How far out of the way will we travel?
Built environment influences on route selection for bicycle and car travel

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Background
Current travel demand models are calibrated for motorized transportation, and perform less well for non-motorized modes. Little evidence exists on how much, and for what reasons, the routes people actually travel deviate from shortest-path or least-cost routes generated by transportation models. The purpose of this study was to identify factors to be considered in travel models when modeling travel by bicycle, making comparisons to motorist travel. We investigated differences in total distance, road type used, and built environment features along the shortest distance routes and the actual routes for car and bicycle trips in an urban area with extensive bicycle facilities, the Metro Vancouver region. The study captures travel behaviors in a population-based sample of cyclists, including potential, infrequent, and regular cyclists, a population purposefully selected based on Stages of Change Theory from health promotion.

Metro Vancouver
Setting
The Metro Vancouver region in southwestern British Columbia, Canada comprises 21 municipalities and a population of 2.6 million. The median work commute distance is 7.4 km, suggesting that cycling is a viable mode for daily travel in the region. The region has a mild climate, facilitating cycling year round. Despite this, cycling mode share for work trips is only 3.7% within the city itself, and 1.7% for the entire census metropolitan area. Bicycle facilities
The region has over 1300 km of “designated” bike routes, about 170 km of which are off-road.

Methods
• Interviews with a random sample of participants from the Cycling in Cities survey
• Collected trip data on 117 trips from 74 individuals: 8% cycled ≥ 1 week, 43% ≥ 1/month, 35% ≥ 1/year, and 14% had not cycled in the past year
• Compared shortest distance and actual travel route, using GIS tools to calculate:
  - Total trip distance
  - Distance traveled along road type classifications
  - Built environment measures in a 250 m buffer around route.

How far out of the way do people go?

<table>
<thead>
<tr>
<th>Route Type</th>
<th>Shortest Route (n=67)</th>
<th>Actual Route (n=67)</th>
<th>Mean Detour</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car Trips</td>
<td>6.9 km</td>
<td>7.4 km</td>
<td>0.5 km</td>
<td>0.29-0.79</td>
</tr>
<tr>
<td>Bike Trips</td>
<td>4.9 km</td>
<td>5.3 km</td>
<td>0.4 km</td>
<td>0.14-0.58</td>
</tr>
</tbody>
</table>

Regardless of mode, people do not detour far off the shortest distance route. Detour ratios (actual distance/shortest distance) were similar between modes:
- % of trips within 10% of the shortest path route distance
- at least 90% within 25% of the shortest path route distance.

Policy Implications
Road infrastructure and bicycle-specific aspects of the built environment do influence travel patterns in mode-specific ways:
• Cyclists deviate from shortest routes to routes with better bicycle facilities (traffic calming features, bike stencils, and signage) and to local roads, off-street paths, and designated bike routes.
• Car drivers detour from shortest routes to highways and arterials.

Cyclists are a heterogeneous population and not all will make the same route choices. However, this study included regular and infrequent cyclists, work and non-work trips, and its findings clearly indicate the importance of bike facilities. These factors should be considered in transportation models to more accurately reflect bicycle travel.

Furthermore, this research provides guidance about how dense a bike network needs to be to attract more people to cycling for daily travel: cyclists are unlikely to detour more than ~0.4 km to find good facilities.

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