphalt street, $20,000 on concrete street.
Curb bulbs	$15,000-30,000 per bulb.
Traffic circles	$7,000 for landscaped circle on asphalt street, $10,000 on concrete street.
Chicanes	$14,000 for landscaped chicanes on asphalt streets, $20,000 on concrete streets.
Traffic signs	$100-200 per sign.
Speed humps	$3,000 per hump
Traffic signals	$20,000-100,000 for a new signal
Traffic signs	$100-200 per sign.
Traffic circles	$6,000 for landscaped circle on asphalt street and $10,000 on concrete street.

This table summarizes examples of active transport facility costs. Older values were updated based on the National Highway Construction Cost Index (10).

- Using detailed field data from Albuquerque, New Mexico, Corning-Padilla and Rowangould estimated that improving all sidewalks to optimum standards would cost approximately $54 million, averaging $60 per capita or about $6 annual per capita if implemented over ten years (11).
- A city engineering study found that approximately 40% of Denver, Colorado's sidewalks are missing or substandard, and filling these gaps would cost between $273 million and $1.1 billion, which averages $385 to $1,550 per capita or about $40 to $150 annual per capita over a decade (12). The city's new Ordinance 307 will collect special property taxes to upgrade and complete the city's sidewalk and recreational trail network.
- Ithaca, New York charges $70 annually per household (about $30 annual per capita) and $185 per business to build and maintain city sidewalks (13).

- Los Angeles has approximately 10,750 miles of sidewalks of which 40% are rated inadequate. A 2016 class-action lawsuit by disability rights advocates requires the City to spend $1.4 billion over 30 years to fix its sidewalks, which averages about $12 annual per city resident (14).
- The city of Nashville's *WalknBike* study estimates that new sidewalks cost $1,000 per linear foot, of which 82% is construction costs and 18% professional services (15). This is higher than most other estimates because it includes costs for property acquisition, curbs, stormwater infrastructure and trees.
- The Washington State Department of Transportation (WSDOT) 2020 *Draft Active Transportation Plan* estimates that upgrading the state transportation system to maximize active travel safety would cost $5.7 billion, which is approximately $750 per capita, or about $75 annual per capita over a decade, which represents about 13% of the WSDOT budget (16).
- U.S. federal and state departments of transportation typically spend $1 to $3 annually per capita on special walking and bicycling facilities (17, 18).

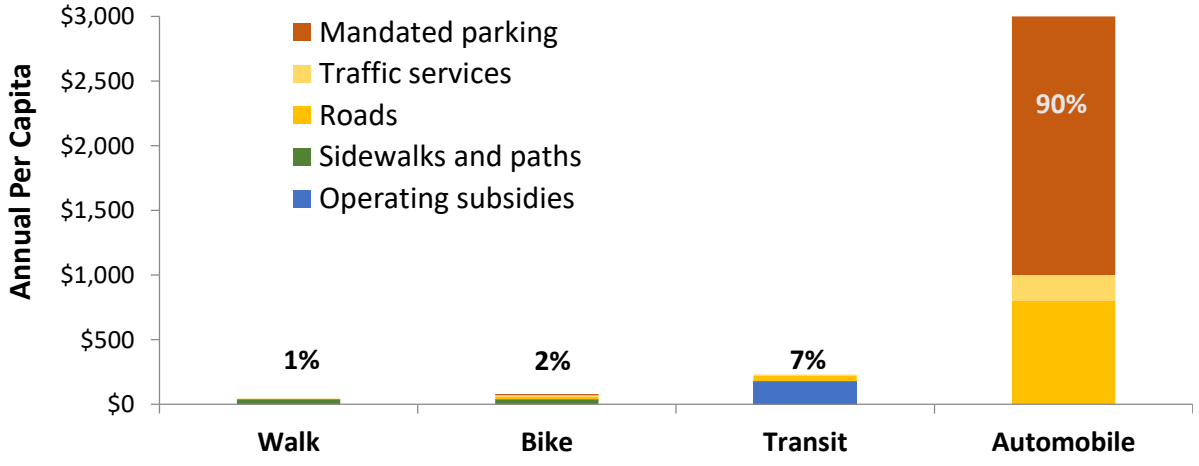
Summary

These data sources indicate that typical U.S. communities spend $30 to $60 annually per capita on sidewalks, primarily by property owners as mandated by law, plus some government expenditures. This results in sidewalks on just 40-60% of urban streets, with higher rates in older city neighborhoods and lower rates in suburbs. Completing sidewalk networks to fill in gaps and achieve universal design standards typically requires doubling or tripling these expenditures to $80 to $150 annually per capita, and more in some areas to make up for decades of underinvestment. Note that this estimate is specific to sidewalk networks and does not include curbs, traffic calming, streetscaping, landscaping, or recreational trail networks.

COMPARING TRANSPORTATION INFRASTUCTURE INVESTMENTS

Figure 1 compares current U.S. transportation infrastructure spending by mode, including sidewalks, public transit subsidies, roads and government mandated parking facilities. This indicates that only about 1% of transportation infrastructure spending is devoted to sidewalks.

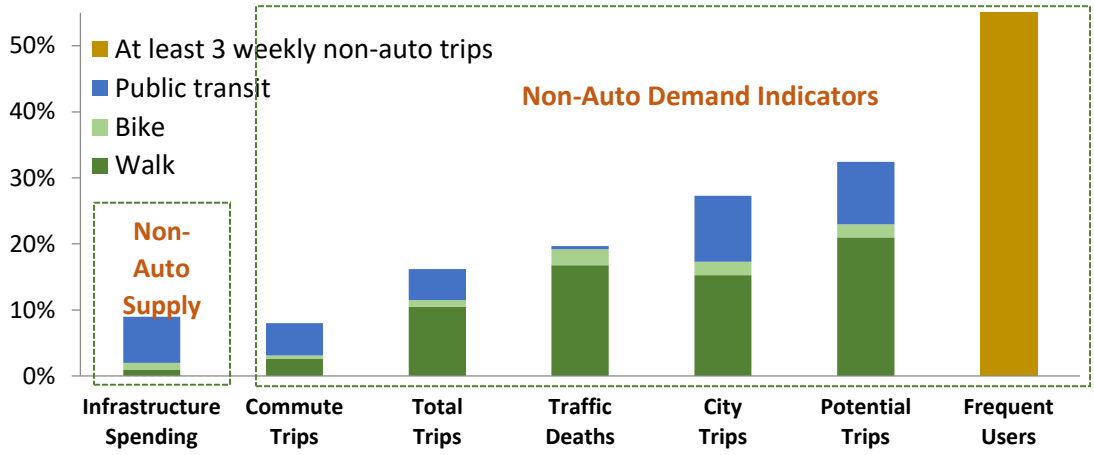
***Figure* 1** **Estimated Transportation Infrastructure Spending** (19)



Currently only about 1% of total transportation infrastructure spending is devoted to walking facilities.

Figure 2 compares current expenditures on non-auto modes with indicators of their demands, including commute mode shares (based on Census Journey to Work data, which significantly undercounts walking since it ignores walking trips to access public transit or between parked vehicles and destinations), total trips (based on National Household Travel Survey Data), traffic deaths, city trips, potential trips (including latent demands), and residents who use non-auto modes at least three times per week. This indicates that most communities underinvest in non-auto modes relative to their demands.

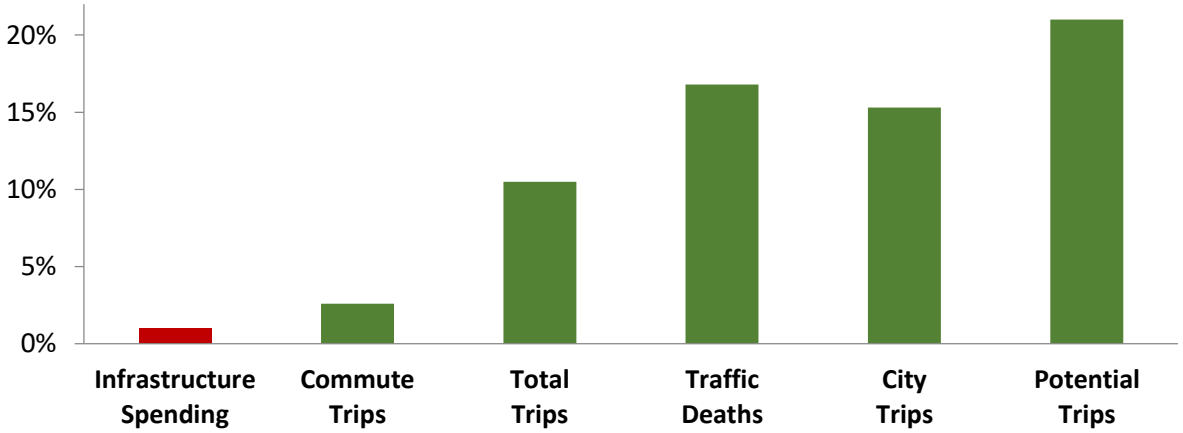
Figure 2 **Comparing Non-auto Infrastructure investments with Demand Indicators** (20)



Non-auto modes receive a smaller portion of infrastructure spending than their share of total trips, traffic deaths, potential trips, or users.

This disparity is particularly large for walking. Typical communities spend about 1% of their transportation infrastructure budgets on public walkways although walking represents 11% of total trips, 17% of traffic deaths, 15% of city trips, and 21% of potential trips if walking conditions were improved. This suggests that significant increases in sidewalk funding can be justified on social equity grounds, to ensure that pedestrians receive their fair share of public resources.

Figure 3 **Comparing Walking Infrastructure investments with Demand Indicators** (21)



Walking receives far less investment than its share of current and potential trips, and traffic deaths.

TRAVEL IMPACTS AND BENEFITS

Pedestrian improvements can significantly increase walking and reduce driving (22). The *Nonmotorized Transportation Pilot Program*, which invested about $100 per capita in pedestrian and bicycling improvements in four typical U.S. communities (Columbia, MO; Marin County, CA.; Minneapolis, MN; and Sheboygan County, WI) increased walking trips 23% and bicycling trips 48%, reduced total vehicle-miles about 3%, and reduced active mode crash rates (23). Researchers Guo and Gandavarapu predict that installing sidewalks on all streets in a typical North American community would increase 0.097 average daily walk- and bike-miles per capita and reduce 1.1 vehicle-miles, about 12 miles of reduced driving for each additional active mode mile (24). Neighborhoods with excellent walkability often have 20% to 50% walking mode shares and much lower vehicle ownership and use than in auto-oriented areas (25).

Of course, these impacts will vary depending on specific conditions. Sidewalk improvements may have little impact on travel activity where there is no demand. There is evidence of significant and growing latent demands for walking. According to the 2017 US National Household Travel Survey (NHTS), approximately 11% of total trips are made by walking, but their potential use is much greater. Approximately a quarter of all personal trips are one mile or less, suitable for a twenty-minute walk (26). The National Association of Realtor's "National Community and Transportation Preference Survey" indicates a growing preference for living in walkable urban neighborhoods even if that requires attached housing, such as an apartment or townhouse (27). Current demographic and economic trends (aging population, rising fuel prices, changing consumer preferences, and increasing health and environmental concerns) are likely to increase future demands for walking and the benefits of servicing those demands.

Serving these demands by completing sidewalk networks can provide large savings and benefits, as summarized in Table 1, which is likely to more than offset their costs. A FHWA report found that providing walkways separated from travel lanes can prevent up to 88% of crashes involving pedestrians walking along roadways, and reduces head-on, sideswipe, and fixed object crashes (28). Walkability improvements tend to increase nearby property values, but individual owners cannot capture the full benefits of a complete sidewalk network and so are likely to underinvest in these facilities (29).

For example, in a typical community, completing sidewalk networks is estimated to cost about $100 annually per capita. Using Guo and Gandavarapu's estimate that completing sidewalk networks would reduce average annual vehicle miles and associated costs about 3%, this would provide about $30 in annual roadway savings, $60 in annual parking cost savings, $180 in vehicle cost savings, plus significant health benefits and reductions in traffic congestion, crash risk and pollution emissions.

These are lower-bound estimates because they ignore the many ways that walkability improvements help increase urban transportation system efficiency. For example, completing sidewalk networks improves public transit access and expands the number of parking spaces that serve a destination, increasing traffic and parking system efficiency. This indicates that sidewalk network improvements provide at least a 2.7 benefit/cost ratio ($270/$100), and probably far more.

Completing sidewalk networks also helps achieve social equity goals. As previously described, most jurisdictions currently underinvest in walking facilities relative to their demands, and since physically and economically disadvantaged groups tend to rely on walking, completing sidewalk networks tends to be progressive – it helps disadvantaged groups. This is indicated by efforts by disability advocacy organizations to complete and improve sidewalk networks based on universal design standards.

POTENTIAL FUNDING OPTIONS

Many jurisdictions are developing pedestrian or active transportation plans which evaluate current walking and bicycling facilities and identify and prioritize improvements. To be fully implemented they usually require new funding options. Currently, most jurisdictions develop their sidewalk networks by requiring owners to build sidewalks when their properties are developed and repair sidewalks that fail. A survey of 82 U.S. cities found that 40% simply require property owners to pay the full cost of repairing sidewalks, 46% share costs, and 13% pay for sidewalk repairs directly (30). Relying on property owners results in sidewalk network gaps, fails to improve sidewalks to meet current standards, and imposes occasional large cost burdens. There are better approaches (31).

Options include general funds, special community-wide assessments, tax increment financing, sales taxes, and grants from other levels of government (32). Some jurisdictions fund pedestrian improvements as part of parks and recreation, but these are mainly special trails rather than sidewalk networks. Ithaca, New York charges household and business annual fees to build and maintain city sidewalks (33). Denver's Ordinance 307, approved by referendum, will collect special property taxes to upgrade and complete the city's sidewalk and recreational trail network (34). In response to a lawsuit, the city of Sacramento agreed to dedicate 20% of its annual transportation budget to make public sidewalks accessible (35).

In the article, "Fixing Broken Sidewalks," Donald Shoup recommends that municipalities require sidewalk repairs at the point of sale (36). Sidewalks are inspected and any inadequacies must be repaired. The sale then provides funds to pay for any required repairs. To accelerate this process, cities can offer to repair sidewalks and receive payment when the property is sold in the future. The city effectively lends funds for sidewalk repairs, with owners paying market interest rates so governments recover their costs.

Local and regional governments can also improve sidewalk data, inspection and enforcement. They can develop GIS sidewalk inventories that identify conditions and gaps, encourage residents to report problems, and hire trained inspectors – wheelchair users are particularly qualified – to collect field data.

Regional and state/provincial transportation agencies traditionally invest little in sidewalks based on the assumption that their mandate is to serve longer distance motorized traffic, not active travel. However, that division is a fallacy. In fact, many of their facilities, such as urban arterials and interregional highways, serve many local trips and are affected by walkability. Sidewalk improvements can reduce traffic volumes and congestion on those facilities, directly and by improving transit access.

Regional and state/provincial transportation agencies can significantly improve pedestrian facilities on their highway and public transit projects, such as sidewalks on bridges and pedestrian crossings over highways, and provide grants to local governments to improve pedestrian facilities including sidewalks.

Regional and state/provincial agencies can also provide information to facilitate sidewalk development. For example, they can provide guidance and funding for local governments to develop comprehensive GIS sidewalk inventories that can be used to identify network gaps and inadequacies, evaluate walking and bicycling levels-of-service, and set targets for improvement (of example, that 95% of streets will have ADA compliant sidewalks within a decade). This is a critical first step in sidewalk network planning that benefits from regional standardization, so methods and data sets are consistent between jurisdictions.

CONCLUSIONS

Walking is the most basic and universal travel mode, and sidewalks are the most basic walking infrastructure, but they are often overlooked and undervalued in transportation planning. Completing and improving sidewalk networks can help achieve many economic, social and environmental goals.

Most communities have incomplete sidewalk networks: many streets lack sidewalks, and many of those that do exist are inadequate and fail to meet universal design standards. This is unfair to people who want to walk, and increases various costs by suppressing non-auto travel and increasing motor vehicle traffic. Current demographic and economic trends are increasing walking demands and the benefits to society of serving those demands.

Recent case studies indicate that typical North American communities spend $30 to $60 annually per capita on sidewalks, and would need to double or triple these spending levels to complete their networks. This is a large increase compared with current pedestrian spending but small compared with what governments and businesses spend on roads and parking facilities, and what motorists spend on their vehicles. Sidewalk funding increases are justified to satisfy ethical and legal requirements, and to achieve various economic, social and environmental goals. There are several possible ways to finance sidewalk improvements. These usually repay their costs thorough savings and benefits.

ACKNOWLEDGMENTS

Thanks to Shoshana Kort Litman for assisting in pedestrian field studies.

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