Oregon Pedestrian and Bicycle Safety Implementation Plan

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Outline

- Project Background
- Study Scope
- Methodology
- Countermeasures
- Implementation & Next Steps

Project Background

- ODOT has developed two statewide safety implementation plans
  - Roadway Departure
  - Intersections
- Pedestrian and Bicycle next highest priority in SHSP
- Pedestrian and bicycle crash frequency requires unique approach
  - Low frequency
  - Few proven countermeasures
  - Limited crash descriptors, exposure data, and inventory of facilities
- Identify and rank sites on all roads in Oregon with potential for crash reduction
  - $4 million pedestrian/bike safety funding in 2017

Photo source: ODOT

Project Goals and Objectives

- Reduce **fatalities and severe injuries** resulting from pedestrian and bicycle crashes
- Increase understanding of pedestrian and bicycle crash causes and locations
- Identify and rank potential sites for safety projects
  - **Data-informed** approach consistent with MAP 21

    "Highway safety improvement projects must be identified on the basis of crash experience, crash potential…or other data-supported means."

    (23 USC 148(c)(2)(B))
  - **Systemic** method applied statewide
- Set framework that can be applied/improved annually
  - Data collection & management
  - Proven countermeasures

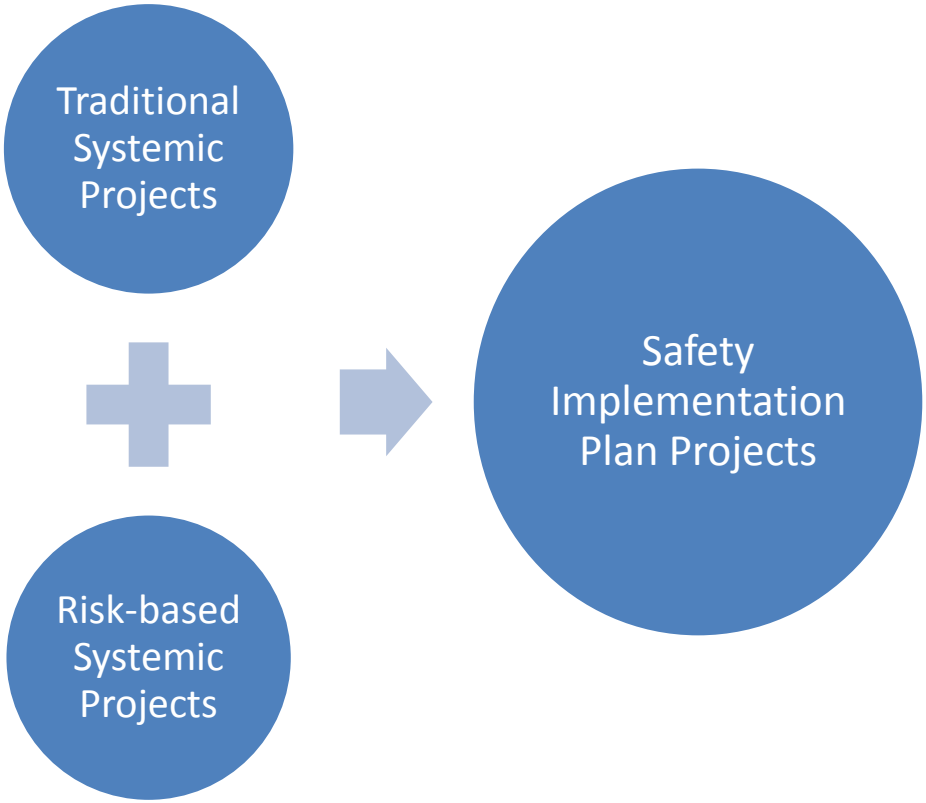
Photo source: ODOT

Study Scope

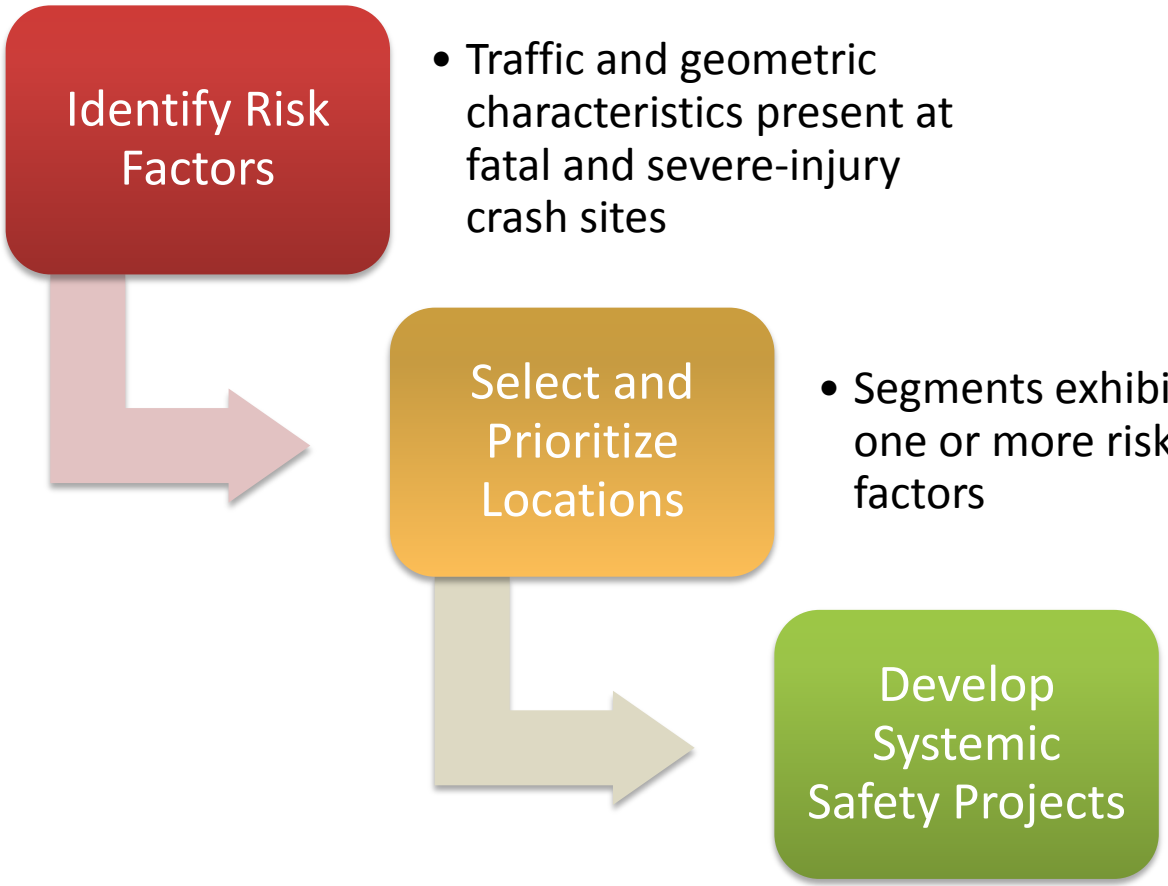
- Literature Review
  - Network Screening
  - Countermeasures
- Stakeholder Input
- Risk-Based Systemic Approach
  - Crash Analysis
  - Development of Risk Factors

Overview of Systemic Methods

1. Traditional
   - Implement many low-cost countermeasures where frequent and severe crashes were reported
2. Risk-based
   - Prioritize locations with potential for crash reduction based on presence of risk factors



Overview of Risk-Based Systemic Method



- Traffic and geometric characteristics present at fatal and severe-injury crash sites
- Segments exhibiting one or more risk factors
- Apply counter-measures to address risk factors at specific locations

Crash Analysis - Statewide Reported Pedestrian Crashes (2007-2011)

Total: 3,505
Severe: 752 (21% of total)

State Highways
Total: 658 (19%)
Severe: 211 (28%)

Intersection
Total: 338 (10%)
Severe: 70 (9%)

Segment
Total: 320 (9%)
Severe: 139 (19%)

Non-State Highways
Total: 1,052 (30%)
Severe: 222 (30%)

Intersection
Total: 520 (15%)
Severe: 77 (10%)

Segment
Total: 532 (15%)
Severe: 145 (20%)

Portland Metro
Total: 1,795 (**51%**)
Severe: 319 (**42%**)

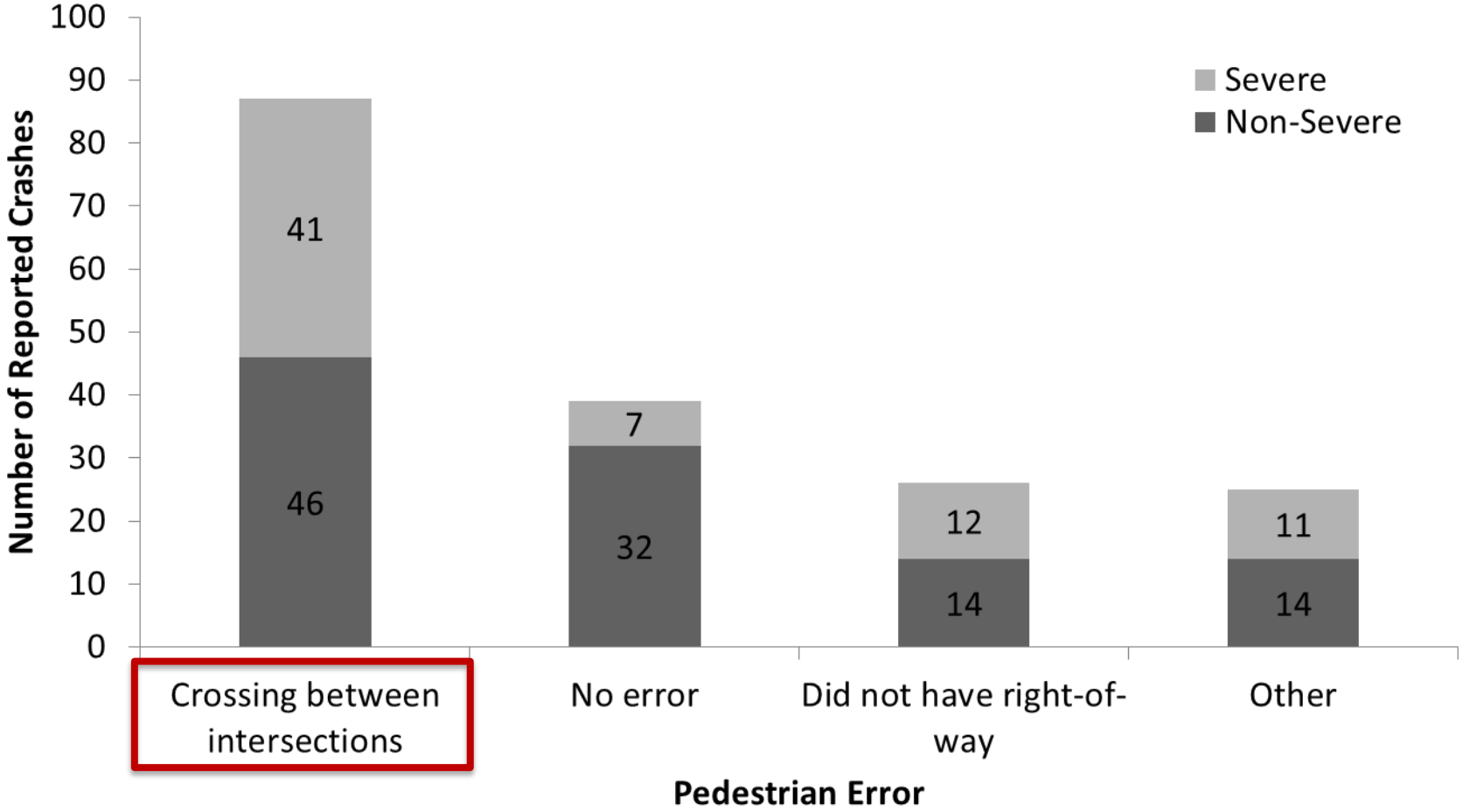
Intersection
Total: 1,098 (31%)
Severe: 137 (18%)

Segment
Total: 697 (20%)
Severe: 182 (24%)

Identify Risk Factors → Select and Prioritize Locations → Develop Systemic Safety Projects

Crash Analysis – Example Pedestrian Trend

- Reported Crashes on State Highway Segments in Urban Areas (2007-2011)



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Crash Analysis – Example Bicycle Trend

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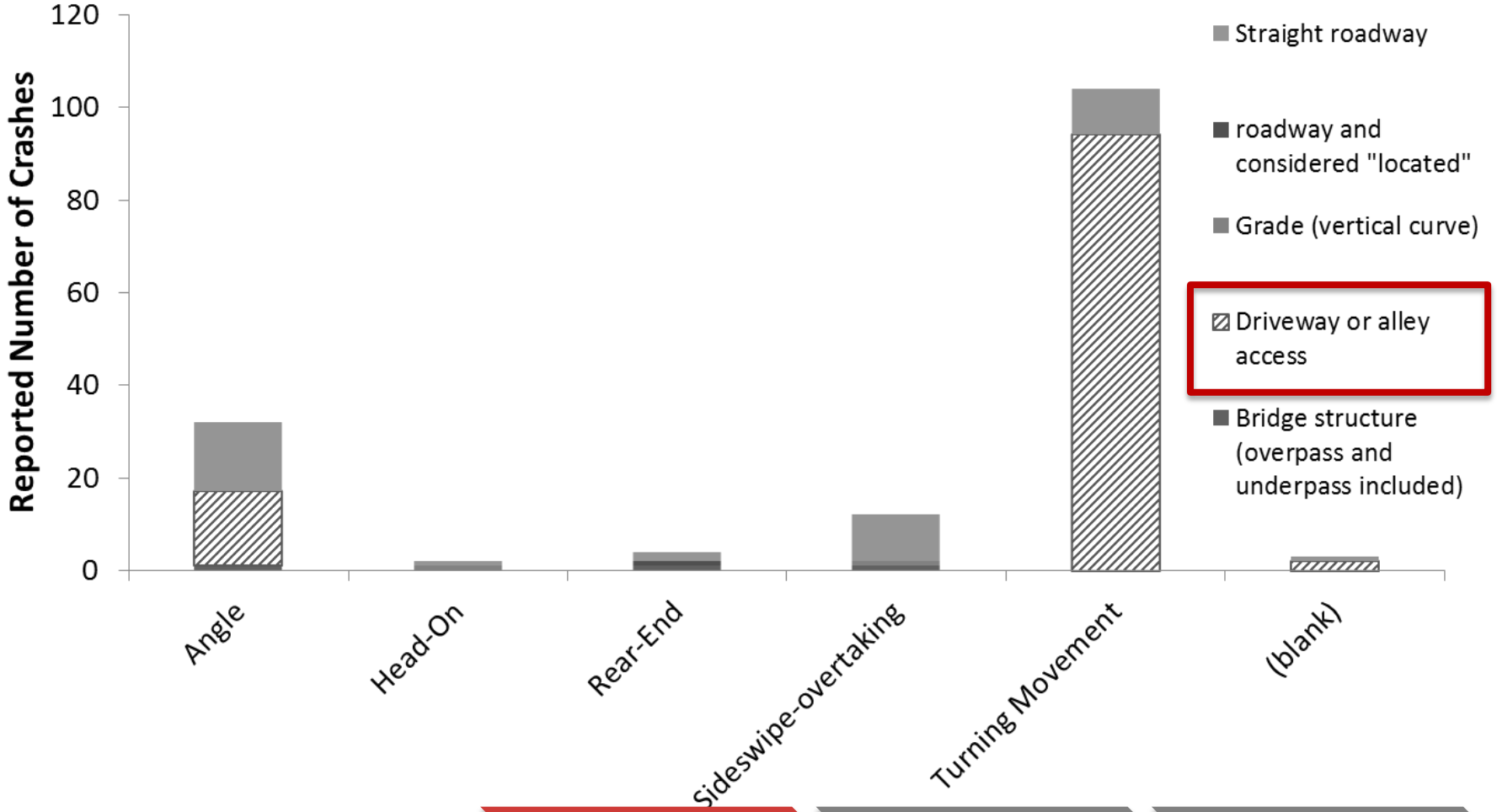


Identify Risk Factors → Select and Prioritize Locations → Develop Systemic Safety Projects

Risk Factors - Pedestrians

- Pedestrian risk factors identified:
  - Number of travel lanes along segments
  - Presence of median on 4-lane roads
  - Posted speed along segments
  - Distance between signals or enhanced crossings
  - Average Daily Traffic
  - Presence of transit stop
  - Number of fatalities or injuries resulting from a pedestrian crash

Risk Factors - Bicycle

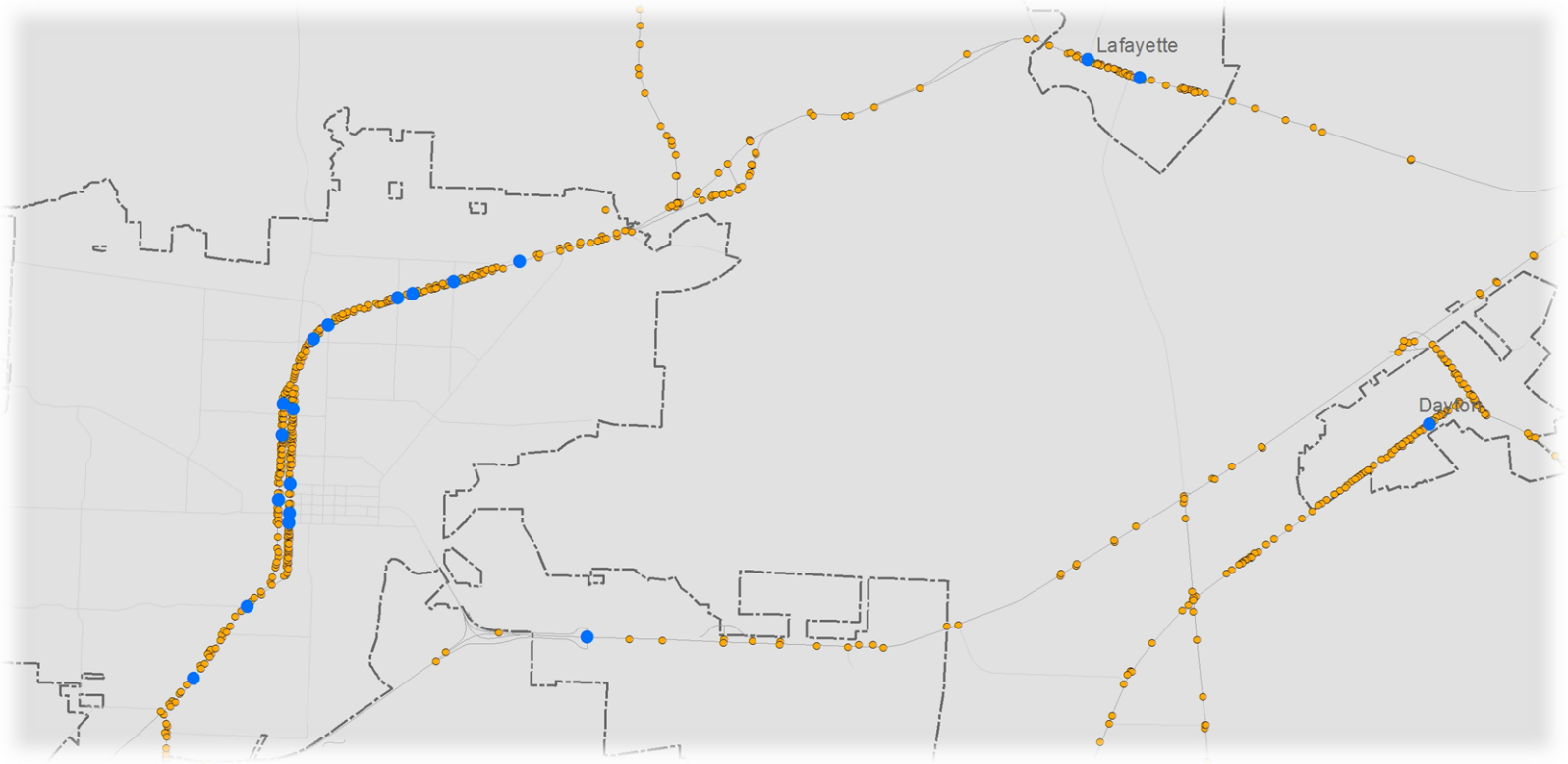
- Bicycle risk factors identified:
  - Number of driveways
  - Number of lanes on major street at intersection
  - Lack of bicycle facility on at least one approach at intersection
  - Proximity to transit stop
  - Average Daily Traffic
  - Number of fatalities or injuries resulting from a bicycle crash

Network Development

- GIS data were aggregated into a linearly-referenced network
- To provide a consistent scale, the network was subdivided into 1/10th of a mile segments
- Separate networks were developed for three levels of the road system
  - Urban State Network (Risk-Based and Traditional)
  - Rural State Network (Traditional)
  - Non-state Network (Traditional)

Risk-Based Network Screening

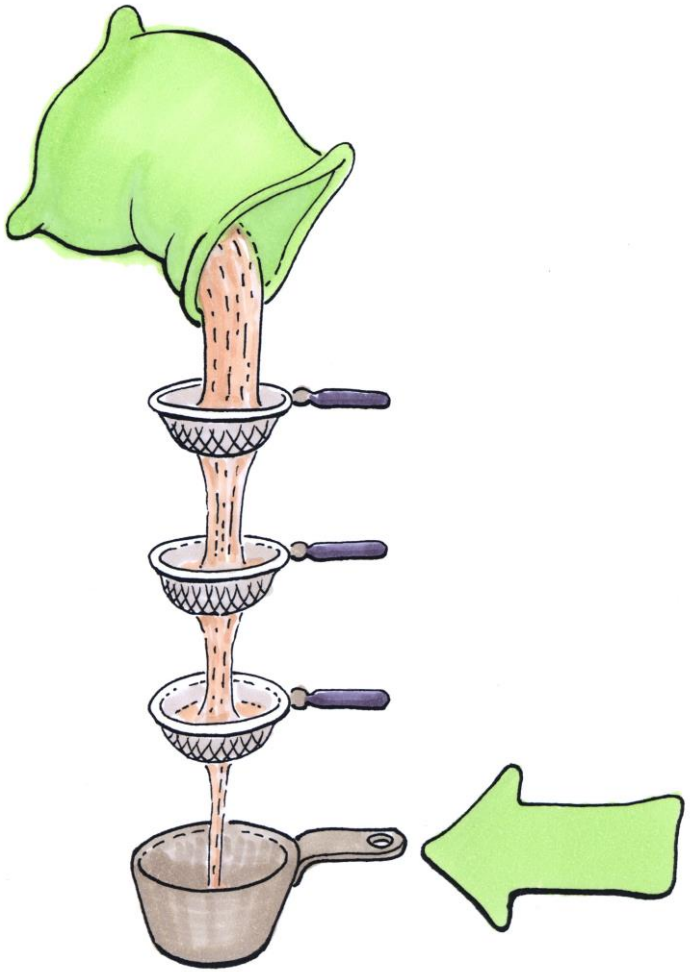
- Example of risk-based correlation between risk factor and crash frequency
- Driveway locations in orange, crash locations in blue



Identify Risk Factors → Select and Prioritize Locations → Develop Systemic Safety Projects

Risk-Based Site Prioritization

- Segments were scored based on the number of risk factors present
  - Some risk factors carry higher point value than others
  - Scoring based on risk factors on the segment
- Consecutive segments with high scores were aggregated into project corridors



Identify Risk Factors → **Select and Prioritize Locations** → Develop Systemic Safety Projects

Risk-Based Site Prioritization

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Risk Factor	Data	Score
How many driveways or alleys are located on the corridor?		

Risk Factor	Data	Score	Score Methodology
Is at least 1 traffic signal located within 100' of the segment?			1 point if at least 1 signal is located on the segment or within 100' of the segment
Is the corridor an undivided, 4-lane segment?			2 points if segment is an undivided 4-lane segment
How many transit stops are located within 100' of the segment?			1 point for segments with 1 transit stop located on the segment or within 100' of the segment; 2 points for 2 or more transit stops
Does the left side of the road have a bicycle facility?			2 points awarded for the lack of bicycle facility on the left side of the road
Does the right side of the road have a bicycle facility?			2 points awarded for the lack of bicycle facility on the right side of the road
AADT of corridor			2 points for AADT between 12,000 and 18,000; 4 points awarded for AADT above 18,000
What is the posted speed limit?			2 points for posted speed limit of 35 or 40 mph; 4 points for posted speed limits above 40 mph
How many driveways or alleys are located on the			2 points awarded for segments with 1 driveway; 3 points for segments with 2-3 driveways; 4 points for segments with 4 to 8 driveways; 5 points for segments
resulting from bicyclist-involved crashes*			reported; 2 additional points awarded for each additional injury
Number of fatalities resulting from bicyclist-involved crashes*			4 points awarded for fatalities
Total Score			

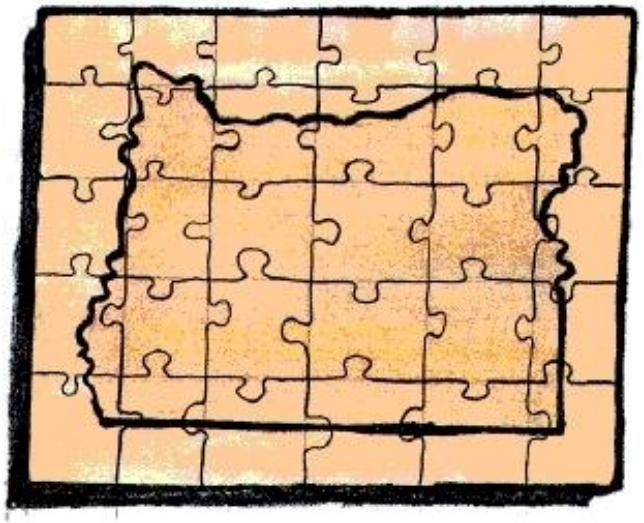
2 points awarded for segments with 1 driveway; 3 points for segments with 2-3 driveways; 4 points for segments with 4 to 8 driveways; 5 points for segments with more than 8 driveways

All crash history should reflect the latest five years of available data.

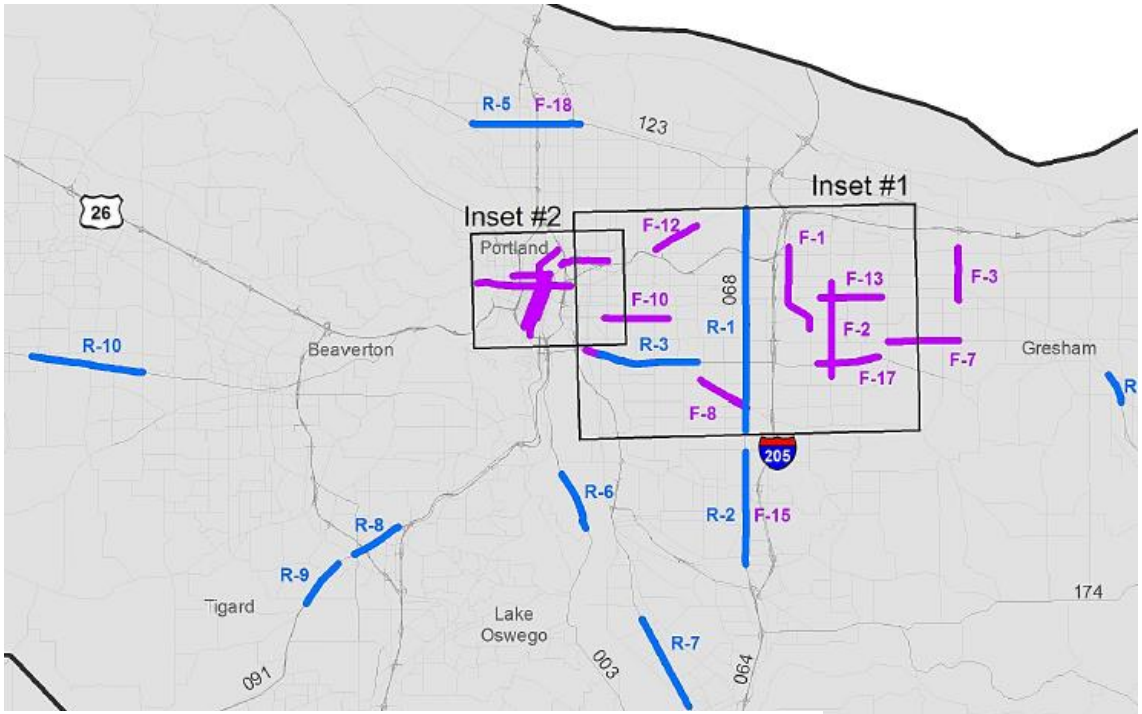
Traditional Method Site Prioritization

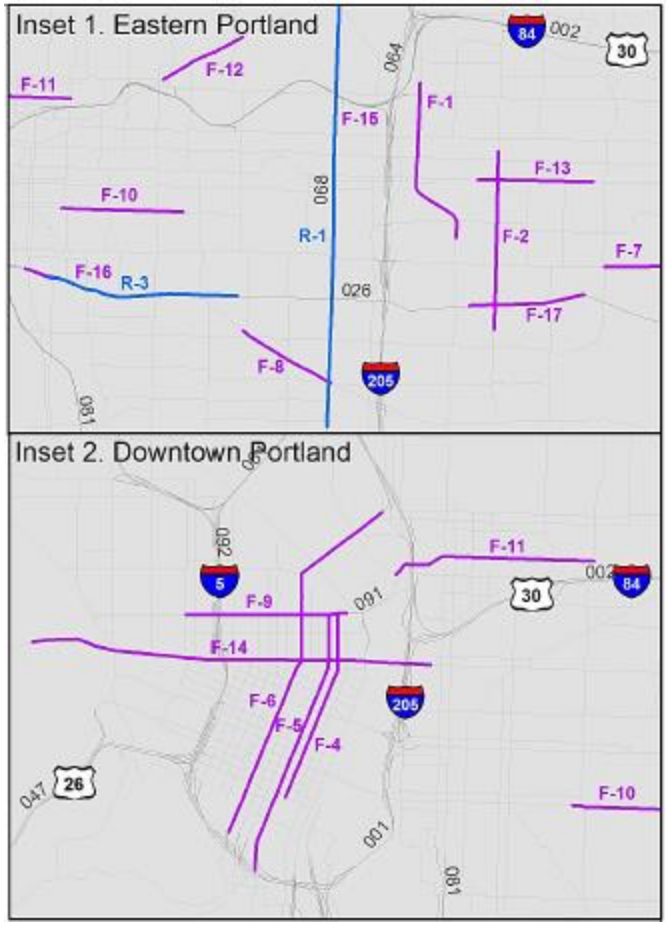
Traditional

- Identify corridors with highest frequency of severe-injury and fatal crashes for the entire state
- Scoring based on total number of severe-injury and fatalities along the segment
- Segments were aggregated into project corridors based on proximity and prioritized by overall score



Prioritized Corridor Maps – R4 Pedestrian Example





(R) Risk-Based Pedestrian Project Corridors

(F) Frequent and Severe Pedestrian Crash Project Corridors

ODOT Region Boundary

State Roadways

Non-State Roadways

Identify Risk Factors → **Select and Prioritize Locations** → Develop Systemic Safety Projects

Systemic Countermeasures

- Countermeasures evaluated based on
  - Documented effectiveness
  - Ease of implementation
  - Relative cost
- Countermeasure toolbox developed with input from stakeholders and project management team
- Includes several FHWA Proven Safety Countermeasures

Graphic source: FHWA

Example Countermeasures – Pedestrian

Crash Countermeasures by Area Type and Traffic Control	Relative Construction Cost	Relative Ease of Implementation	Countermeasure Effectiveness*	Relative Reliability of CMF
All Locations				
Signalized				
Lighting	2	2	0.58	1
Right-turn channelization island	2	2	Reduces conflict points	N/A
Signal Timing - Install countdown signals	1	1	0.45	2
Signal Timing - Leading pedestrian/bicyclist interval	1	1	0.63	2
Signal Timing - Modify left-turn phasing	1	1	Reduces conflict points	N/A
Vehicle turning movement restrictions	1	2	Reduces conflict points	N/A
Unsignalized				
Enhanced crossing treatment	1	2	0.58	2
Lighting	2	2	0.58	1
Reduce curb radii	2	2	Reduces speed	N/A

Example Countermeasures – Bicycle

Crash Countermeasures by Area Type and Traffic Control	Relative Construction Cost	Relative Ease of Implementation	Countermeasure Effectiveness*	Relative Reliability of CMF
All Locations				
Signalized				
Bike detection	1	1	Accounts for human factors	N/A
Lighting	2	2	0.58	1
Pavement markings	1	1	Accounts for human factors	N/A
Right-turn channelization island	2	2	Reduces conflict points	N/A
Signal Timing - Leading pedestrian interval	1	1	0.59	2
Signal Timing - Modify left-turn phasing	1	1	Reduces conflict points	N/A
Vehicle turning movement restrictions	1	2	Reduces conflict points	N/A

Implementation Plan Content

- Prioritizes bicycle and pedestrian corridors for safety improvements
  - Risk-based prioritization for State Highways in urban areas
  - Traditional prioritization for all roadways (State and Non-State)
- Countermeasure Toolbox to assist in determining safety improvements

Implementation Plan Benefits

- Directs funding/staff resources to locations with greatest potential for crash reduction
- Allows region/local agency flexibility to select countermeasures
- Informs educational and enforcement efforts

Improving the Plan

- Opportunities to improve data:
  - Consistency across jurisdictional boundaries
  - Broader spatial coverage
  - Crash reporting details for pedestrian and bicycle crashes
  - Exposure data
- Evaluate Effectiveness of Implementation
- Enforcement and Education

Questions?

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- Plan available online at: http://www.oregon.gov/ODOT/HWY/TS/Pages/Bicycle_Pedestrian_Safety.aspx or search "Oregon bicycle pedestrian safety implementation"