A BICYCLE TRANSPORTATION PRIMER: Dispelling the Myths and Promoting the Realities

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Professor and Director
Outline

• The bicycle traffic engineering basics
• 10 Bicycle Transportation Myths versus Reality
• Research results (mine and others)

Objective: Bicycles are one part of a multifaceted solution to our transportation problems
Goals for Today’s Class

• Bicycle as a mode - cover all modes
• Transportation Engineering and Safety
  – Facts and technical approaches - for your projects
  – As a profession / body of expertise
• Data and Perceptions in Transportation
  – For professionals
  – For the public
Top Ten Reasons to Promote Biking

• Quality of life
• Health
• Transportation safety
• Traffic congestion
• Air quality
• Equity
• Parking needs
• User costs
• Economic development
• Vibrant communities
The Short Version…

• Better Health: 60% of Americans lead completely sedentary lifestyles, 40% clinically overweight
• Better Environment: reduction in air pollution and traffic congestion
• Better Communities: people want to get out and walk or bike
Myth 1:

Bicycles are such a small part of the transportation system they cannot make a meaningful difference.
• There are 9 million bike trips and 56 million walking trips in the U. S. everyday
• One in ten U. S. households do not own an automobile
• 1/3 of the population is either too old or too young to drive an automobile
Highway Capacity Manual - Volume Speed Functions
Travel Time / Delay and Capacity

![Graph showing relationship between traffic demand and travel time](image)
Reality #1:

Bicycles can serve the marginal demand near capacity where they result in travel time benefits for the whole system.
Myth # 2:

Bicycles are slow vehicles.
Bicycle Speed Distribution

- Ottawa (mean = 18.7 km/h)
- Toronto (mean = 14.9 km/h)
Bicycles as Design Vehicles

- dimensions
- speed
- stopping distance
- climbing ability
Bicycle Operating Space

From AASHTO 1999
Design Speeds

- Paved 30 km/h or 20 mph
- Unpaved 25 km/h or 15 mph

From AASHTO 1999
Myth #3:

Sidewalks are a good place for bicycles, especially on busy roads.
Geometric Highway Design

Design speed is linked to curvature, width, surface treatment and roadside design
Sidewalk Riding
Traffic Safety

Intersections are the high risk locations on the road network
Sidewalk Riding
Sidewalk Riding

- speed
- predictability
- pedestrian conflict
- ambiguity of traffic rules
- close objects
- geometric standards and surface conditions
Sidewalk Riding and Children

YES

NO

MAYBE
Sidewalk Safety Research

- Wachtel and Lewiston 1994
  - sidewalk riding 1.8 X the incident rate of road travel
- Aultman-Hall and Kaltenecker 1999
  - No collision rate difference
  - Fall and injury rates higher
Myth #4:

Bicycling on paths is safer than roads.
Relative Rates off-road path / on-road

<table>
<thead>
<tr>
<th>Event</th>
<th>Ottawa</th>
<th>Toronto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision</td>
<td>1</td>
<td>3.5</td>
</tr>
<tr>
<td>Fall</td>
<td>2.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Injury</td>
<td>1.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Major Injury</td>
<td>1.6</td>
<td>1.2</td>
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</tbody>
</table>
## Connecticut Rail Trail Safety Study

### Travel Exposure (1000s miles)

<table>
<thead>
<tr>
<th></th>
<th>Farmington R. 1</th>
<th>Farmington R. 2</th>
<th>Canal Greenway</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>66</td>
<td>21</td>
<td>74</td>
<td>162</td>
</tr>
<tr>
<td>Bicycle</td>
<td>48</td>
<td>8</td>
<td>68</td>
<td>124</td>
</tr>
<tr>
<td>Skating</td>
<td>16</td>
<td>5</td>
<td>22</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
<td>34</td>
<td>167</td>
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### Incident Counts

<table>
<thead>
<tr>
<th></th>
<th>Farmington R. 1</th>
<th>Farmington R. 2</th>
<th>Canal Greenway</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Bicycle</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Skating</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>9 (includes 1 scooter event)</td>
<td>3</td>
<td>25</td>
<td>37</td>
</tr>
</tbody>
</table>

### Incident Rates (per 1000 miles of travel)

<table>
<thead>
<tr>
<th></th>
<th>Farmington R. 1</th>
<th>Farmington R. 2</th>
<th>Canal Greenway</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0.05</td>
<td>0.00</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Bicycle</td>
<td>0.04</td>
<td>0.25</td>
<td>0.22</td>
<td>0.15</td>
</tr>
<tr>
<td>Skating</td>
<td>0.19</td>
<td>0.20</td>
<td>0.32</td>
<td>0.26</td>
</tr>
<tr>
<td>Total</td>
<td>0.07</td>
<td>0.09</td>
<td>0.15</td>
<td>0.11</td>
</tr>
</tbody>
</table>
Reality #4:

Roads and paths show similar collision, fall and injury rates (paths higher in some cases).
Myth #5:

Pedestrians should walk facing bicycle traffic on a shared-use path
User Rules

• Walker facing bicycle traffic
Reality #5

- Walk and bike on the right
- Warn before passing
User Rules

- Walk and bike on the right
User Rules

• Walk and bike on the right
User Rules

- Walk and bike on the right
Myth #6:

When bicycling on a road, there is a great risk of being hit from behind by an overtaking motor vehicle.
Risk

- FHWA study 3000 bicycle-motor vehicle crashes in 1990s
- 18% serious injury or fatality
Circumstance

- Hunter study team at UNC
- 8.6% of crashes overtaking
- 58% crossing paths
- intersections, driveways, failing to yield
Reality #6

- Nature of bicycle-mv crashes is not dramatically different from mv-mv crashes
- Overtaking is a small part of the overall picture
Myth #7:

Serious injuries are caused when bicyclists are hit by vehicles.
Helmets and Safety
Safety Facts

- In 2001, there were 4,882 pedestrian fatalities and 78,000 pedestrian injuries resulting from traffic crashes. On average, a pedestrian is injured in a traffic crash every 7 minutes and killed in one every 111 minutes.

- In 2003, 622 bicycling fatalities and 46,000 bicycling injuries resulting from traffic crashes in the United States. Account for 1.5 % of all traffic fatalities and 2 % of all traffic injuries.
Myth #8:

Bicycles on freeways is a very bad idea.
Shoulder Bikeways on Freeways

- AASHTO guide recognizes this need
- Suggests criteria for evaluating use
- An issue where access is prohibited (bridges for example)
Rumble Strips
Rumble Strips

• Reduce frequency of run off of road crashes
• Bicyclists do not completely oppose rumble strips but they are working to clarify design requirements
• Why – they cause bicycle crashes and in some cases make roads unusable for cycling
Rumble Strips

• FHWA released a national standard in fall 2001
  – gaps, width, placement
• Care should be exercised in installing rumble strips because they may destroy a road for bicycling until a complete resurfacing is undertaken
Reality #8:

There are both pros and cons for bicycles and freeways & bicycles and rumble strips.

THE JURY IS OUT!
Myth #9:

The “complete streets” is a improvement plan for bicycles
The Road Diet
Complete Streets – good standard vehicle lanes, vehicle crash reduction, increased capacity
Road Diet – good bicycle lanes
Benefits of a Complete Street

- Motor vehicle safety is improved as travel lanes are moved away from curb, fixed objects, and parking
- Bike lanes increase sight distance and turning radii at intersections and driveways
- Rutting moves- extending life of pavement
- Pedestrians on sidewalk are buffered from traffic
Myth #10:

Bicycle lanes and bikes are always on the right edge of the road
Shared Bicycle Right Turn Lane
Reality #10

- Bicycle lane placement is a complex issue and care in design and use of guidelines are a necessity
- Bicycles should be in the right most lane that leads to their destination
Current Issues for Bicycle Planners

- Signage
- Shared roadways
- Lack of demand models
- Bicycle compatibility indices
- Parking and storage
- (G)rumble strips
Current Issues for Bicycle Researchers

- travel exposure information
- incomplete crash databases
- impact of bicycle lanes
- shared use path operation and safety
- evaluation of programs and innovative facility treatments
- health benefits
Current Issues for Bicycle Educators

- cycling skills, helmets
- dispelling myths
  - Bicycles are a complex transportation mode and design requires specific expertise
  - Even at low levels, bicycles can contribute to a diversified transportation system and congestion management
The 5 Key Transportation System Design Principles

1. Make the land use – transportation connection
2. Network connectivity
3. Make space for everyone
4. Reduce speed - traffic calming
5. More and better designed facilities
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