Analysis of Non-Motorized Crash Data
October 3, 2018

Patricia Kovacs
Ohio Bicycle Federation
Improving Ohio bicycling through legislation, education and shared ideas.
Outline

• Uses of crash report data
• Motivation for understanding crash types and contributing circumstances
• NHTSA Crash Report Criteria and OH-1
• Analysis of crash causes
• Examples of bikeway safety
Why look at crash report data?

- Crash type analysis helps to focus education and advocacy
- Roundabout safety
- Traffic signal removal safety
- Legislative advocacy
  - Hit & runs - 26% bicycle, 28% pedestrian crashes
  - Rear-ends and Sideswipes to support and evaluate 3’ law
    - US: 9.4% in 1999 (Bicycling & Law, Bob Mionske, JD)
    - Ohio: 10.1% in 2017
  - Increase highway speed limits to 70 in 2013 – highway injury and fatal crashes increased 8.7% in 2014.
    - Note: due to change in reporting, total reported crashes decreased 10.4% from 2010 to 2013
Cross study of Car/Bicycle Crashes

Car/Bike Accident causes
Cross 1974

- Cyclist Wrong-way riding facing traffic - drive on right side of road
- Cyclist Left turn from the right side of the road - scan, signal, move to left side of lane
- Cyclist Failure to yield from driveway - stop at street and look left, right, left again
- Cyclist Running a stop sign or signal - stop at stop signs and red lights
- Cyclist Swerving in front of car - ride in straight line, practice scanning
- Motorist Left turn in front of bicyclist - take lane at intersection, keep pedaling, make eye contact, watch for turn signal, prepare to stop
- Motorist Right turn in front of bicyclist - take lane at intersection, watch for turn signal or wheel turning, don't pass on right
- Motorist Running a stop sign or signal - look ahead, make eye contact, prepare to stop
- Motorist Opening car door into path of bicyclist - leave 4' clearance
- Motorist Failure to yield from driveway - watch for backup lights
- Motorist Overtaking Error - be visible, take the lane when narrow
- Other
Quality of crash report data

- Lack of reporting of bike/pedestrian crashes
  - “It’s only a bicycle”
- Property damage limits increased in 2011 from $400 to $1000
  - Total reported crashes decreased 10.4% from 2010 to 2013.
  - All injury crashes must be reported, 84% bicycle, 90% pedestrian crashes result in injury
- Bike/bike, bike/pedestrian and doorings do NOT need to be reported to ODPS
- Errors in reporting and judgment of fault
- In general, Columbus police are fair with bike crash reporting
- Sidewalk cycling ban in Columbus leads to many cyclists at fault when hit in crosswalks
Model Minimum Uniform Crash Criteria (MMUCC)

- Update begun in early 2016
- Fatal crash section – to improve FARS quality
- Large Vehicle/Hazardous Cargo
- Automated vehicle capability (none, partial, full)
- New Non-Motorist Section
  - Additional bikeway types
  - Add origin/dest for school and transit
  - Add distraction, DUI, point of contact
- Other miscellaneous changes
Major issues with bicycle crash reporting

- Manner of collision
- Vehicle type does not include bicycle
- Pre-crash action
- Contributing circumstances
Manner of collision

- MMUCC states this applies only to 2 MOTOR vehicles
  - Angle
  - Rear-end
  - Head-on
  - Rear-to-rear
  - Backing
  - Sideswipe – same direction
  - Sideswipe – opposite direction

- Bicycle crashes - Not a collision between two motor vehicles in transport (99.5% of Ohio bicycle crashes)
Vehicle type != bicycle

- MMUCC data element is MOTOR vehicle
- Ohio DOES include vehicle type = bicycle and animal-drawn vehicle
- So… we can derive manner of collision from vehicle attributes

- Right hook
  - (MotoristFrom = CyclistFrom) AND (MotoristAction = Turning right)
Pre-crash Action

• Cyclist is not considered a driver
• Non-Motorist Actions
  – Entering or crossing location
  – Walking, running, jogging, playing, cycling
  – Working
  – Pushing vehicle
  – Approaching or leaving vehicle
• In Ohio, ~50% are “Walking… cycling”, 25% are “Entering or crossing”, 25% are other/unknown
• Useful driver actions: turning, changing lanes, overtaking
Contributing Circumstance

• Non-Motorist Contributing Circumstances
  – Improper crossing
  – Darting
  – Lying in roadway
  – Failure to yield right of way
  – Failure to obey traffic signs
  – Not visible
  – Inattentive
  – Wrong side of road

• Why are cyclists the only drivers who “dart”?

• Useful driver circumstances: swerving to avoid obstacle, driving left of center
Doorings

• The only indication of dooring is by non-motorists “approaching or leaving vehicle”
  – This value is not used for motorists (drivers)

• Derive from
  – (ErrorUnit = Motorist) AND (MotoristAction = Parked) AND (MotoristImpact Like ("*side*")))
Highest Priority Recommendations

• Remove “not a collision between two vehicles in transport” from Manner of collision for car/bike crashes

• Bicycles are vehicles, add vehicle type = bicycle

• Add Dooring as a pre-crash action
  – Already included in Illinois crash report since 2011
  – 18% of Chicago crashes are doorings in 2011-2015
Additional Vehicle Asks

- Vehicle type: animal-drawn vehicle (for Amish)
- Traffic signals: pedestrian signal, pedestrian hybrid beacon, rectangular rapid flash beacon, bike signal, bus signal
- Pavement markings: bike box, two stage turn queue
New pedestrian beacons
Additional Person Asks

• New Data Element Assistive Devices: wheelchair, guide dog, cane
Additional Roadway Asks

• Edgeline presence/type: shoulder rumble strip, edgeline and centerline rumble stripe
• New Data Element Accessible Features: curb cut, audible signal, tactile pavement
Edgeline/centerline rumble stripes
Proposition

- Proposition reviewed by American Bicycling Education Association, League of American Bicyclists and Ride Illinois
- Proposal submitted to Governors Highway Safety Association and Ohio Traffic Records Coordinating Committee
- MMUCC Fifth Edition released summer, 2017
• Most proposals were NOT accepted.
• Clarification of bikeway types
  – Signed route
  – Shared lane markings (sharrows)
  – On-street bike lanes
  – On-street buffered bike lanes
  – Separated bike lanes
  – Off-street trails/sidepaths
• New pre-crash actions related to walking/cycling on roadway, shoulder or sidewalk and whether with or against traffic
Ohio OH-1 crash report

- Vehicle/unit type includes bicycle (no change)
  - Unit type includes pedestrian and wheelchair user (previously unit attributes not applicable to pedestrians)
  - Bicycle and pedestrian point of contact added
- Manner of Collision will still be “not a collision between two motor vehicles in transport” for bicycle crashes
- Dooring added as pre-crash action – but bike/parked car crashes will not be submitted to ODPS
- New bikeway types were not added to non-motorist location
- New pedestrian beacons were not added to control type
  - But TIMS system provides roadway characteristics such as bikeways, traffic control types and pavement attributes such as rumble stripes/strips.
Ohio crash report analysis

- Ohio Dept of Public Safety provides crash data in the public domain
- Data is downloaded quarterly
- Bicycle and pedestrian crashes are queried and normalized
- Manner of collision is derived
- Crashes are imported into Google Maps to allow users to view crash locations and select crash records. Excel spreadsheets are also posted for data analysis.
Magic Happens
Google Map of bike crashes
Crash Attributes

- City: Columbus
- Document Number: 20166121778
- Crash Date: 08102016
- Crash Time: 1804
- County: Franklin
- Location Road: Livingston
- Reference Road: Burlington
- Latitude: 39.945091
- Longitude: -82.8828
- Collision: Not collision between two vehicles in transport
- Collision Derived: Angle
- Severity: Fatal
- Hit Skip: Solved
- Location: Not an intersection
- Weather: Clear
- Contour: Straight level
- Light: Daylight
- Error Unit: Motorist
Motorist Attributes

- MotoristUnitType: Mid size
- MotoristAge: 41
- MotoristGender: F
- MotoristEvent: Pedalcycle
- MotoristAction: Straight ahead
- MotoristCircumstance: Unknown
- MotoristLocation: Zero
- MotoristFrom: W
- MotoristTo: E
- MotoristControl: No controls
- MotoristImpact: Right front
- MotoristCondition: Normal
- MotoristDistraction: No distraction
- MotoristSafety: Unknown
Cyclist Attributes

- **CyclistAge**: 69
- **CyclistGender**: M
- **CyclistEvent**: Motor vehicle in transport
- **CyclistAction**: NonMotorist Walk, run, jog, play, cycling
- **CyclistCircumstance**: Failure to yield
- **CyclistLocation**: Shoulder/roadside
- **CyclistFrom**: S
- **CyclistTo**: N
- **CyclistControl**: No controls
- **CyclistImpact**: None
- **CyclistCondition**: Normal
- **CyclistDistraction**: No distraction
- **CyclistSafety**: None
### Derived Manner of Collision

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<thead>
<tr>
<th>Collision Derived</th>
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<th>2017%</th>
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<td>Right hook</td>
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<td>Sideswipe, opposite direction</td>
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<td>Bike bike</td>
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<tr>
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**Total: 1489**
Cyclist at fault

### Cyclist Circumstance Cyclist Fault

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<td>Failure to yield</td>
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<td>Improper crossing</td>
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<td>Other improper action</td>
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<td>Darting</td>
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<td>Ran stop sign</td>
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<td>Not visible (dark clothing)</td>
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<td>Ran red light</td>
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<td>Vision obstruction</td>
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<td>Left of center</td>
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Total: 685
Motorist at fault

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<td>Ran red light</td>
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<td>Left of center</td>
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<td>Vision obstruction</td>
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<td>Improper start from parked position</td>
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<tr>
<td>Stopped or parked illegally</td>
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<tr>
<td>Operating vehicle negligent manner</td>
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<td>Unsafe speed</td>
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<td>Load shifting/falling/spilling</td>
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Total: 615

Motorist Circumstance Motorist Fault
- Failure to yield: 52%
- Unknown: 1%
- Followed too closely: 1%
- None: 1%
- Improper lane change/Passing/Off road: 2%
- Other improper action: 2%
- Improper turn: 1%
- Ran stop sign: 1%
- Ran red light: 1%
- Failure to control: 1%
- Improper backing: 1%
- Left of center: 1%
- Wrong side or wrong way: 1%
- Vision obstruction: 1%
- Improper start from parked position: 1%
- Stopped or parked illegally: 1%
- Operating vehicle negligent manner: 1%
- Inattentive: 1%
- Swerving to avoid due to external conditions: 1%
- Unsafe speed: 1%
- Load shifting/falling/spilling: 1%
## Bikeway evaluation

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<th>duration</th>
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<th>avg crashes/yr</th>
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<th>after</th>
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Columbus Summit St
Separated Bike Lanes
Columbus Summit St separated bike lanes

- Separated bike lanes installed on 1.4 miles in 2015
- Bicycle counts increased 50%
  - Avg 149/day before, 224/day after
- Bicycle crashes increased 766%
  - Avg 1.5 crashes/yr 2011-2014
  - 15 crashes 2016, 11 crashes 2017
  - 4 crashes in 2018 (through Sept 5), hopefully trend continues down
- Compare with buffered bike lane on Fourth St
  - Bicycle crashes increased 300%: avg 0.5 before -> 2 crashes 2016, 2 crashes 2017
Columbus Summit St
separated bike lanes
Summit crash types (2016-2017)

• 13 Motorist drive outs
• 6 Motorist right hooks (3 at traffic signals)
• 2 Motorist right cross
• 2 Motorist sideswipe (cyclist in travel lane and motorist in bike lane)
• 2 Cyclist drive outs
• 1 Cyclist ran red light

20 injury crashes
11 contra-flow cyclists
Chicago sharrow study
Marshall & Ferenchak

- Safety measured per census block group
- Results of injuries per year per 100 bicycle commuters:

- Flaws in methodology:
  - Cyclists ride outside census block group
  - Cyclists may choose NOT to ride infrastructure
  - Bike lanes and trails grouped together
  - Includes only commuting cyclists
Columbus High St
Sharrows
Columbus High St sharrows

- Sharrows installed on 6.6 miles in 2009-2010
- Bicycle counts increased 109%
  - Avg 19.7 in 2 hour periods 2005-2009
  - Avg 41.1 in 2 hour periods 2010-2015
- Bicycle crashes decreased 29%
  - Avg 28 crashes/yr 2008-2009
  - Avg 19.8 crashes/yr 2010-2016
How can you help?

- Help us to advocate for better legislation – distracted driving, pedestrian rights of way
- Collect bike/ped counts before constructing experimental infrastructure so risk can be evaluated
- Install all traffic control signs before opening bikeway to traffic
- Please use this sign: Not this sign:
Future Focus

• Update studies of specific projects in Ohio – sharrows, bike lanes, separated bike lanes using crash data and bike counts where available.

• Focus on distracted driving legislation
Conclusion

• Bike and pedestrian crash maps available on OBF website
  http://www.ohiobike.org/advocacy

• Questions?

• Patricia Kovacs, pkovacs@att.net