

Evidence to Inform a Cycling and Walking Investment Strategy

Using national data to evaluate evidence for how investments in walking and cycling may support physically active transportation



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The Issue

In the United States, few people regularly use physically active modes of transportation like walking or bicycling to travel to work or school. Increasing the use of physically active transportation modes in place of cars may be a cost-effective and sustainable strategy to increase population physical activity and improve health. This study uses national data on federal spending on investments in pedestrian and bicycling programs and infrastructure at the county-level to evaluate the evidence for how these investments may support physically active transportation.



Introduction

In the United States, only one out of ten students travels to school using physically active modes of transportation like bicycling (1.1%) and walking (9.6%), and among U.S. workers, one in 25 commutes to their job on foot (2.9%) or bicycle (1.1%). Nationally, 11.5% of all trips employ a physically active transportation mode with the majority of these being on foot (10.5%).¹ Increasing the use of physically active transportation may be a cost-effective and sustainable strategy to increase population physical activity and improve health^{2,3} when compared to car travel. Despite national calls to increase active transport,⁴ communities lack clear and practical guidance⁵ including data on the resources needed to produce shifts to active transportation modes. Since 1991, specific federal transportation funding has been made available to support investments in infrastructure and programs that can support walking and bicycling.⁶ However, few U.S.-based studies document clear evidence on how such investments, when made locally, can help shift transportation mode from sedentary choices to more physically active options or whether this may vary by community type based on population size. This research summary examines whether higher per capita investments in bicycling and pedestrian programs and infrastructure can result in gains in the use of physically active transportation modes like bicycling and walking.

Methodology

This study capitalizes on existing information from the 2000 U.S. Census Bureau and the five-year 2016 American Community Survey. It covers the transportation mode that workers aged 16 years and older in counties with a population over 100,000 regularly reported using to get to and from work in the past week. Physically active modes included bicycling and walking. Researchers obtained data from the Fiscal Management Information System (FMIS) of the Federal Highway Administration (FHWA)⁷ on federally funded transportation projects and the amount of federal funding obligated annually for fiscal years (FY) 1992 through 2015. This enables a single national comparison metric. However, it does not account for investments that may be made solely through local-level funding sources. The levels of local funding used for bicycle and pedestrian-oriented projects and infrastructure in these counties are unknown, but likely vary by community. The total amount of federal funding obligated to implement bicycle and pedestrian-focused programs and infrastructure for FY 2000 through 2015 was summarized for each county with a population over 100,000, adjusting for inflation. We categorized counties with higher levels of bicycle or pedestrian funding investments for bicycling and walking infrastructure and programs, or “high investment counties”, as those counties at or above the 90th percentile for per capita federal funding within each of two population size categories (>250,000 vs. <250,000). Counties with “low investment” were those with per capita investments lower than the median level (i.e., 50th percentile) within each population size category.

Low Investment County Groups Used for Comparison with High Investment Counties



State-Matched:

Best within-state match for each high investment county based on county characteristics (the neighboring state was used if an in-state match was not available)



Overall-Matched:

Best match anywhere in the U.S. for each high investment county based on county characteristics



National:

All low investment counties with populations of 100,000 or more persons

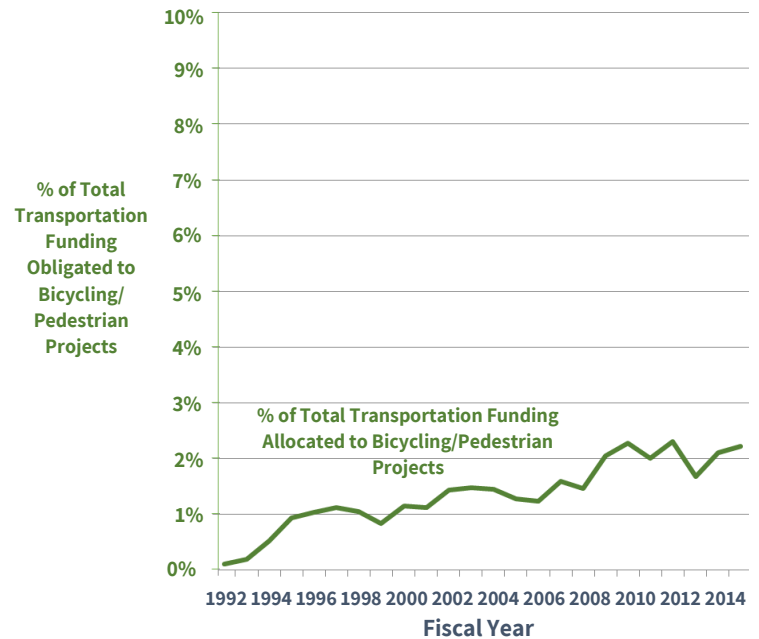
Researchers used a difference-in-difference analytical strategy to calculate the absolute difference over time in the percentage point change in the proportion of commuters (i.e., workers not working from home) getting to work via a bicycle or by walking in counties with “high investments” compared to the difference over time in similar counties with “low investments”. In order to account for differences in historical trends and other county-level factors that were not measured, researchers used three types of low investment county comparison groups – one-to-one best match county within-state (or neighboring state if an in-state match was not available), one-to-one best match county overall across the U.S., and all “low investment” counties with populations of 100,000 or more persons (i.e., “national comparison group”). Using established sources,⁸ researchers identified matched comparison communities among counties with similar baseline commuting rates, population size, density, metropolitan status, and county demographics, as well as factors shown to be associated with federal bicycle and pedestrian funding implementation including car ownership, low education, low employment, and prior investment in bicycle and pedestrian infrastructure and programs. Researchers also compared the county-level changes over time in the proportion of commuters taking public transit or taking cars to get to work in high investment counties vs. low investment counties.

Key Findings

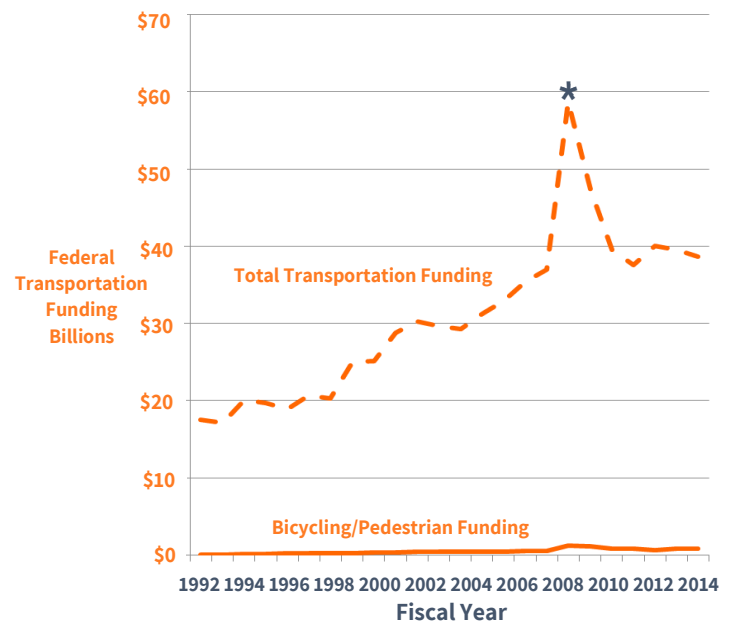
- ▶ **Nationally, the proportion of total federal transportation funding allocated specifically for bicycling and pedestrian investments has increased over time from 0.1% of total transportation funding allocation in FY 1992 to 2.2% of total transportation funding allocation in FY 2015.**

The proportion of total federal transportation funding that is dedicated to programs that support bicycle and pedestrian projects or infrastructure is a small percentage (2%) of total transportation funding. It has, however, increased over time since the passage of the Intermodal Surface Transportation Efficiency Act of 1991 that created new objectives, programs, and planning requirements for bicycle and pedestrian activities.⁶ The fiscal year 2009 saw the highest total federal expenditures for transportation funding (\$58.7 billion) due to the economic stimulus funding provided in the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). In that year, \$1.2 billion of the total expenditures were used to support transportation via foot or bicycle, the highest expenditure currently recorded for a single fiscal year. This bicycle and pedestrian funding represented approximately 2% of the total annual obligation of federal transportation funds in that fiscal year.

Figure 1: Percent of all federal transportation funding that is allocated to bicycling and pedestrian projects



Data Sources: Fiscal Management Information System, FY1992-FY2015; 2012-16 American Community Survey; National Household Travel Survey, 2017



*Spike in funding due to spending associated with American Recovery and Reinvestment Act of 2009 (Public Law 111-5)

► **Locally, the allocation and use of federal funding for bicycling and pedestrian investments is variable across counties in the US.**

Among 524 counties with a population of at least 100,000, annual federal funding per capita obligated to bicycle and pedestrian infrastructure and programs between FY 2000 and 2015 ranged from zero to \$18.05 with an average of \$2.59. Annual federal funding per capita obligated to all transportation projects during this period ranged from \$19.42 to \$437.57 with an average of \$130.55. In the 52 counties in the US with the highest investments, the average annual federal funding per capita obligated to bicycle and pedestrian infrastructure and programs between FY 2000 and 2015 was \$7.28. On average, this represents 5.3% in total average annual per capita federal transportation funding in these counties between FY 2000 and 2015. Among comparison counties with lower investment in bicycling and pedestrian programs and infrastructure, funds per capita dedicated to bicycling and pedestrian use (\$1.14 to \$1.40 per capita) were on average 5 to 6 times lower than in higher investment counties (Table 1). In most cases, the use of federal funding for a project requires cost-sharing or a local funding match, that may include state or other local funding in the total funding amount for a project. In high investment counties, the average annual total amount of federal, state and other dollars per capita dedicated to bicycle and pedestrian uses was \$9.06, 5.5 to 6.5 times higher than in low investment counties.

Table 1: Transportation funding and investment in bicycling and pedestrian projects in high and low investment counties

	High Investment Counties	Low Investment Counties		
		State-Matched	Overall-Matched	National
Number of Counties	52	52	52	261
Transportation Infrastructure and Program Investment, Mean (Min, Max)				
Annual Federal Transportation Funding*, \$ per Capita	\$157.21 (\$76.62, \$332.37)	\$126.97 (\$48.08, \$302.15)	\$137.25 (\$43.46, \$437.57)	\$123.98 (\$35.64, \$437.57)
Annual Federal Bicycle and Pedestrian Project Funding*, \$ per Capita	\$7.28 (\$4.75, \$18.05)	\$1.40 (\$0.00, \$2.23)	\$1.36 (\$0.05, \$2.20)	\$1.14 (\$0.00, \$2.23)
Percentage (%) of Federal Transportation Funding Allocated to Bicycle and Pedestrian Projects*	5.3% (1.9%, 21.1%)	1.2% (0.0%, 3.5%)	1.2% (0.0%, 2.9%)	1.1% (0.0%, 4.4%)
Annual Federal + Local Match (State/ Other) Funding Allocated to Bicycle and Pedestrian Projects*, \$ per Capita	\$9.06 (\$4.64, \$23.39)	\$1.66 (\$0.00, \$3.37)	\$1.63 (\$0.05, \$3.49)	\$1.40 (\$0.00, \$4.30)

*Fiscal Years 2000-2015, adjusted for inflation

- **The share of commuters bicycling to work increased on average in counties between 2000 and 2016, but the increases were greater in those counties with high levels of bicycle and pedestrian funding compared to counties with low levels of funding.**

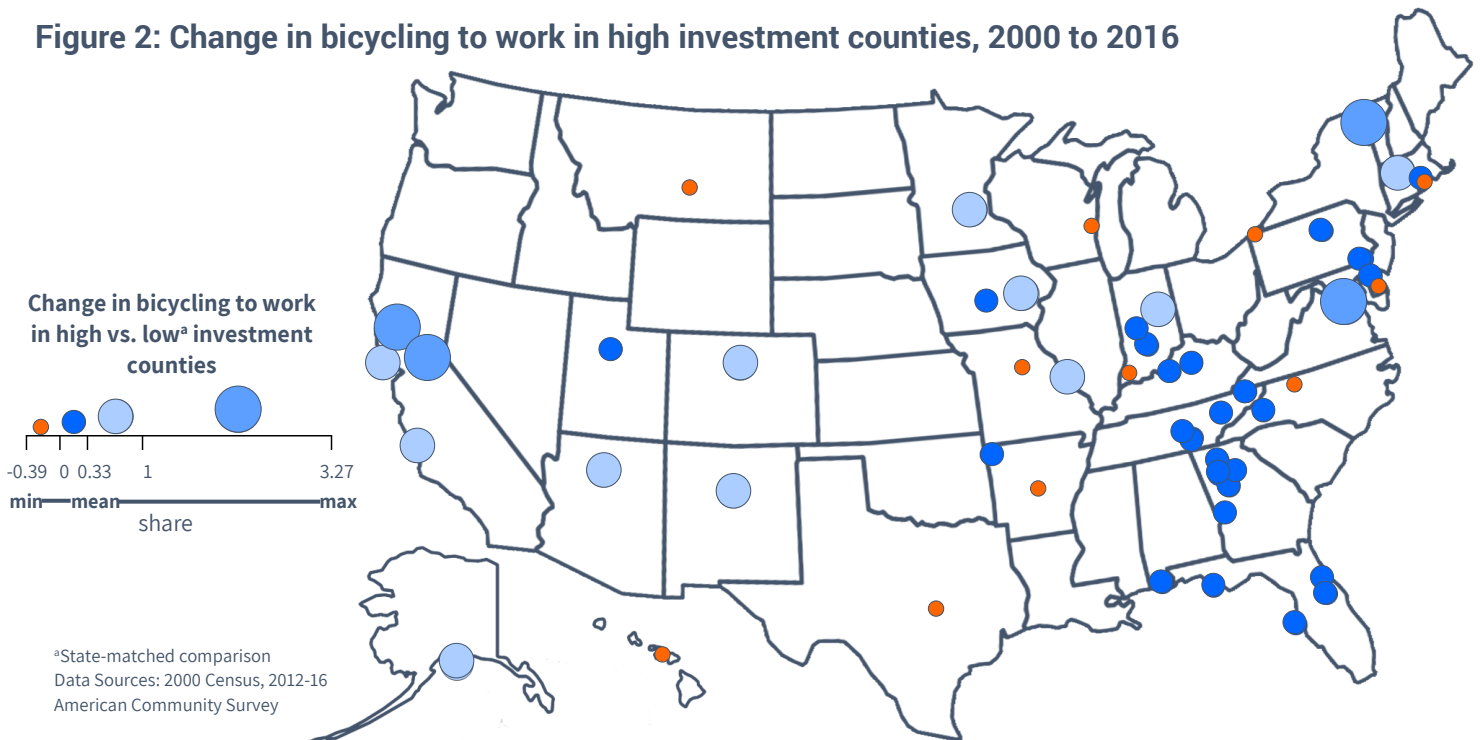
Among all 524 counties with a population of at least 100,000, the share of commuters bicycling to work increased on average from 0.40% in 2000 to 0.60% in 2012-16, a 50% increase. Among commuters living in the high investment counties, the share of persons bicycling to work increased from 0.71% in 2000 to 1.10% in 2012-16, or a 56 percent increase in the share of persons commuting by bicycle over time. In contrast, state-matched low investment counties saw only a 23% increase in bicycle commuters over time, from 0.30% in 2000 to 0.37% in 2012-16. The difference-in-difference analysis comparing high investment counties with state-matched low investment counties suggests that high investment in bicycle and pedestrian funding was associated with an increase of 0.33 (95% CI 0.16, 0.49, $p < 0.001$) in the mode share of commuters traveling to work by bicycle. This difference translates into 26,000 more people bicycling to work in these counties that could be associated with higher investments in bicycle and pedestrian projects. Higher absolute increases in the share of commuters traveling to work via bicycle were also seen in high investment counties compared to the other comparison groups – 0.19 percentage points in comparison with overall matched counties (95% CI 0.06, 0.32, $p = 0.01$) and 0.28 percentage points compared to all low investment counties nationally (95% CI 0.17, 0.39, $p < 0.001$) (Table 2).

Table 2: Change in share of commuters bicycling to work between 2000 and 2016

	High Investment Counties	Low Investment Counties		
		State-Matched	Overall-Matched	National
Number of Counties	52	52	52	261
Share of Commuters Bicycling to Work, Mean (Min, Max)				
2000 Census, Mean (95% CI) ^a	0.71% (0.38, 1.03)	0.30% (0.23, 0.37)	0.45% (0.31, 0.59)	0.30% (0.26, 0.34)
2012-16 ACS, Mean (95% CI) ^a	1.10% (0.66, 1.54)	0.37% (0.26, 0.48)	0.66% (0.43, 0.88)	0.42% (0.36, 0.48)
Change in Share 2000 to 2012-16, Mean (95% CI) ^a	0.40 (0.22, 0.57)	0.07 (0.00, 0.14)	0.20 (0.08, 0.33)	0.12 (0.08, 0.15)
Difference in Share Change (High vs. Low Investment), Mean (95% CI) ^b	N/A	0.33 (0.16, 0.49)	0.19 (0.06, 0.32)	0.28 (0.17, 0.39)
p-value	N/A	<0.001	0.01	<0.001

ACS, American Community Survey; CI, confidence interval.
 Data Sources: 2000 Census, 2012-16 American Community Survey
^aMetric is calculated for each county and estimates presented are mean and confidence interval among all counties in group
^bComparison of means between intervention and comparison counties estimated using linear regression models accounting for matched pair indicators

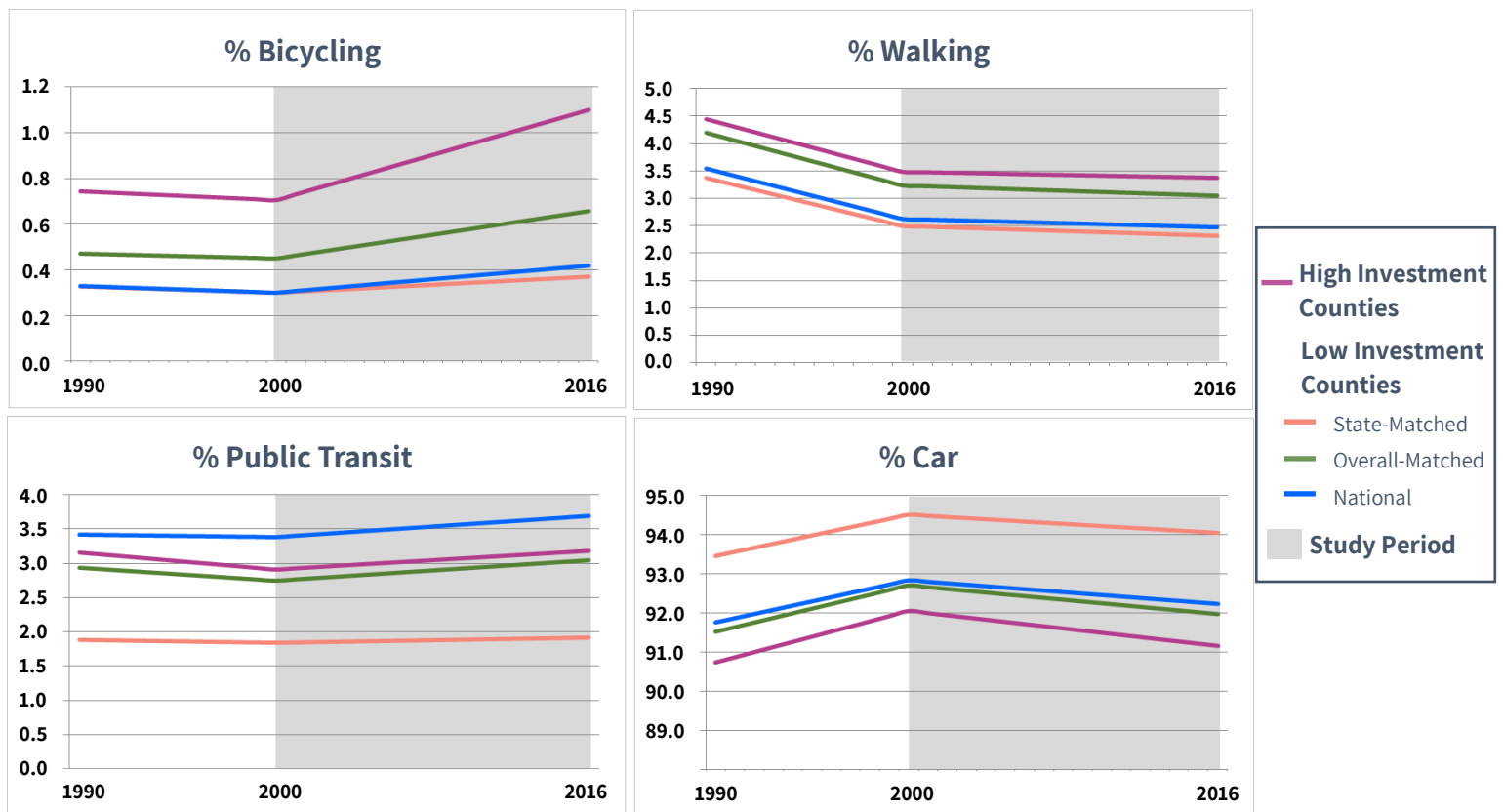
Figure 2: Change in bicycling to work in high investment counties, 2000 to 2016



- **The share of commuters traveling via transportation modes besides bicycling, including walking, driving or using public transit, did not change significantly between 2000 and 2012-16 in high-investment counties when compared with low-investment counties.**

Historic commute trends in these counties from 1990 to 2000 suggest declines in the share of commuters walking to work, while showing increases in the share of those commuting via car. Trends in bicycling and taking public transit to work were relatively flat during this same period in these counties. After 2000, high-investment counties had smaller declines over time in the share of commuters traveling to work on foot and greater decreases in the share taking a car to work compared with low-investment counties, though these differences were not statistically significant. Similarly, there were no statistically significant differences over time in the change in the share of workers taking public transit to work in high-investment counties compared with low-investment counties.

Figure 3: Share of commuters traveling by transportation mode in high and low investment counties, 1990 to 2016



Conclusions

- ▶ **Federal transportation funding for bicycling and walking is not proportional to transportation trips taken by bicycle or on foot.**

For example, while 3.6% of commuters walk or bicycle to work and 11.5% of all transportation trips were taken on foot or bicycle,¹ only 2% of federal transportation funding was devoted to bicycle and pedestrian improvements. Federal funds can be used to support projects that promote walking and bicycling for all transportation purposes, not just the work commute.

- ▶ **Federal funding for bicycle and pedestrian projects can play a role in facilitating an increase in the proportion of workers using a bicycle to get to and from work.**

The bicycle commute share increased significantly more in the high-investment counties compared with similar low-investment counties. However, rates of cycling to work in the U.S. remain low, even in high-investment counties. In the United Kingdom, among cycling communities that have seen significant increases in physically active transportation over time, annual per capita investments are substantively higher than the average in our “high investment” U.S. counties.⁹ Additional and sustained investments may be needed in order to promote bicycling more broadly in the commuting population.

- ▶ **Communities may need to use pedestrian-specific programming, infrastructure or other planning strategies to increase pedestrian commute mode share.**

In this study, data were suggestive of smaller declines over time in walking to work in high investment counties, though we did not observe significant gains in walking commute share in counties with these higher investments when compared with low investment counties. While we lack the longitudinal data within counties on walking for trips other than the work commute over time, is possible that these federal funding programs may support walking for other trip purposes.



Future Research Needs

This study incorporates national data on federal funding along with locally-matched funding sources for bicycle and pedestrian programs and infrastructure that enables a single national comparison metric. However, it does not account for investments that may be made solely through local-level funding sources. The levels of local funding used for bicycle and pedestrian-oriented projects and infrastructure in these counties are unknown, but likely vary by community. Transportation investments may be targeted for specific modes (e.g., pedestrian sidewalk improvements, recreational paths) and result in different impacts on commute share. We are not able to separate funding for bicycle-only or pedestrian-only projects and walking can be part of a multi-modal trip. If communities are spending more or less in local funding for pedestrian or bicycle infrastructure or programs, their findings may be different from the average. Communities may also have other programming that is not accounted for in this study, such as bike share systems, that may influence bicycling rates. Additionally, there may be a mismatch in the data on federal funding investments at the county level and how these funds are invested within a county. For example, investment may be used to support changes within a denser metropolitan core where commutes via foot or bicycle may be more likely due to shorter commute distances to work. The use of county-level funding and county-level commute shares may mask greater impacts among sub-populations in urban centers. While investments designated as serving bicycle and pedestrian users were summarized in this study, improvements that may have been made to bicycle and pedestrian infrastructure as part of larger transportation projects not designated explicitly as serving bicycle and pedestrian users were not captured.

Approximately 17% of all trips are trips that are taken to or from work.¹ Thus a majority of trips are taken for other purposes including shopping, errands, and social engagements, and preference in mode may not be the same as a commute trip. Thus, it may be important to capture how federal investments for bicycling and walking may influence the transportation mode used for non-commuting transportation purposes. Similarly, it is possible that bicycling or walking infrastructure that is suitable for transportation purposes may also be used for recreation or exercise. These additional uses could contribute to creating opportunities for community residents to be more physically active. This study uses a natural experimental design to evaluate the impact of higher levels of per capita investment for bicycle and pedestrian use but does not explain why there is such variation between communities in the amount and proportion of funding that it allocated to these transportation modes.^{10,11} Additionally, it is not clear from these data that the same levels of funding (in absolute or relative terms) would result in similar bicycle commuting mode shifts in other U.S. counties.



Study Methodology

Comparisons between high and low investment counties were analyzed using linear regression models to assess the difference in mean commute share outcomes across counties. The number of people bicycling associated with high investment was calculated as the difference between high and low investment counties in the difference between actual counts of cyclists in 2016 and expected counts based on the share of commuters biking in 2000 and the average number of commuters in high and low investment counties in 2016. High investment counties were matched to low investment counties using Euclidean distance matching, selecting the comparison with the lowest Euclidean distance score based on selected county characteristics standardized by their standard deviation and selecting a unique comparison for each high investment county to achieve the lowest distance score when summed across all matches. On average, high investment counties were similar to low investment counties on matching characteristics. In the 52 high investment counties compared with the 52 state-matched low investment counties, characteristics were as follows: 0.7% vs. 0.3% of commuters bicycled to work in 2000, 2.9% vs. 1.8% of commuters took public transit to work in 2000, county population size was 318,000 vs. 342,000, population density was 896 vs. 605 people per square mile, there was a 17.4% vs. 16.8% increase in population size from the 1990 to 2000 Census, 56.8% vs. 58.6% of households had 2 or more vehicles, 24.7% vs. 25.7% of residents were of non-white race/ethnicity, 34.0% vs. 36.5% of households had children, 6.9% vs. 4.9% of residents were enrolled in college, 15.9% vs. 18.4% of residents had low education (less than a high school degree), 5.3% vs. 5.7% of residents were unemployed, and federal investments in bicycle and pedestrian projects during fiscal years 1992-1999, inflated to the 2015 U.S. dollar, were \$1.47 vs. \$0.47 per person per year.



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