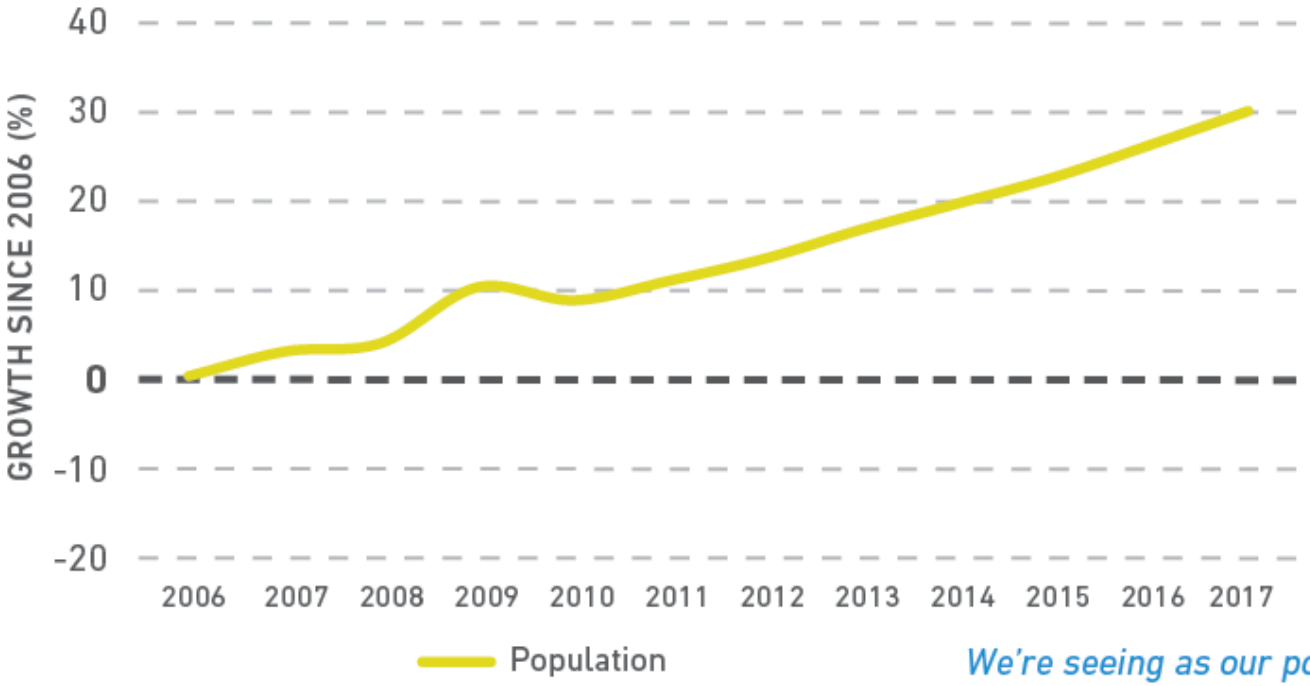
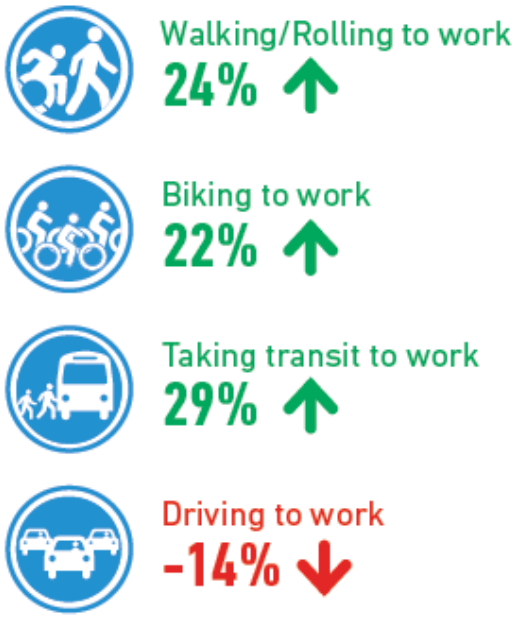
Bicycle and Pedestrian Safety Analysis – Phase 2

SDOT
Seattle Department of Transportation

Seattle and Vision Zero

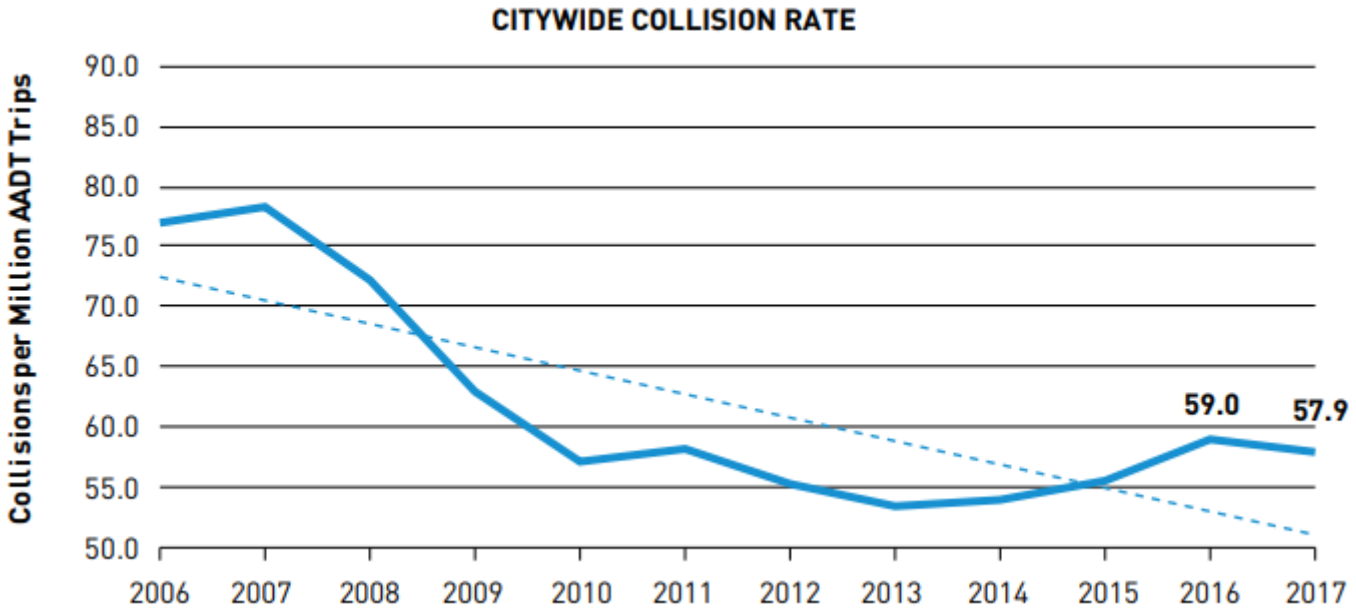
- Targeting zero severe/fatal collisions by 2030





We're seeing as our population continues to grow, people are choosing to walk/roll, ride a bicycle, or use transit to travel to work instead of driving a car.

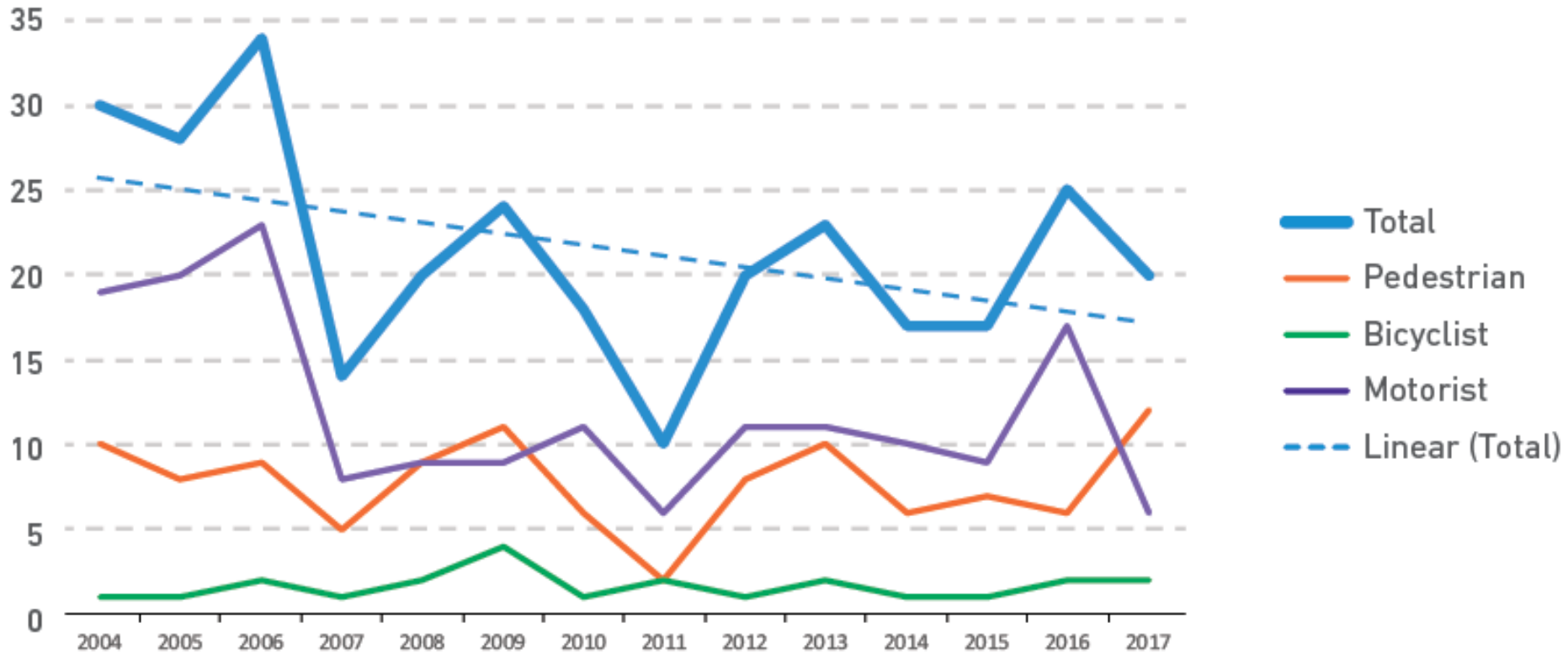
Data



Pedestrian and bicycle collisions make up 7% of total crashes but 46% of fatalities

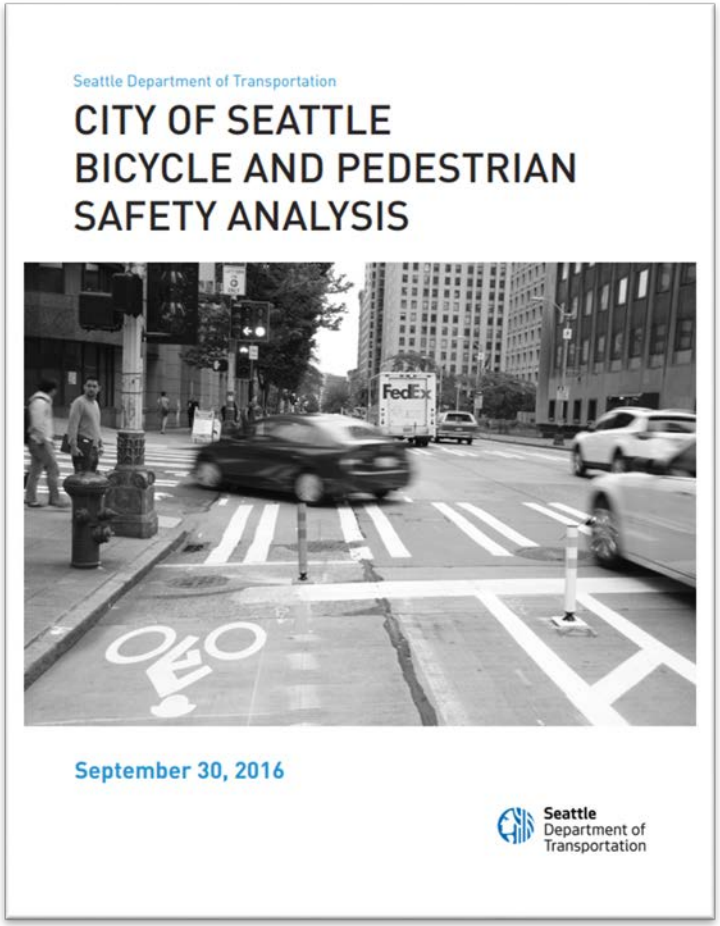
9 out of 10 reported bicycle/pedestrian collisions result in injury

Citywide Fatal Counts by Mode



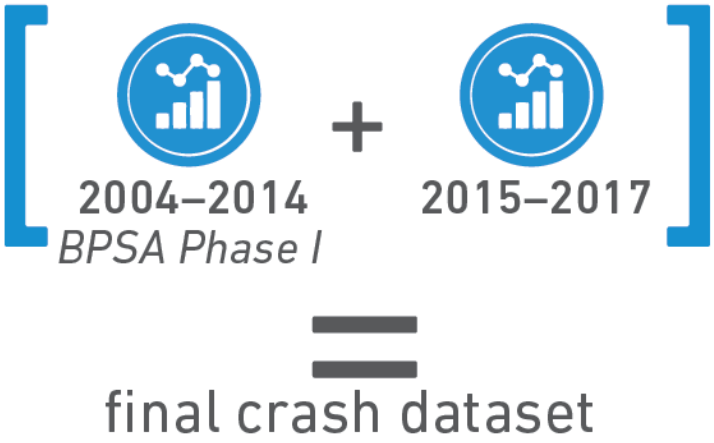
Purpose of Bicycle and Pedestrian Safety Analysis (BPSA)

- Produced in 2016
- Improved understanding of risk factors contributing to pedestrian and bicyclist crashes
- Used to address crash risk proactively and systemically
- Advanced Seattle's Vision Zero Goals

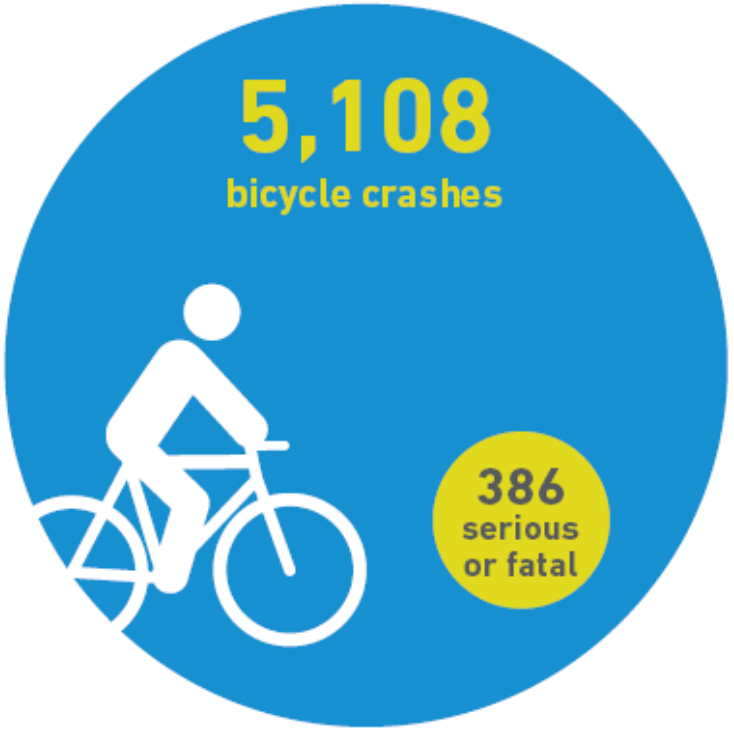


BPSA Phase 2

- Folded in 3 additional years of data
- Developed a more robust exposure model for bicycle and pedestrian activity
- Evaluated protected bike lane safety
- Conducted video analysis of bicycle facility interactions with vehicle movements

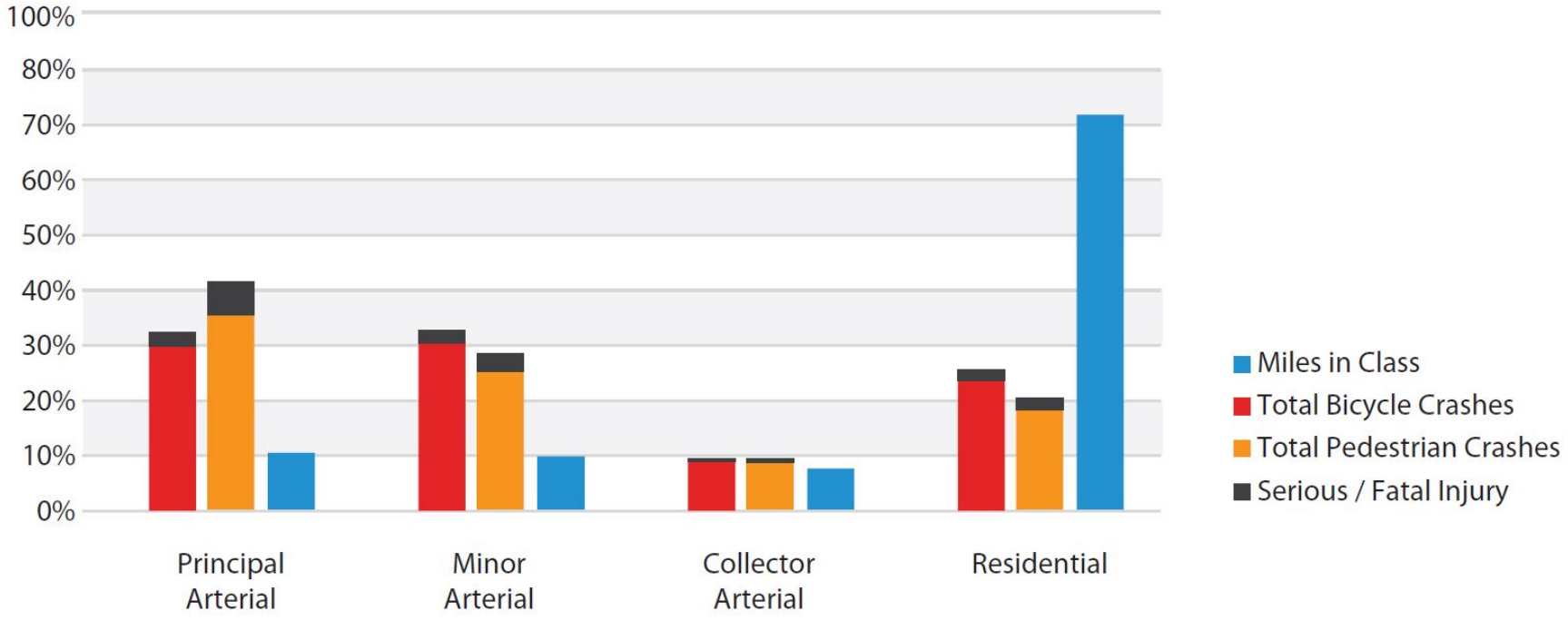


Data At a Glance – Crash Data

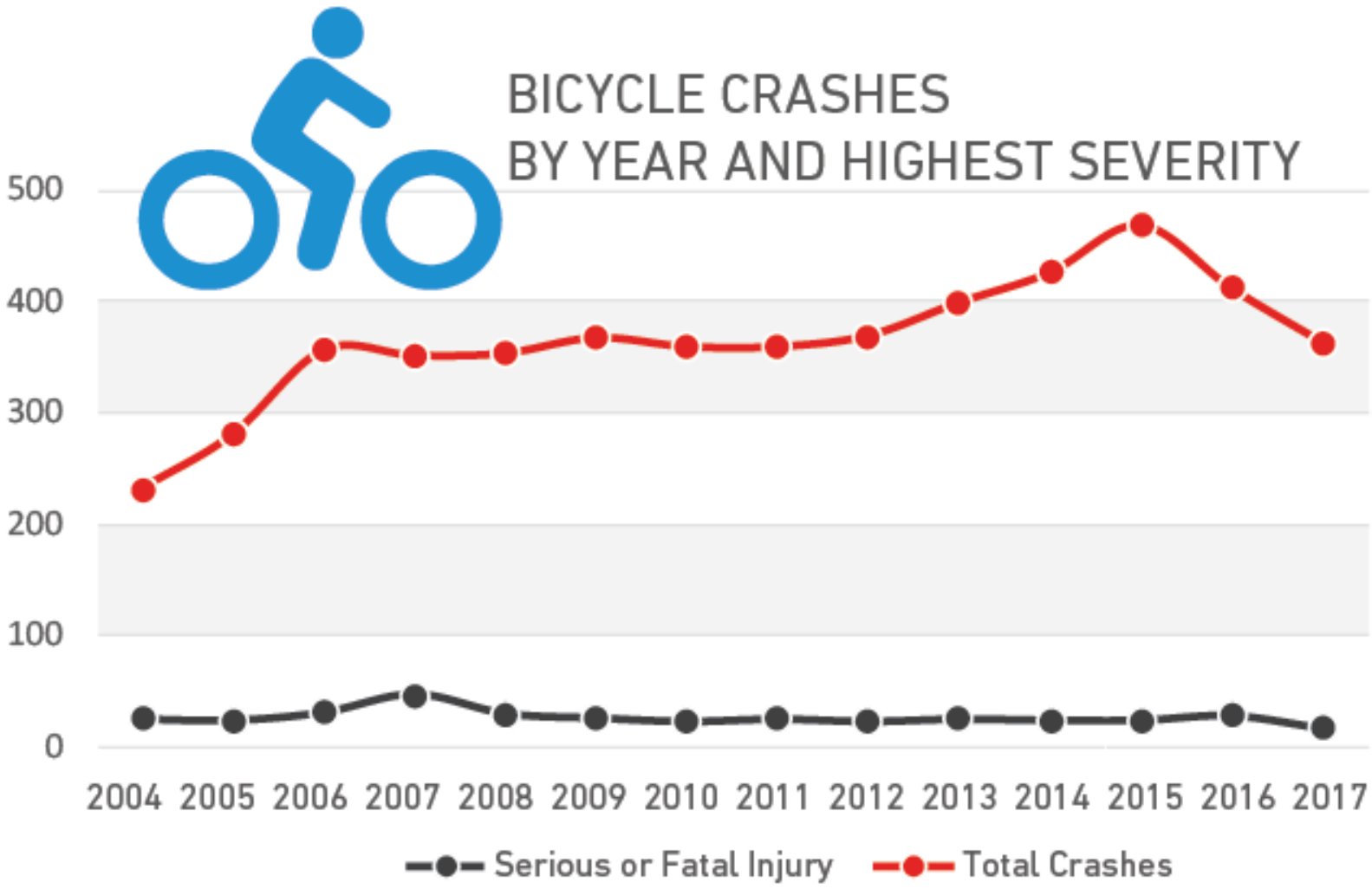


Exploratory Analysis

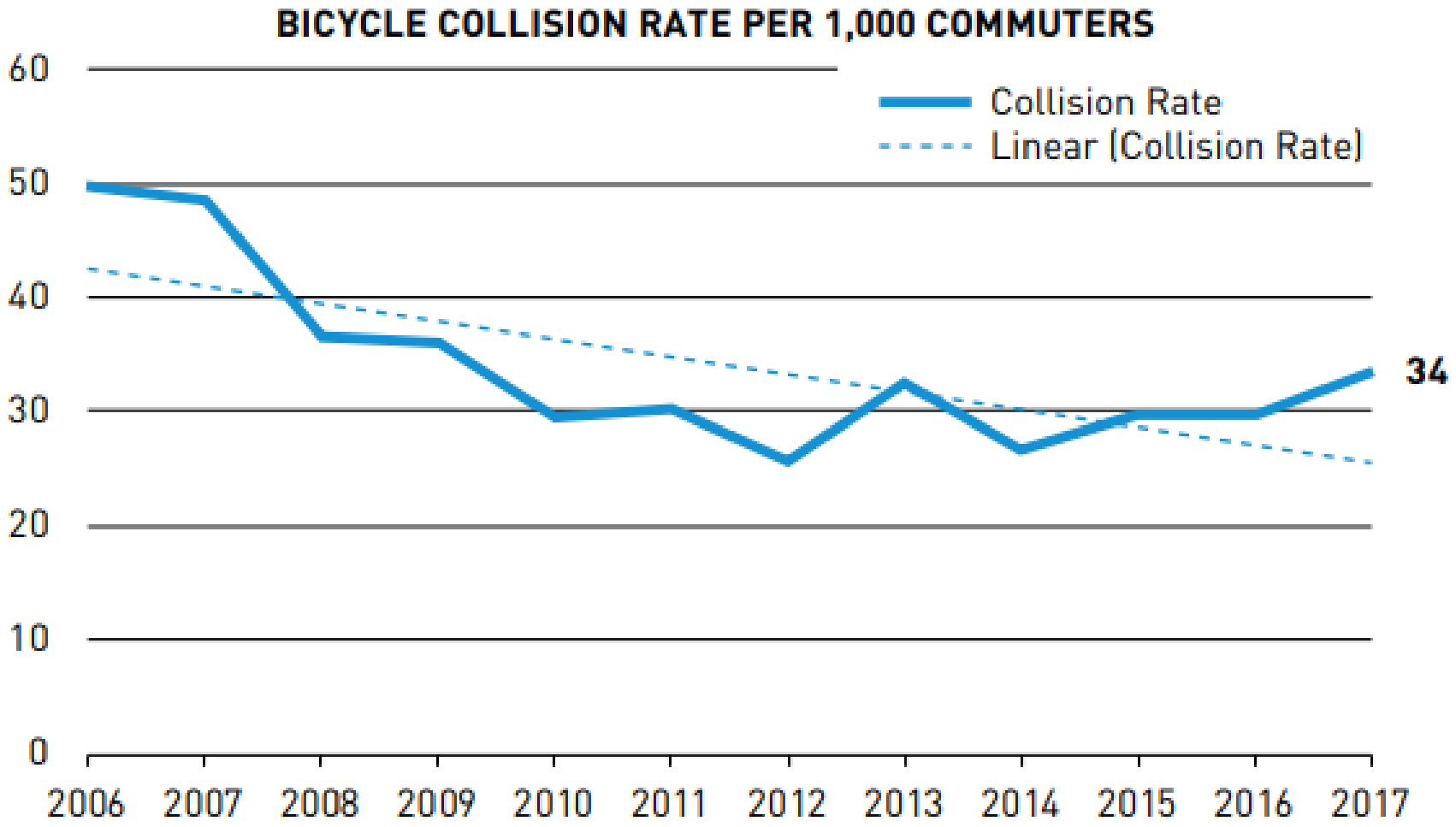
74.5% OF BICYCLE CRASHES AND NEARLY 80% OF PEDESTRIAN CRASHES HAPPEN ON ARTERIAL STREETS.



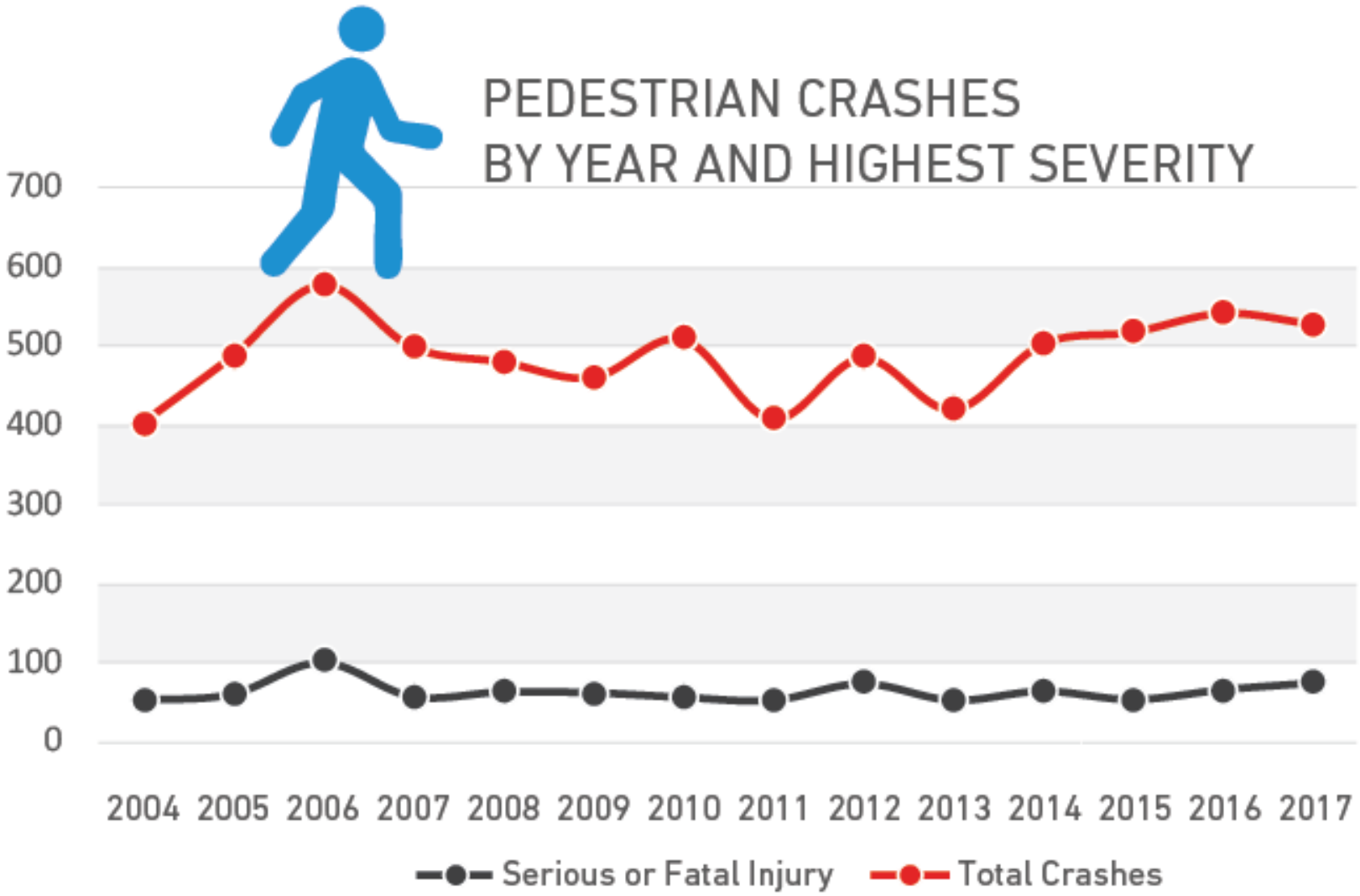
Bicycle Collision Trends



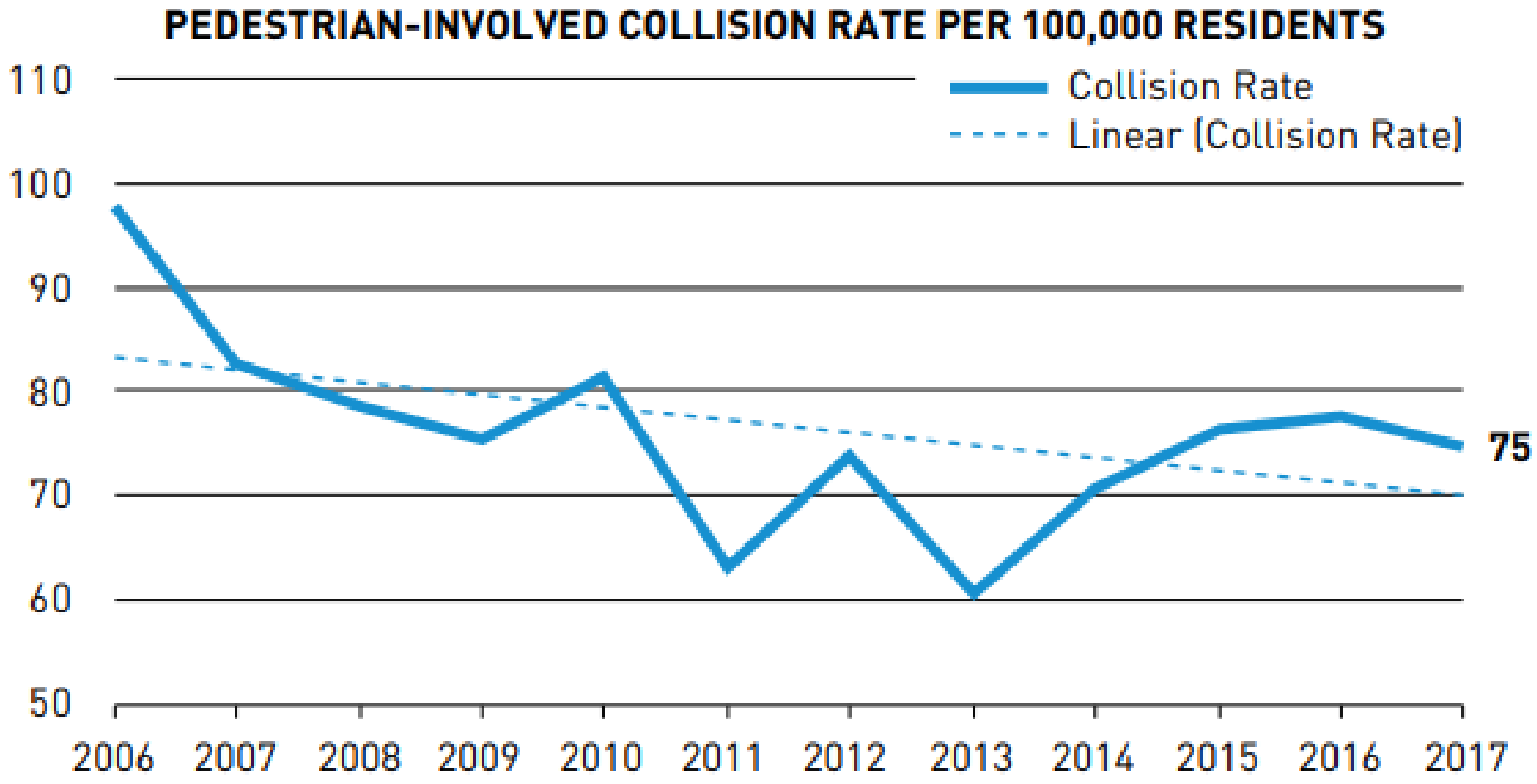
Bicycle Collision Rates



Pedestrian Collision Trends



Pedestrian Collision Rates



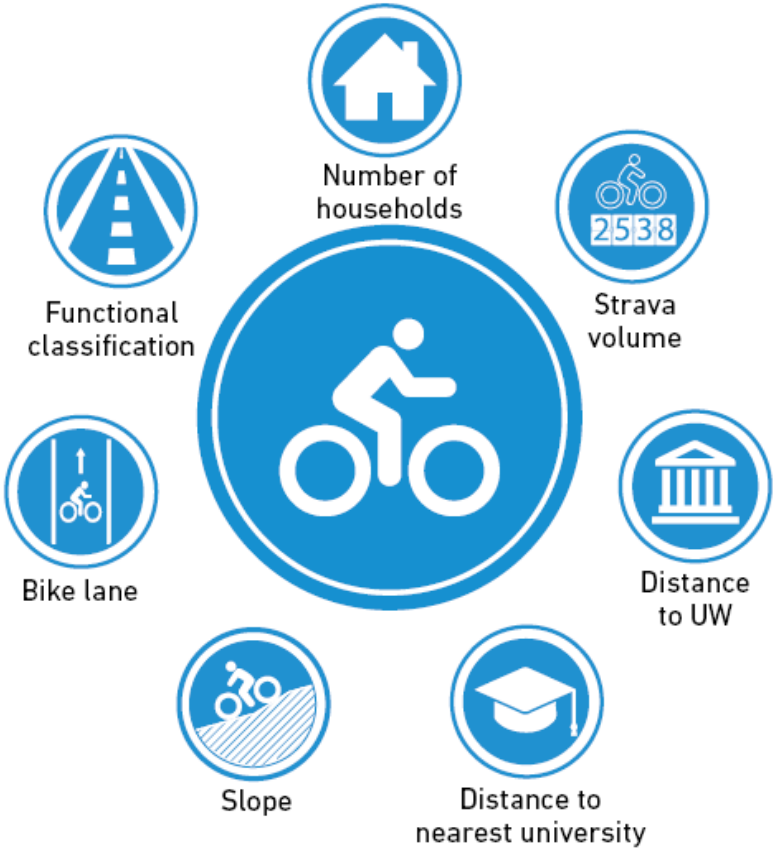
Initial Attempts at Accounting for Exposure

Exposure = level of pedestrian/bicycling activity

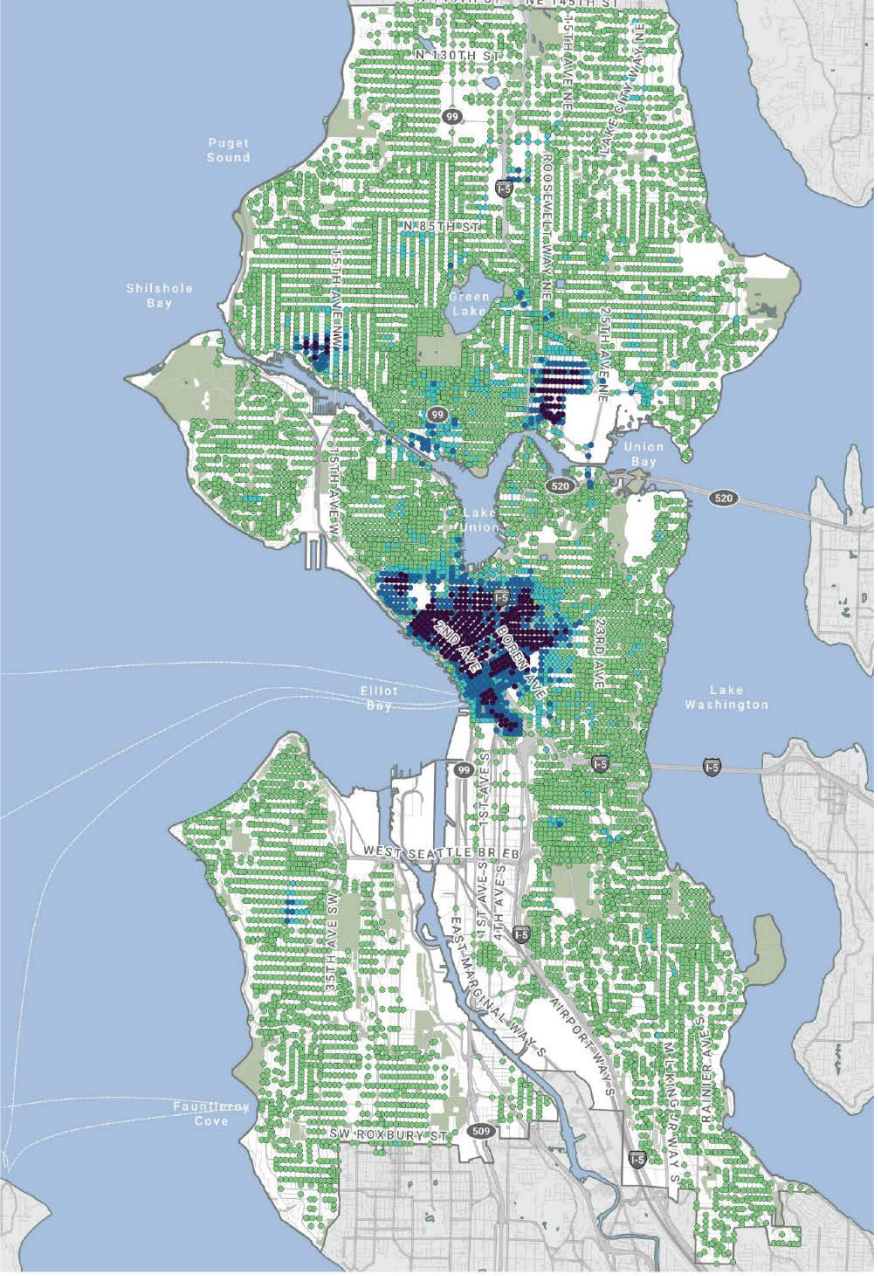
Trip generators: housing units (single family or multifamily), commercial destinations, transit locations, and universities or schools.

What's Different This Time Around?

Revised exposure models for pedestrian and bicyclist activity.



Pedestrian Volumes

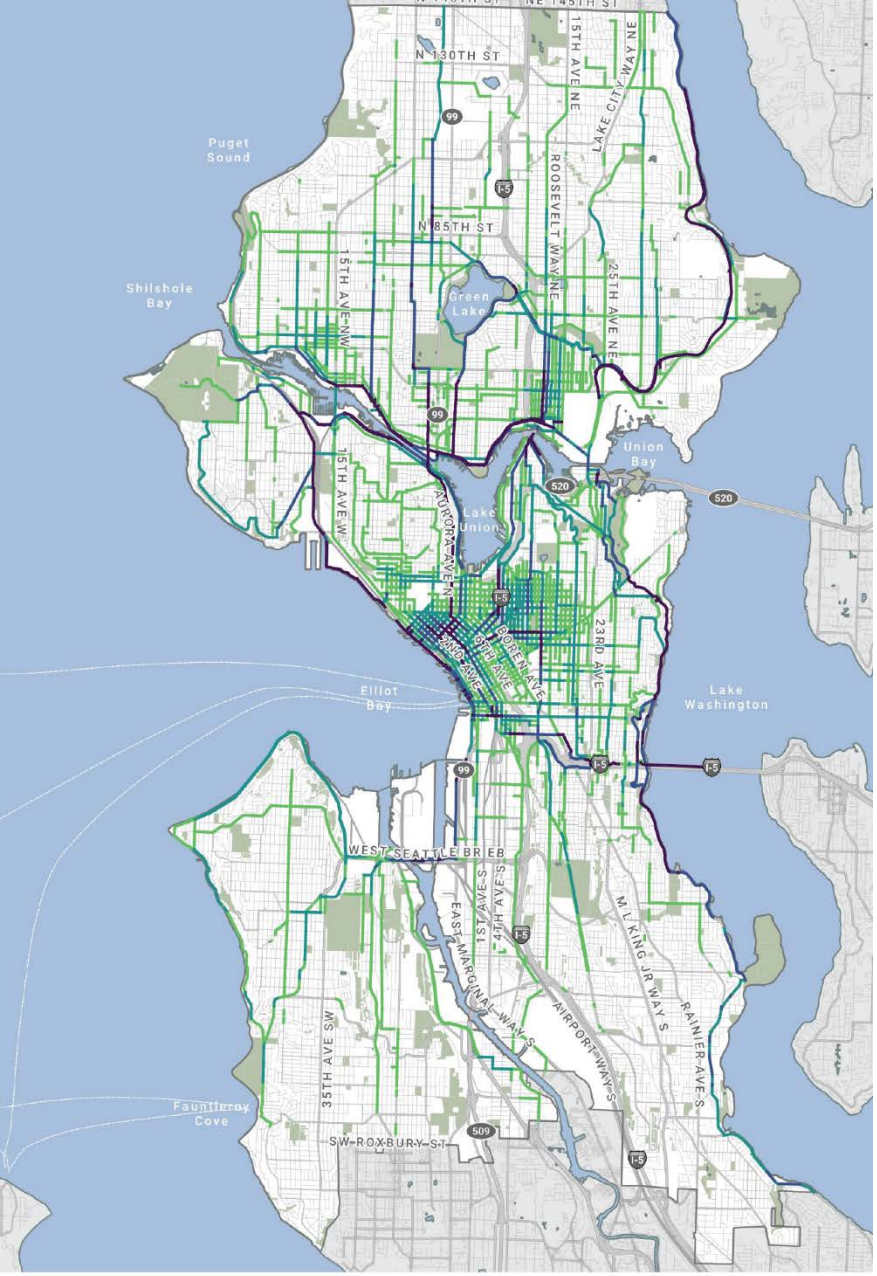


Modeled Pedestrian Intersection Volumes
Note: volumes < 114 are not displayed
- 114 - 1,181
- 1,181 - 2,449
- 2,449 - 7,051
- 7,051 - 48,161

N

0 1 2 Miles

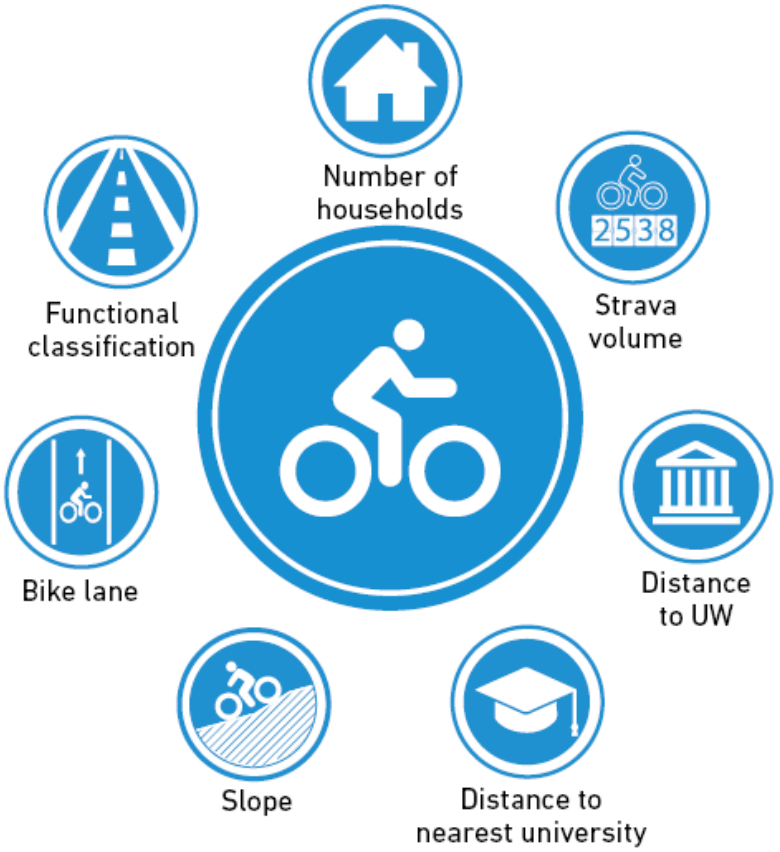
Bicyclist Volumes

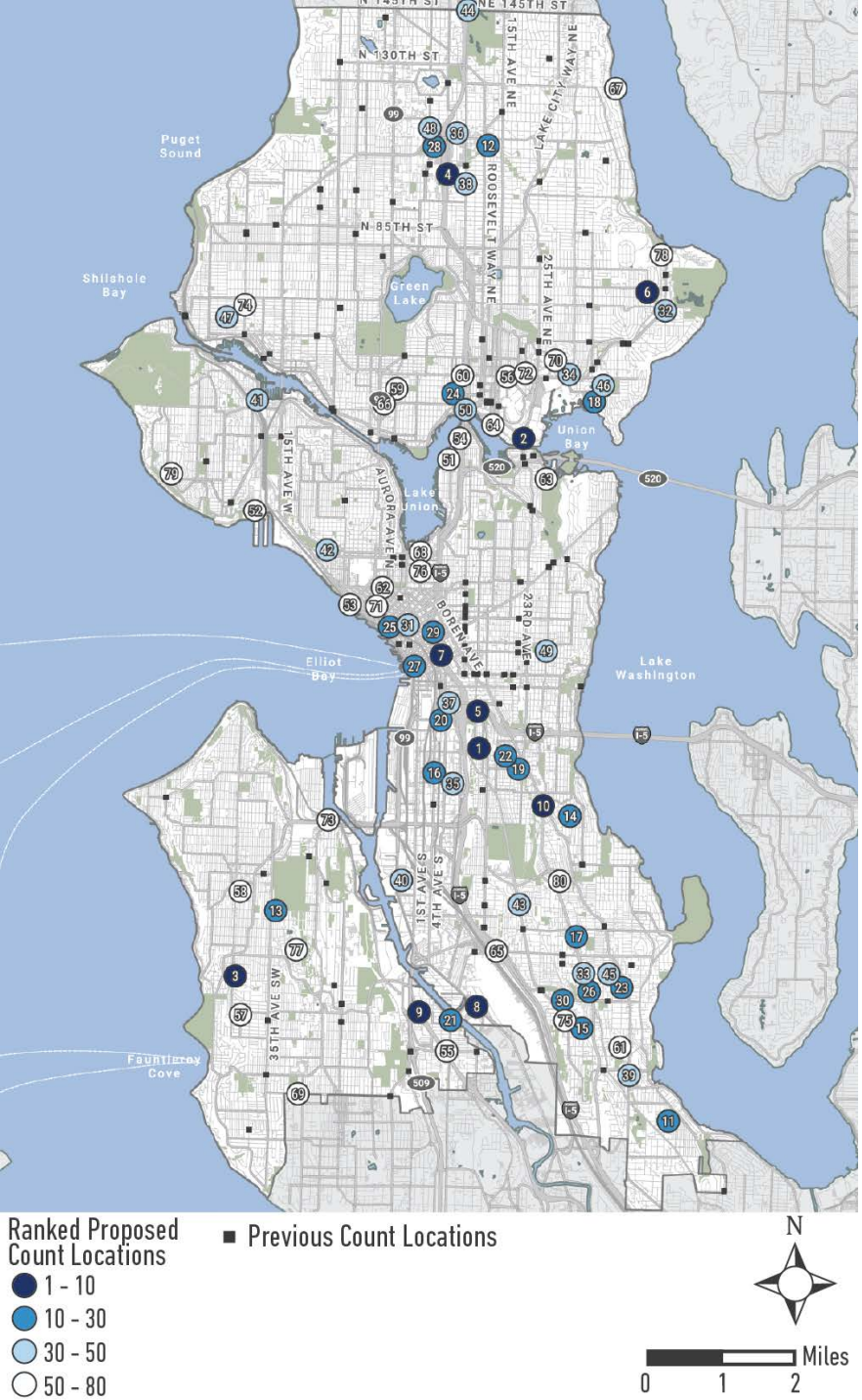


Modeled Bicycle Segment Volumes
Note: volumes < 31 are not displayed
- 31 - 99
- 99 - 337
- 337 - 672
- 672 - 8,306

N

0 1 2 Miles

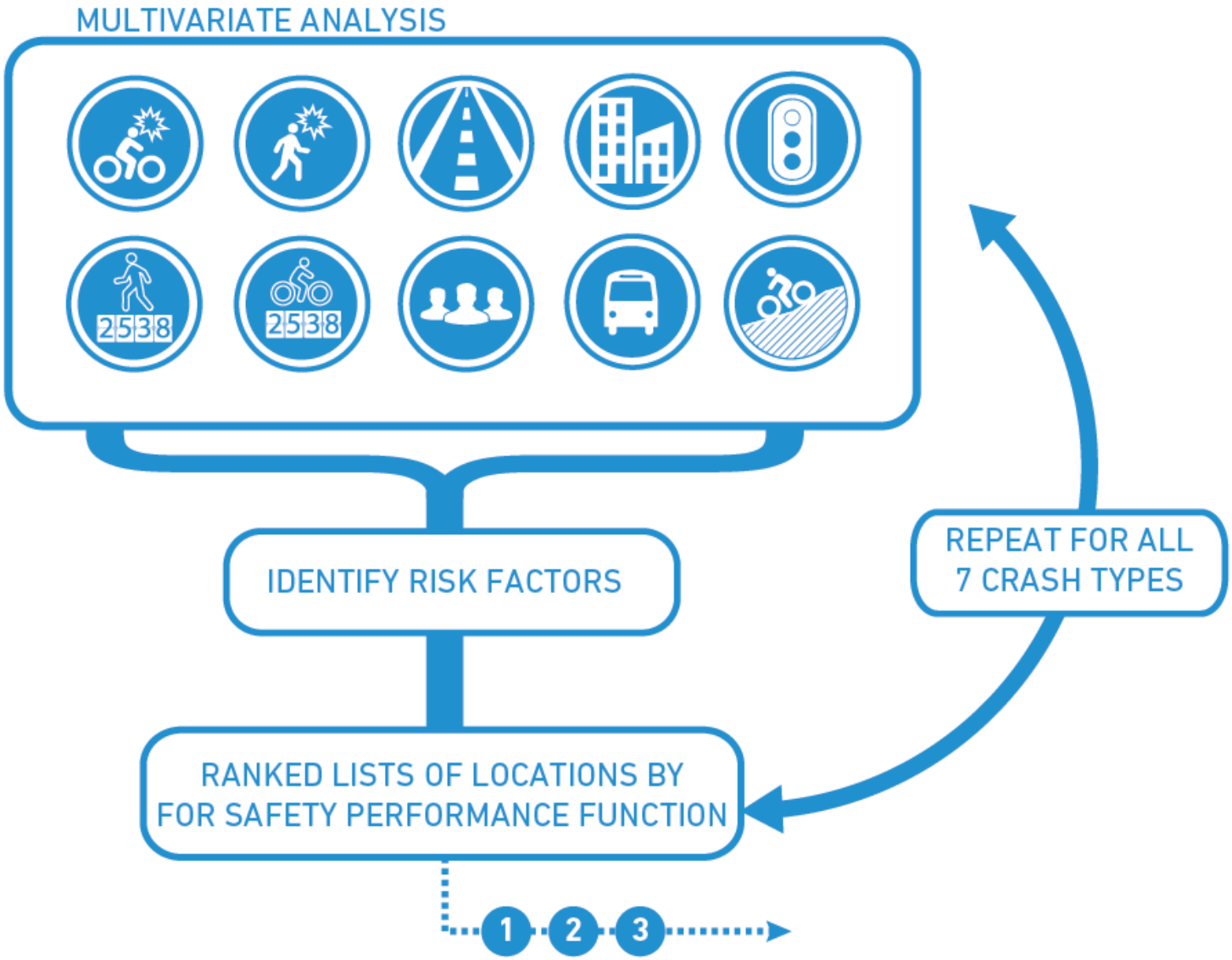




Count Location Optimization Effort

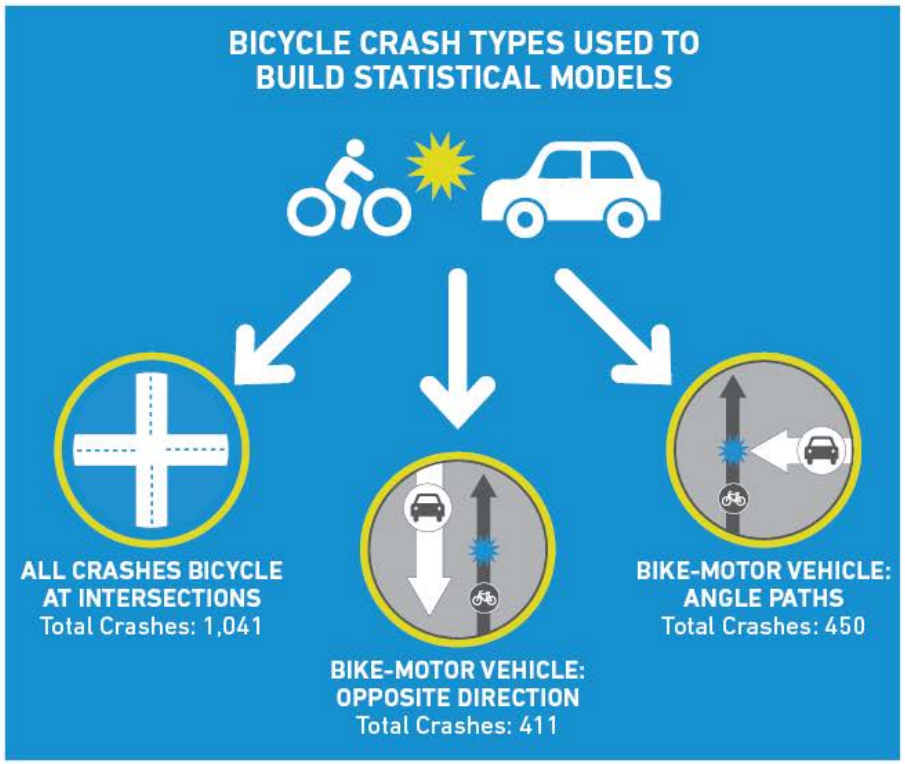
- Fills in gaps where volume data hasn't been collected
- Recommends priority count locations based on factors identified as predictors for volume

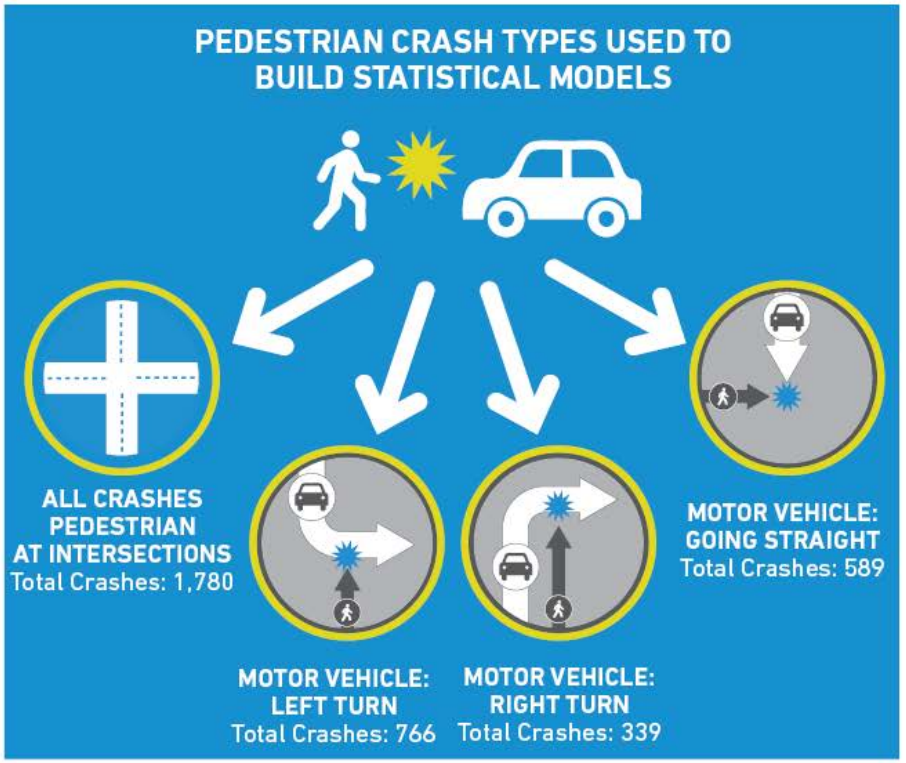
Leading Edge Analysis



A Proactive, Systemic Approach

Focusing on modeled performance factors at **intersection locations** based on 7 collision types





All Bicycle-Motor Vehicle Collision Types

Number of Legs

Intersections with more legs are positively associated with higher numbers of bicycle crashes.

Universities

Intersections within a quarter mile from a university were positively associated with crashes.

Number of One-Way Legs

The presence of one-way legs at intersections is *negatively* associated with bicyclist crashes.

Non-Through Lanes

Turn lanes, center left-turn lanes, and peak-hour bus lanes are positively associated with crashes.

Urban Villages

The Urban Village designations were positively associated with crashes. Residential Urban Villages is the only designation with significant association.

Opposite Direction Bicycle-Motor Vehicle Collision Types

Number of Legs

Intersections with more legs are positively associated with higher numbers of bicycle crashes.

Bicycle Volume

As bicycle volumes increase, the number of bicycle crashes per capita decrease (safety in numbers effect).

Stop Signs

All-way stop-controlled intersections have lower crash risk than partially stop-controlled intersections.

Traffic Signals

Signalized intersections are likely positively associated with increased traffic exposure and conflicting movements.

High Traffic Volumes

Areas with higher vehicle volumes have fewer bicycle crashes, but also have lower bicycle volumes.

Urban Villages

The Urban Center Village designations were most associated with crashes, followed by the Hub Urban Village and Residential Urban Village designation.

Angle Paths Bicycle-Motor Vehicle Collision Types

Number of Legs

Intersections with more legs are positively associated with higher numbers of bicycle crashes.

Bicycle Volume (Safety in Numbers)

We did NOT observe the safety in numbers effect. As bicycle volumes increases, so did the risk of angled crashes.

Crosswalks

All-way stop-controlled intersections have lower crash risk than partially stop-controlled intersections.

Shared Use Paths

Intersections with a shared use path were found to be positively associated with bicycle crashes.

High Traffic Volumes

As motor vehicle traffic increases, angles crashes increase even when controlling for traffic volumes.

Urban Villages

The Residential Urban Village was most associated (positive) with bicycle crashes, followed by Urban Center, Hub Urban Village, and Urban Center Village.

All Pedestrian-Motor Vehicle Collision Types

Intersection size

Intersections with more legs and lanes are positively associated with higher numbers of pedestrian crashes.

Functional Classification

Major and minor arterials, had a significant and positive association with pedestrian crashes.

Safety in Numbers

As more people walk/roll to connect to transit and other daily needs, the number of crashes per trip is decreasing.

Arterial-Residential Intersections

The combination of major arterial roadways and non-arterial roadways at intersections were found to be positively associated with crashes.

Left Turn Pedestrian-Motor Vehicle Collision Types

Protected Left Turn Signal Phase

Intersections with a protected left turn signal phase have a lower “left hook” crash risk than permissive of protected/ permissive signal phases.

Speed Limit

Intersections with higher maximum posted speeds have a slightly positive association to left turn related crashes.

Striped Left Turn Lane

Intersections with striped left turn lanes are associated with lower risk of “left hook” crashes.

Right Turn Pedestrian-Motor Vehicle Collision Types

Transit Stops

Transit stops were found to have a positive association with right hook crashes.

Non-Through Lanes

Turn lanes and peak-hour bus lanes are positively associated with “right hook” crashes

Arterial-Residential Intersections

Intersections of arterial streets and non-arterial streets had a strong association with “right hook” crashes.

All-Way Stop Signs

All-way stop-controlled intersections had a stronger (and positive) association to crashes than partially stop-controlled intersections.

Straight Pedestrian-Motor Vehicle Collision Types

Transit Stops

Transit stops were found to have a positive association with crashes, possible related to multiple-threat scenarios.

Non-Through Lanes

Turn lanes and peak-hour bus lanes with a positive association with crashes.

Traffic Signals

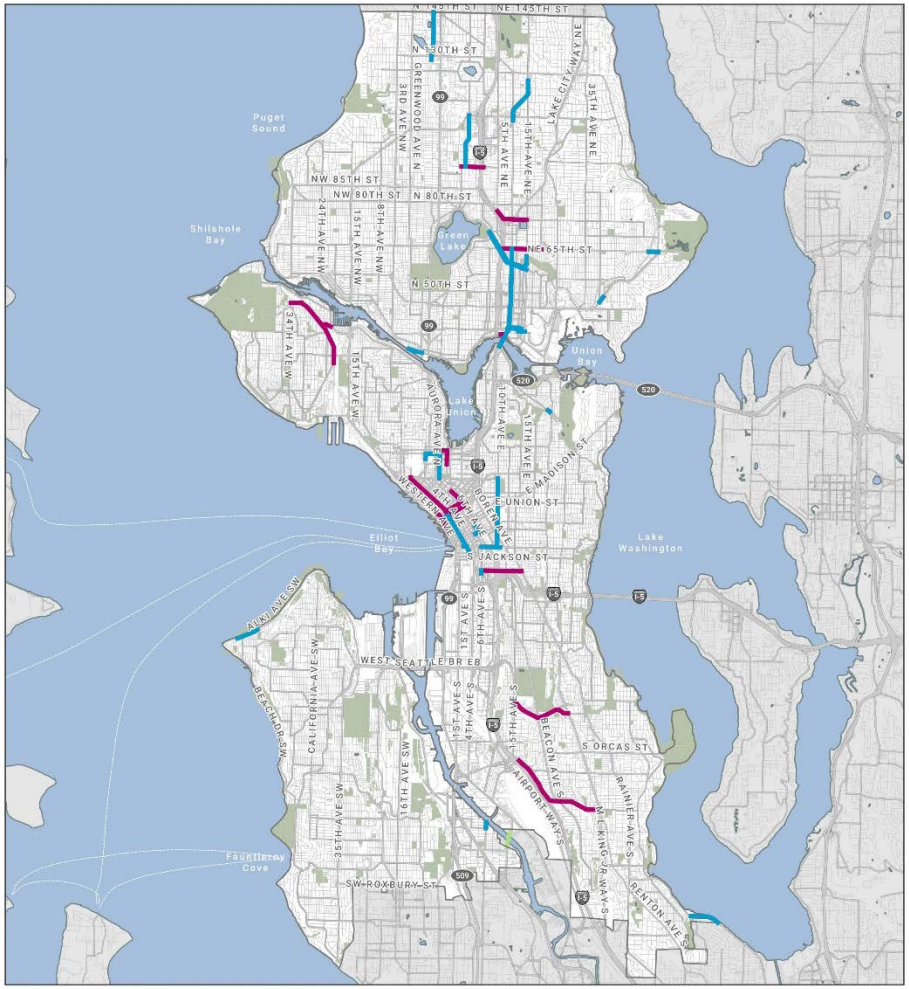
Intersections with a traffic signal were found to have a positive association with crashes.

All-Way Stop Signs

All-way or partial-control (i.e. 2-way) stop-controlled intersections had a strong and positive association to crashes.

Protected Bike Lane (PBL) Evaluation Approach

- Created a PBL construction database
- Developed descriptive statistics on bicycle, pedestrian, and vehicle crash numbers and patterns on the PBLs
- Prioritized PBLs for video analysis



PBL Evaluation Findings

- PBLs led to a reduction of bicycle crashes on most streets (before vs. after crash frequencies)
- Lower crash frequencies at intersections with *both* a left turn lane and a protected left turn signal phase
- Lower crash frequencies on one-way PBLs than two-way PBLs (crash per mile basis)
- Mid-block and driveway related crashes are significant on two-way PBLs

PBL Evaluation Video Analysis

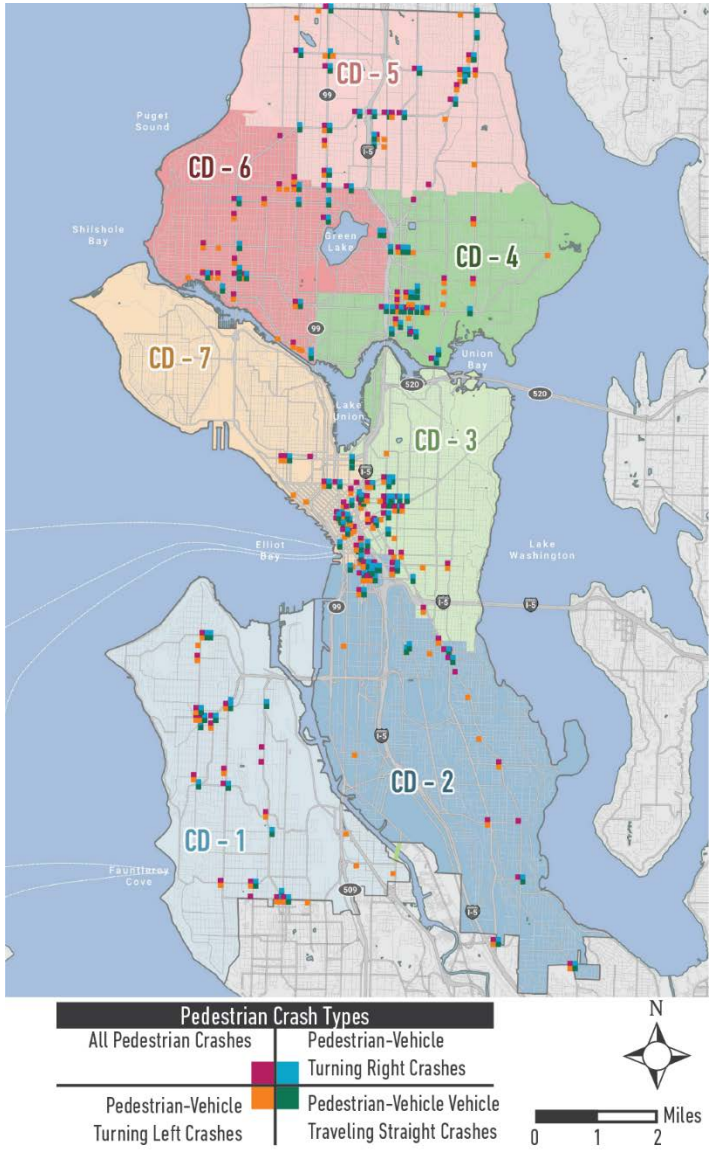
PBL Evaluation Locations

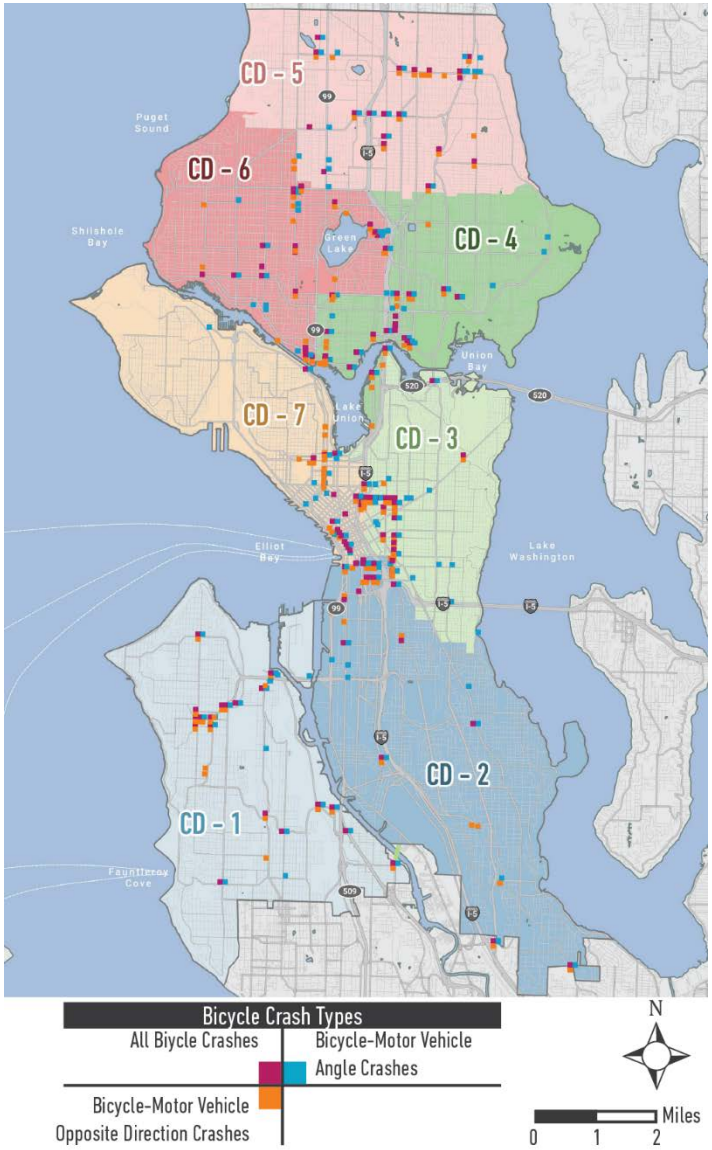
- 2nd Ave and Pike St
- 6th Ave and Pine St
- Dexter Ave N and Thomas St
- Broadway and E Union St
- Linden Ave N and N 135th St
- Eastlake Ave E and E Edgar St

How is Seattle Using These 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

How is Seattle Using These Findings?





Questions?

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http://www.seattle.gov/visionzero




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