Will You Stop?

Roadway Design and Traffic Control Devices Influences on Driver Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacons

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Presentation by Kay Fitzpatrick
FHWA Interim Approval

- Optional use of rectangular rapid flashing beacons (July 16, 2008)
- Several Official Interpretations (e.g. OK to place beacons above sign and revised flash pattern)

Source: Fitzpatrick et al.
Staged Pedestrian Data Collection

• Typical clothing = jeans, grey t-shirt, cap
• Employees trained to approach in similar manner – foot placed on pavement
• 40 to 60 per site

Source: Fitzpatrick et al.
Overview

• Several research studies have documented the benefits of the RRFB

But...

• Range of 19 to 98 percent driver yielding

Why such a large range??
Will You Stop? Project

- Objective: identify variables associated with driver yielding at RRFBs
- Source of data:
  - FHWA = several research efforts
  - TxDOT = recent research project (0-6702)
  - TTI CTS = Texas A&M Transportation Institution Center for Transportation Safety (funded additional sites)
# Sources of Data

<table>
<thead>
<tr>
<th>Study</th>
<th>Sponsor</th>
<th>Sites</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas 2012</td>
<td>TxDOT</td>
<td>22 (most in Garland, TX)</td>
<td>Trend: driver yielding increases over time</td>
</tr>
<tr>
<td>A/B 2014-2015</td>
<td>FHWA</td>
<td>13 (Arizona, Colorado, Illinois, Texas)</td>
<td>Example placement of beacons (above or below warning sign)</td>
</tr>
<tr>
<td>CvR 2013-2014</td>
<td>FHWA</td>
<td>12 (Arizona, Texas, Wisconsin)</td>
<td>Examine shape of beacon (circular or rectangular)</td>
</tr>
<tr>
<td>FP 2014</td>
<td>FHWA</td>
<td>8 (Garland or College Station, TX)</td>
<td>Examined three flash patterns</td>
</tr>
<tr>
<td>CTS 2015</td>
<td>TTI CTS</td>
<td>25 (Washington or North Carolina)</td>
<td>Priority characteristics: intersection configuration, crossing distance, posted speed limit</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>73 unique sites, 128 site-periods</td>
<td></td>
</tr>
</tbody>
</table>
Statistical Analysis

- Negative binomial mixed-effects model
  - Random effects – account for correlations in clustered data (e.g., all the crossings from a site)
  - Fixed effects – variables of interest to this project
- Evaluate the number of drivers who did not yield to crossing pedestrian
- Evaluations:
  1. All data
  2. Subset of data (when 1-min count was available)
All Data Model (pg 1)

• Fixed effect variables with at least one level significant at 0.10 level
  • **Intersection configuration** – better yielding at midblock sites as compared to 4-leg intersections
  • **Refuge presence** – better yielding when median refuge (raised or short island) was present
  • **Approach (near or far)** – better yielding on far side
  • **Crossing distance** – as distance being crossed increases, drivers are less likely to stop
  • **One-way or two-way** – more driver do not yield on two-way street as compared to one-way
Fixed effect variables not significant (but we thought they might have been):

- Posted speed limit
- Traffic control devices
- Transit stop within 200 ft
- Presence of school within 0.5 mi
- Location of beacon
- Sign face
All Data Model (pg 3)

- Random effects
- Nested structure:
  - State
  - City
  - Site
  - Period
  - Crossing
- Contribute most = crossing and city
Set of Data w/ Vol Model (pg 1)

- Fixed effect variables with at least one level significant at 0.10 level
  - One-minute per lane count – less yielding for higher volumes, and then flattens (concave curve)
  - Intersection configuration – Better yielding at midblock sites as compared to 4-leg intersections
  - Approach (near or far) – better yielding on far side
  - Crossing distance – as distance being crossed increases, drivers are less likely to stop
• Fixed effect variables with at least one level significant at 0.10 level (continued)
  • **Transit within 200 feet** – As expected
  • **School within 0.5 miles** – As expected
  • **Sign face** – More drivers not yielding at bike or bike/ped sign
  • **Beacon location** – More drivers not yielding at sites with beacons on one side of roadway compared to both sides of roadway
Set of Data w/ Vol Model (pg 3)

• Fixed effect variables with at least one level significant at 0.10 level (continued)
  • Advance yield or stop lines – But counterintuitive
  • Posted speed limit – May be counterintuitive

<table>
<thead>
<tr>
<th>Posted Speed Limit (mph)</th>
<th>Average Driver Yielding (%)</th>
<th>Count of Crossings</th>
<th>Near Not Yielding</th>
<th>Near Yielding</th>
<th>Far Not Yielding</th>
<th>Far Yielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>65%</td>
<td>539</td>
<td>317</td>
<td>440</td>
<td>122</td>
<td>376</td>
</tr>
<tr>
<td>40 (more yielding)</td>
<td>66%</td>
<td>572</td>
<td>442</td>
<td>684</td>
<td>246</td>
<td>660</td>
</tr>
<tr>
<td>35 REFERENCE</td>
<td>67%</td>
<td>2493</td>
<td>1444</td>
<td>2714</td>
<td>1069</td>
<td>2451</td>
</tr>
<tr>
<td>30 (less yielding)</td>
<td>58%</td>
<td>781</td>
<td>513</td>
<td>601</td>
<td>172</td>
<td>327</td>
</tr>
<tr>
<td>22</td>
<td>85%</td>
<td>285</td>
<td>42</td>
<td>324</td>
<td>64</td>
<td>300</td>
</tr>
<tr>
<td>Grand Total</td>
<td>67%</td>
<td>4670</td>
<td>2758</td>
<td>4763</td>
<td>1673</td>
<td>4114</td>
</tr>
</tbody>
</table>
Set of Data w/ Vol Model (pg 4)

• Fixed effect variables not significant (but we thought they might have been):
  • One-way or two-way traffic
  • Presence of refuge (but just barely not significant)
Set of Data w/ Vol Model (pg 5)

- Random effects – nominal contribution to model
- Theory: one-minute counts capture much of variability attributed to random effect of full model
- Contributes most = site
Influential Variables on Driver Yielding at Crosswalks w/ RRFBs

- City, site, or crossing random variable
- Intersection configuration
- Refuge presence
- Near or far approach
- Crossing distance
- One-way or two-way
- 1-minute vehicle volume
- Transit within 200 feet
- School within 0.5 mile
- Sign face
- Beacon location
- Advance yield or stop lines (counterintuitive)
- Posted speed limit (complex)
DISCUSSION
AND QUESTIONS

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