Systemic Opportunities to Improve Older Pedestrian Safety: Merging Crash Data Analysis and a Stakeholder Workshop

Translating Safety Research into Real World Solutions (AJE35, ACS10)
Monday, January 10, 4:00 p.m. to 5:30 p.m.

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Introduction

- Older pedestrian/driver = 65 years or older
- 19% of all traffic fatalities in 2018 were people 65 years and older
- 65% increase in older pedestrian fatalities from 2009 to 2018
- Older pedestrians more likely to sustain a serious injury and more susceptible to crashes with motor vehicles
  - Slower walking speeds
  - Situational demands
  - Increased risk of falling
  - Visual and hearing degradation

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Introduction

- Identifying where and what infrastructure improvements need to be made is a challenge to many agencies

- Success of implementation depends on location and its conditions

- Due to increases in fatalities and serious injury crashes, the Special Rule for Older Drivers and Pedestrians (in the FAST Act) was started

- This work, using Oregon crash data, presents a framework for developing safety strategies

Objectives

- Identify overrepresentations for older pedestrian serious injury crashes
- Generate list of potential countermeasures
- Hold workshop with stakeholders and experts
- Summarize workshop findings
- Stakeholders and experts rank potential solutions

Methods

- Identify crash trends from Oregon crash data (2013 to 2016)
- Identify important variables in predicting serious injury crashes using a random forest
- Compare older pedestrians with other age groups
- Generate list of potential countermeasures
- Host workshop with experts and stakeholders

Methods

- Workshop
  - Stakeholders/experts for policy and design guidance
  - 18 stakeholders/experts
  - Divided into four groups
  - Three activities
  - Synthesize findings and present back to participants via posters
  - Rank-order top three proposed solutions

Crash Data Analysis
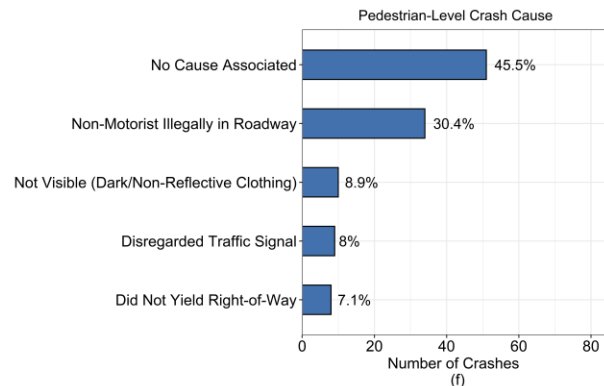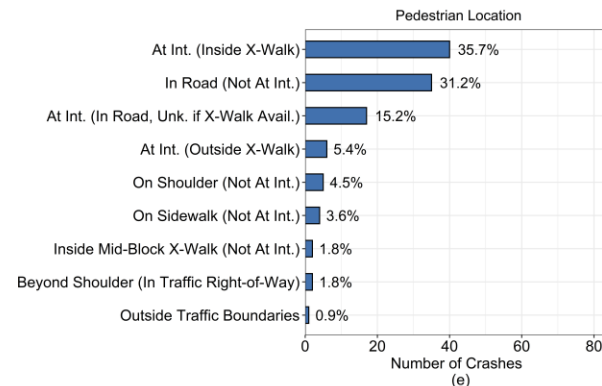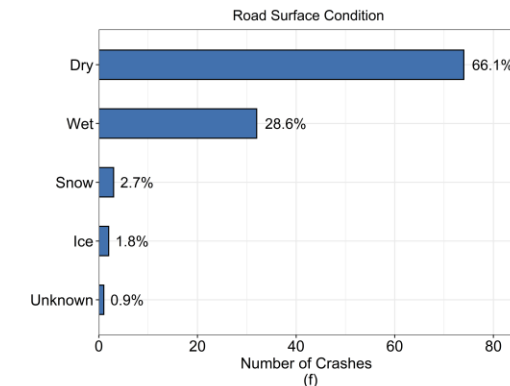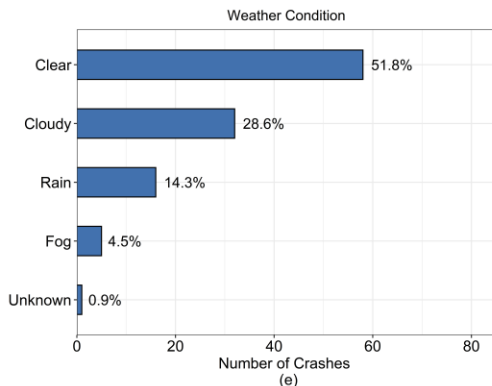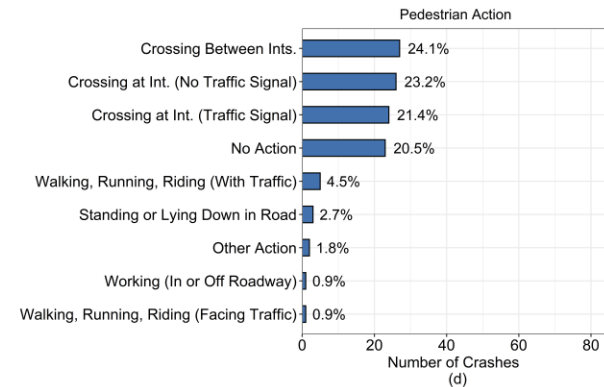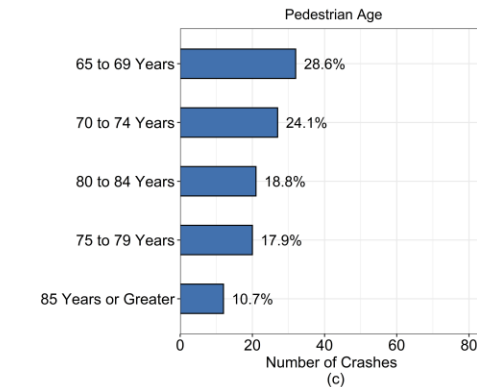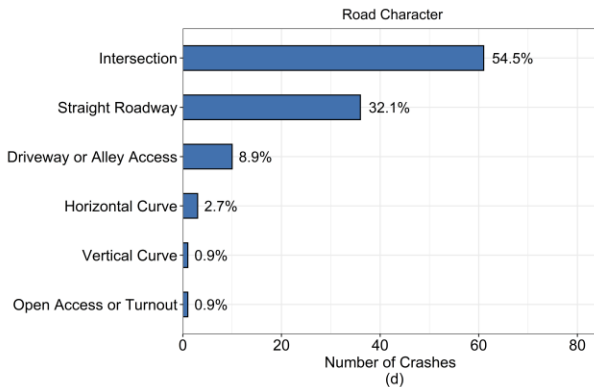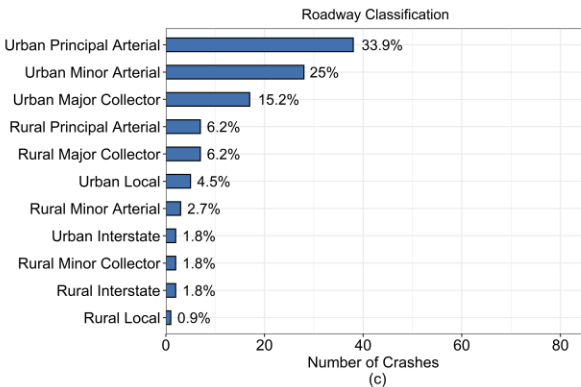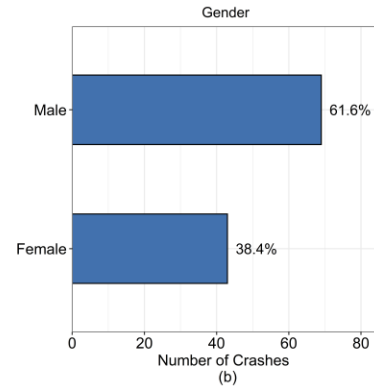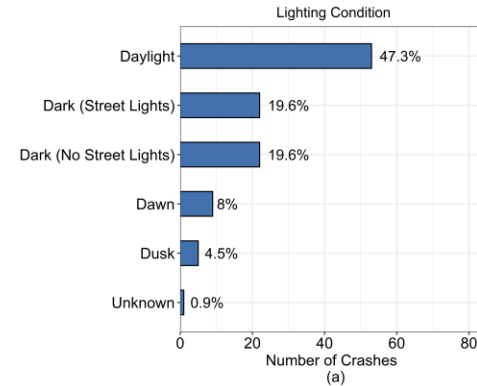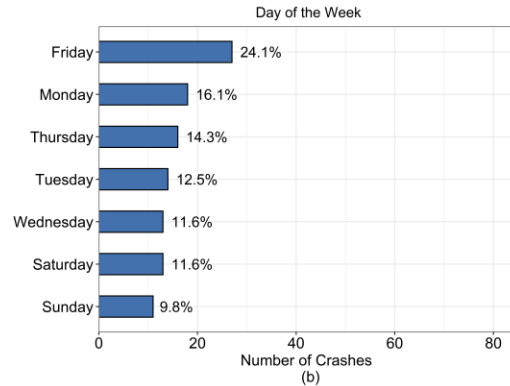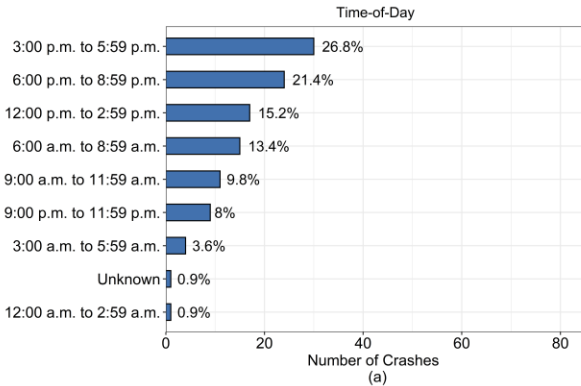
Comparison to Other Age Groups

- Except for 16 to 24 years age group, all groups show increasing trend
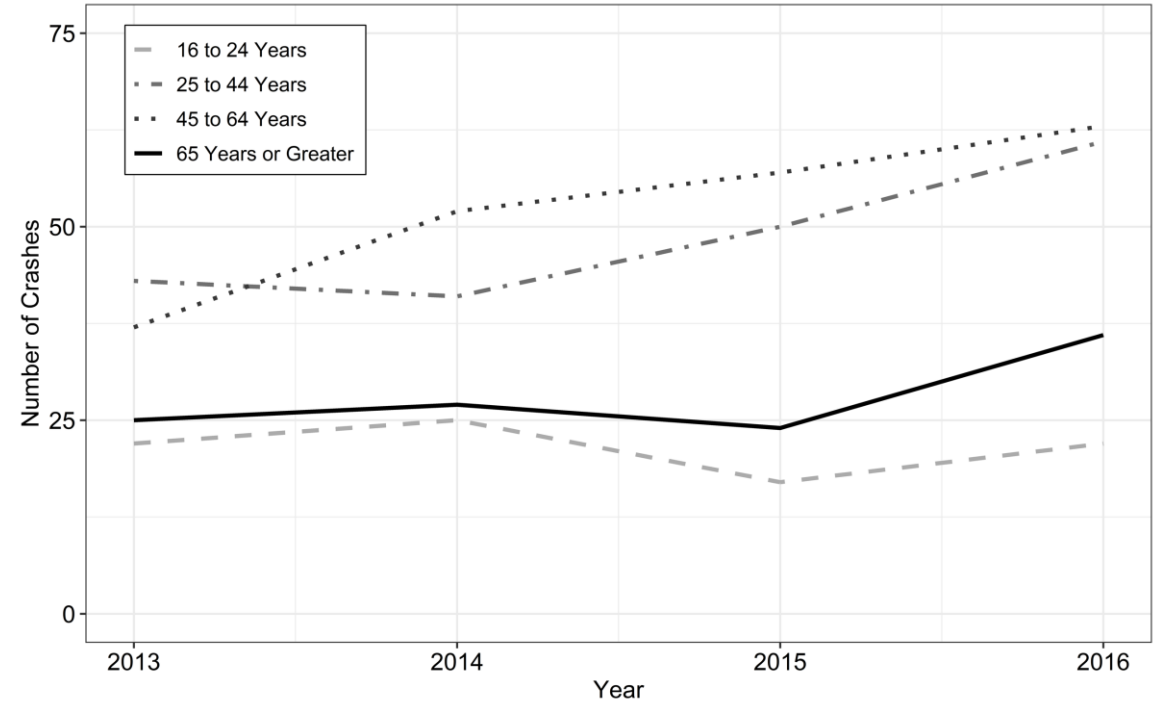
Variable Importance

Variable Importance for Fatal and Serious Injury Crashes Based on Random Forest Analysis	
Top Important Variables based on Mean Decrease in Accuracy	Top Important Variables Based on Gini Index
1. Dark (No Street Lights)	1. Urban Principal Arterial
2. Intersection	2. Urban Minor Arterial
3. At Intersection (Inside Crosswalk)	3. Dark (No Street Lights)
4. Cloudy	4. Cloudy
5. Daylight	5. Illegally in Roadway

Workshop Findings, Activity I

- *"Discuss the crash trend/overrepresentation you identified as unexpected or expected. Take notes on your observations and feel free to speculate on causation"*

- *"Identify the most important trend/overrepresentations from the perspective of your group. Make brief notes on the response sheet for your group"*

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Workshop Findings, Activity I

Most Selected Important Crash Trends	
Crash Trend	Times Selected
Crossing between Intersections	2
Daylight	2
Urban Areas	2

Potential Causation of Most Selected Crash Trends	
Crash Trend	Potential Causation
Crossing between Intersections	Jaywalking Crossing with No Signal Harder to Estimate Speed and Gaps
Urban Areas	Crossing Parallel to Mainline

Workshop Findings, Activity II

- *"As a group, discuss your proposed solutions. Determine if there are any shared ideas. Make brief notes on the datasheet for your group"*

Workshop Findings, Activity II

Most Frequent Proposed Solutions for Older Pedestrians	
Proposed Solution	Groups Selected
Access Management, Driveway Spacing	3
Crosswalk Spacing	3
Lighting/Visibility at Intersections	3
Crossing Visibility	3
Turn Restrictions	2

- Access Management, Driveway Spacing
  - Reducing driveway density
  - Remove driveways from T-intersections
- Crosswalk Spacing
  - Provide "adequate" crosswalk spacing
  - Increase in marked or enhanced crosswalk spacing
  - Spacing frequency at consistent and safe intervals

- Lighting/Visibility at Intersections
  - Increase driver expectation of encountering pedestrians
  - Improved lighting at midblock crossings
- Crossing Visibility
  - Focus on rural arterials
  - Require reflective clothing
  - Lit Signage, flashing signals
  - Maintain reflective striping

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Workshop Findings, Activity III

- *"As a group, discuss and identify possible systemic actions (regular implementation of treatments to workflows) or changes to design standards or policies. Make brief notes on the datasheet for your group. These ideas will be summarized and synthesized for the workshop wrap-up"*

Workshop Findings, Activity III

Intersections			
Solution	Top Priority	Second Priority	Third Priority
Extended Crossing Times	0	1	1
Shorter Crossing Distances/Curb Extensions/Medians	2	1	6
Adequate Pedestrian Crossing at Regular Intervals	1	4	3
Increased Use of Protected Left Turns (Eliminate Permissive Movements)	3	6	5
Mid-Block Crossings	0	0	0

Roadway Design			
Solution	Top Priority	Second Priority	Third Priority
Lower Speeds	2	2	2
Grade Separate at Intersections	0	0	0
Eliminate Free Flow Turns and Right-Turn Slip Lanes	0	4	0
Eliminate Driveway Access in Close Proximity to Intersections	3	2	0
Make Pedestrian Safety More of a Priority	1	1	0

| Roadway Lighting			
Solution	Top Priority	Second Priority	Third Priority
Illumination to Increase Pedestrian Visibility	3	4	1

- Education
  - Educate on crosswalk use
    - 1 third priority vote
- Other
  - Better transit route and stops
    - 1 top priority, 1 second priority, 2 third priority
  - Reduce barriers to obtaining rides
    - 1 top priority, 2 third priority

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Discussion and Implementation (1)

- Three systemic treatments identified:
  - Improving Pedestrian Visibility and Illumination
  - Treatments for Left Turns
  - Shorten Crossing Distances
- Systemic approach allows agencies to implement treatments at multiple locations with similar risk characteristics
- Low-cost solutions were the focus
- The identified treatments should benefit all road users
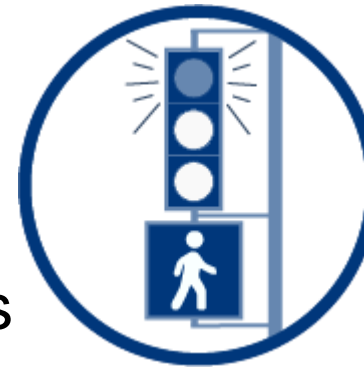
Discussion and Implementation (2)

- Improve Pedestrian Visibility and Illumination
  - ≈ one-third of crashes occurred at dark (no streetlights), dusk, or dawn
  - Voted a top priority by workshop participants
  - Potential countermeasures are:
    - Improved lighting at intersections and near crossing locations
    - RRFB flashing beacons
    - Warning devices, such as LED mounted "Pedestrian Crossing" signs
  - Increased visibility has shown to reduce crashes by up to 13%

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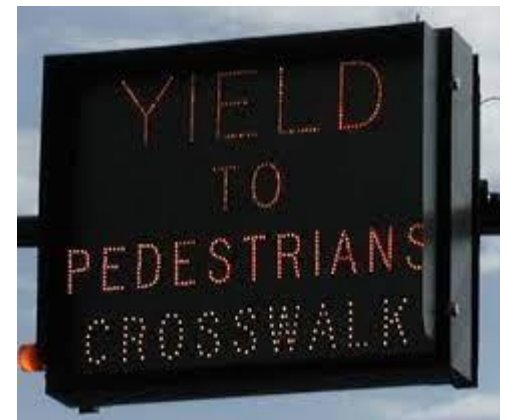
Discussion and Implementation (3)

- Treatments for Left Turns
  - Left turns accounted for ≈ 19% of crashes
  - Increasing use of protected left turns can improve safety
    - Drivers can miss crossing pedestrians with permissive left turns
    - Can improve older driver safety by reducing cognitive load
  - Flashing yellow arrow indication
  - Slowing left turning vehicles by using wedges and centerlines
  - Protected pedestrian phases and leading pedestrian intervals
    - Separating pedestrians by time and space has shown to reduce crashes by up to 13%

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Discussion and Implementation (4)

- Shorten Crossing Distances
  - Proportion of older pedestrian crashes when in the roadway significantly different compared to other age groups
  - Shortens exposure time
    - Pedestrian islands
    - Curb extensions on commercial streets and bus routes
    - Raised crosswalks and road diets
  - Pedestrian islands in the median of wide and busy streets have shown to decrease crashes by up to 14%
  - Raised crosswalks and road diets have shown to decrease crashes by up to 46%

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Summary and Conclusions

- Improving older pedestrian safety important issue nationwide
  - Highest risk for serious injury crashes
  - Finding can be applicable to areas outside Oregon
  - Data-driven framework for agencies to develop location-specific recommendations

- Future Work
  - Consider treatments to address speeding
  - Fuse additional data sources that may provide additional insight on older pedestrian crash behavior

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