Bicycle and Pedestrian Safety Analysis
What is Vision Zero?

• End traffic deaths and serious injuries by 2030
• Multi-faceted approach through data driven action and the many E’s of Safety:
  – Engineering
  – Education
  – Enforcement
  – Evaluation
  – Equity
Pedestrian and bicycle collisions make up 7% of total crashes but 40% of fatalities.

9 out of 10 bike/ped collisions result in injury.
Purpose of Bicycle and Pedestrian Safety Analysis

• Better understand risk factors contributing to pedestrian and bicyclist crashes
• Proactively and systemically address risk factors to mitigate potential crashes
• Advance Seattle’s Vision Zero Goals
Data At a Glance – Crash Data

3,726 pedestrian crashes
445 serious or fatal

3,120 bicycle crashes
237 serious or fatal
Bicycle Collision Trends

BICYCLE CRASHES BY YEAR AND HIGHEST SEVERITY

2007 2008 2009 2010 2011 2012 2013 2014

- Serious or Fatal Injury
- Total Crashes
Data Up Close – Roadway Data

Lane Data + Crash Data = Crashes Associated with Lane Data

Crosswalk Data + Crash Data = Crashes Associated with Crosswalks
Exploratory Analysis

74.5% of bicycle crashes and nearly 80% of pedestrian crashes happen on arterial streets.
Exploratory Analysis - Bicycle

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>% of Total</th>
<th>% of Severe/Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hook</td>
<td>13.9</td>
<td>21.5</td>
</tr>
<tr>
<td>Angle</td>
<td>9.4</td>
<td>9.9</td>
</tr>
<tr>
<td>Right Hook</td>
<td>7.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Dooring</td>
<td>5.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>
Exploratory Analysis - Bicycle

5% of all bike crashes were dooring crashes
And accounted for 6% of all serious and fatal crashes

19% Bike Lane
43% Curb Lane
25% Travel Lane with Sharrow
## Exploratory Analysis - Pedestrian

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>% of Total</th>
<th>% of Severe/Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left hook at crossing (controlled)</td>
<td>29.1</td>
<td>20.7</td>
</tr>
<tr>
<td>Angle at crossing (controlled)</td>
<td>23.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Angle at midblock (uncontrolled)</td>
<td>21.7</td>
<td>33.8</td>
</tr>
</tbody>
</table>
Exploratory Analysis

THE MAJORITY OF BICYCLE AND PEDESTRIAN CRASHES HAPPEN AT INTERSECTIONS
Exploratory Analysis

PEDESTRIAN INTERSECTION CRASHES MORE LIKELY TO HAPPEN AT LOCATIONS WITH TRAFFIC SIGNALS

- 51.1% Crashes happened without a Traffic Signal
- 45.5% Crashes happened with a Traffic Signal
- 9% were Severe
- 7% were Severe
- 30.8% Crashes happened without a Traffic Signal
- 67.1% Crashes happened with a Traffic Signal
- 12% were Severe
- 9.5% were Severe
Accounting for Exposure

Exposure = level of pedestrian/bicycling activity

Pedestrian Activity
- Annualized count data
- Trip generators

Bicycle Activity
- Annualized count data
- Trip generators
- Strava data
- Bicycle Network

Trip generators: housing units (single family or multifamily), commercial destinations, transit locations, and universities or schools.
Pedestrian Volumes
A Proactive, Systemic Approach

Focusing on modeled collision rates at intersection locations based on the 5 following prioritized collision types:

- Total bicycle collisions
- Total pedestrian collisions
- Opposite direction bicycle collisions
- Angle bicycle collisions
- Angle pedestrian collisions
Leading Edge Analysis

Multivariate Analysis

Identify Risk Factors

Ranked Lists of Locations by Safety Performance Factor
A Proactive, Systemic Approach

Data Analysis

Significant Risk Factors

Ranked list of locations where intervention may be needed

Field Investigations

Identify Safety Improvements

<table>
<thead>
<tr>
<th>INTKEY</th>
<th>Location</th>
<th>BOD_int</th>
<th>Pred</th>
<th>EB Est</th>
<th>Pred</th>
<th>Rank</th>
<th>Pred</th>
<th>Rank</th>
<th>EB</th>
<th>Rank</th>
<th>PSI</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>27153</td>
<td>Eastlake Ave E &amp; Fuhrman Ave E</td>
<td>9</td>
<td>6</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26896</td>
<td>Stone Way N &amp; N 34th St</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>140</td>
<td>2</td>
<td>14</td>
<td>12280</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27112</td>
<td>Eastlake Ave NE &amp; University BR</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3179</td>
<td>3</td>
<td>36</td>
<td>12283</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29515</td>
<td>Denny Way &amp; Dexter Ave</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>222</td>
<td>4</td>
<td>17</td>
<td>12278</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27157</td>
<td>Eastlake Ave E &amp; Harvard Ave E</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3209</td>
<td>5</td>
<td>53</td>
<td>12282</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28783</td>
<td>Dexter Ave N &amp; Harrison St</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>6</td>
<td>9</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29795</td>
<td>12th Ave &amp; E Cherry St</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>5281</td>
<td>7</td>
<td>79</td>
<td>12281</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29809</td>
<td>12th Ave &amp; E Jefferson St</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>19</td>
<td>8</td>
<td>10</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25949</td>
<td>25th Ave NE &amp; NE Blakeley St</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29761</td>
<td>12 Ave &amp; E Madison ST</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29791</td>
<td>12th Ave &amp; E Columbia St</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>5277</td>
<td>11</td>
<td>89</td>
<td>12279</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>269714</td>
<td>Cremona St &amp; Nickerson ST</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>11860</td>
<td>12</td>
<td>113</td>
<td>12277</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28736</td>
<td>Dexter Ave N &amp; Valley ST</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>37</td>
<td>13</td>
<td>19</td>
<td>307</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29812</td>
<td>Broadway &amp; Jefferson St</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5292</td>
<td>14</td>
<td>120</td>
<td>12276</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28767</td>
<td>Dexter Ave N &amp; Mercer St</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28731</td>
<td>Aloha St &amp; Dexter Ave N</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>186</td>
<td>16</td>
<td>50</td>
<td>11908</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29740</td>
<td>12th Ave &amp; E Pine St</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5236</td>
<td>17</td>
<td>156</td>
<td>12275</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26688</td>
<td>3rd Ave W &amp; W Nickerson St</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>23</td>
<td>18</td>
<td>21</td>
<td>269</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28741</td>
<td>Dexter Ave N &amp; Roy St</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>187</td>
<td>19</td>
<td>56</td>
<td>11808</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27039</td>
<td>Fremont Ave N &amp; N 34th ST</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>20</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A Proactive, Systemic Approach
A Proactive, Systemic Approach
How is Seattle Going to Use Findings?

• Identify locations where street or signal design changes may be needed
• Make informed decisions around prioritizing safety improvements
• Proactively treat locations with the intention of mitigating potential crashes
Key Takeaways

• Consistent and accurate collision data is key to a data-driven approach
• Simple statistical and spatial analysis can reveal informative patterns that may not be apparent
• Understanding exposure is key to understanding risk, prioritizing safety improvements
Where do we go from here?

- Incorporate more collision data inputs
- Validate countermeasure approaches
- Further develop predictive volume models for the entire city
- Rerun BPSA in future with better bicycle data after bicycle network is developed
- Promote education and enforcement
Questions?

Chris.Svolopoulos@seattle.gov

http://www.seattle.gov/visionzero