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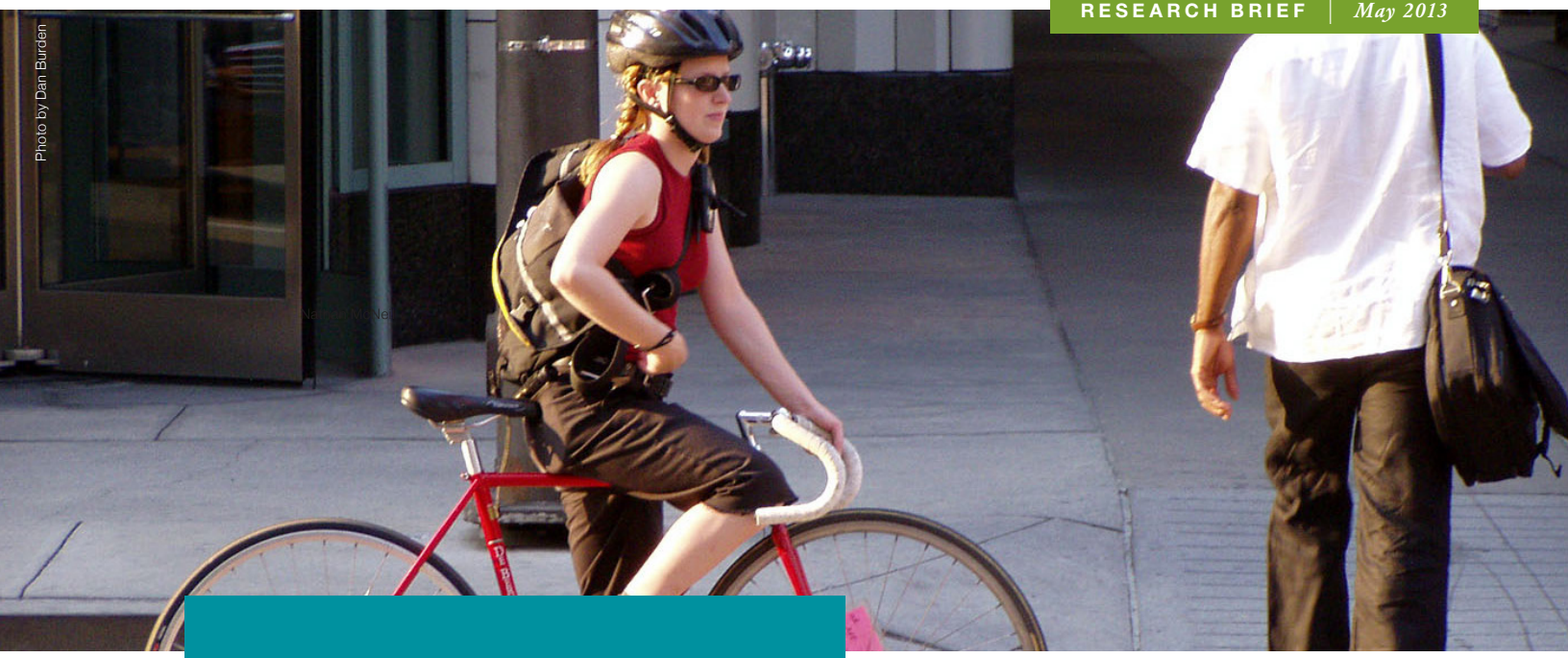

Photo by Dan Burden

How to Increase Bicycling for Daily Travel

INTRODUCTION

Bicycling is healthy: it increases physical activity, improves cardiovascular health, and reduces obesity and disease. Bicycling also can be an excellent mode of transportation for people of all ages. In fact, bicycling to school has been shown to improve cardiovascular fitness and overall health among children and adolescents.[1] As with virtually any kind of sport or physical activity, bicycling poses some risk of injury, but recent studies show that the health benefits of bicycling far exceed the health risks.[2–8] Moreover, as bicycling levels increase, injury rates fall, making bicycling safer and providing even larger net health benefits.[9-12]

Only 1 percent of all daily trips in the United States are made by bicycle, including fewer than 1 percent of trips to school by children younger than age 16.[13, 14] Many more trips could be made by bicycle, as 40 percent of trips made in the United States are shorter than two miles, which is a reasonable bicycling distance for most people. Recognizing this potential, many government

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agencies and public health organizations have advocated for increasing bicycling as a way to improve people's health and reduce air pollution, carbon emissions, congestion, noise, traffic dangers, and other harmful effects of car use.[15–20]

But what are the most effective strategies cities can use to increase bicycling? A growing number of studies have assessed the effectiveness of many strategies for increasing levels of bicycling, including on-street bike lanes, off-street bike paths, and other bicycling infrastructure; promotional and educational programs, such as bike-to-work days and bicycle training classes; and policies, including parking restrictions and traffic-calmed neighborhoods. This brief summarizes the available evidence about strategies for increasing bicycling levels and encouraging bicycling as a mode of transportation. It also presents related policy implications.

Key Research Results

At the city level, bicycling infrastructure is strongly associated with overall levels of bicycling, especially with bicycling to work, school, or shopping.[21–24]

- One study of 35 large U.S. cities found that each additional mile of bike lane per square mile was associated with about a 1 percent increase in the share of workers commuting by bicycle.[21]
- A more recent study using data from 90 large U.S. cities found that cities with 10 percent more bike lanes or paths had about 2 percent to 3 percent more daily bicycle commuters.[25]

It is less clear what *type* of infrastructure is most effective at increasing bicycling for daily travel.[26]

- Simply living close to bike lanes or paths does not necessarily increase levels of bicycling.[27–30] However, a Seattle study found that adults living within a half-mile of a bike path were 20 percent more likely to bicycle at least once a week.[29]

Photo by Jennifer Dill

- Creating bicycle boulevards by adding traffic calming features, such as speed humps, curb extensions, and pedestrian crossways, on streets with a low volume of traffic and installing cycle tracks, which are on-street bike lanes that are physically separated from motor vehicle lanes, encourages bicycling on streets where they are installed. Studies in Copenhagen,[31] London,[32] Washington, D.C.,[33] and Montreal[34] found that bicycling increased after cycle tracks were installed and that cycle tracks attract more bicyclists than similar streets without cycle tracks. Although the studies did not examine whether bicycling increased overall or simply shifted from other streets to those with cycle tracks, the results confirm the popularity of cycle tracks. A Portland study found that cyclists went the furthest out of their way to use off-street bike paths, followed by bicycle boulevards, suggesting a general preference for facilities protected from motor vehicle traffic. Striped bike lanes (i.e., those without physical separation) helped offset the unsafe, uncomfortable feeling of bicycling on busy arterial roads, but were not preferred over residential streets that had a low volume of traffic and no lanes.[35]

- New forms of pavement markings, including bike boxes (see photo), shared lane markings or sharrows, and colored bike lanes, increase perceptions of safety, help guide bicyclists and motorists, and provide official, visible recognition that bicyclists are legitimate users of the road.[36–40] The impact of such markings on levels of bicycling has not been determined.

Photo by Nathan McNeil

- Other features of bicycle infrastructure also make a difference. Bicycling declines with the number of stops (e.g., due to stop signs or signals) along a route,[41] poor pavement quality[23, 32, 42] and inadequate bike parking.[43]

- Several studies have found that women prefer facilities that have less motor vehicle traffic or are separated from traffic.[45–48] One study also found that women felt less comfortable than men on off-street paths, perhaps because of personal security concerns, such as fear of assault in isolated areas.[45]

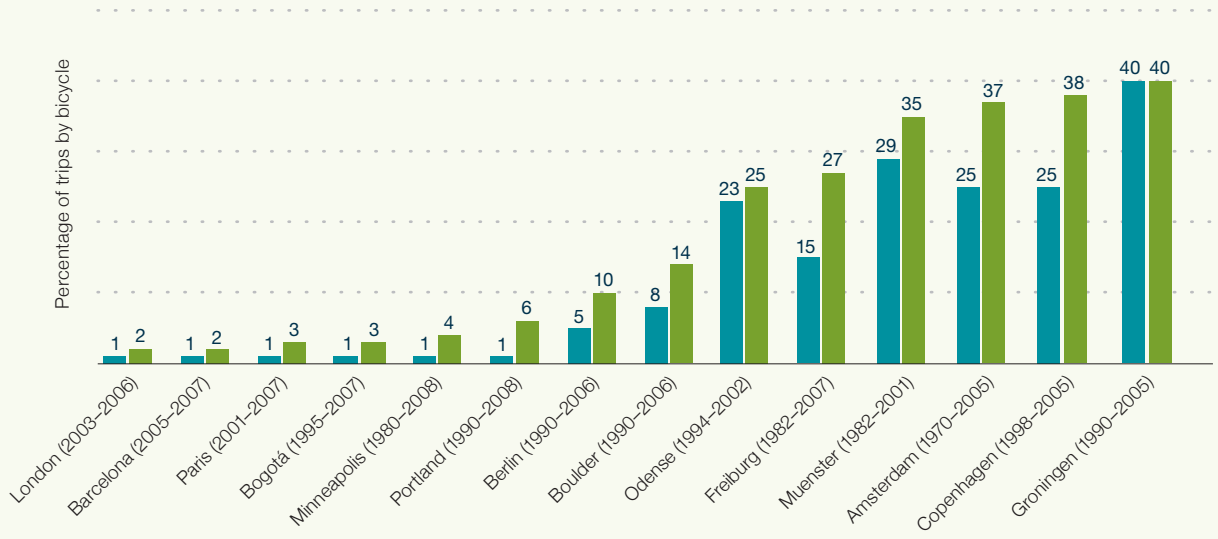
Marketing and educational programs, as well as regulations, also can affect levels of bicycling.

- Programs that promote bicycling may help increase the effectiveness of investments in bicycle facilities.[49–52] Studies have reported long-term increases in bicycling following bike-to-work days,[53, 54] "ciclovias," and similar events that close streets to cars for the enjoyment of cyclists, pedestrians, and others.[55, 56] One study of the impact of Safe Routes to School programs found an increase in bicycling,[57] but a second study found no effect.[58]
- Cities that have implemented bicycle sharing programs report substantial increases in bicycling.[59] For example, the proportion of trips made by bicycle increased from 1 percent to 2.5 percent in Paris[60, 61] and from 0.75 percent to 1.76 percent in Barcelona.[62] In London, the OYBike bike share program has encouraged bicycling as a mode of transportation—6 percent of users reported shifting from driving and 34 percent reported shifting from transit. Another 23 percent reported that without the bike share program, they would not have traveled at all.[63]
- Helmets can help prevent head injuries in falls and crashes,[64] but laws requiring helmet use have been shown to reduce bicycling among adults in Canada and Australia.[65–67]
- Lower speed limits for vehicles make bicycling safer and more attractive. One study conducted in Germany found that reducing general speed limits led to a significant increase in bicycling.[68]

A comprehensive package of infrastructure, programs, and policies is likely to have the greatest effect.[69]

- Countries and cities with high levels of bicycling have extensive infrastructure, as well as pro-bicycle policies and programs, whereas those with low levels of bicycling have done much less.[70-72]
- Some cities, even very large cities, have dramatically raised bicycling levels but only with a multifaceted, coordinated approach that involved careful planning and ongoing input from residents. Figure 1 shows the increase in bicycling rates for 14 cities that implemented a wide range of measures to increase bicycling. The rates reflect bicycling for all purposes or only for commuting, depending on the data source.[73]
- Because cities have implemented a wide range of measures at the same time, sometimes over many years or decades, it is difficult to isolate the separate impact of individual measures on bicycling levels.
  - Bike sharing programs in Paris (Velib') and Barcelona (Bicing) have unquestionably increased cycling,[59] but several other efforts occurred at the same time, including expansion of the bikeway system and bike parking, bicycling education, and traffic calming.
  - The daily fee charged to cars for accessing central London, which is a 21-sq.km zone, has been widely credited for increased bicycling there, but it is only one of many programs that have encouraged more bicycling since 2000.

FIGURE 1. **Increase in Bicycling for Transportation in 14 Cities with Comprehensive Efforts**[69]



- Integrating bicycling with public transportation increases the viability of each. Bicycling can expand the service areas of rail transit stations and bus stops. Trains and buses, in turn, can transport bicyclists over much longer distances than would be feasible by bicycle alone. Studies show that bike racks on buses and good bike parking at rail stations increase both bicycling and transit use.[44]

- In contrast to North American cities, European cities have implemented many deterrents to driving along with efforts to increase bicycling.[69–72] In northern Europe, the much higher cost of owning, using, and parking a car, combined with car-free zones, comprehensive traffic calming, more compact land use, lower overall speed limits, and the limited availability of parking for cars, reduce the convenience and attractiveness of car use.[78,79] Cities such as Berlin have installed traffic calming features on many of their streets, thus discouraging and slowing down driving. While it is likely that policies that deter driving also serve to encourage bicycling, their impact on bicycling has not been directly tested.

Conclusion

Research shows that infrastructure, programs, and policies that support bicycling can significantly increase levels of bicycling for daily travel. However, it is difficult to generalize about the effectiveness of specific strategies or particular kinds of bicycle infrastructure.

Many studies only measure the impact of incremental expansions and do not capture the full impact of a completed bicycle system. Indeed, the most compelling evidence comes from communities that have implemented a fully integrated package of strategies to increase bicycling. The evidence reviewed in this brief suggests that a comprehensive approach produces a much greater impact on bicycling than individual measures that are not coordinated.

POLICY IMPLICATIONS

- To maximize bicycling opportunities, cities must build a network of safe and comfortable routes using a mix of bike lanes, bike boulevards, cycle tracks, and bike paths that connect residents to potential destinations.[26] Infrastructure that maximizes the separation between bicyclists and motor vehicles, without making bicyclists travel too far out of their way, may be more effective for encouraging new bicyclists than on-street pavement markings.
- Investments in infrastructure should be supported by promotional programs, such as bike-to-work days and bicycle training, Safe Routes to School programs, and other programs that facilitate bicycling, including bike sharing systems and those that accommodate bicycles on buses and trains.
- Policies that make driving more expensive (e.g. higher gasoline taxes and parking fees) and less convenient (e.g. reduced parking supply and reduced speeds) may be necessary to maximize the effectiveness of infrastructure investments in encouraging bicycling.
- To encourage bicycling as a mode of transportation, communities also must implement land use and development policies to help ensure that destinations for daily needs, such as school, work, and shopping, are within convenient bicycling distance from home.[77]

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Active Living Research, a national program of the Robert Wood Johnson Foundation, stimulates and supports research to identify environmental factors and policies that influence physical activity for children and families to inform effective childhood obesity prevention strategies, particularly in low-income and racial/ethnic communities at highest risk. Active Living Research wants solid research to be part of the public debate about active living.

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Endnotes

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