Making Cycling Irresistible: Lessons from Europe and North America

Ralph Buehler, Virginia Tech & John Pucher, Rutgers University

Photo: Susan Handy

Photo: SF Bicycle Coalition

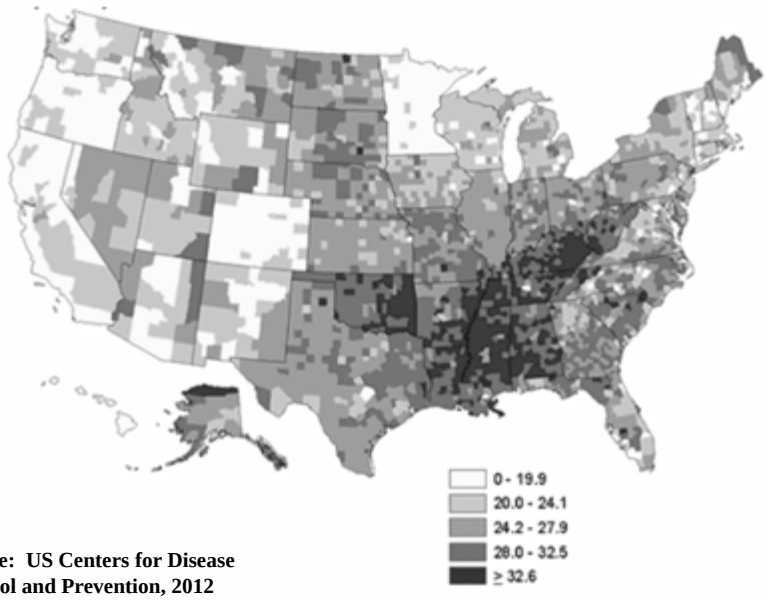
Advantages of Walking and Cycling:

- ***Economical*:** Affordable by everyone, requiring minimal costs for individuals and governments
- ***Good for business*:** Generate retail sales and profits from tourism
- ***Environmentally friendly*:** Virtually no pollution
- ***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

WALKING AND CYCLING ARE HEALTHY!

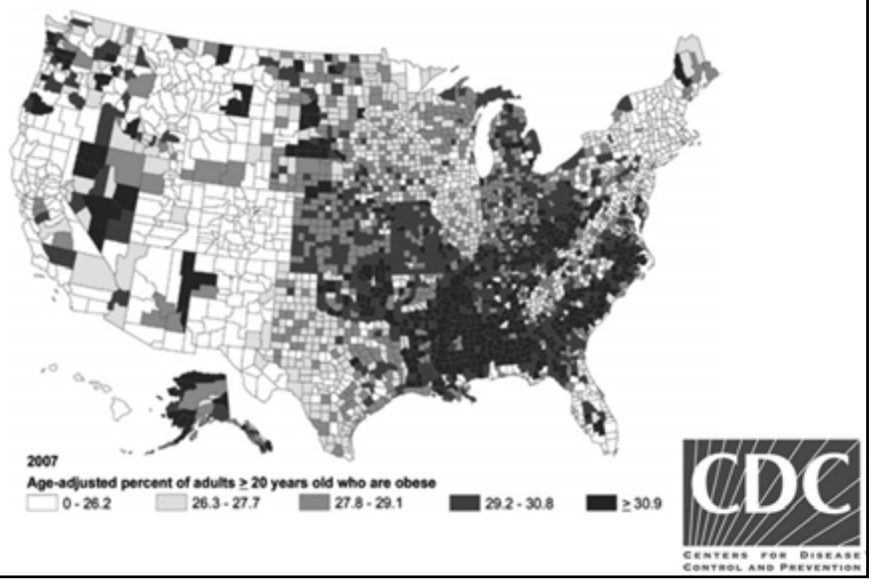
- **GREAT source of physical activity:**
  - **Both for daily travel and for recreation**
  - **Cheaper, easier, and more dependable than formal exercise routines**
  - **Can be integrated into daily lifestyle to achieve practical travel needs**

2007 Age-Adjusted Estimates of the Percentage of Adults Who Are Physically Inactive

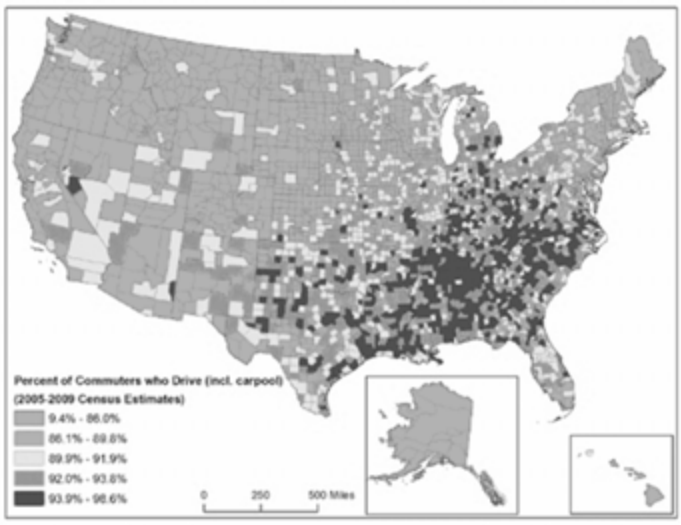


Source: US Centers for Disease Control and Prevention, 2012

Obesity, 2007

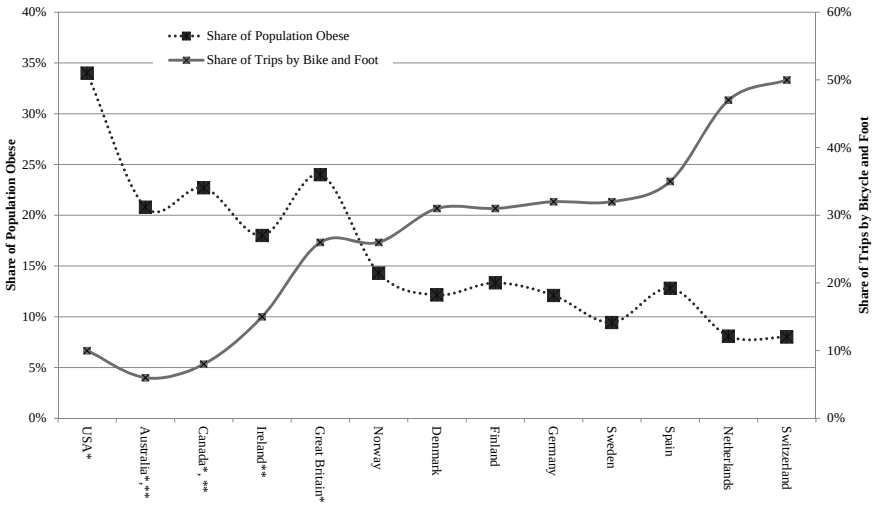


Percent of Commuters Who Drive



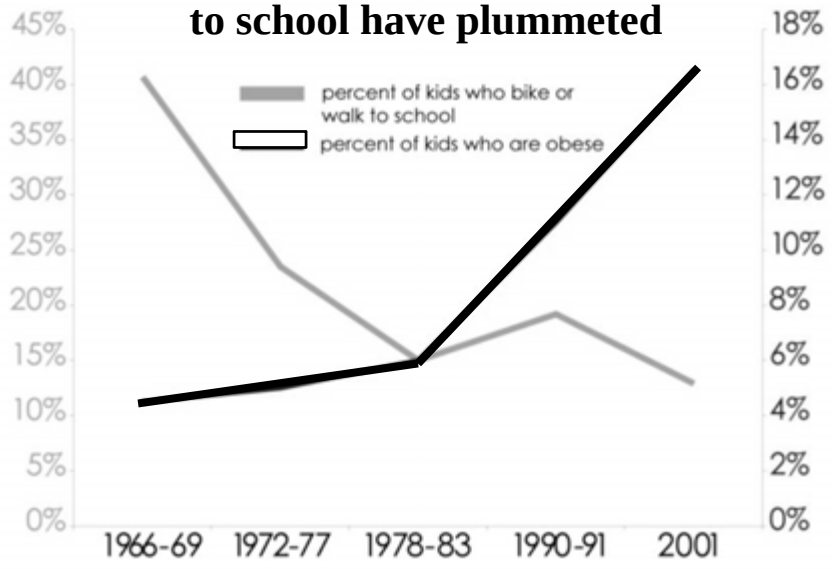
Price and Godwin, *Planetizen* 2012

Obesity Falls with Increased Walking and Cycling

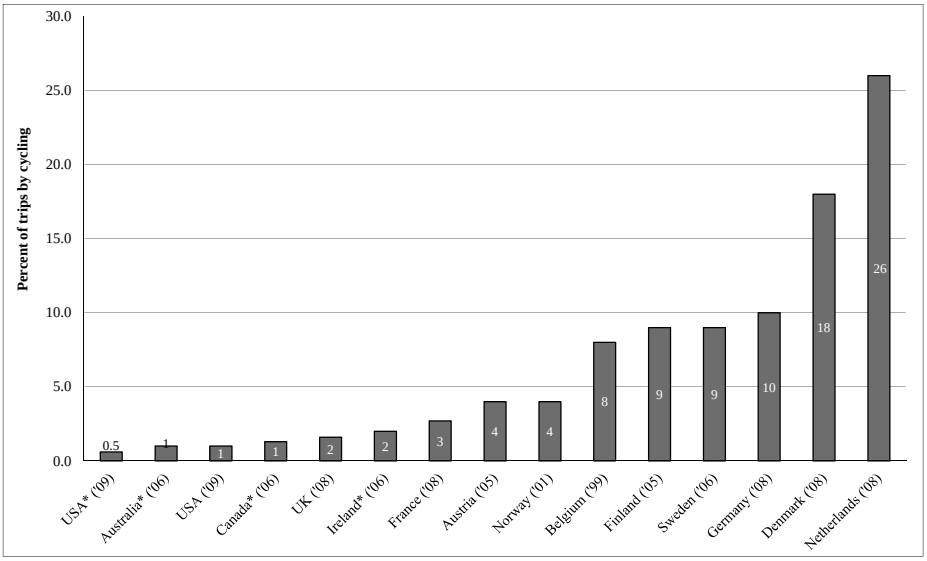


Pucher, J., Buehler, R., Bassett, D., Dannenberg, A. 2010. "Walking and Cycling to Health: Recent Evidence from City, State, and International Comparisons," American Journal of Public Health, Vol. 100, No. 10, pp. 1986-1992.

Obesity among US children has quadrupled as rates of walking and cycling to school have plummeted

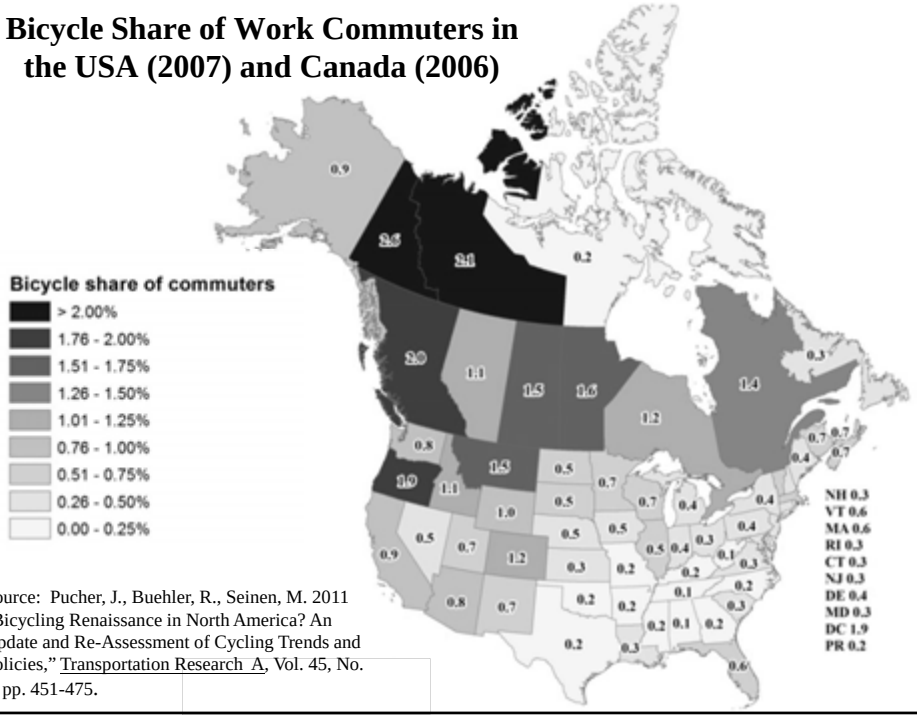


Cycling Share of Daily Trips in Europe, North America, and Australia, 1999-2008



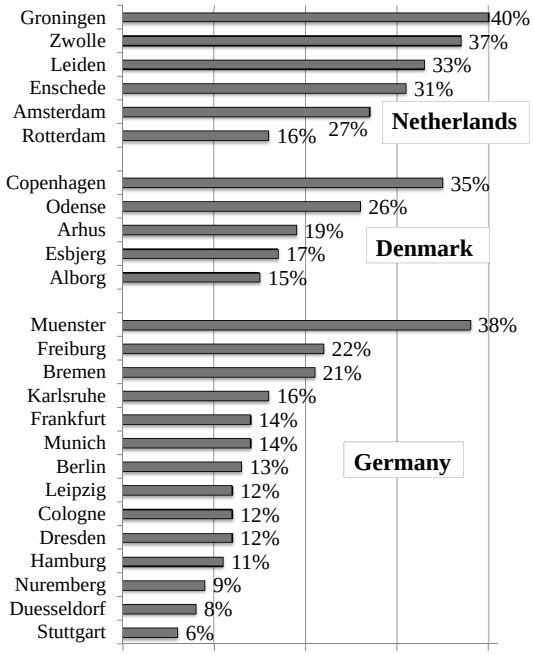
Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

Bicycle Share of Work Commuters in the USA (2007) and Canada (2006)



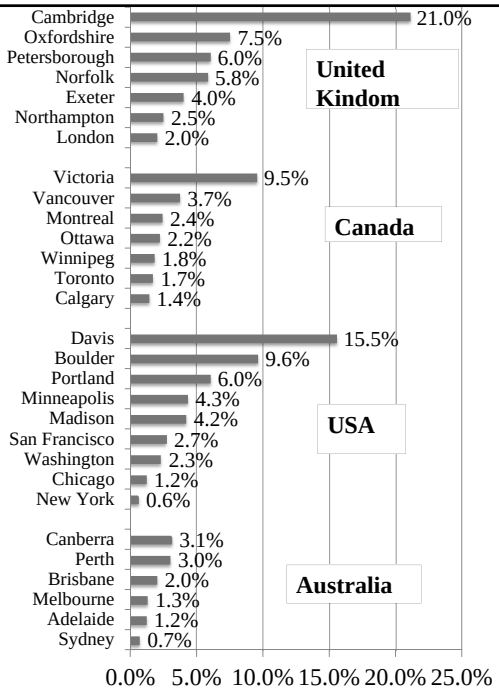
Source: Pucher, J., Buehler, R., Seinen, M. 2011 "Bicycling Renaissance in North America? An Update and Re-Assessment of Cycling Trends and Policies," Transportation Research A, Vol. 45, No. 6, pp. 451-475.

Bike Share of Trips in Selected Cities in the Netherlands, Denmark, and Germany (2000-2009)



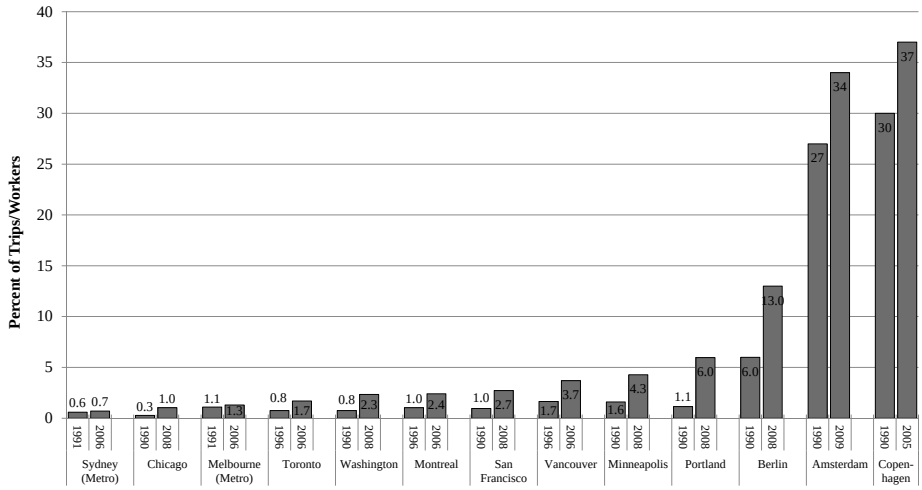
Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

Bike Share of Trips in Selected cities in UK, Canada, USA, and Australia (2000-2009)



Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

Trend in Bike Commuting in Large North American, Australian, and European Cities, 1990-2009



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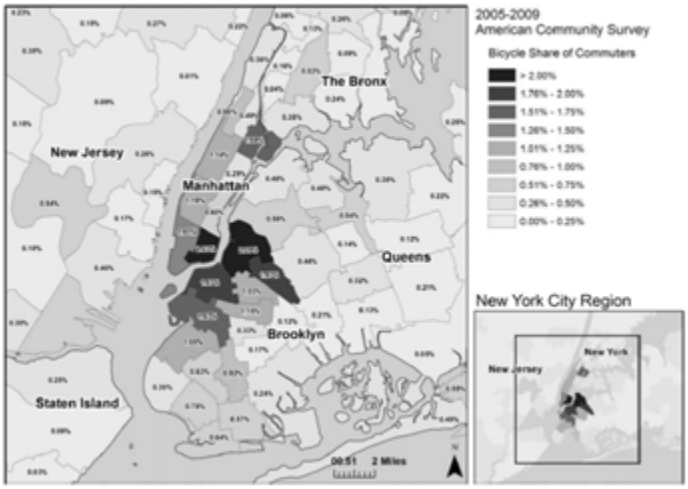
Spatial Variation in Bicycle Share of Work Commuters in New York City Area, 2005-2009



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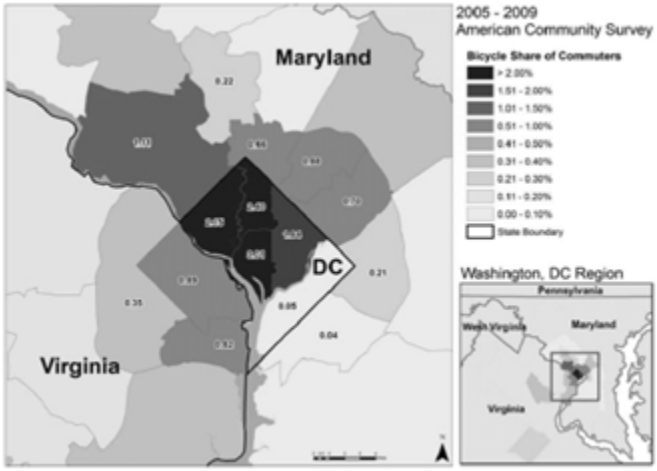
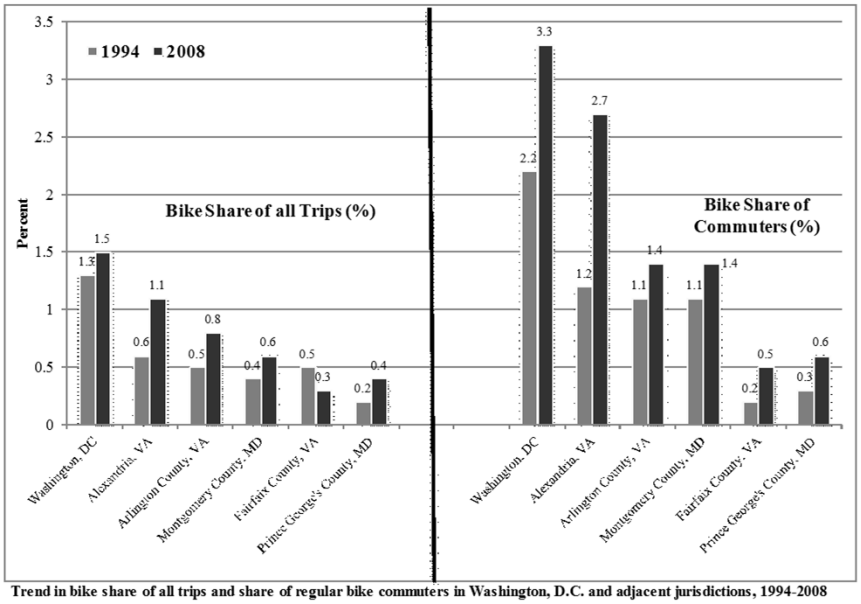
Spatial Variation in Bicycle Share of Work Commuters in Washington, D.C. Area, 2005-2009



Pucher, J., Buehler, R., Seinen, M. 2011 "Bicycling Renaissance in North America? An Update and Re-Assessment of Cycling Trends and Policies," Transportation Research A, Vol. 45, No. 6, pp. 451-475.

Trend in bike share of all trips and share of commute trips by bicycle in Washington, DC and adjacent jurisdictions, 1994-2008



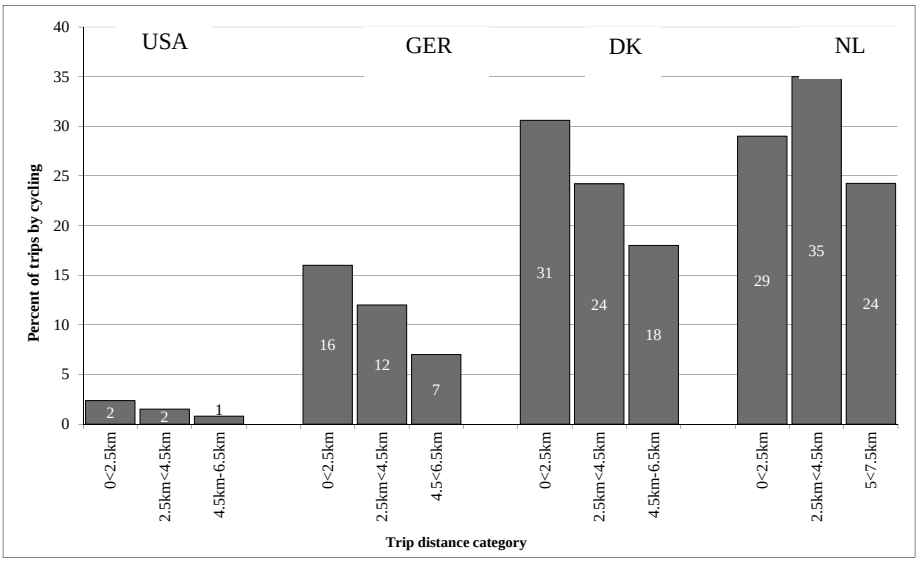
Trend in bike share of all trips and share of regular bike commuters in Washington, D.C. and adjacent jurisdictions, 1994-2008

Lots of Potential for Increased Cycling:

Many daily trips in American and Canadian urban areas are short enough to 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**

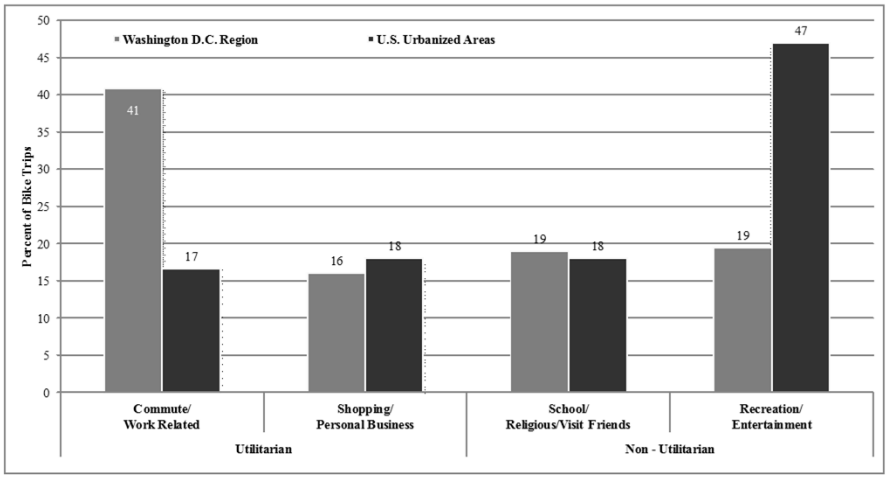
Share of Cycling for Short Trips



Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

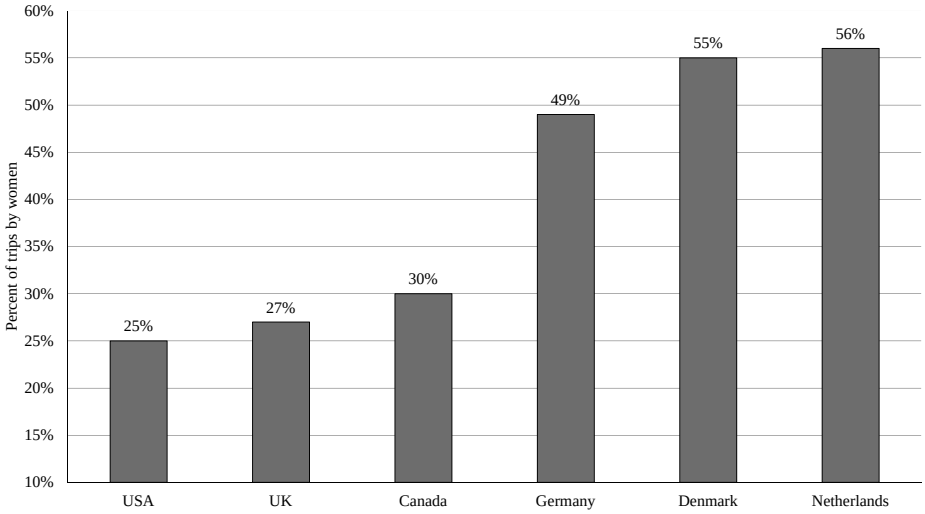
Europeans cycle for many trip purposes

Share of weekday bicycle trips by trip purpose in the Washington, D.C. region compared to U.S. national averages for urbanized areas, 2008/2009

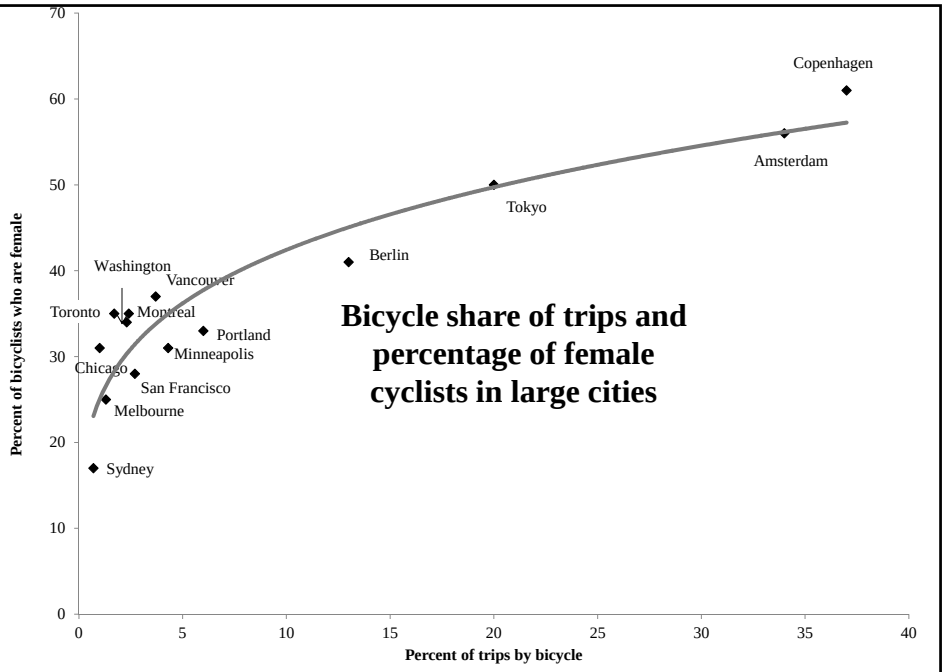


Share of bike trips by trip purpose in the Washington, D.C. region compared to U.S. national averages for urbanized areas, 2008/2009
Source: MWCOG Travel Survey 2008 and NHTS 2009

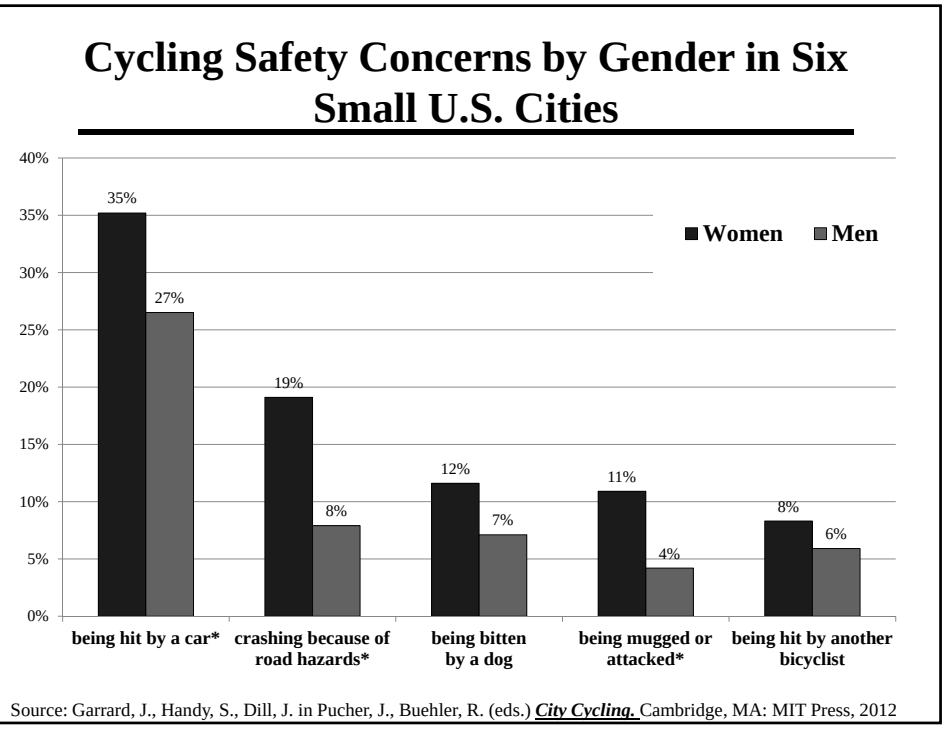
Women's Share of Bike Trips in Europe and North America



Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

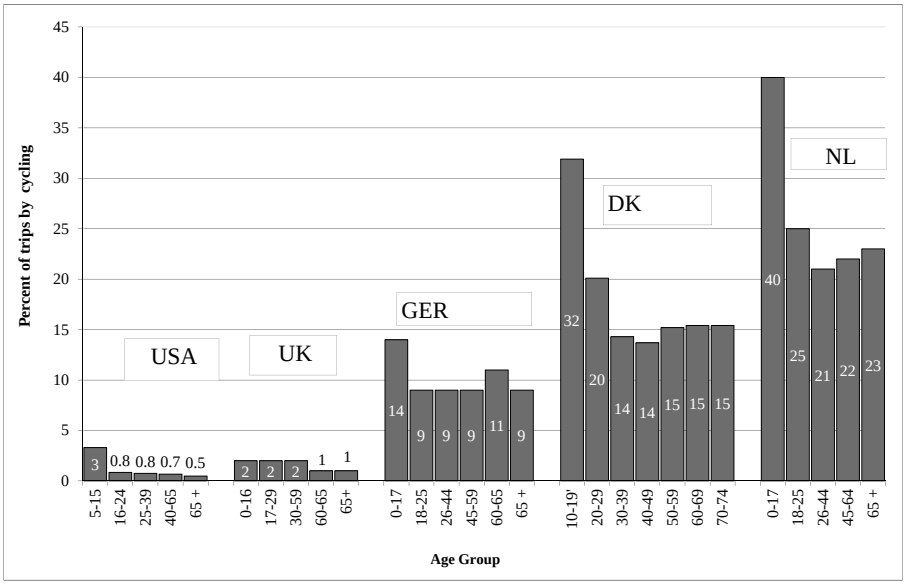


Source: Garard, Handy,and Dill, "Women and Cycling," in Pucher and Buehler (eds.), *City Cycling*. Cambridge, MA: MIT Press, 2012



Source: Garrard, J., Handy, S., Dill, J. in Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

Bike Share of Trips by Age Group



Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

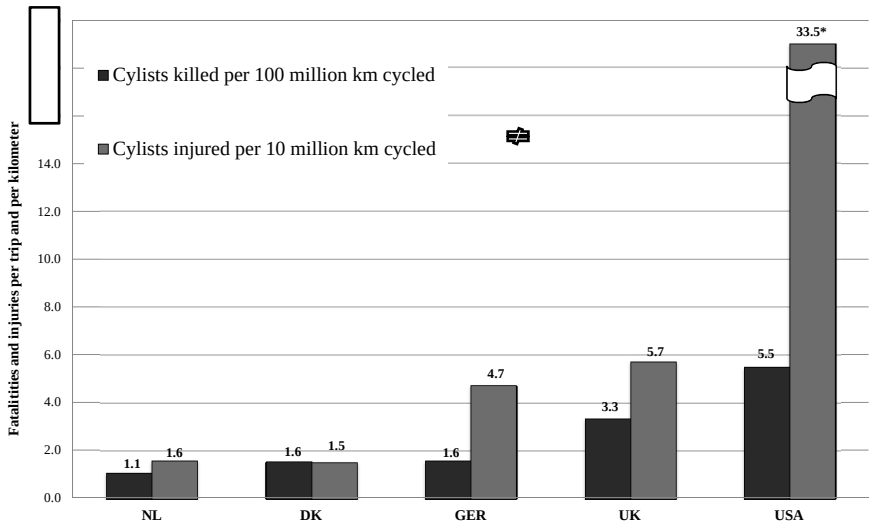

Cycling for all ages


Multi-generational cycling
in Amsterdam

Make Walking and Cycling Safe for Everyone !

- **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 walking and cycling in the Netherlands, Denmark, and Germany helps explain high levels of walking and cycling there**

Cyclist Fatality and Injury Rates, 2007-2010



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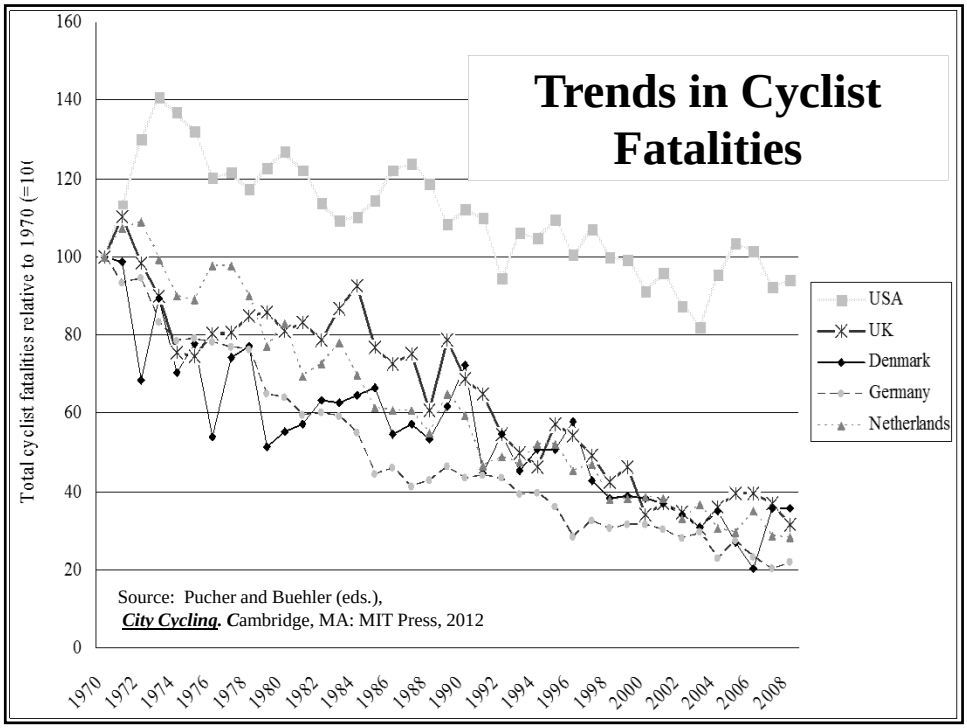
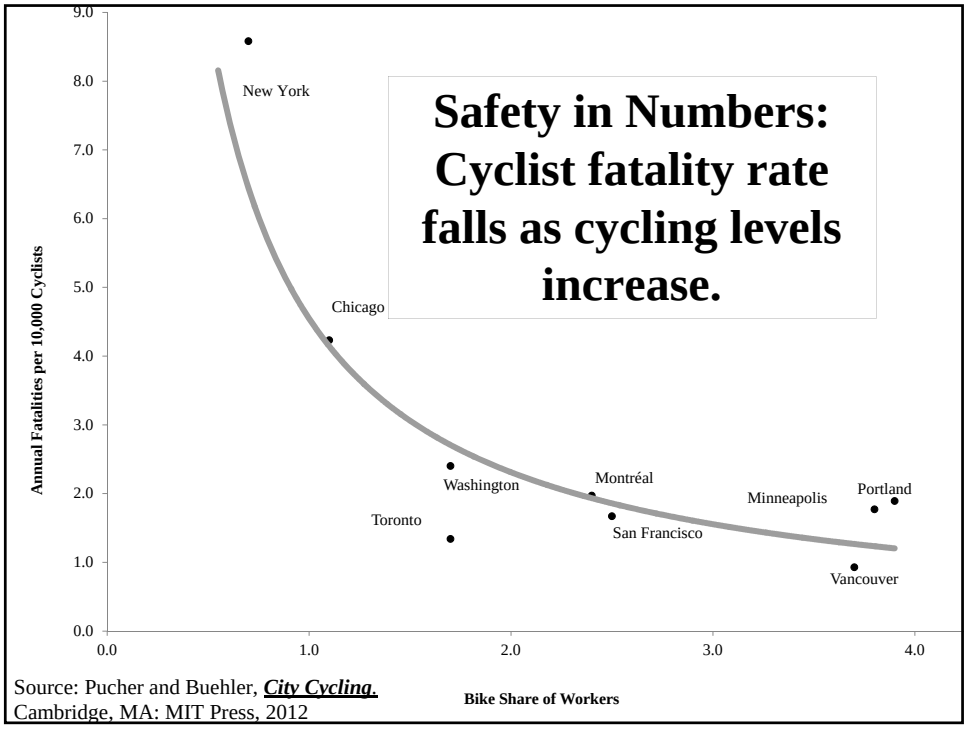
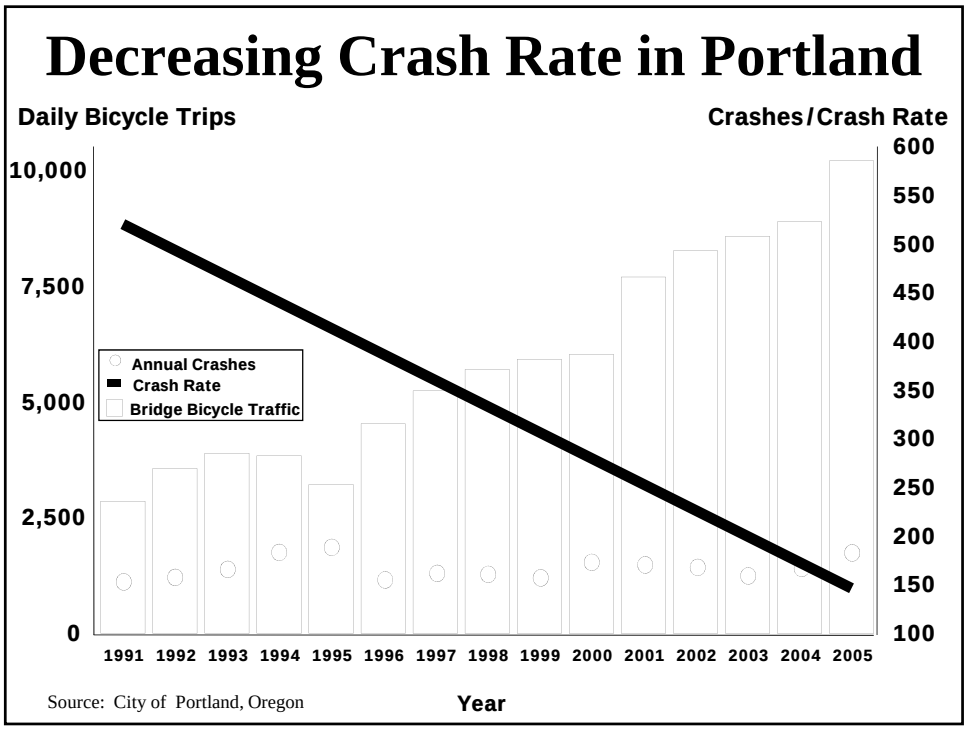


SAFETY IN NUMBERS

- *As levels of cycling increase, injury and fatality rates per trip and per km traveled fall dramatically*
- *Thus, if we can increase cycling, it will almost inevitably be safer*

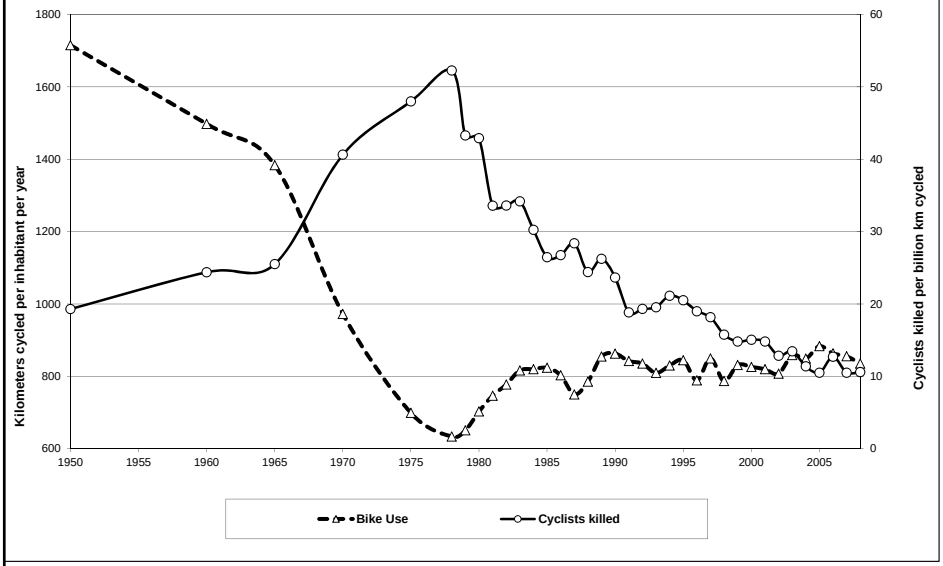


Source: Pucher and Buehler, ***City Cycling***. Cambridge, MA: MIT Press, 2012



Source: City of Portland, Oregon

Safety in Numbers Over Time



Pucher, J., Buehler, R. 2008. "Making Cycling Irresistible: Lessons from the Netherlands, Denmark, and Germany," Transport Reviews, Vol. 28, No. 4, 2008, pp. 495-528.

Public Policies *Crucial* to Walking and Cycling

- **Pro-car policies in European cities in 1950s and 1960s caused huge decline in walking and cycling**
- **Dramatic policy turn-around since 1970s to limit car use and promote cycling, walking, and public transport in Dutch, Danish, and German cities**

Bridge in Freiburg BEFORE and AFTER reforms

Typical residential street in Freiburg BEFORE traffic calming reforms

Typical residential street in Freiburg AFTER traffic calming reforms

Cathedral Square in Freiburg BEFORE transport and urban planning reforms

Cathedral Square in Freiburg AFTER transport and urban planning reforms

Lörrach, Turmstrasse 1953

Source: Archives, City of Lörrach

Source: Archives, City of Lörrach

Lörrach, Turmstrasse 1972

How to Encourage More Cycling and Walking while Improving Safety

- **Better cycling and walking facilities**
- **Integration of walk/bike 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**

National Level Policies

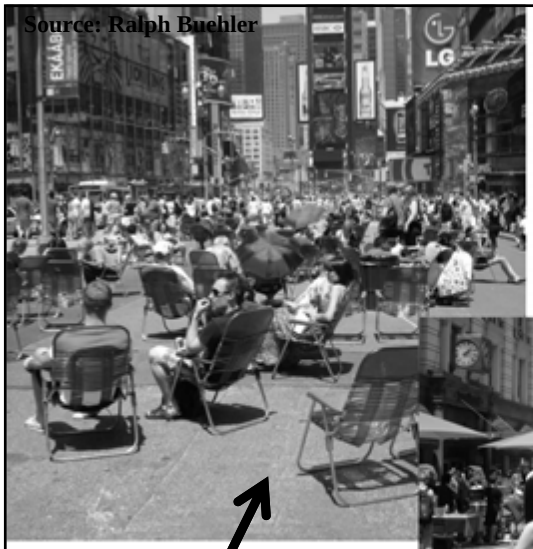
- Goals of increasing cycling levels and safety
- Improved data collection and benchmarking
- Bike infrastructure along federal/national roadways
- Cyclist and motorist training
- Traffic laws, signage, roadway and bikeway design guidelines
- Matching funds for approved state and local projects
- Funding for 'showcase' projects

→ **State and local governments ultimately responsible** for implementing specific cycling infrastructure and programs.

Most European cities have extensive car-free districts ideal for walking and cycling

Source: Ralph Buehler

Car-free Broadway in New York City

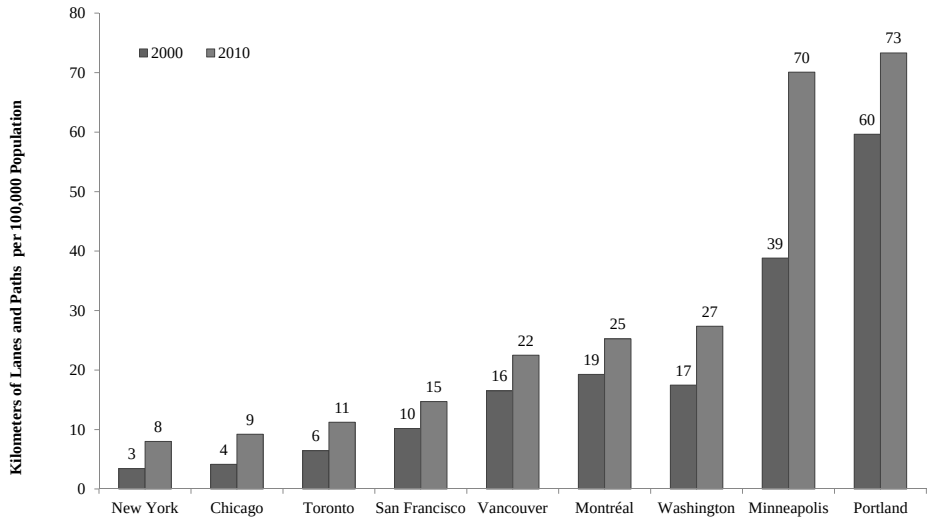


Times Square

Herald Square

Source: Ralph Buehler

Trend in Bike Paths and Lanes per 100,000 Population in Nine Large North American Cities, 2000-2010



Separate Bikeways in Germany

Sources: City of Freiburg & Pucher

Greenway in Minneapolis

Source: Buehler

Photo: Fertig

One-way cycle track in The Hague

Source: Peter Furth

Almost 100km of 2-way cycle tracks in Montreal

Photo: Peter Furth

Photo: Velo Quebec

Traffic-Protected Cycle Track on 9th Avenue, NYC

Photo: NYCDOT

Source: Buehler

Cycle Track on Pennsylvania Avenue in Washington, DC

Connects the White House with U.S. Capitol

Dutch bicycle facility selection matrix

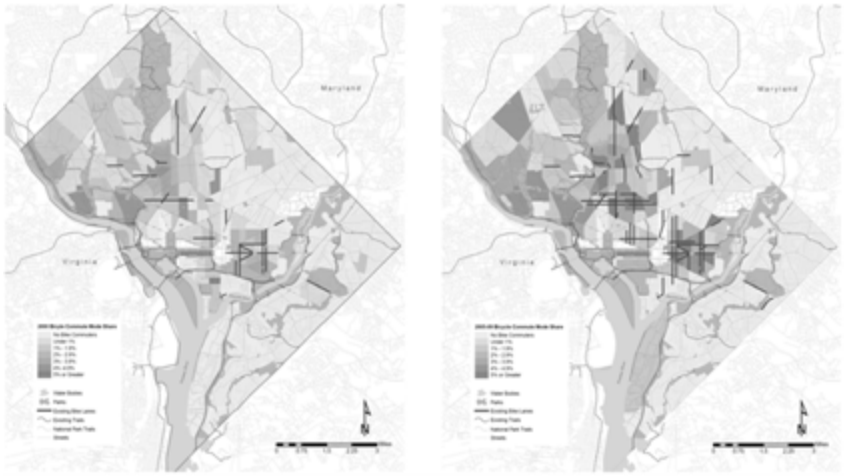
Lane Configuration	Average daily traffic (vehicles / day)	Street type and speed limit			
		Urban local street	*Urban through street*	*Rural local road*	*Fast traffic road*
		30 km/h (19 mph)	*50 km/h (31 mph)*	*60 km/h (37 mph)*	*70+ km/h (44+ mph)*
2-way traffic with no centerline	*≤ 2500*	mixed traffic[1]	bike lane[2] or cycletrack[3]	advisory bike lane[4]	cycle track or low-speed service road
	2000 to 3000			bike lane[2] or cycle track[5]	
	3000 to 5000				
	> 4000	bike lane or cycle track	bike lane or cycle track[3]		
2 lanes (1+1)	*any*	bike lane or cycle track	bike lane or cycle track[3]		
4 lanes (2 + 2) or more	*any*	(does not exist)	cycle track or low speed service road		

Source: Peter Furth, "Cycling Infrastructure," in Pucher and Buehler, eds. *City Cycling*, **MIT Press, 2012.**

Supply of bike lanes and paved off-street paths and trails, 2011

Jurisdiction	On-Street Lanes (miles)	Paved Off-Street Trails (miles)	On-Street Lanes and Off-Street Trails (miles)
Washington, DC	60	50	110
Arlington County	29	48	77
Alexandria City	13	13	26
Fairfax County	22	200	222
Montgomery County	17	146	163
Prince George's County	4	90	94

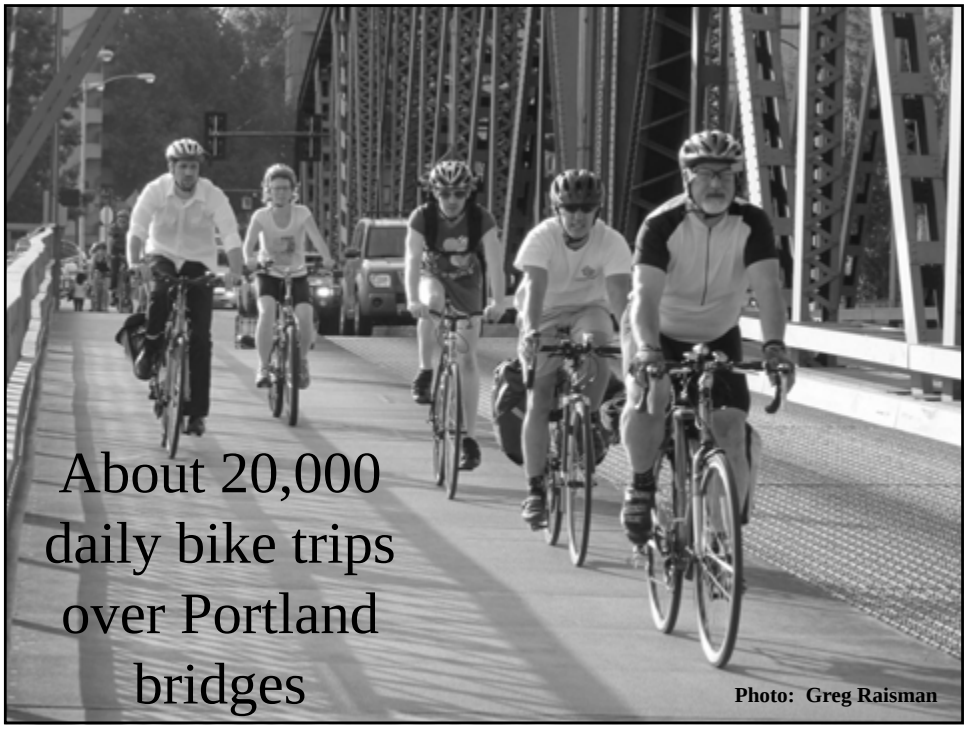
Supply of bike lanes and paths and cycling commute levels in Washington, DC, early 2000-2003 (left) and 2007-2009 (right).

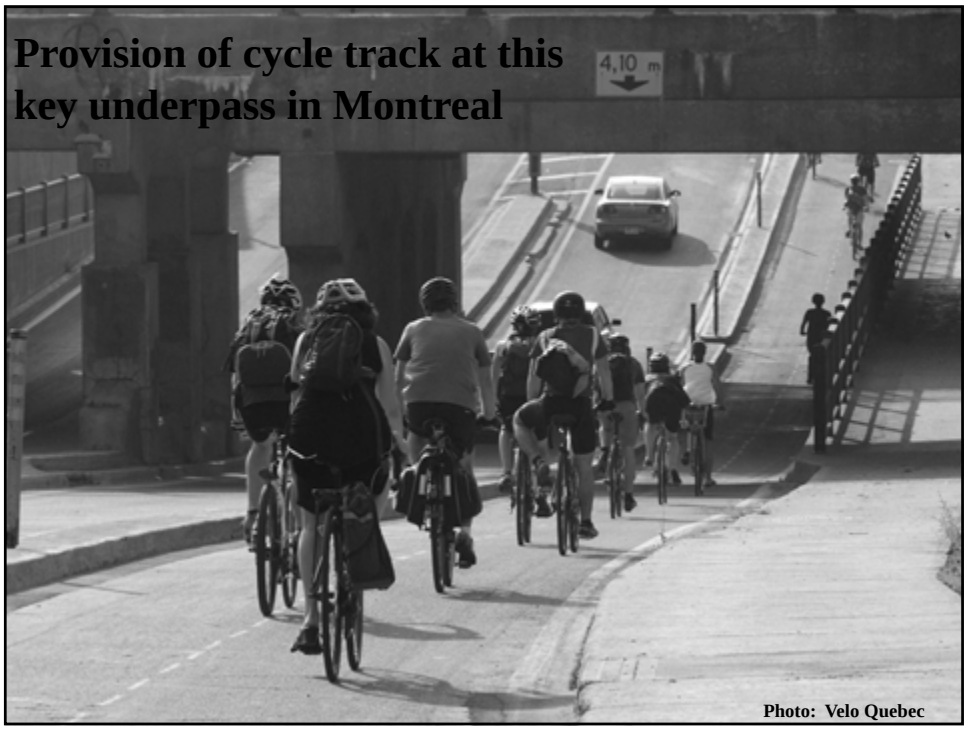


Crucial to provide river crossings for cyclists

Bike bridge over Yarra River in Melbourne, Australia

Bike bridge over Ems River in Muenster, Germany


About 20,000 daily bike trips over Portland bridges
Photo: Greg Raisman


Provision of cycle track at this key underpass in Montreal
4,10 m
Photo: Velo Quebec

Special traffic signals and signs give priority to cyclists

Intersection in Copenhagen, with Separate Crossings for Pedestrians and Cyclists

Four-way all-green signal for cyclists in Portland

Bike sensor in pavement

Red bike lanes for intersection crossings, connected with red brick sidepaths on both sides of every road

Source: City of Muenster, Germany

Bike lane, advance stop line, and priority signal for cyclists in Muenster

Pucher: Walking and Cycling for Health

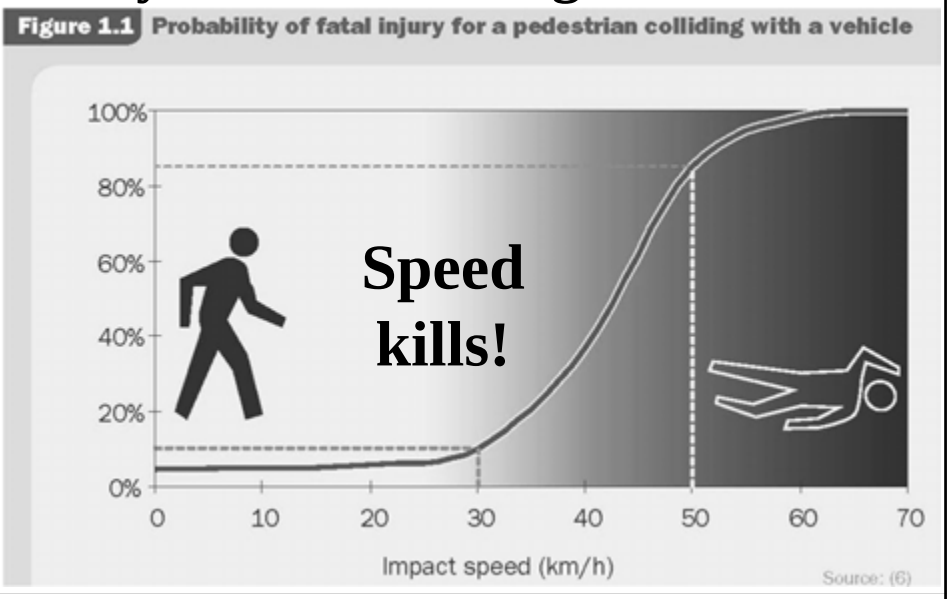
Advanced stop line for cyclists in Berlin

Advanced stop line *and* bike box in Portland

Traffic Calming of Residential Neighborhoods

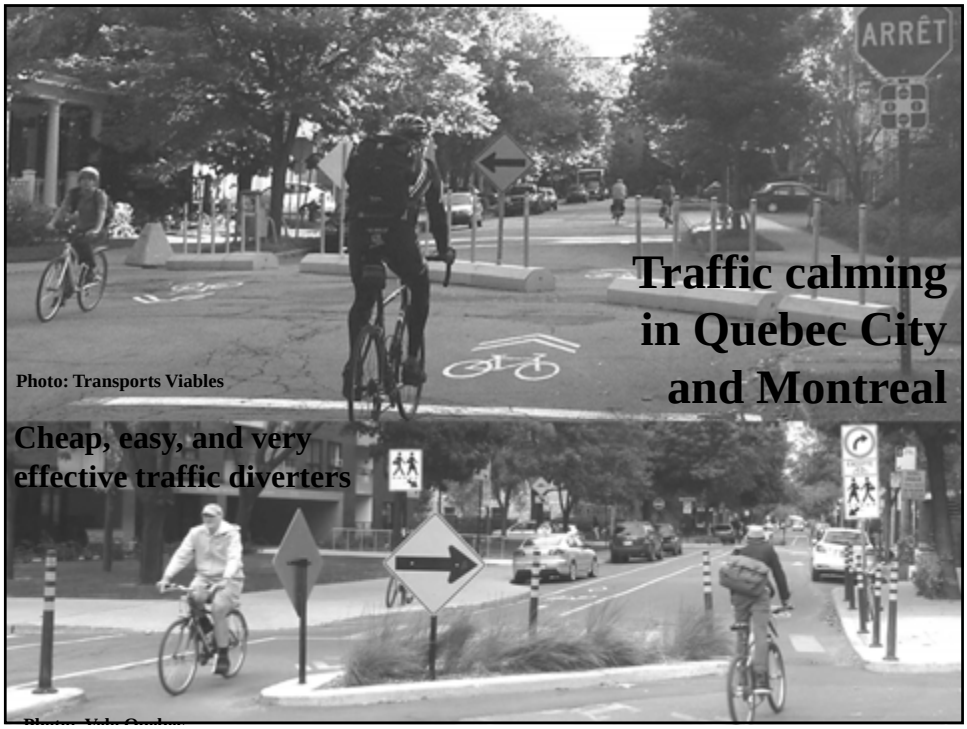
- **Speed limited *by law* to 30km per hour (19mph) or less**
- ***Physical measures* that force cars to slow down**:
  - Road narrowing, zigzag routing, chicanes
  - Raised intersections and crosswalks
  - Traffic circles
  - Speed humps and bumps
  - Mid-block closures and artificial dead-ends
  - Bulb-outs at intersections and crosswalks, with sidewalk widening

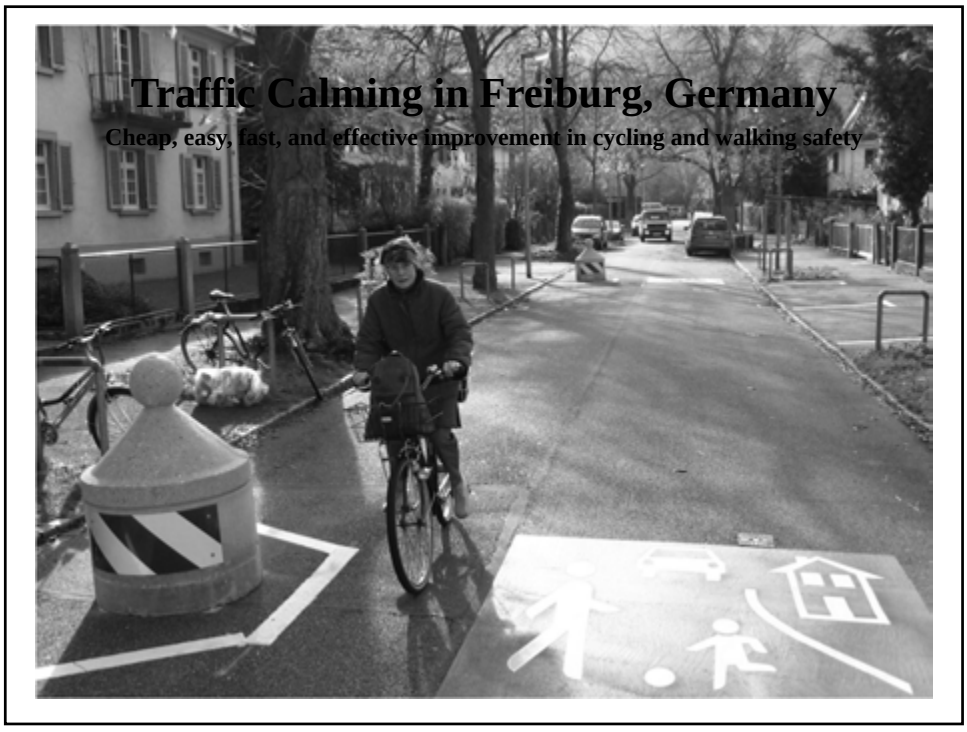
Why Traffic Calming Saves Lives



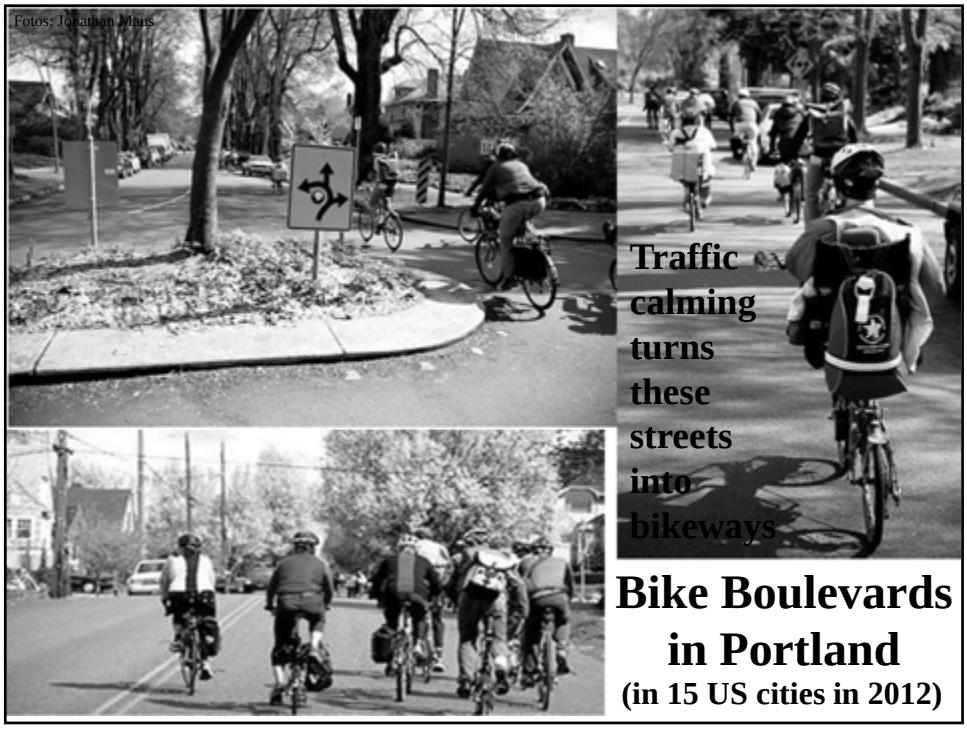
Source: World Health Organization (2008) and OECD Transport Research Centre (2006)

Convenient bike cut-thru for cyclists

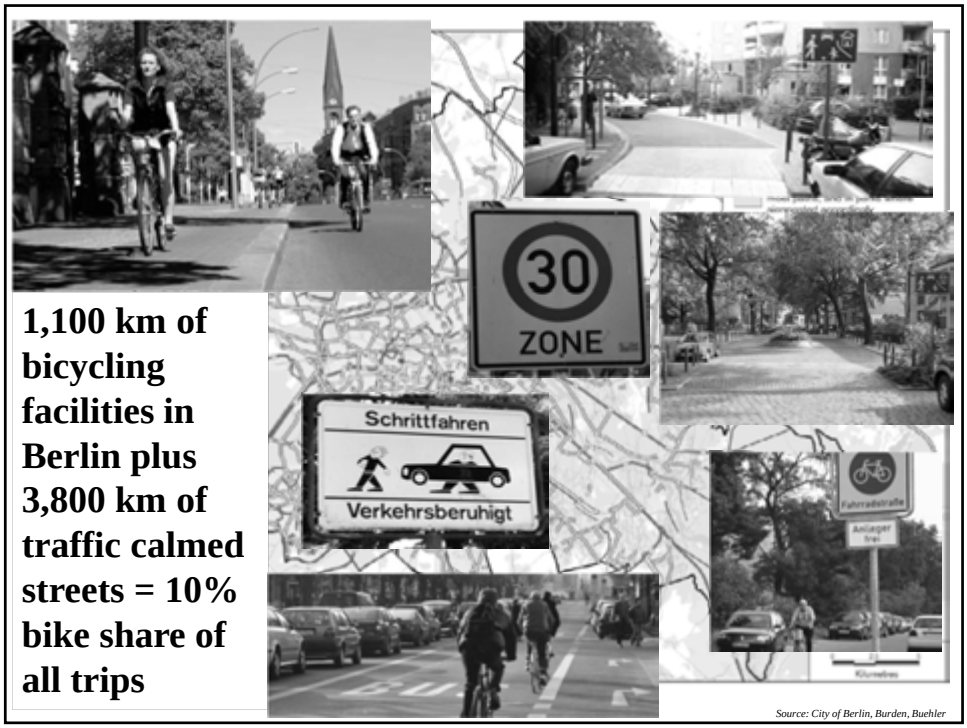

ARRÊT
Traffic calming in Quebec City and Montreal
Photo: Transports Viables
Cheap, easy, and very effective traffic diverters


Traffic Calming in Freiburg, Germany
Cheap, easy, fast, and effective improvement in cycling and walking safety

Fotos: Jonathan Maus



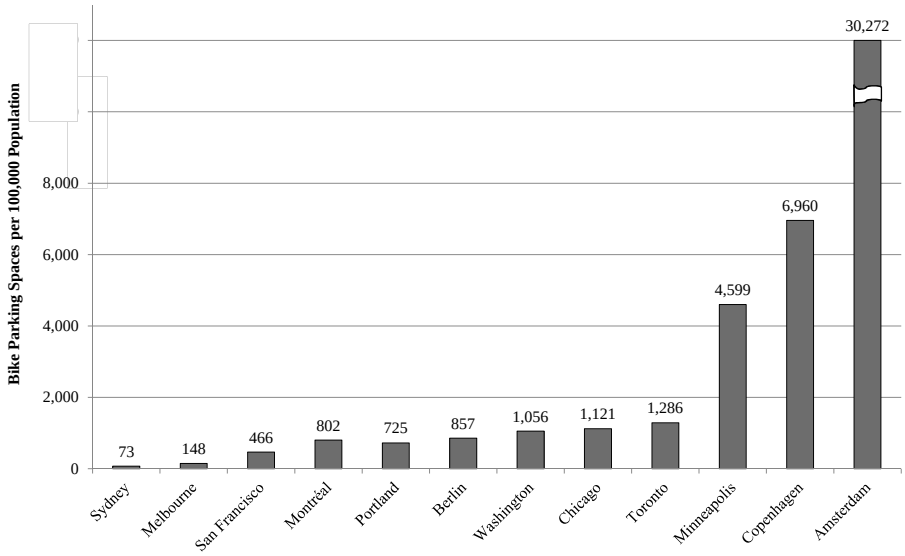
Bike Boulevards in Portland
(in 15 US cities in 2012)



1,100 km of bicycling facilities in Berlin plus 3,800 km of traffic calmed streets = 10% bike share of all trips

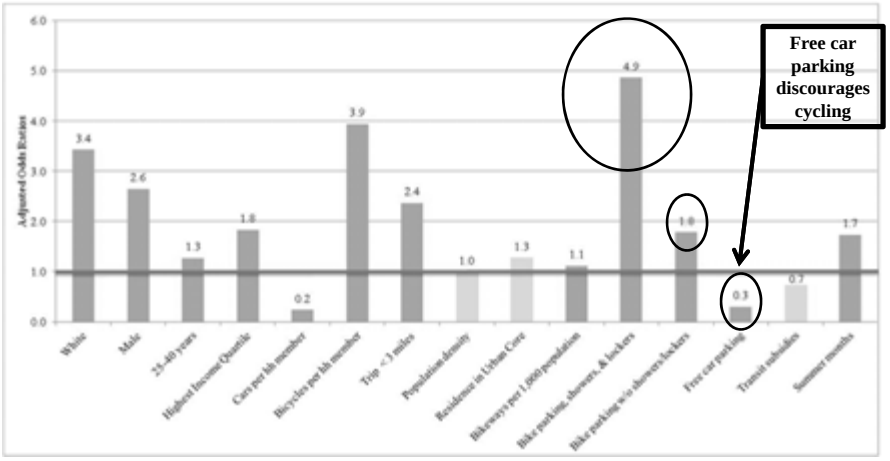
Source: City of Berlin, Burden, Buehler

Bike Parking Spaces per 100,000 Residents, 2008



Source: Pucher, J., Buehler, R. (eds.) ***City Cycling.*** Cambridge, MA: MIT Press, 2012

Bike Parking and Showers At Work Increase Likelihood to Commute by Bike



Note: Relative to 1. Above 1=more likely. Below 1=less likely.

Buehler, R. 2012. "Determinants of Bicycle Commuting in the Washington, D.C. Region: The Role of Bicycle Parking, Cyclist Showers, and Free Car Parking at Work," Transportation Research Part D: Transportation and Environment Vol. 17, No. 7, pp. 525-531.

Over 50,000 buses in the USA now come equipped with bike racks

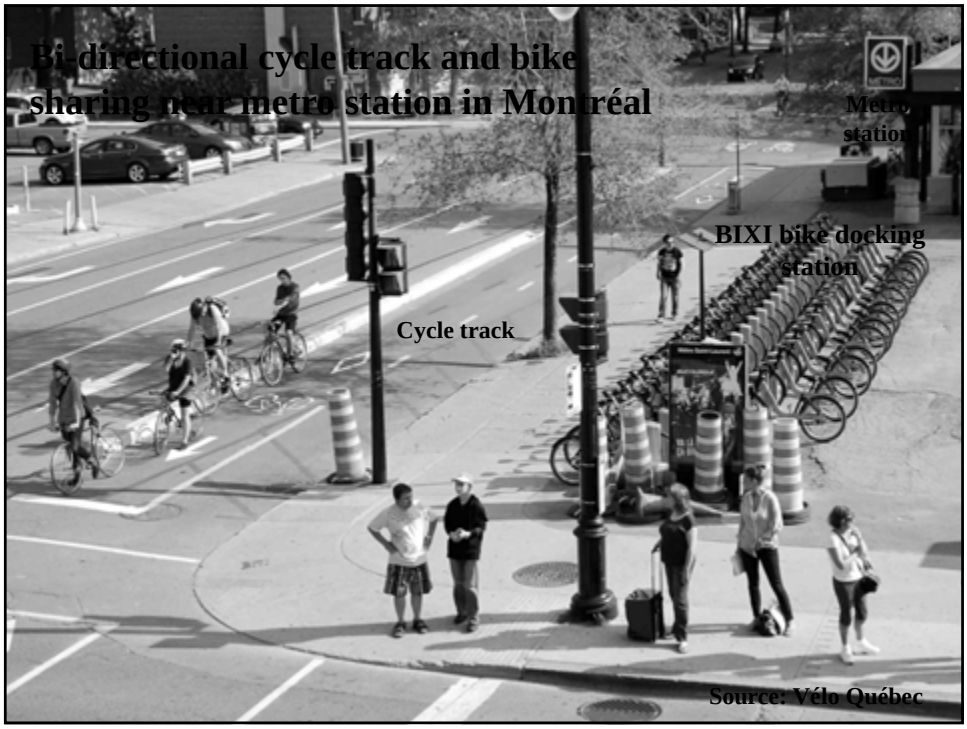
Bike on LRT in NJ and Minneapolis

Photo: John Boyle

Photo: Metro Transit

Bikes on Caltrain in San Francisco

Photo: San Francisco Bicycling Coalition


Bi-directional cycle track and bike sharing near metro station in Montréal
Metro station
BIXI bike docking station
Cycle track
Source: Vélo Québec


Capacity: 3,500 bikes
Bike Station next to main train station in Muenster, Germany
Photo: Peter Berkeley

Bike Wash at Muenster Bike Station

Bike Station next to Union Station in Washington, D.C.

Photo: Ralph Buehler

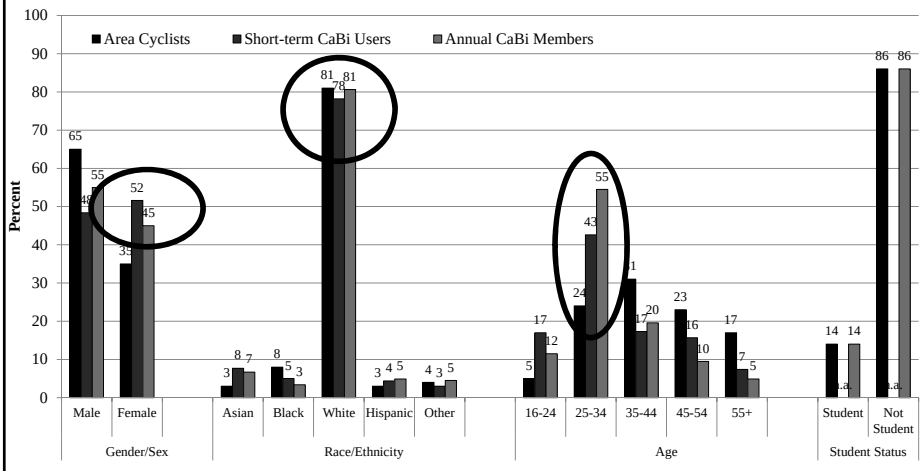
Nice Ride in Minneapolis

Hubway Bikeshare in Cambridge, Boston, Somerville, and Brookline

Over 20 bike sharing systems in North America

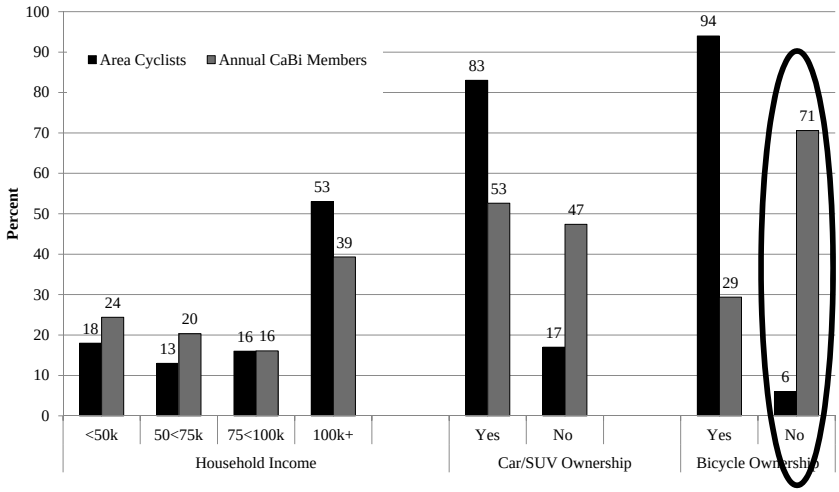
Capital Bikeshare in Washington, DC

Who are the 'bike-sharers'? Example Washington DC (1)



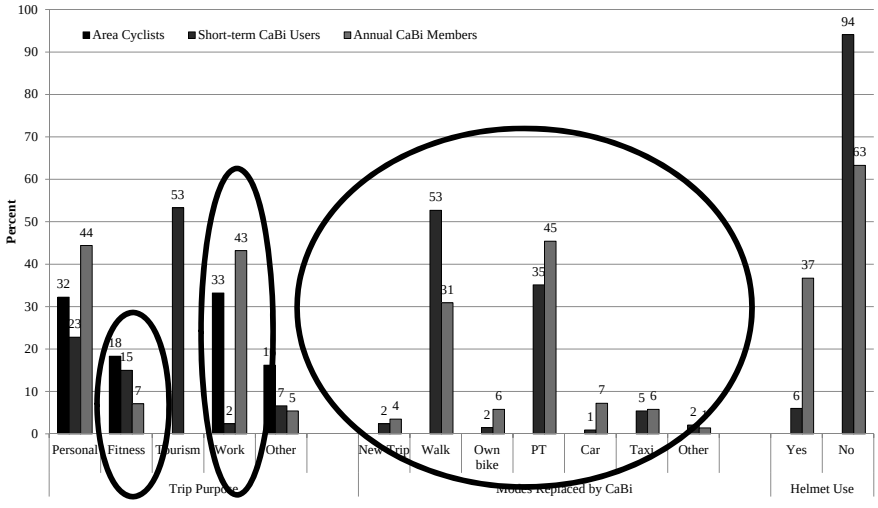
Source: Buehler et al. 2012. Are Bikeshare Users Different from Regular Cyclists? A First Look at Short-Term Users, Annual Members, and Area Cyclists in the Washington, DC Region

Who are the ‘bike sharers’? Example Washington DC (2)



Source: Buehler et al. 2012. Are Bikeshare Users Different from Regular Cyclists? A First Look at Short-Term Users, Annual Members, and Area Cyclists in the Washington, DC Region

Bike Sharing Trips in Washington DC



Source: Buehler et al. 2012. Are Bikeshare Users Different from Regular Cyclists? A First Look at Short-Term Users, Annual Members, and Area Cyclists in the Washington, DC Region

Traffic Education

- **Improved motorist training, with *much* more emphasis on how to avoid endangering pedestrians and cyclists**
- **Compulsory traffic safety lessons for all school children by the age of 10, with testing by traffic police on actual traffic test courses, to ensure safe and defensive walking and cycling by an early age (as in the Netherlands and Germany)**

German traffic laws generally favor cyclists and pedestrians over motorists

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 path leads directly to school in NL

Source: NJ Bike Walk Coalition

Bike Training for Children in New Jersey

Cycling training course for adults

Summer Streets in New York City attracts 200,000 participants on Saturdays in August

Source: Troels Andersen

Guided Bicycle Tours for Seniors

CONCLUSIONS

- ***Cycling is one of the most sustainable means of getting around our cities***
- ***Broad range of environmental, social, economic, and health benefits***
- ***Many ways to increase cycling while making it safer***
- ***Lots of daily trips in American cities are short enough to cover by cycling***
- ***Many cities in Europe and some in North America show what is possible and offer superb examples to follow***

New book with MIT Press

http://citycyclingbook.wordpress.com

About the authors:

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

http://ralphbu.wordpress.com

Measures to Increase Cycling

1. Provide a comprehensive package of integrated measures
2. Build a network of integrated bikeways with intersections that facilitate cycling
3. Provide good bike parking at key destinations and public transport stations
4. Implement bike sharing programs
5. Provide convenient information and promotional events
6. Introduce individualized marketing to target specific groups
7. Improve cyclist education and expand bike to school programs
8. Improve motorist training, licensing, and traffic enforcement
9. Restrict car use through traffic calming, car-free zones, and less parking
10. Design communities to be compact, mixed-use, and bikeable

Implementation Strategies

1. Publicize both individual and societal benefits
2. Ensure citizen participation at all stages of planning and implementation
3. Develop long-range bike plans and regularly update them
4. Implement controversial policies in stages
5. Combine incentives for cycling and disincentives for car use
6. Build alliances with politicians, cycling organizations, and other bike friendly groups
7. Coordinate bike advocacy and planning through national organizations