How to Increase Cycling for Daily Travel: Lessons from Cities across the Globe

Joint Webinar for the Institute of Transportation Engineers and the Active Living Research Program of the Robert Wood Johnson Foundation, 14 August 2013

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How to Increase Bicycling for Daily Travel
Review

Infrastructure, programs, and policies to increase bicycling: An international review

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ARTICLE INFO
Available online 16 September 2009

Keywords:
Bicycling
Active travel
Active transport
Health
Intervention
Policy
Infrastructure
Sustainable transportation

ABSTRACT

Objectives. To assess existing research on the effects of various interventions on levels of bicycling. Interventions include infrastructure (e.g., bike lanes and parking), integration with public transport, education and marketing programs, bicycle access programs, and legal issues.

Methods. A comprehensive search of peer-reviewed and non-reviewed research identified 139 studies. Study methodologies varied considerably in type and quality, with few meeting rigorous standards. Secondary data were gathered for 14 case study cities that adopted multiple interventions.

Results. Many studies show positive associations between specific interventions and levels of bicycling. The 14 case studies show that almost all cities adopting comprehensive packages of interventions experienced large increases in the number of bicycle trips and share of people bicycling.

Conclusions. Most of the evidence examined in this review supports the crucial role of public policy in encouraging bicycling. Substantial increases in bicycling require an integrated package of many different, complementary interventions, including infrastructure provision and pro-bicycle programs, supportive land use planning, and restrictions on car use.
Advantages of Cycling:

- **Economical**: Affordable by everyone, requiring minimal costs for individuals and governments
- **Good for business**: Generate retail sales and profits from tourism
- **No pollution**: Clean and quiet
- **Energy-efficient**: Use up calories we need to burn off from eating too much
- **Healthy**: Many studies report on physical, social, mental health benefits
- **Fun**: Getting out into the fresh air with family and friends
Cycling Share of Daily Trips in Europe, North America, and Australia, 1999-2009

Lots of Potential for Increased Cycling:

Many daily trips in American urban areas are short enough to walk or bike!

- ~27% of all trips in the U.S. were a mile or shorter in 2009
- ~41% of all trips were shorter than two miles

Source: USDOT, 2009 National Household Travel Survey
Share of Cycling for Short Trips

Potential for growth

Women’s Share of Bike Trips in Europe and North America

Potential for growth

Cycling Safety Crucial

• Especially important for the young, the old, for anyone with disabilities, for the timid or risk-averse

• Women more sensitive to safety than men

• Safety of cycling in the Netherlands, Denmark, and Germany helps explain high levels of cycling there
Cycling can be made very safe, as in the Netherlands and Denmark.

Trends in Cyclist Fatalities

Vast improvement in cycling safety in Europe

Pro-car policies in European cities in 1950s and 1960s caused huge decline in cycling and walking

Dramatic policy turn-around since 1970s to limit car use and promote cycling, walking, and public transport in Dutch, Danish, and German cities
Rebound of Bike Share of Trips in German, Dutch, and Danish Cities

Recent Boom in Pro-Bike Policies in Many Cities

• Especially since 2000, European and North American cities without a tradition of cycling for daily travel have dramatically raised cycling levels

• Improved cycling infrastructure and many other measures to encourage cycling
More and better cycling facilities and complementary programs have increased bike share of trips in cities without a tradition of cycling for daily travel.

Boom in Cycling to Work in 14 Large US and Canadian Cities


*2011 figures for Canadian cities are preliminary estimates.*
How to Encourage More Cycling while Improving Safety

• Better cycling facilities
• Integration of cycling with public transport
• Traffic calming of residential neighborhoods
• Mixed-use zoning and improved urban design
• Restrictions on motor vehicle use
• Traffic education and Safe Routes to School
• Traffic regulations and enforcement
Most European cities have extensive car-free districts ideal for walking and cycling.
Cycling is perfect for getting around car-free college campuses such as here at UC Santa Barbara.
Santa Barbara coastal path: Safe and attractive both for cyclists and pedestrians

Conversion of two car lanes to bike path and wider sidewalk

Source: Ralph Fertig
Bike paths in Dutch cities make it safe and comfortable for all to bike: including women, children, and seniors

Source: Warren Salomon
One-way cycle track in The Hague

Raised curb between cycle track and traffic lane

Source: Peter Furth
Almost 100km of 2-way cycle tracks in Montreal

Separation from traffic via bollards and parked cars

Separation from traffic via concrete barriers

Photo: Peter Furth

Photo: Velo Quebec
Provision of cycle track at this key underpass in Montreal

Separation from traffic via concrete barriers AND bollards

For 6 Montreal cycle tracks studied, injury rate averaged 28% lower and usage rate 2.5 times higher than on comparable “reference streets” without facilities (Lusk et al, 2011, Injury Prev)
• 380 mi of new bike lanes and paths since 2000
• Quadrupling in bike trips since 2000
• 74% decrease in serious cyclist injuries and fatalities per million bike trips
• Biggest increases in cycling on protected bike lanes (cycle tracks)

Traffic-protected cycle track on 9th Avenue, NYC
Cycling has doubled in Sydney, Australia since installation of its cycle track network. Economic benefits of this cycle track exceed costs by over three-to-one!

Photo: Fiona Campbell
Increased Bicycling on Protected Bike Lanes
(\% growth in bike trips relative to pre-installation levels)

• Buffered bike lanes on Spruce and Pine Streets in Philadelphia: +266\%
• Buffered median bike lanes, DC, Pennsylvania Ave: +200\%
• Cycle track, Kinzie St., Chicago: +55\%
• Cycle track, NYC, Prospect Park West: +190\%
• Cycle track, NYC, Columbus Avenue: +56\%
• Cycle track, SF, Market St: +115\%
• Cycle track, Vancouver, Canada, Dunsmuir St: +54\%

• 6 cycle tracks in Montreal: 2.5 times more cyclists on cycle tracks than on comparable “reference streets” without facilities
• New system of 164km of cycle tracks in Sevilla, Spain led to over a 6-fold increase in number of daily bike trips from 2006 to 2011
Are Protected Bike Lanes Safer?

• 3 cycle tracks in NYC, decrease in total cyclist injuries
  • 9th Ave: -57%; 8th Ave: -30%; Prospect Pk West: -62%

• Sevilla, Spain: Construction of 164km of cycle tracks led to halving in cyclist serious injury rate per 100,000 trips from 2006 to 2010

• Study of 19 cycle tracks in USA: Avg. injury rate per million bike km much lower on cycle tracks (2.3) than on roads without cycling facilities (range of 4-54 in other published studies). (Lusk et al., 2013, Am J of Public Health)

• Montreal, 6 cycle tracks: Avg. cyclist injury rate 28% lower than on nearby “reference streets.” (Lusk et al, Injury Prevention, 2011)

• Vancouver and Toronto: Cycle tracks had only 11% the injury rate of cycling on busy roads without bike facilities (Teschke et al., Am J of Public Health, 2012)
Buffered median bike lanes on Pennsylvania Avenue in Washington

200% increase in bike trips after installation

Photo: Ralph Buehler
Cultural Heritage cycle track in Indianapolis

Tripling in cycling in Indianapolis since 2000

Construction and maintenance financed by private foundation

Photos: Ralph Buehler
Transformation of Hornby Street in Vancouver with installation of first-class cycle track
Improving safety of cycle tracks at road crossings

Raised crossing for both cyclist and cars, with special pavement and markings

Photo: Warren Salomon
Safe cycle track crossing at busy intersection in Montreal

Photo: Velo Quebec
Bike lanes are much more typical in US cities

Photo: Ralph Fertig
Photo: Lewis Thorwaldson
Contra-flow lanes facilitate bike travel in both directions on one-way streets for cars.
But bike lanes are definitely better than no separate bike facilities, but they do not provide nearly as much protection of cyclists from motor vehicles as cycle tracks.
Installation of these buffered bike lanes in Philadelphia improved safety and greatly increased cycling levels.

265% increase in bike trips (2009-2012)

Spruce St, Philadelphia

111% increase in bike trips (2008-2012)

South St Bridge, Philadelphia

Photo: Nick Klein

Photo: Paul Krueger

Photo: Kyle Gradinger

Photo: Kyle Gradinger
Bridge connections crucial for an integrated cycling network

Almost 20,000 daily bike trips over Portland bridges

Photo: Greg Raisman
Sharp increase in cycling safety in Portland as cycling levels rose

6-fold increase in bike trips

70% fall in crash rate

Source: City of Portland (2013)
Bike paths on the four East River bridges provide crucial connections from Brooklyn and Queens to Manhattan.

Source: Transportation Alternatives NYC
Bike boxes in Seattle also

Photo: Seattle DOT
Why Traffic Calming Saves Lives

Figure 1.1: Probability of fatal injury for a pedestrian colliding with a vehicle

Speed kills!

These streets are, in effect, bike boulevards, neighborhood greenways, and local street bikeways.

3,800 km of traffic-calmed streets in Berlin: ideal for cycling: 78% of ALL streets in Berlin!
Shared streets: Typical traffic calming in new German suburbs

7 km/hr speed limit
Shared street in Indianapolis

Photo: Ralph Buehler
Blockage of through car and truck traffic but convenient cut-through for cyclists and pedestrians

Photo by Peter Berkeley
Traffic calming in Québec City and Montreal

Cheap, easy, and very effective traffic diverters

Photo: Transports Viables

Photo: Velo Quebec
Traffic diverter in Berkeley which provides a through connection for two bike boulevards

Source: Eric Anderson

Bollard blocks passage of cars
152km of bike boulevards in Vancouver
Cut-thrus along bike boulevards in Vancouver
Traffic calming in Vancouver that creates bike boulevards
# Dutch bicycle facility selection matrix

<table>
<thead>
<tr>
<th>Lane Configuration</th>
<th>Average daily traffic (vehicles / day)</th>
<th>Street type and speed limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban local street</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban through street</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural local road</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fast traffic road</td>
</tr>
<tr>
<td>2-way traffic with no centerline</td>
<td>&lt; 2500</td>
<td>mixed traffic(^1)</td>
</tr>
<tr>
<td></td>
<td>2000 to 3000</td>
<td>bike lane(^2) or cycle track(^3)</td>
</tr>
<tr>
<td></td>
<td>3000 to 5000</td>
<td>bike lane(^2) or cycle track(^3)</td>
</tr>
<tr>
<td></td>
<td>&gt; 4000</td>
<td>bike lane or cycle track(^3)</td>
</tr>
<tr>
<td>2 lanes (1+1)</td>
<td>any</td>
<td>bike lane or cycle track(^3)</td>
</tr>
<tr>
<td>4 lanes (2 + 2) or more</td>
<td>any</td>
<td>(does not exist)</td>
</tr>
</tbody>
</table>

BIKE TRANSIT INTEGRATION

Photo: Peter Berkeley

Photo: Translink
Over 50,000 buses in the USA now come equipped with bike racks, as here in Santa Barbara.

Source: Ralph Fertig
Bike on LRT in NJ and Minneapolis

Photo: Metro Transit

Photo: John Boyle
Bike Station next to main train station in Muenster, Germany

Capacity: 3,500 bikes
Bike Station next to Union Station in Washington, D.C.

Capacity: 150 bikes

Photo: Ralph Buehler
300 bike parking spaces in two bike cages at northern terminus of subway line in Boston

Bike-transit integration at Alewife Station on Red Line in Boston

Photo: David Loutzenheiser
Bikes on Caltrain in San Francisco

Photo: San Francisco Bicycling Coalition
Bi-directional cycle track and bike sharing near metro station in Montréal

Source: Vélo Québec
72% average increase in overall cycling by bikesharing users (Shaheen et al., 2013)

Over 50 bike sharing systems in North America by end of 2013

Nice Ride in Minneapolis

Hubway Bikeshare in Cambridge, Boston, Somerville, and Brookline

Capital Bikeshare in Washington, DC
Citi Bike in New York

- Launched May 27, 2013
- 6,000 bikes
- 330 bike stations
- Over 30,000 daily users

Which is the cheaper and more sensible way to get exercise?

Photo: Alta Planning
Innovative directional signs and bike trip counters in Denmark
Convenient, free air pumps for bikes on local neighborhood bikeways in Vancouver

Photo: Paul Krueger
Good bike parking benefits merchants

27 bike corrals in San Francisco

97 bike corrals in Portland
Safe Routes to Schools

Photos: Bike Texas
After installation of this cycle track in Sydney, Australia, over a third of children now bike to school!
Cycling training and testing course in Berlin

Most German and Dutch children take cycling lessons by the 3rd or 4th grade and must pass a police-administered cycling safety test!
Bike Training for Children in New Jersey

Source: NJ Bike Walk Coalition
Cycling training course for adults

Photo: Bonnie Fenton

Photo: Amy Walker
Guided Bicycle Tours for Seniors

Source: Troels Andersen
Bike to Work Day in San Francisco

Source: San Francisco Bicycle Coalition
GIVE EMPLOYEES FREE BIKES!

The perfect zero emissions vehicles!

Photo: Troels Andersen
Over 100,000 participants at LA’s fourth annual CicLAvia in October 2012

CicLAvia: 9 miles of car-free streets in Los Angeles

Source: Ryan Snyder
Expansion of Open Streets (Ciclovias) in the Americas (cities with at least two events per year)

New book with MIT Press

http://citycyclingbook.wordpress.com

About the authors:

http://policy.rutgers.edu/faculty/pucher/

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CONCLUSIONS

• Many economic, environmental, social, and health benefits of cycling
• Even in North America, many local trips are short enough to cover by cycling
• Many cities throughout the USA and Canada are vastly improving their cycling facilities
• But much more could be done, and there are many ways to do it.

QUESTIONS?