Implementing Low-Stress Bicycle Routing in Accessibility Evaluation

Brendan Murphy
CTS Research Conference
11/1/18

Background

• How to measure bicycle access to destinations?
• Not all roads/routes equal for bikes
• Need systematic classification system for how bikeable roads are – nationally
Accessibility and Bike LTS

• Determine scalable LTS framework using OSM data
• Apply LTS in national bicycle accessibility calculations
• Develop & present metrics assessing quality of bike access
• Compare bicycle access and network quality across the country

Methodology

• OpenStreetMap
• Tag roads nationally as LTS 1, 2, 3, and 4
• Tag intersections based on the LTS value of connecting roads
• Calculate accessibility per LTS level
• Compare networks & accessibility data per level, for 50 largest cities
LTS Classifications

• LTS 1: residential streets, off-street / protected bicycle facilities
• LTS 2: tertiary roads, slower streets with some mixed traffic, good bike lanes
• LTS 3: faster streets, secondary roads, maybe some bike lanes
• LTS 4: primary roads, arterials, no bike facilities

LTS 1 (lowest stress)
LTS 2 (low stress)

https://www.minnpost.com/sites/default/files/imagecache/article_detail/park-ave-bike-lane_main.jpg

LTS 3 (high stress)
LTS 4 (highest stress)

LTS 1 Network - Minneapolis
LTS 2 Network - Minneapolis

LTS 3 Network - Minneapolis
LTS 4 Network - Minneapolis

LTS 1 Accessibility - Minneapolis
LTS 4 Accessibility - Minneapolis

Bike network – Washington, D.C.
Metrics – LTS 3 vs. 2

• “People willing to bike in mixed traffic can reach 10,000 (or 25%) more jobs than people who prefer separated facilities.”
• Access gap – underserved communities stand to gain with low-stress networks
• Identify areas that benefit from low-stress investments
## Metrics – Minneapolis Neighborhoods

<table>
<thead>
<tr>
<th>Location</th>
<th>LTS 2</th>
<th>LTS 3</th>
<th>LTS 2 vs. 3</th>
<th>LTS 2 vs. 3 pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBSA</td>
<td>14,529</td>
<td>28,362</td>
<td>-13,833</td>
<td>-49%</td>
</tr>
<tr>
<td>City of Minneapolis</td>
<td>75,368</td>
<td>120,020</td>
<td>-44,652</td>
<td>-37%</td>
</tr>
<tr>
<td>City of St. Paul</td>
<td>38,497</td>
<td>66,260</td>
<td>-27,763</td>
<td>-42%</td>
</tr>
<tr>
<td>Bryn – Mawr (W)</td>
<td>26,404</td>
<td>143,225</td>
<td>-116,821</td>
<td>-82%</td>
</tr>
<tr>
<td>Lind – Bohanon (N)</td>
<td>2,390</td>
<td>11,833</td>
<td>-9,443</td>
<td>-80%</td>
</tr>
<tr>
<td>Northeast Park (NE)</td>
<td>35,534</td>
<td>173,989</td>
<td>-138,455</td>
<td>-80%</td>
</tr>
<tr>
<td>Harrison (W)</td>
<td>49,842</td>
<td>201,889</td>
<td>-152,047</td>
<td>-75%</td>
</tr>
<tr>
<td>Windom Park (NE)</td>
<td>26,074</td>
<td>102,896</td>
<td>-76,822</td>
<td>-75%</td>
</tr>
<tr>
<td>Columbia Park (NE)</td>
<td>7,711</td>
<td>28,951</td>
<td>-21,240</td>
<td>-73%</td>
</tr>
<tr>
<td>Holland (NE)</td>
<td>40,016</td>
<td>148,971</td>
<td>-108,955</td>
<td>-73%</td>
</tr>
<tr>
<td>Shingle Creek (N)</td>
<td>3,207</td>
<td>11,243</td>
<td>-8,036</td>
<td>-71%</td>
</tr>
<tr>
<td>Page (S)</td>
<td>8,150</td>
<td>28,025</td>
<td>-19,875</td>
<td>-71%</td>
</tr>
<tr>
<td>Bottineau (NE)</td>
<td>42,773</td>
<td>146,188</td>
<td>-103,415</td>
<td>-71%</td>
</tr>
</tbody>
</table>

## Metrics – City Summaries

<table>
<thead>
<tr>
<th>Location</th>
<th>Total % low-stress</th>
<th>% LTS 4</th>
<th>% LTS 2</th>
<th>% LTS 3</th>
<th>% Difference</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minneapolis</td>
<td>84.7%</td>
<td>14,529</td>
<td>28,362</td>
<td>-13,833</td>
<td>-48.8%</td>
<td></td>
</tr>
<tr>
<td>Miami</td>
<td>80.9%</td>
<td>7,268</td>
<td>18,376</td>
<td>-11,108</td>
<td>-60.4%</td>
<td></td>
</tr>
<tr>
<td>Seattle</td>
<td>82.1%</td>
<td>13,796</td>
<td>33,348</td>
<td>-19,552</td>
<td>-58.6%</td>
<td></td>
</tr>
<tr>
<td>Washington, D.C.</td>
<td>84.6%</td>
<td>16,965</td>
<td>33,333</td>
<td>-16,368</td>
<td>-49.1%</td>
<td></td>
</tr>
</tbody>
</table>

*Table:* Total number of street segments, percentages of low-stress street segments and of LTS 4 segments, and person-weighted accessibility values for LTS 2 and LTS 3 bicycle networks for the four CBSAs included in the analysis.
Implications & Future Work

• ID areas of bike network for improvement
• Analyze areas of network less well-served (e.g. neighborhoods)
• Compare across cities – which locations have good low-stress bicycle networks?
• Inform policy and planning – e.g. scenario analysis for specific projects

Thanks!

Brendan Murphy (Lead Researcher, UMN Accessibility Observatory)
murph677@umn.edu