



**OTREC**  
OREGON TRANSPORTATION RESEARCH  
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## CLEARING A PATH FOR BICYCLING INVESTMENTS

*Research gives policymakers the tools to invest in facilities that do the most to meet active transportation goals.*

### The Issue

When planners and policymakers look to make new investments in the transportation system, they turn to travel demand models to see what the effects of those investments will be. Because of the wealth of research backing them up, these models do well at predicting how automobile drivers will respond to a new freeway or arterial lane. Those same models, however, have either ignored bicycle trips altogether or treated them simplistically—assuming cyclists always take the shortest route, for example. A policymaker seeking to increase active trips, then, has little idea which investment would accomplish that goal, putting bicycle projects at a disadvantage.

### The Research

This study recorded and modeled cyclists' actual routes to determine which routes they prefer and why. Cyclists are willing to detour from the shortest route for a variety of bicycle facilities, intersection characteristics and other factors. Separated bike paths are most attractive, followed by bike boulevards, the low-traffic neighborhood streets tailored for cycling. Cyclists will go 26 percent out of their way to use a separated path and 18 percent to use a bike boulevard. They will avoid turning left at a busy intersection without a traffic light, voluntarily detouring 16 percent of their trip distance. And routes with many jogs or turns are less attractive, with each additional turn equal to adding 7 percent of the trip distance.

Researcher Jennifer Dill equipped 164 bicyclists in the Portland, Ore., area with global positioning system, or GPS, units that recorded their trip route, in the first large-scale study using GPS to record the actual routes cyclists chose. The data gathering was supported by a grant from the Robert Wood Johnson Foundation through its national program Active Living Research. Data collected were used to create maps of each trip, which participants then viewed and answered questions about the trip, including route choice preferences. About 30 percent of trips were between home and work, with the average commute

### THE ISSUE

When policymakers look to boost cycling by building new bicycle routes, they have little research to determine whether cyclists will actually use them. This keeps cycling facilities at a disadvantage compared to motor vehicle infrastructure.

### THE RESEARCH

Researchers tracked cyclists with GPS units and modeled their route choices, determining the attractiveness of paths, bike boulevards and the effect of intersection design, turns and slope. Among the findings:

- Cyclists will go **26 percent** out of their way to use a separated path, **18 percent** to use a bike boulevard;
- Cyclists will detour **16 percent** of their trip to avoid a left turn at a busy intersection with no traffic light;
- Each additional turn is equal to adding **7 percent** of the trip distance.

### THE IMPLICATIONS

The research has been incorporated into the regional travel demand model that helps inform regional and local transportation investments.

*Photo: A low-traffic neighborhood street in Portland, Ore.*

distance 3.7 miles. Noncommute trips averaged 2.2 miles. Dill joined with researchers Joseph Broach and John Gliebe to model cyclists' route choices, revealing their priorities for facilities.

The research shows that even confident cyclists prefer routes that reduce their exposure to motor vehicles. Separated paths and bike boulevards were most attractive, but striped bike lanes were only preferred when low-traffic neighborhood streets were not an option. This study, the first to explore bike boulevards with revealed preference route choice data, found that bike boulevards have a high and inherent value to cyclists. This value persists even beyond their measurable characteristics such as low traffic, improved street crossings and fewer stop signs. In addition, the study found that intersection design, the number of turns and jogs, and the slope of the route are as important as the bicycle facility itself. Cyclists will go significant distances to avoid steep hills, in particular, but also to avoid frequent turns and to seek out traffic lights to help cross busy streets.

### Implications

Metro, the Portland area's metropolitan planning organization, partnered with OTREC on the research and has incorporated the findings into its regional travel demand model. Now, when local governments want to study the impact of a bike trail along a suburban light-rail line, to use one recent example, or to compare a host of improvements to a state highway corridor, to use another, they can run the model to find the most effective way to meet their goals.

Metro has fielded calls on the bicycle modeling application from its counterpart planning organizations in Denver, Seattle, San Diego and elsewhere. The Lane Council of Governments in Eugene, Ore., adopted the research into its own travel demand model. In addition, the open nature of the research allows for endless new applications. Transit agency TriMet has woven

Cyclists will detour from their noncommute trip ...	to use or avoid:
7.4 percent ...	to avoid additional turns
72.3 percent ...	to avoid uphill slope of 2 to 4 percent
10.4 percent ...	to avoid unsignalized crossing with cross traffic 10,000 to 20,000 vehicles per day
16.2 percent ...	to avoid unsignalized left turns, parallel traffic 10,000 to 20,000 vehicles per day
17.9 percent ...	to use a bike boulevard
26.0 percent ...	to use an off-street bike path

**Figure 1**

The results of this study show that details like street crossing treatments, route "jogs" requiring extra turns and route planning to avoid slopes are as important as the facility itself. This highlights the importance of building bike boulevards, paths and lanes as part of comprehensive designs that consider all aspects of the route.

### PROJECT INFORMATION

**TITLE:** Evaluation of Bike Boxes at Signalized Intersections; and Improving Regional Travel Demand Models for Bicycling

**INVESTIGATORS:** Jennifer Dill, John Gliebe, Joseph Broach, Portland State University

**PARTNERS:** Robert Wood Johnson Foundation's national Active Living Research program; Metro

**SOURCE:** Broach, J., et al. Where do cyclists ride? A route choice model with revealed preference GPS data. Transport. Res. Part A (2012). [bit.ly/QThkJP](http://bit.ly/QThkJP)

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**MORE INFORMATION**  
<http://otrec.us/project/33> and  
<http://otrec.us/project/249>

the research values into its multimodal Map Trip Planner software. Users receive customized directions based on the value they place on quick, flat or bike-friendly routes. The open-source Open-TripPlanner uses these same values and has been adopted in 10 countries and five North American cities since its Portland launch.