Effects of Bicyclists on Vehicle Operating Speed: A Study on Urban Arterial Roads

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June 2018
Acknowledgements

• Coauthors: Subasish Das and Manaswini C
• Funding: Safe-D University Transportation Center
Background and Project Objective

• Identifying speed change with presence of bicyclists:
  • Changes in bicyclist-vehicle crashes
  • Variations in crash severity level
  • Affect posted speed limit?

• This study objective:
  • Identify key contributing factors that influence vehicle operating speed in presence of bicyclists on urban arterials
San Diego Bicycle Data

- San Diego Regional Bike and Pedestrian Counter Network
- Data recorded continuously / automatic data transmission
- Identified on-road site with bicycle lanes
- Selected sites with higher historical bike counters and full batteries
<table>
<thead>
<tr>
<th>Site Number</th>
<th>Number of Sites</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1 to Site 5 (both directions), Site 8 (only eastbound)</td>
<td>11</td>
<td>Two weeks (14,784 15-minute bins)</td>
</tr>
<tr>
<td>Site 6 (both directions)</td>
<td>2</td>
<td>One week (1344 15-minute bins)</td>
</tr>
<tr>
<td>Site 7 (both directions)</td>
<td>2</td>
<td>Two weeks (2688 15-minutes bins)</td>
</tr>
</tbody>
</table>
Geometric and Traffic Control Devices

- Posted speed limit (25 or 45 mph)
- Number of through lanes (2, 4, or 6)
- Number of signalized intersection (1 to 5)
- Driveway density (0 to 32/mile)
- Distance to feature (ft)
- Median type (raised or TWLTL)
VVolPerLn = vehicle volume per lane
ID_BC = distance to feature affecting speed
DWS_BC or DWO_BC = driveway density
PW = parking lane width
SigInter = number of signalized intersections
BusStop = presence of bus stop
Med = type of median
## Findings

<table>
<thead>
<tr>
<th>Variable</th>
<th>25 mph</th>
<th>45 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle volume per lane</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bicycle volume</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Influence distance (ft)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bus stop present</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Driveway density</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
### How Influential?

<table>
<thead>
<tr>
<th>Increase in 15 min</th>
<th>25 mph sites</th>
<th>45 mph sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 veh per lane</td>
<td>- 3 mph</td>
<td>- 0.2 mph</td>
</tr>
<tr>
<td>20 bicyclists</td>
<td>- 1 mph</td>
<td>- 1 mph</td>
</tr>
</tbody>
</table>

**Questions? Limits?**

- Only 4 site, with 2 being 2-lane roads and 2 being 4-lane roads
- All sites 4 or 6 lanes...could drivers be moving away from bicyclists and, therefore, less influenced by the number of bicyclists?
Future Research Needs

• This study included smaller range of bicycle volumes than desired
• Next study should:
  • Obtain speed measurements away from features that may influence speed
  • Include more sites
• Other areas of interest:
  • Speed of vehicle (and lane position) when a bicyclist is present
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