Local Road Safety Assessments

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Seeing the Big Picture

Finding the Best Opportunities fo Improvement

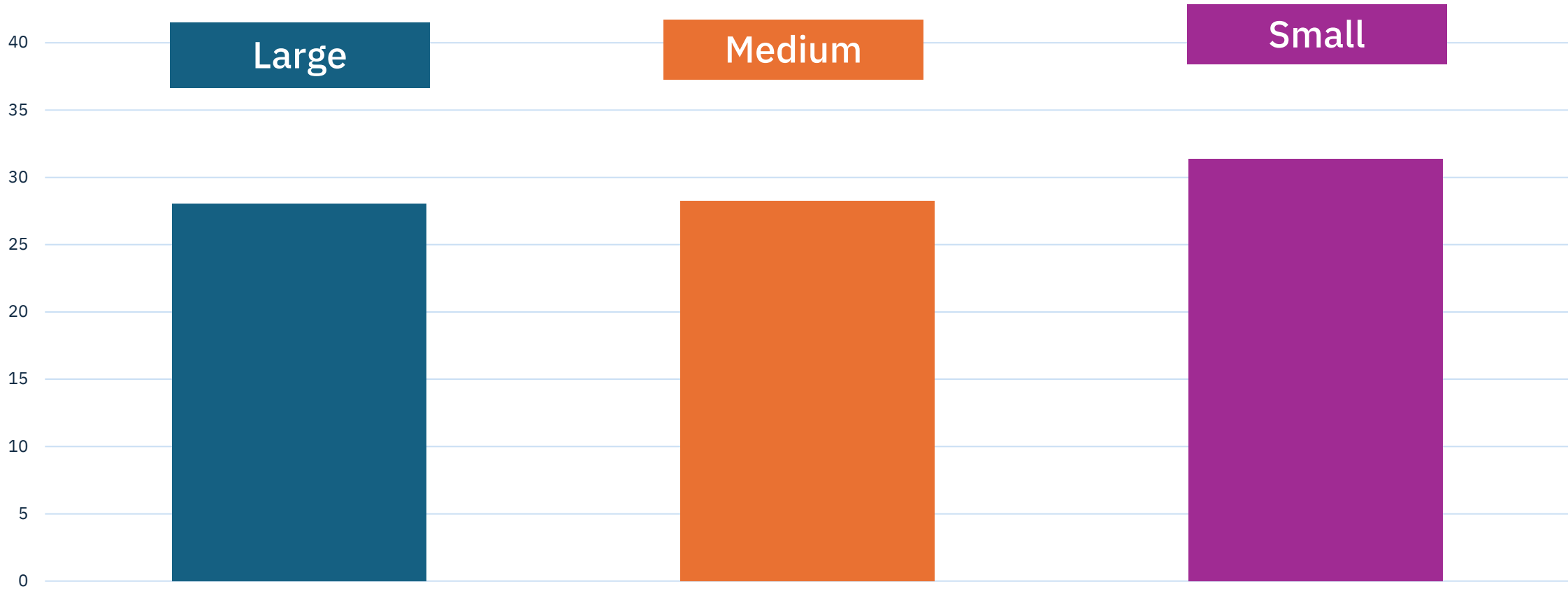
Addressing the Issues

Understanding the Role of Speed in Crash Severity

Selling Safety

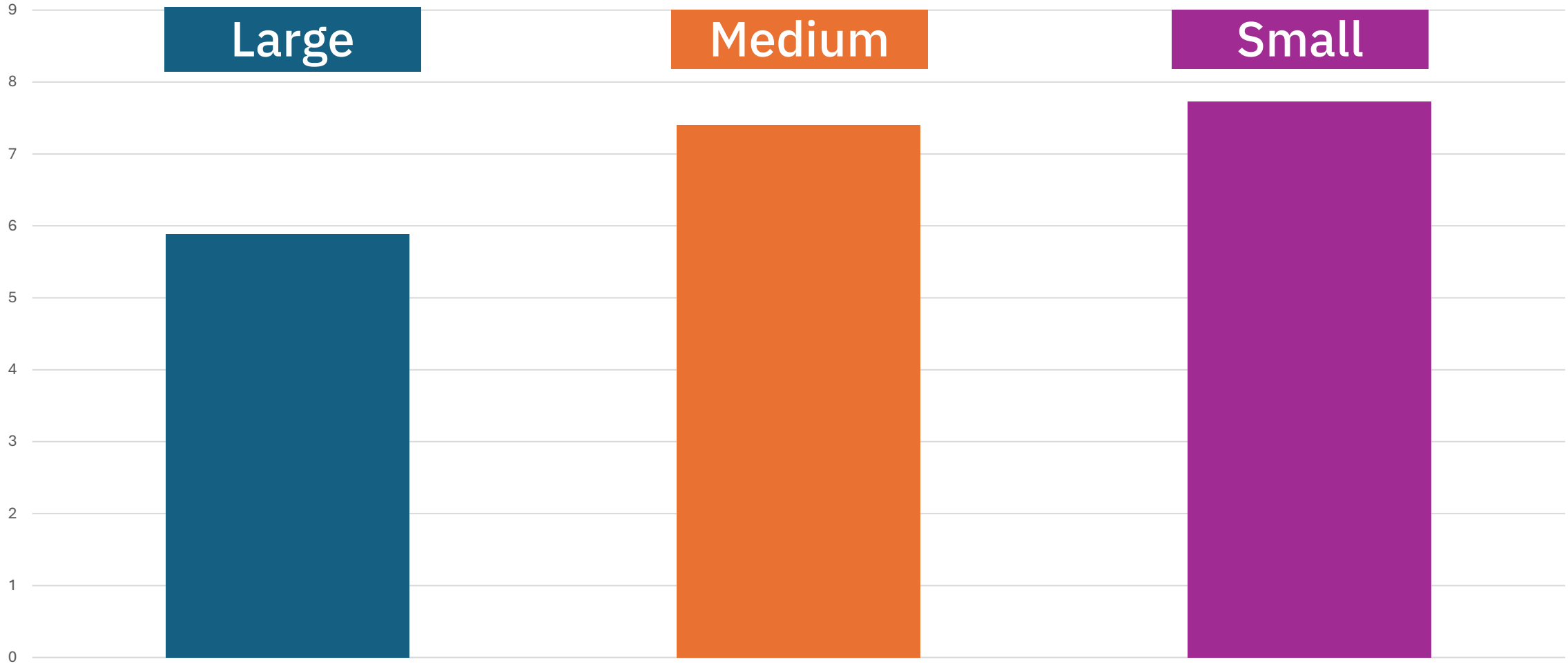
Dig into the Data

Fatal and Serious Injury (Casualty) Crashes per 1000 Total Crashes (Texas Urban Areas)



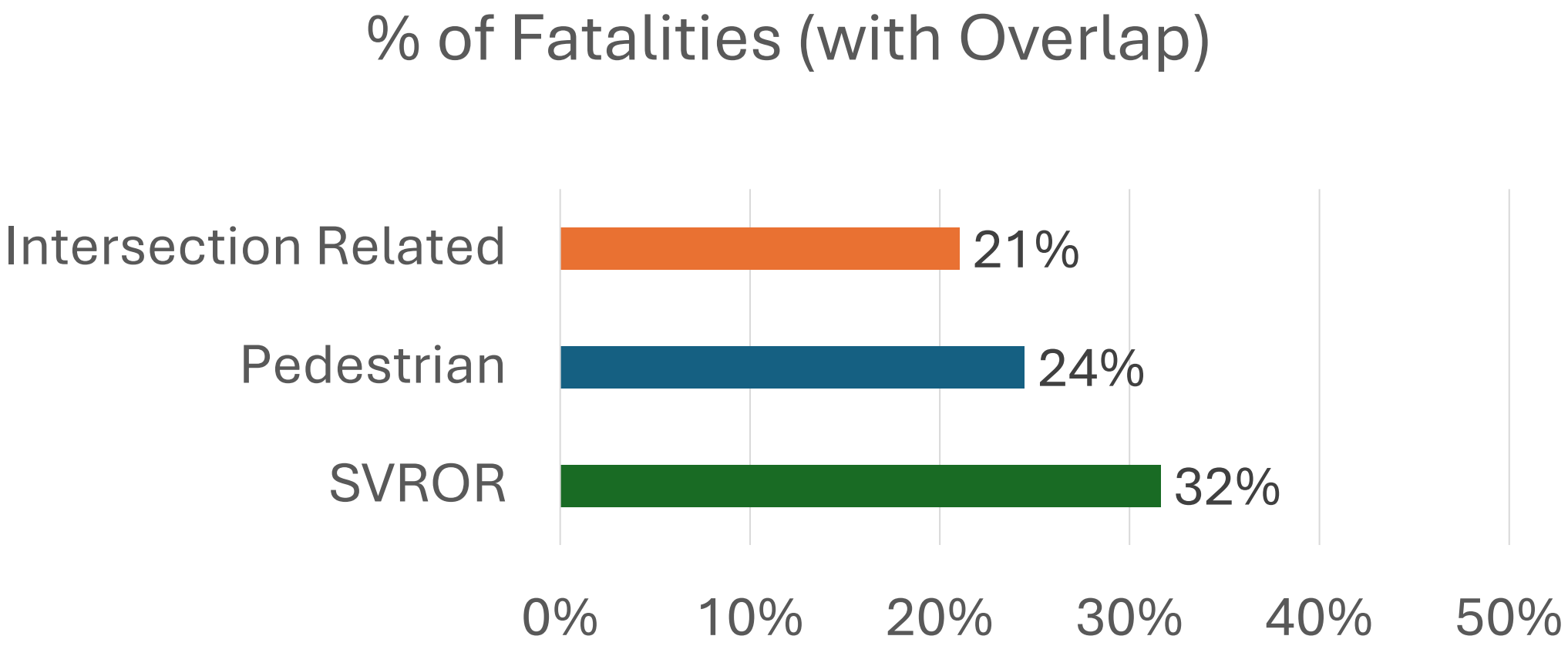
This metric indicates how severe any given crash is. The higher the value, the more likely any given crash results in serious injury or death.

100 Million Vehicle Miles Traveled in Texas Urban Areas

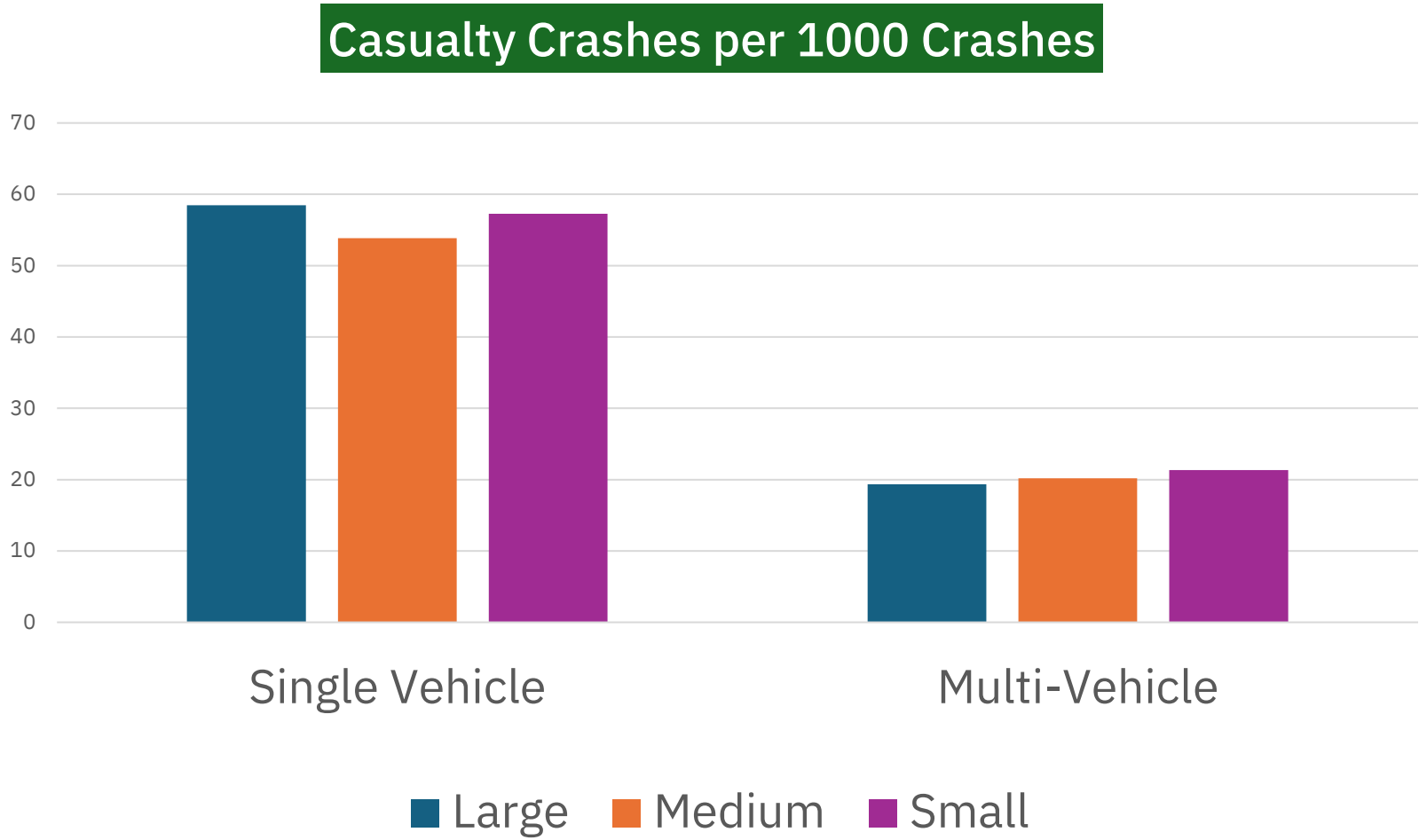


This metric indicates how likely a death or serious injury is based on the amount of travel in the MPO area. A vehicle mile is one vehicle travelling one mile.

The Big Three (77%)



Single versus Multi-Vehicle Crash Severity



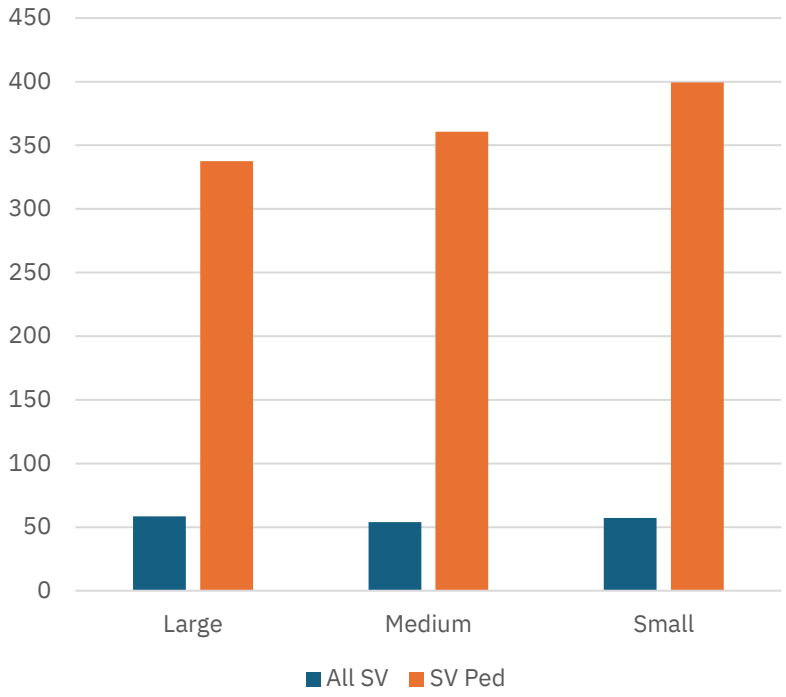
Single vehicle crashes are more severe than multi-vehicle crashes.

75% - MV crashes
25% -50 SV Crashes

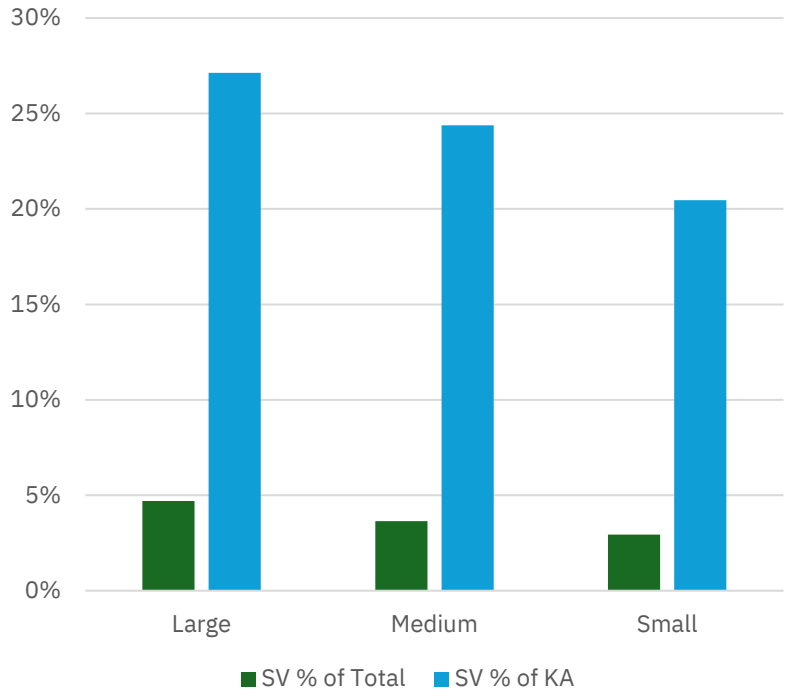
50/50 split of casualty

Pedestrian Crashes are very severe

Casualty Crashes per 1000 Crashes

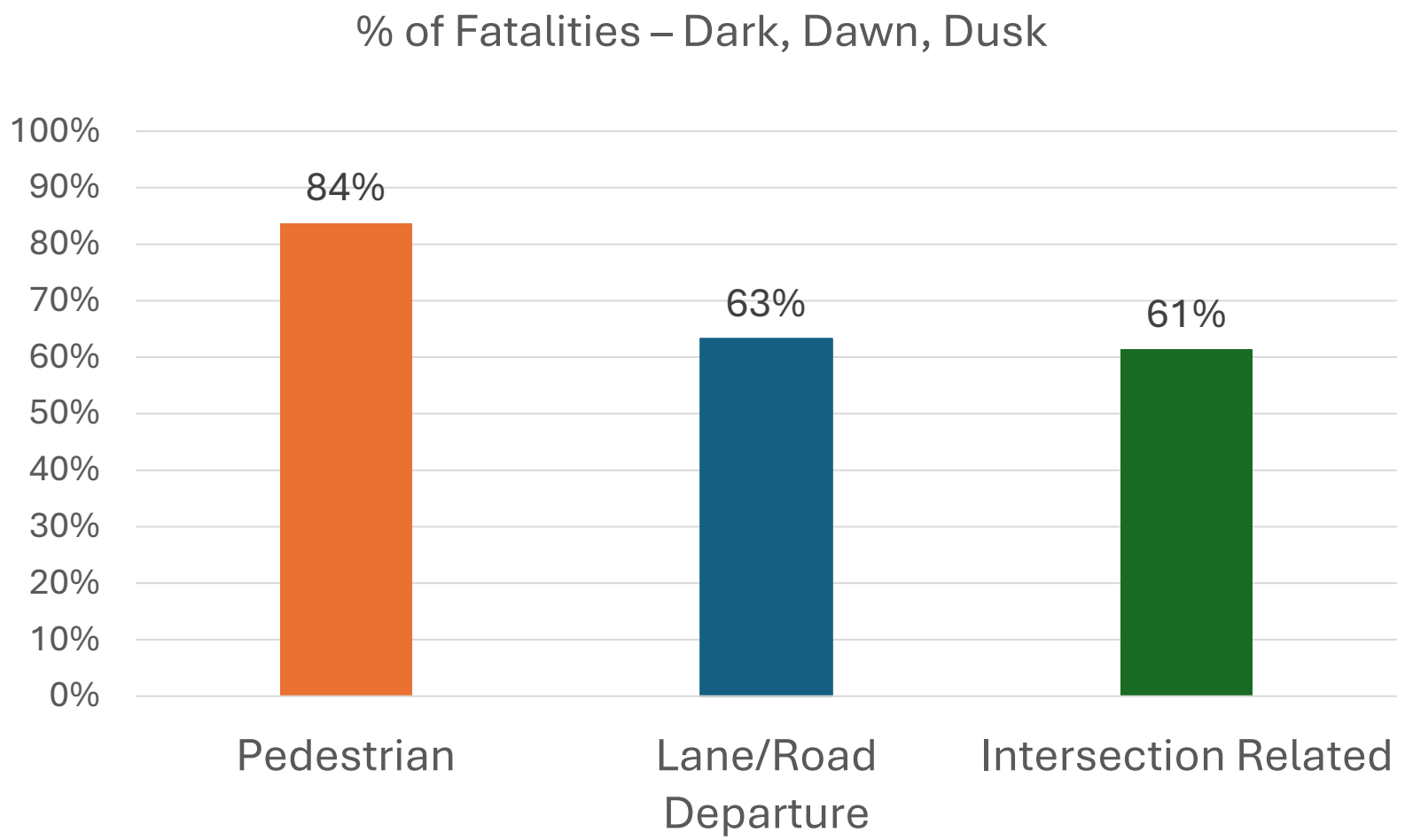


SV Pedestrian Crash Percentages



- 95% are Single Vehicle.
- 20 to 27% of all Casualty Single Vehicle Crashes involve pedestrians.
- Single Vehicle/Ped Crashes are 6 to 7 times more severe than all Single Vehicle crashes.
- 88% of KA in Urban Areas.

Role of Limited Visibility



- 84% of pedestrian fatalities occur during times of limited visibility.
- About half of all pedestrian crashes occur during these conditions

Identifying Locations with the Highest Potential for Safety Improvement

(Screening)

How to Find Them

Intersections vs Segments

Excess Crash Concept

Inventory

Prioritizing

Intersections vs Segment Crashes

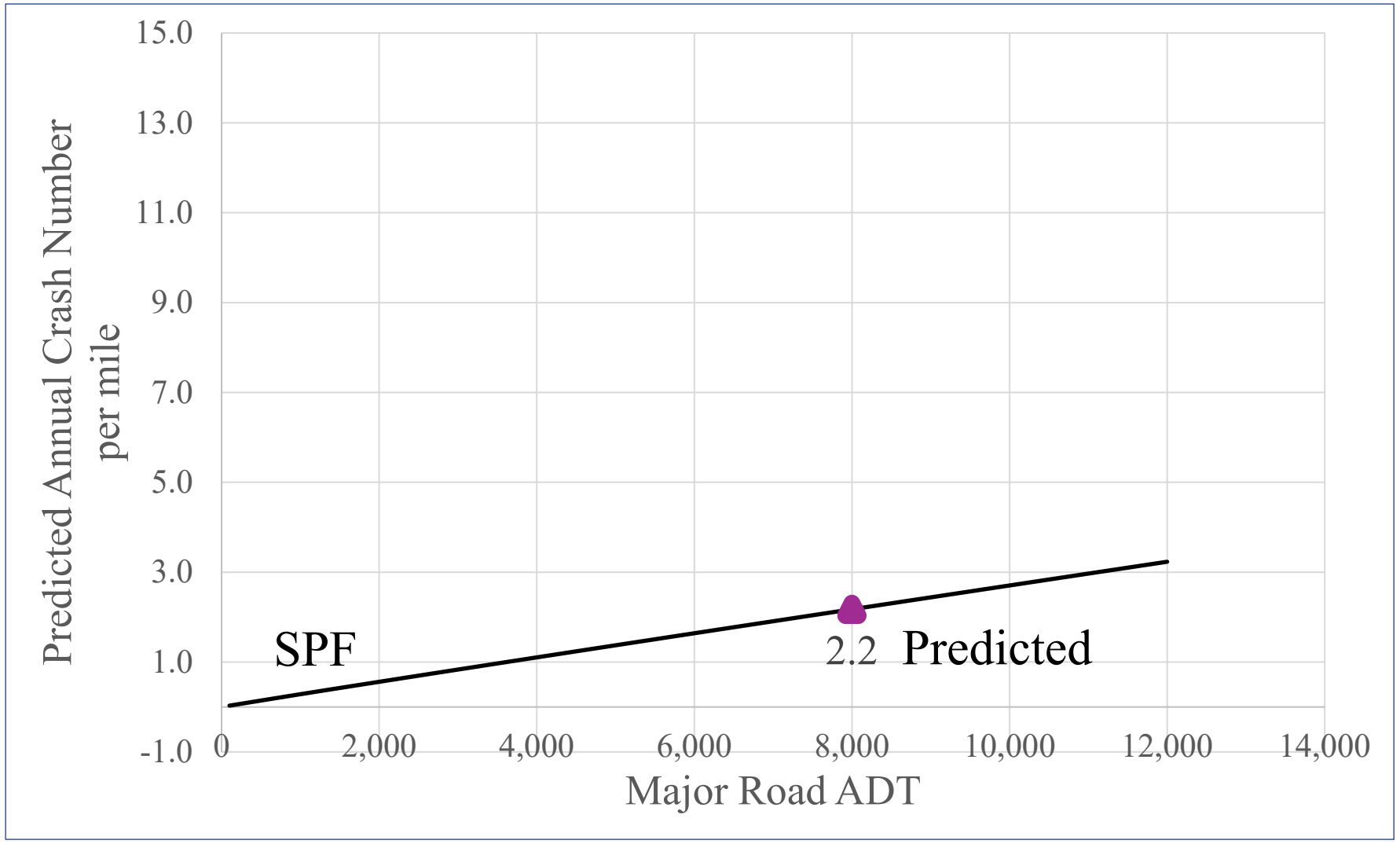
Characteristics vastly different

Segment-only Analyses creates issues

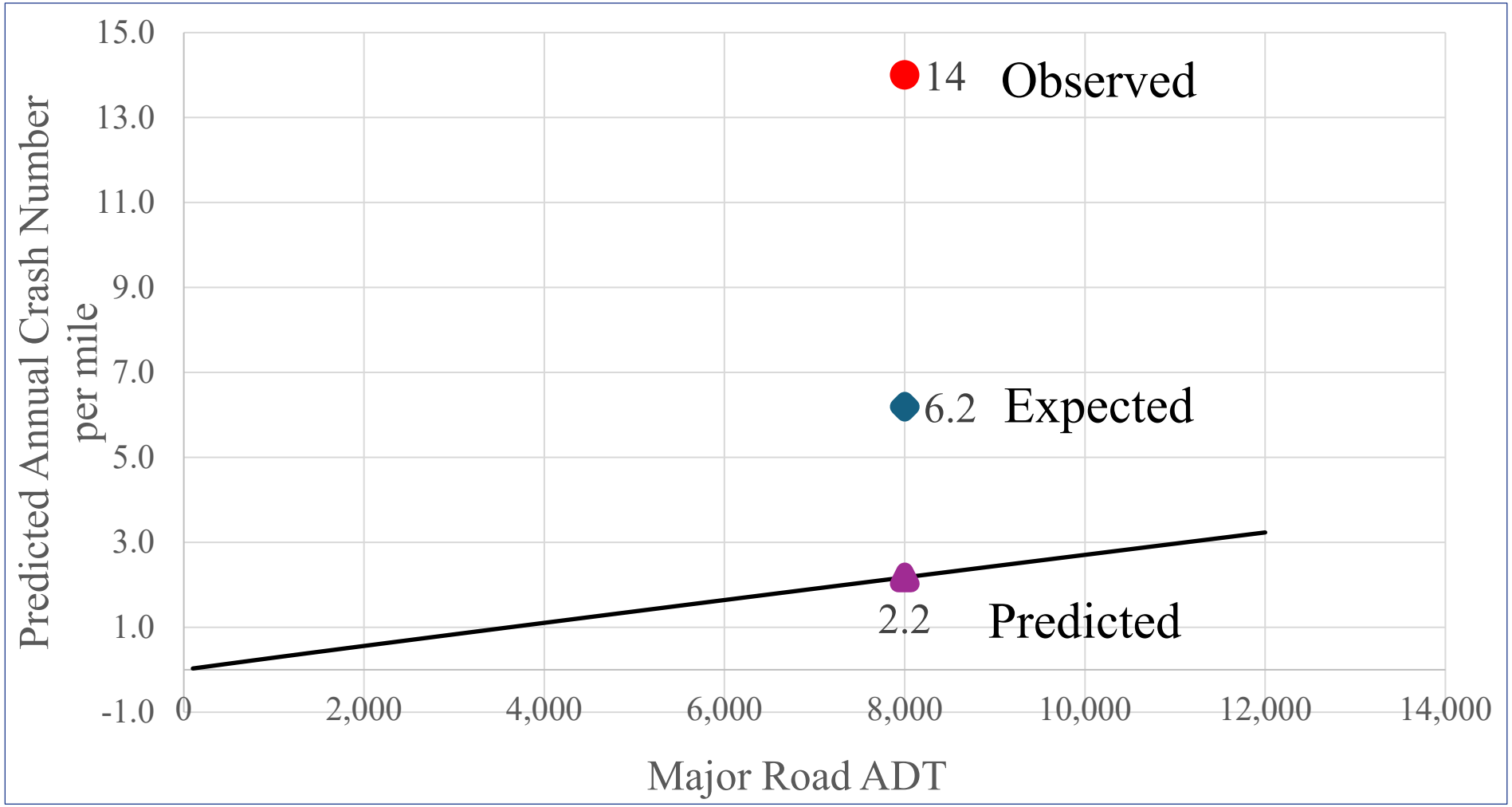
Requires separating to analyze

Excess Crash Concept

Safety Performance Functions (SPFs) relate number of crashes to ADT



Predicted, Observed and Expected Crashes

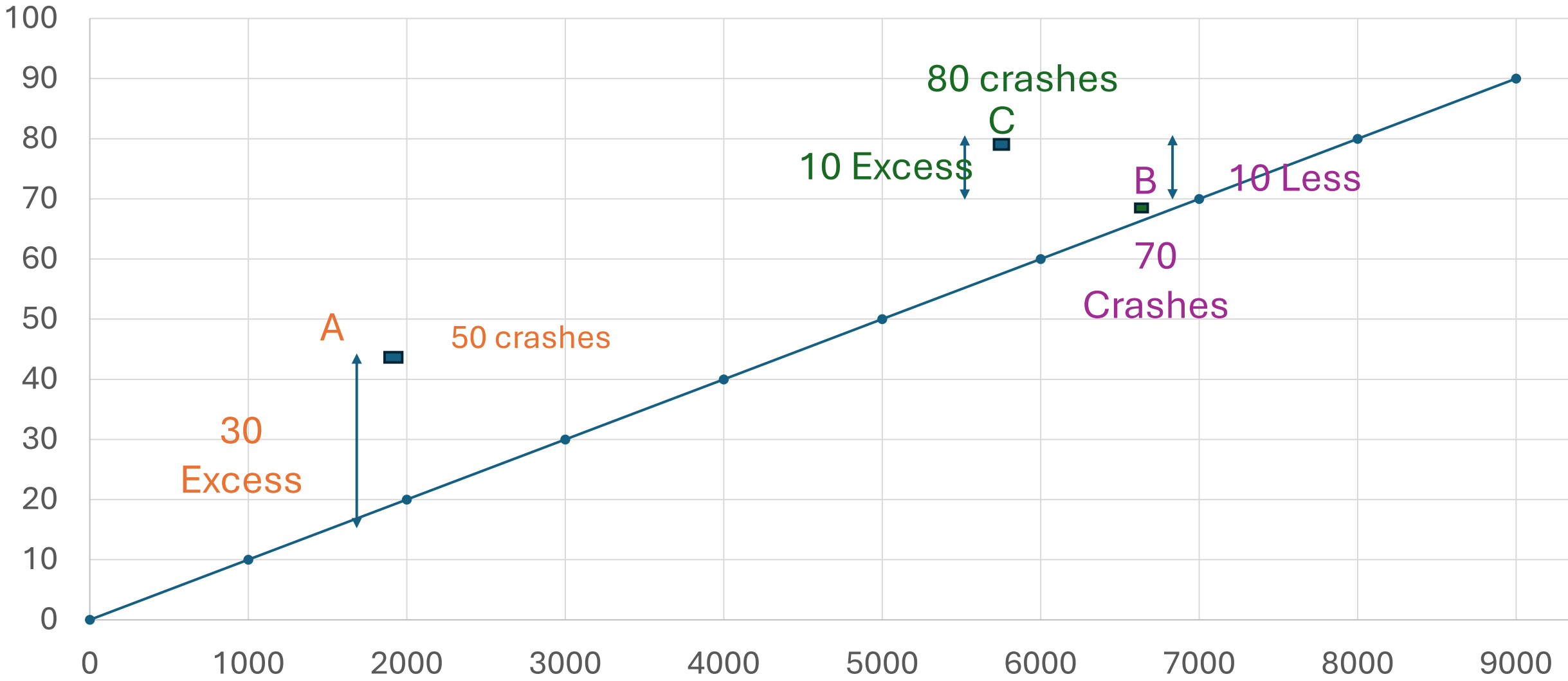


Calculating Excess Crashes

Each segment or intersection type is calculated separately. Therefore, like is compared to like.

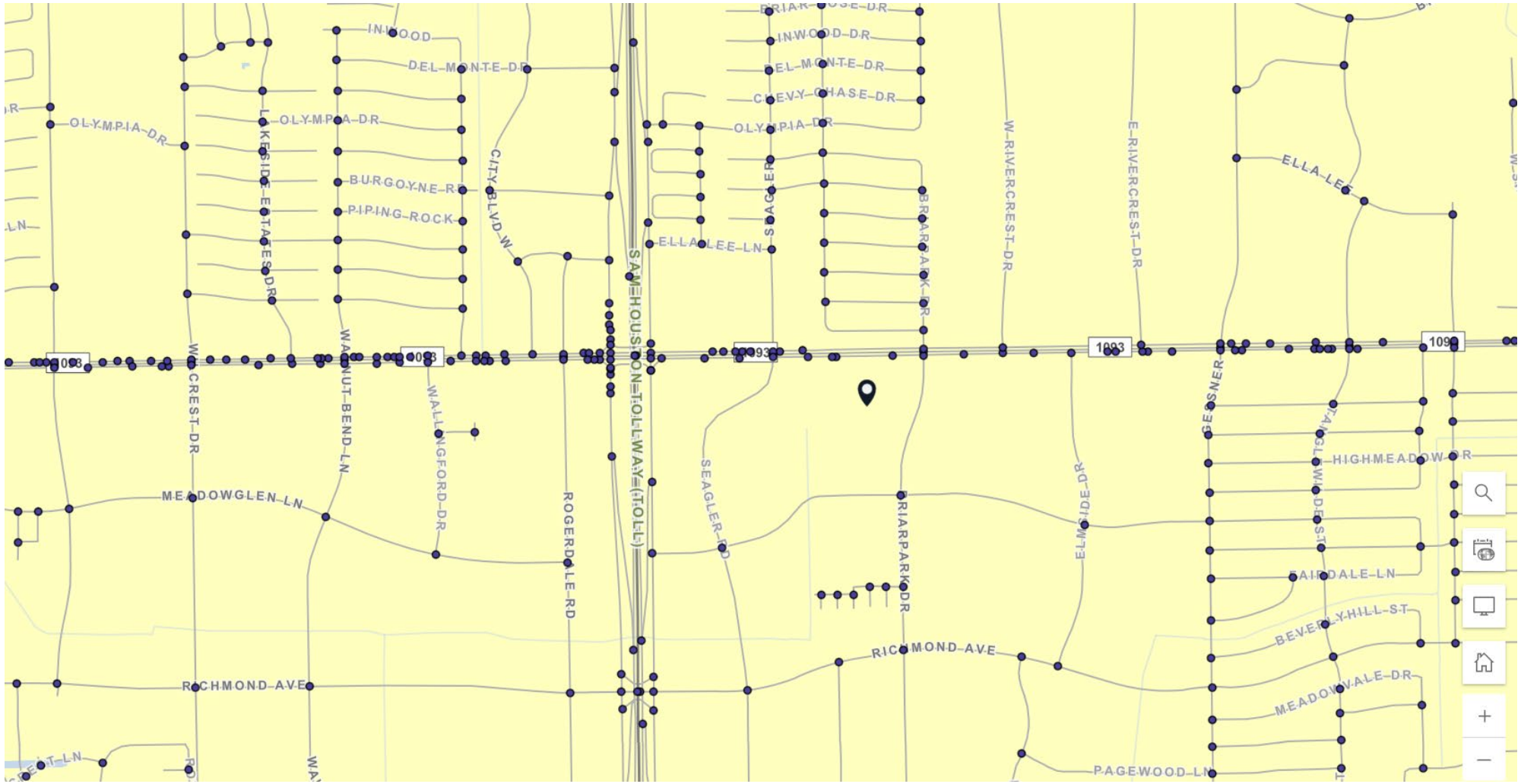
For roadway segments – Crashes per Mile to account for segment length
For intersections - Crashes

Why Priorities Should be Based on Excess Crashes



You need an inventory of intersections and segments

A TxDOT Intersection Inventory is coming!



What do you need to Apply SPFs?

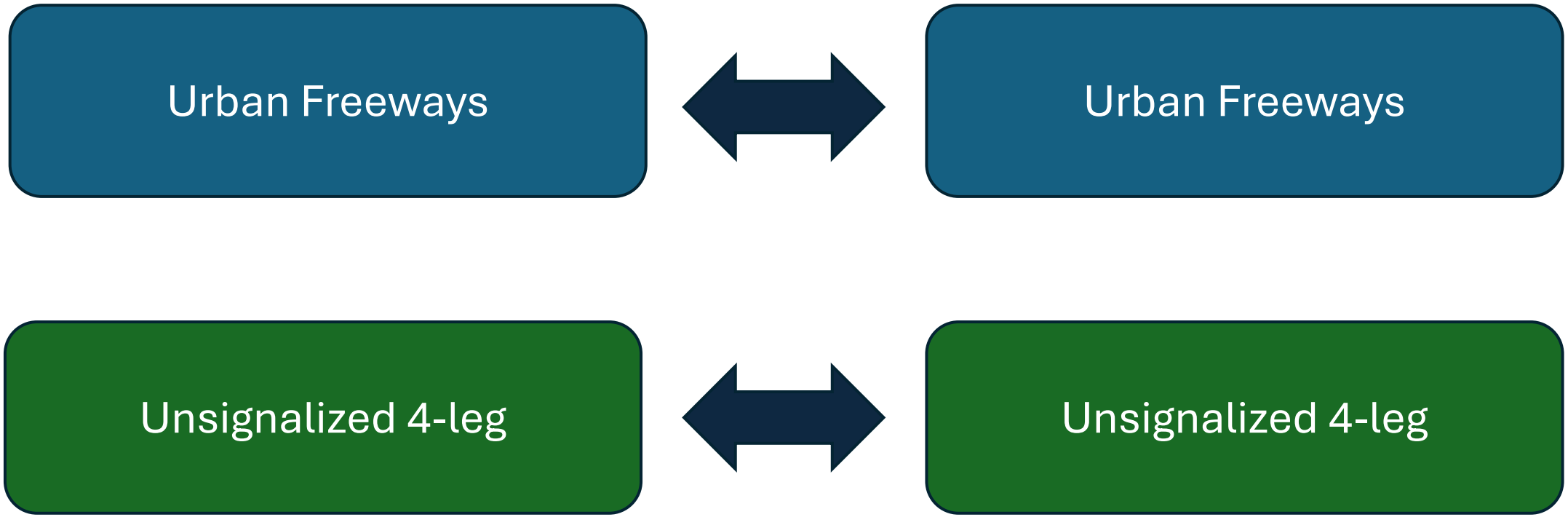
Divide Intersections and Segments into Categories

Match Crashes to intersections and segments

Apply SPFs

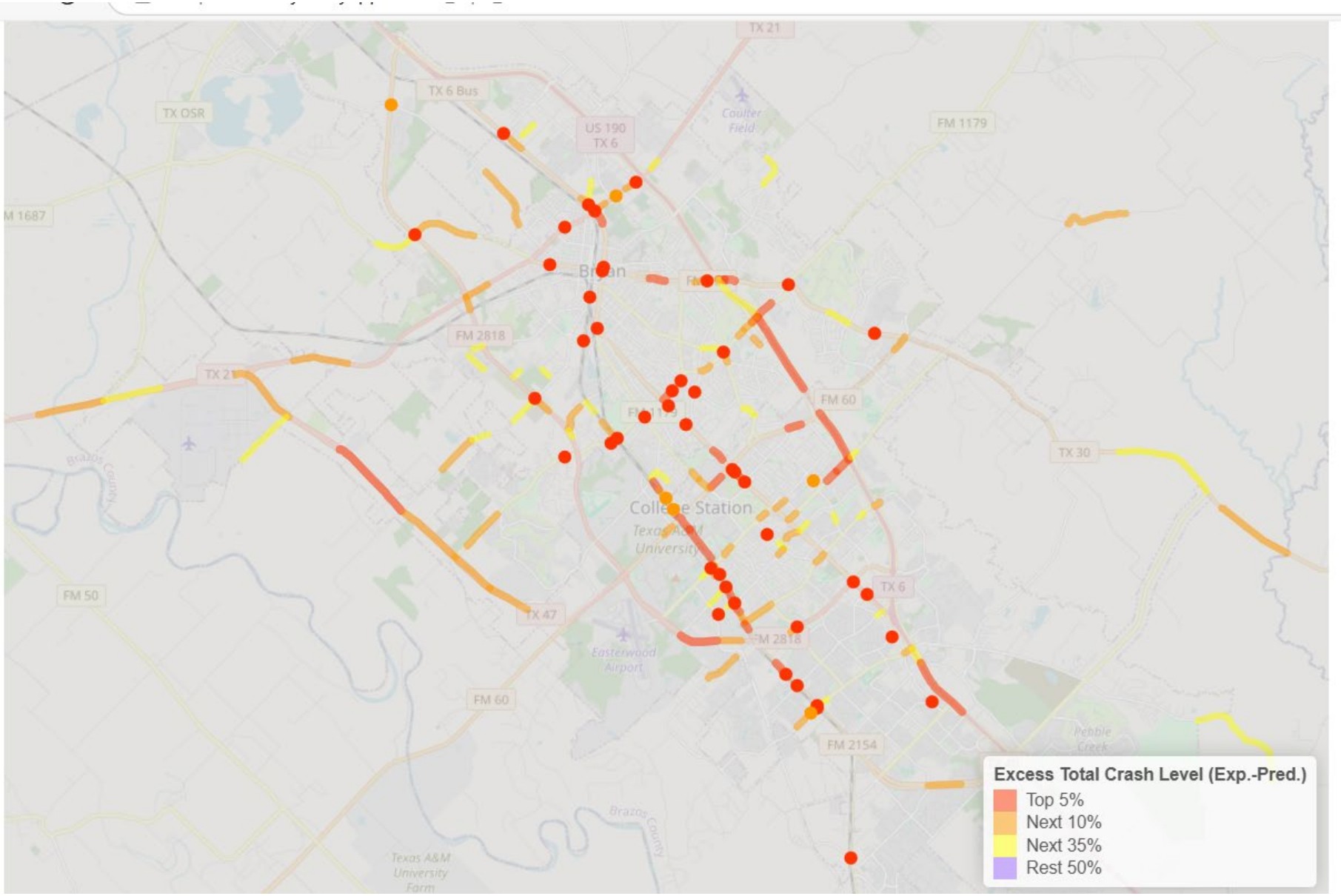
Quantify Excess Crashes

We want to do evaluations comparing like to like



TTI has SPFs for this

Excess Crashes Mapped



Prioritizing

By Excess Crashes

&

KA Crashes

Prioritizing and Diagnosing

Benchmark % of Crash Types and Factors

Look for Over-representation

Addressing Crash Issues

Countermeasures for Over-Represented Crash Types

FHWA Proven Safety Countermeasures

FHWA Alternate Intersection Guides

Texas SHSP
TxDOT HSIP

TxDOT Safer by Design Tool

Systemic Approach for Pedestrians

Pedestrian crashes are rarely concentrated at single locations or segments

We look for locations with characteristics associate with Pedestrian Crashes

List of Safety Tools

This page includes a list of safety analytical tools designed to help the user identify roadway locations with the best opportunities to improve safety performance and to evaluate design alternatives

Read More

Segments

Systemic Approach for Pedestrian Safety - Segments

Input data

Variable	Value	Notes
Area type	Rural	Enter the area type from drop-down menu
AADT	3,000	Enter the daily traffic volume, vehicles per day
Median type	Curbed	Enter the median type from drop-down menu
Number of lanes	5	Enter total number of lanes on the segment
Pavement Width	50	Enter total pavement width, feet
Truck precentage	99%	Enter percentage of trucks in the daily traffic volume, %

Output

AADT weight	27	Weight for AADT as a risk factor
Median type weight	10	Weight for median type as a risk factor
Lane count weight	11	Weight for number of lanes as a risk factor
Pavment width weight	23	Weight for pavement width as a risk factor
Truck percentage weight	21	Weight for truck percentage as a risk factor
Total weight	**92**	**80th Percentile**

Note: Higher percentile means higher potential for the safety improvement

Intersections

Systemic Approach for Pedestrian Safety - Urban Signalized Intersections

Input data

Variable	Value	Notes
Pedestrian activity	Low (<=400)	Enter the pedestrian activity level from drop-down menu (based on daily volume)
Median type	Full (all approaches)	Enter the median type from drop-down menu
Land use	Residential	Enter the land use from the drop-down menu

Output

Pedestrian activity weight	6	Weight for median type as a risk factor
Median type weight	10	Weight for number of lanes as a risk factor
Land use weight	10	Weight for land use as a risk factor
Total weight	**26**	**11th Percentile**

Note: Higher percentile means higher potential for the safety improvement

Safer by Design

Develop and Compare
Safety Effects
For Safety Projects

Evaluate Safety
For
All Projects

A Tool for evaluating Alternatives

Google: TxDOT Safer by Design

A different Way to View Safety

Nominal vs Substantive

Nominal Safety

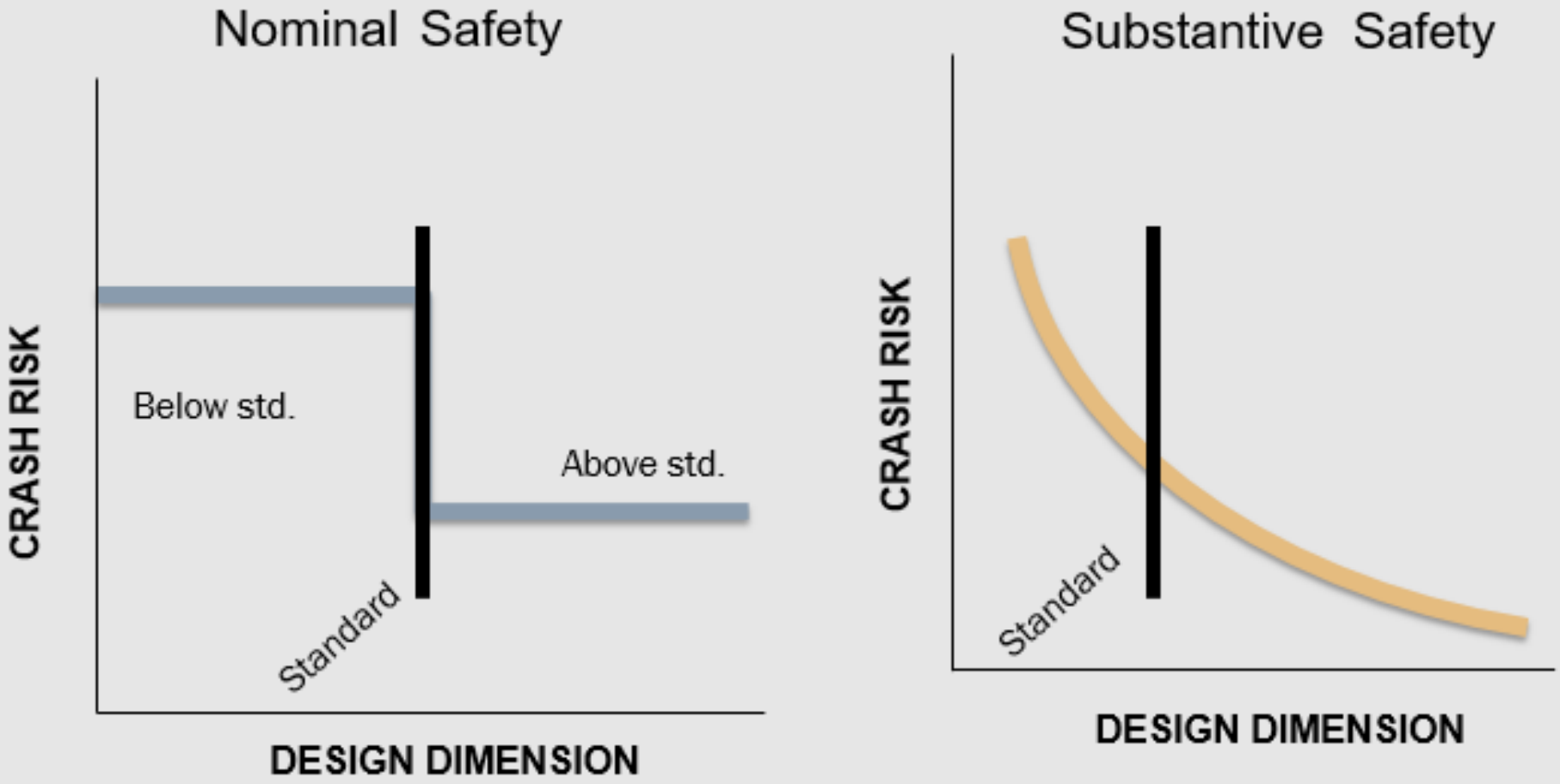
Substantive Safety HSM HIGHWAY SAFETY MANUAL

STANDARDS, WARRANTS, AND GUIDELINES

CRASH FREQUENCY AND SEVERITY

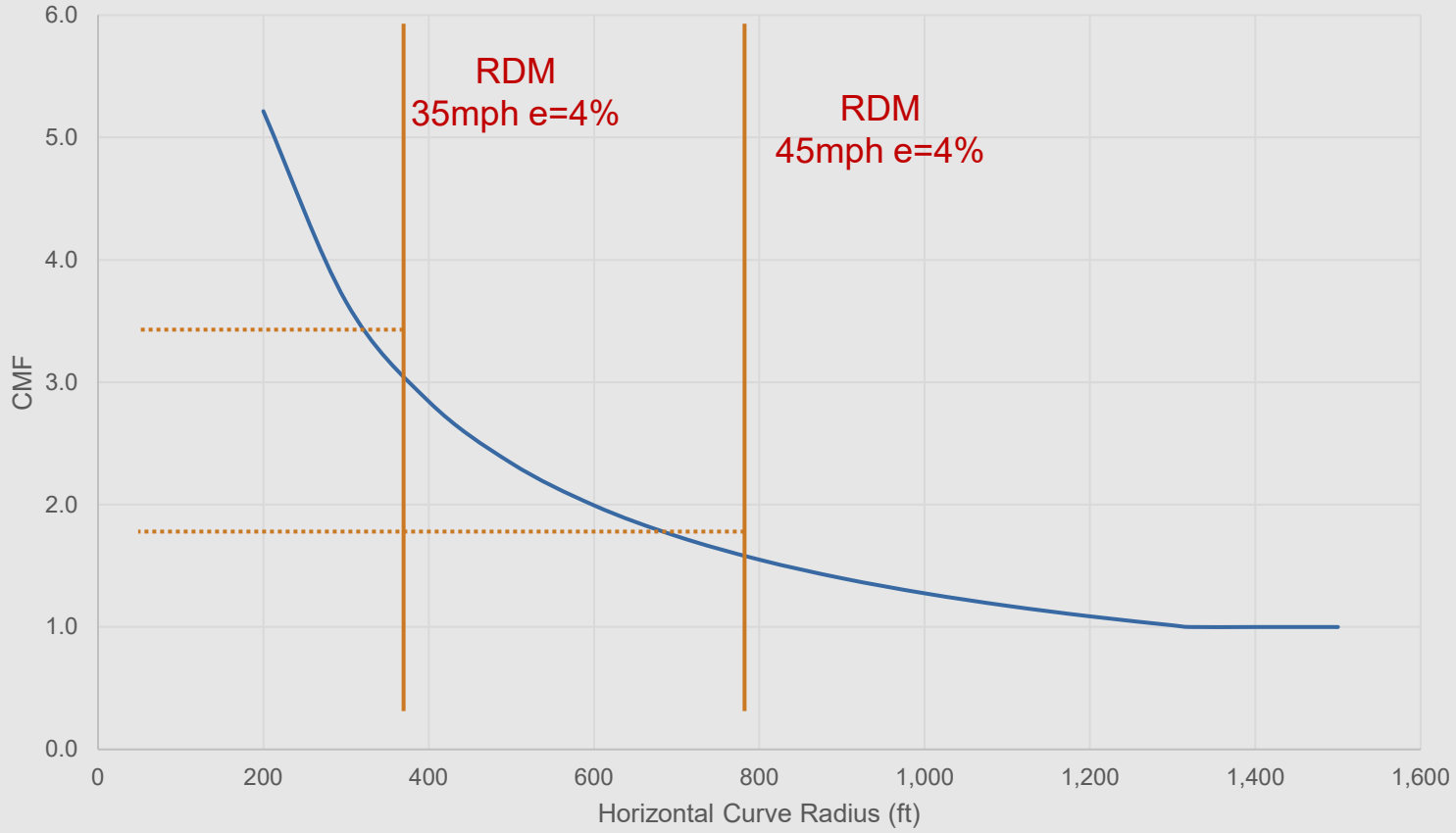
Building to Standard ≠ Safety Performance

Safety is a Continuum



Lane Width, Shoulder Width, Median Configuration, Roadside, etc.

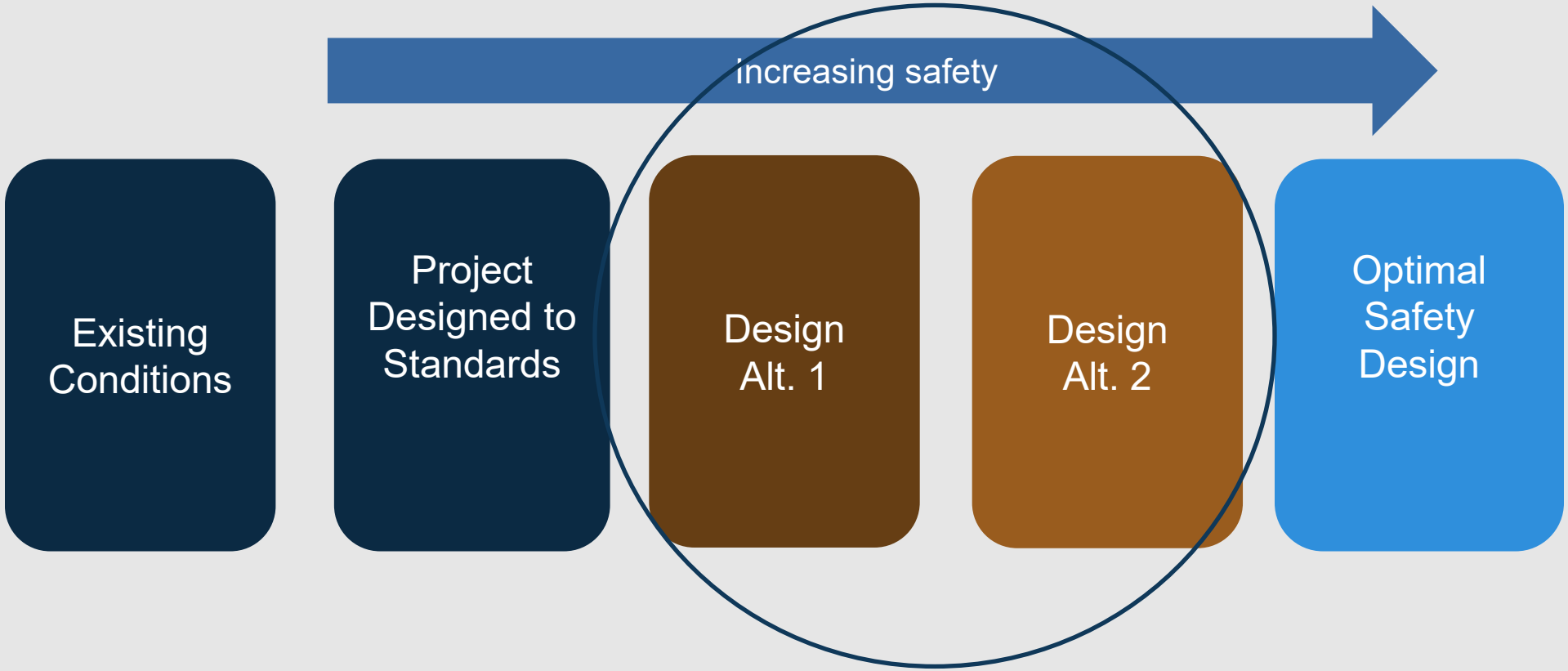
Nominal vs Substantive



CM-Function for Horizontal Curve on 2-Lane

Creating a Basis for Comparing Alternatives

Tool provides for the analyst to input two alternatives



What does the SBD Tool Cover

Urban and Rural Intersections and Segments

Does not Cover Freeways

Intersections

Conventional
Roundabout
Alternate

Segments

Divided/Undivided
TWLTL
Super 2

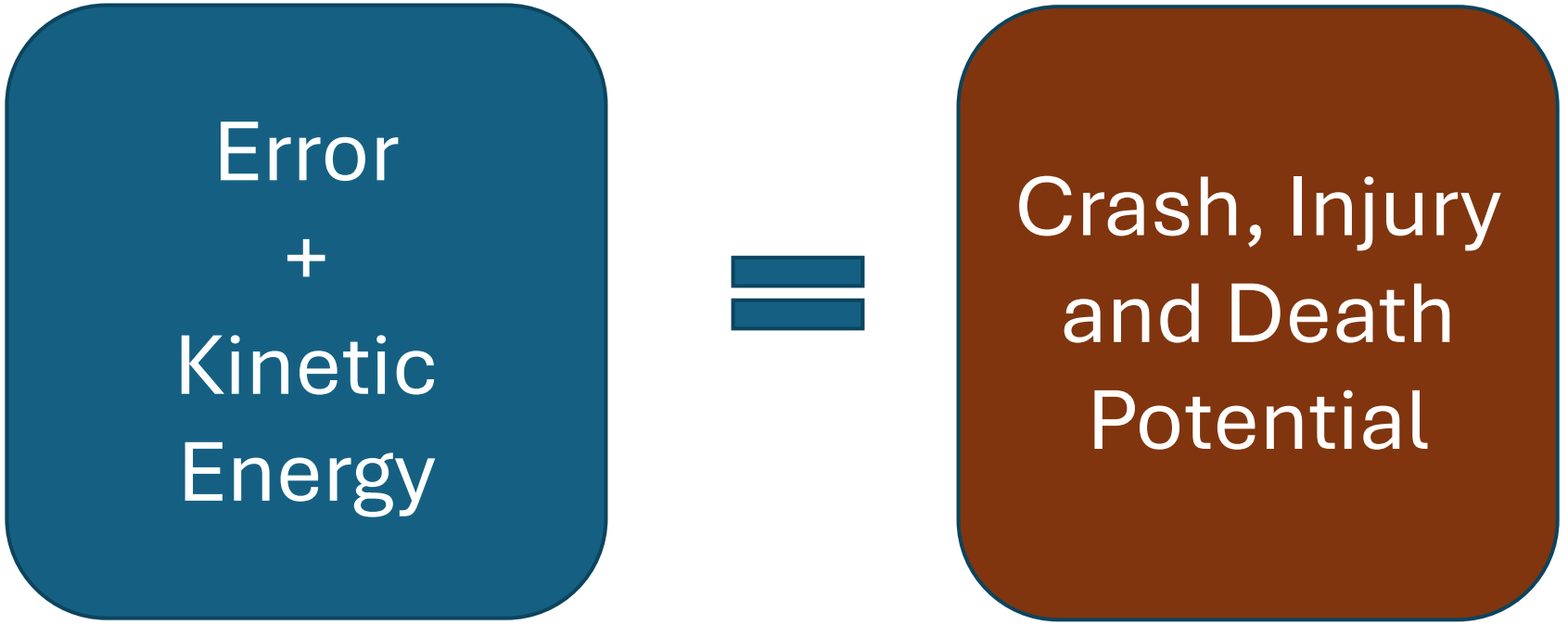
Speed: The root of all injury

Speed is necessary for Travel

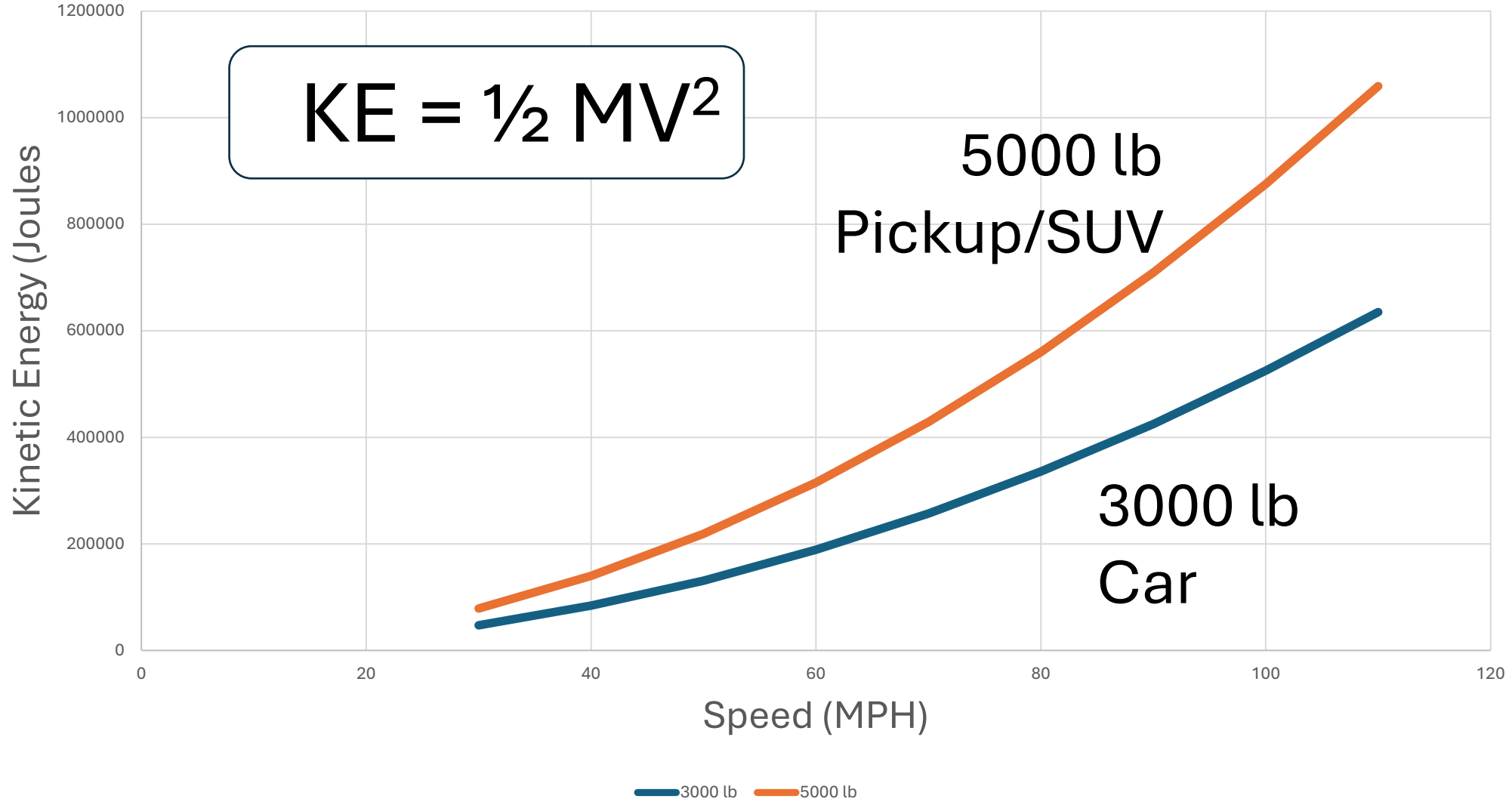
Movement requires Speed

Speed creates Kinetic Energy

But Speed has Consequences



Kinetic Energy vs Speed



Power Model of Speed from Elvik

$$\frac{Fatal\ Crashes\ after}{Fatal\ Crashes\ before} = \left(\frac{Average\ speed\ after}{Average\ speed\ before}\right)^{Exponent}$$

Exponent = 4.5 for fatalities

3.0 for serious injuries

Elvik R, et al. *Handbook of Road Safety Measures, Second Edition*. Amsterdam: Elsevier, 2009

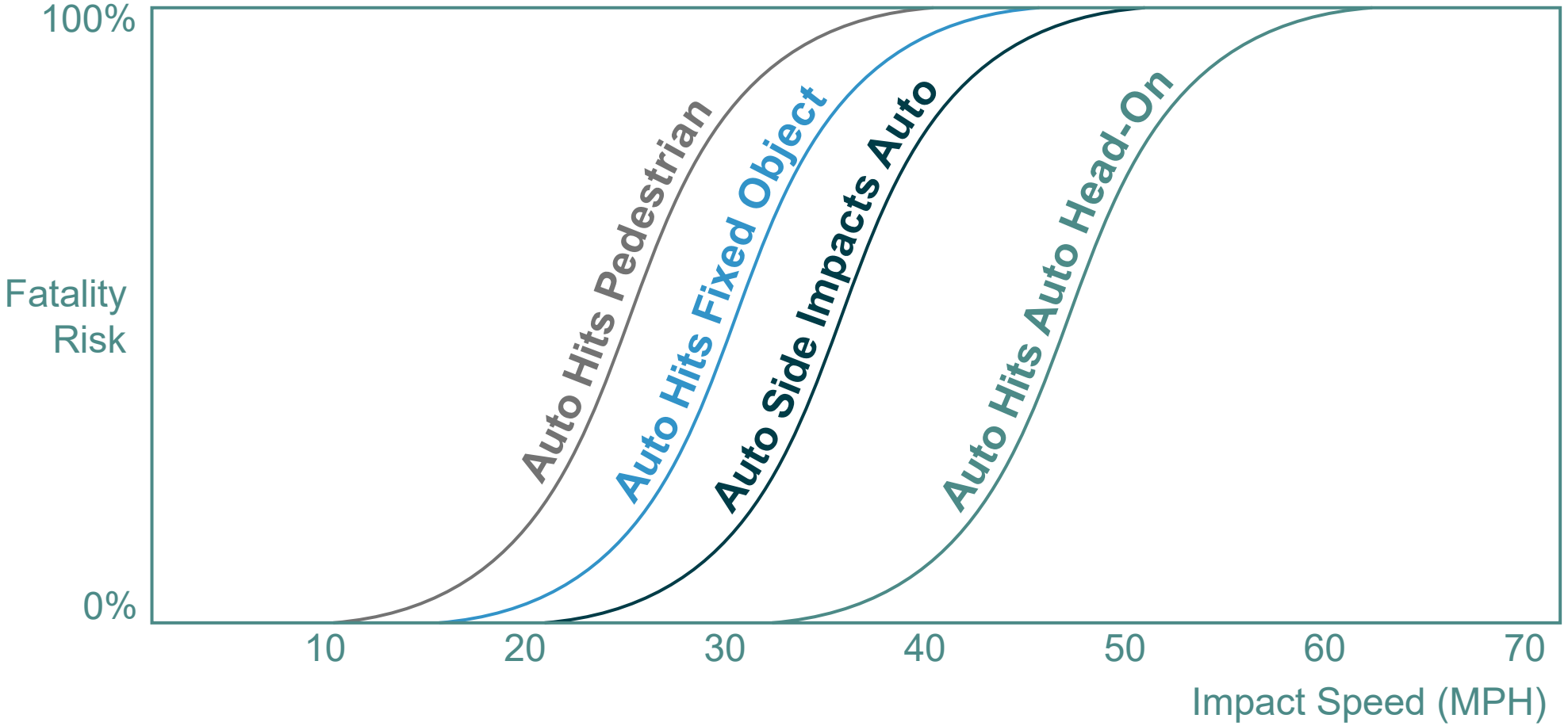
Changes in Speed Magnified in Crash Severity

-10% in Speed = -38% in fatalities

-27% in serious injuries

Elvik R, et al. *Handbook of Road Safety Measures, Second Edition*. Amsterdam: Elsevier, 2009

Fatality Risks



Source: FHWA presentation

Safe System Principle

Accommodate Human Injury Tolerance

by

Reducing Kinetic Energy Transfer

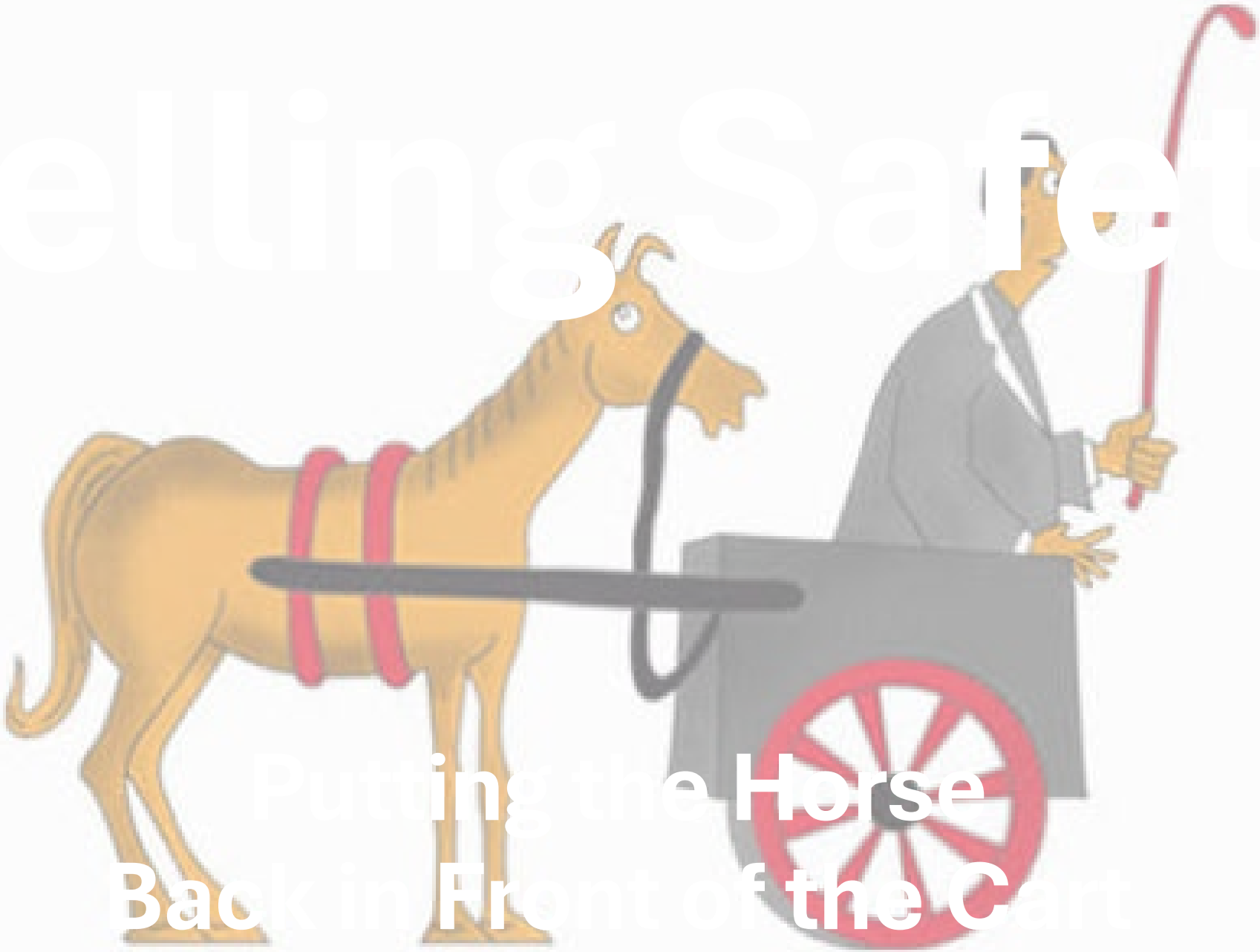
The Tools Exist. What does it take to improve safety?

Someone
To
Use Them

&

Implement
Safety
Improvements


PLEASE STAND BY
...your program will resume shortly



Putting the Horse Back in Front of the Cart