



SAFE STREETS
Research + Consulting

Proven & Promising Strategies to Improve Traffic Safety

Rebecca L. Sanders, PhD, RSP_{2B}

Southern Nevada Regional Transportation Commission, June 26, 2025

Overview

- National Trends & Background
- Proven and Promising Strategies and Tools



Photo credit: Safe Streets Research & Consulting

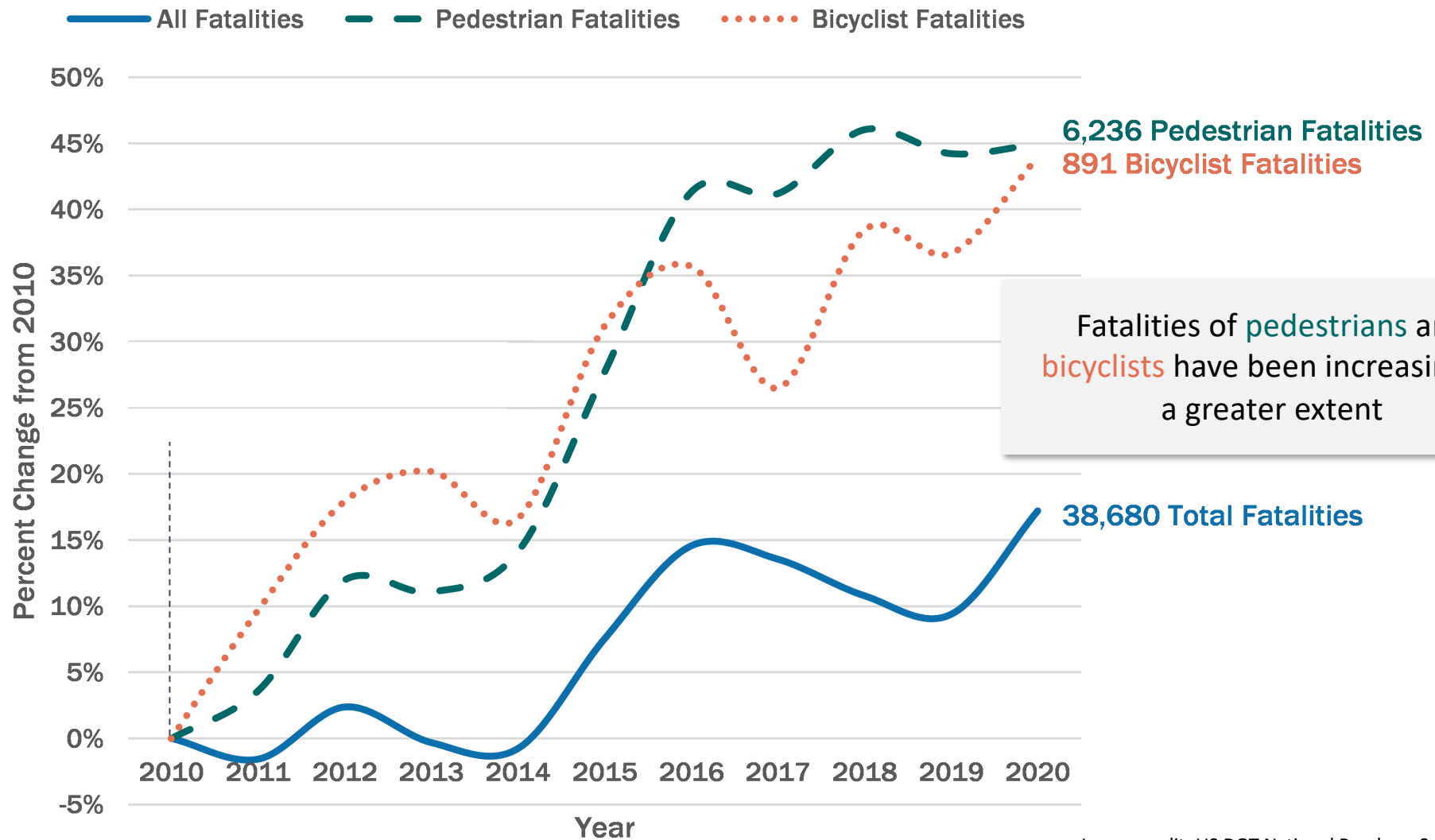
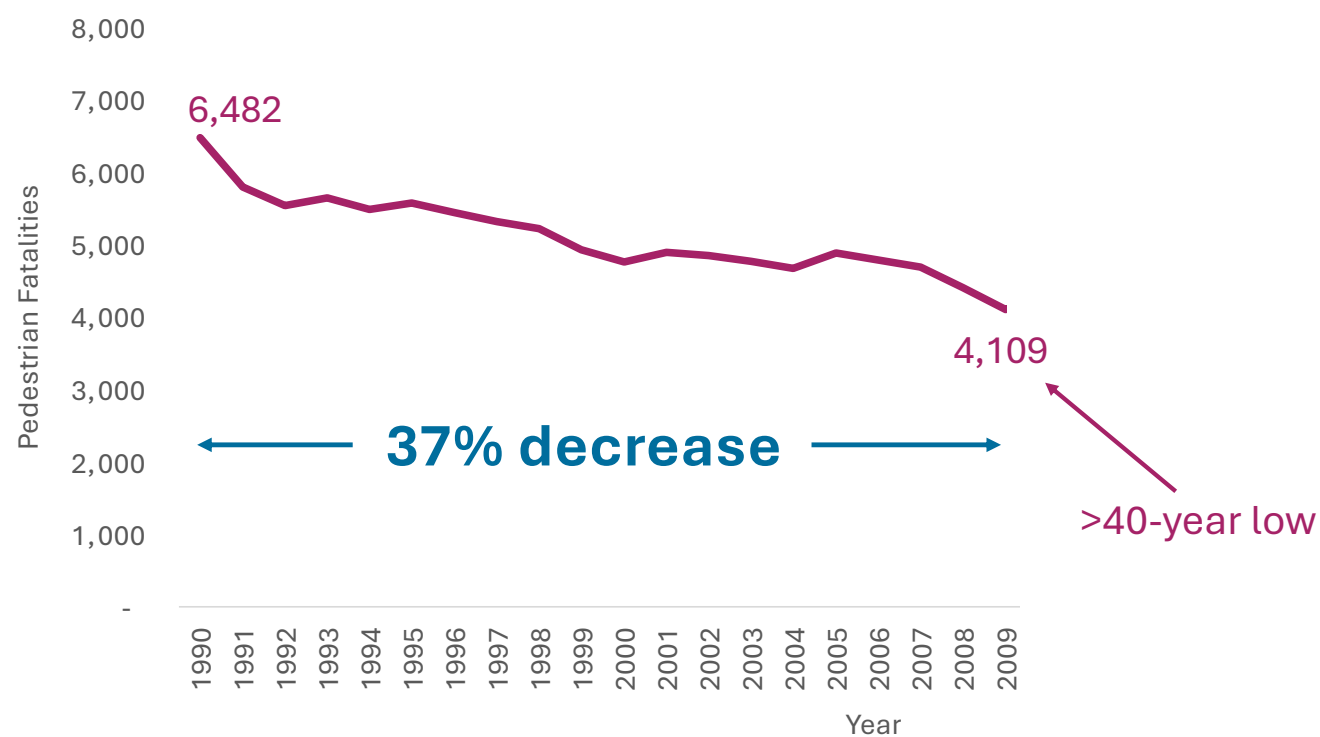
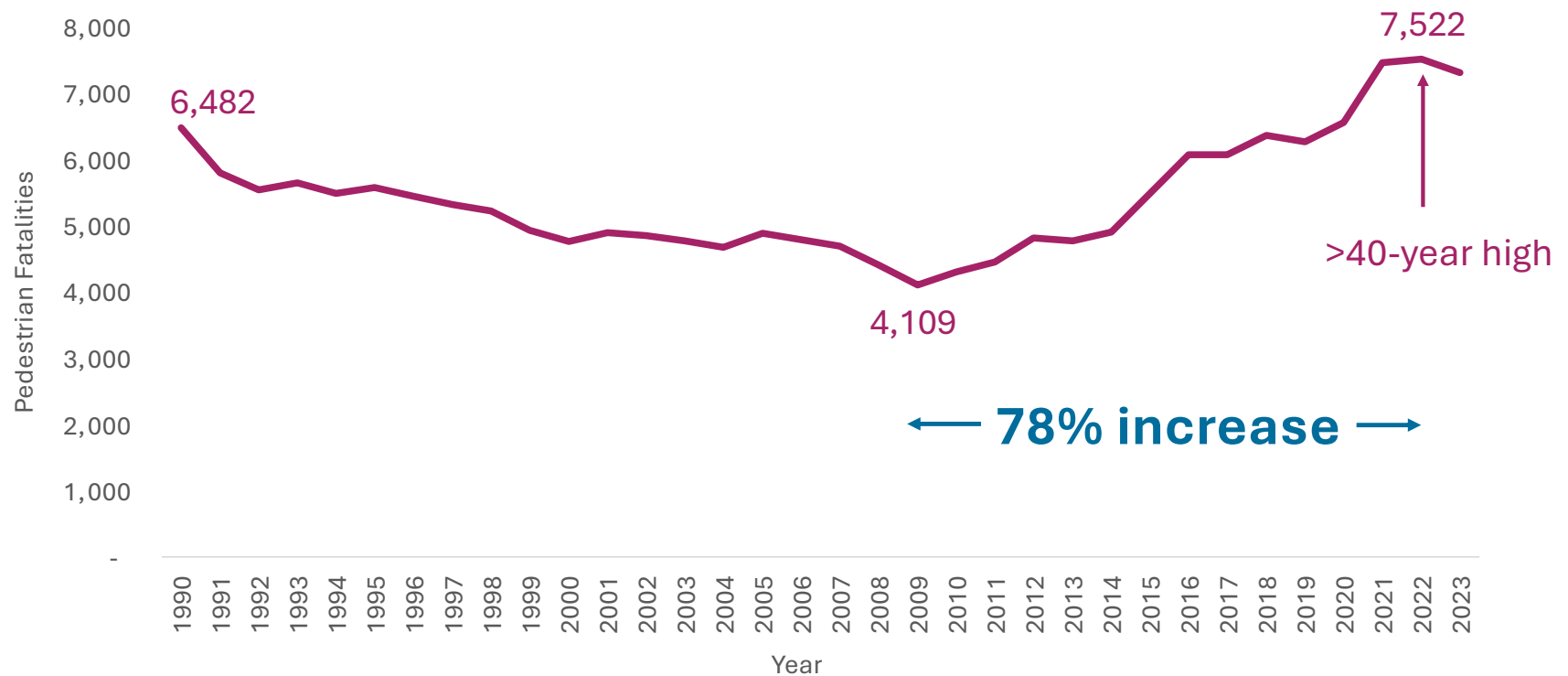


Image credit: US DOT National Roadway Safety Strategy
Data source: Fatality Analysis Reporting System

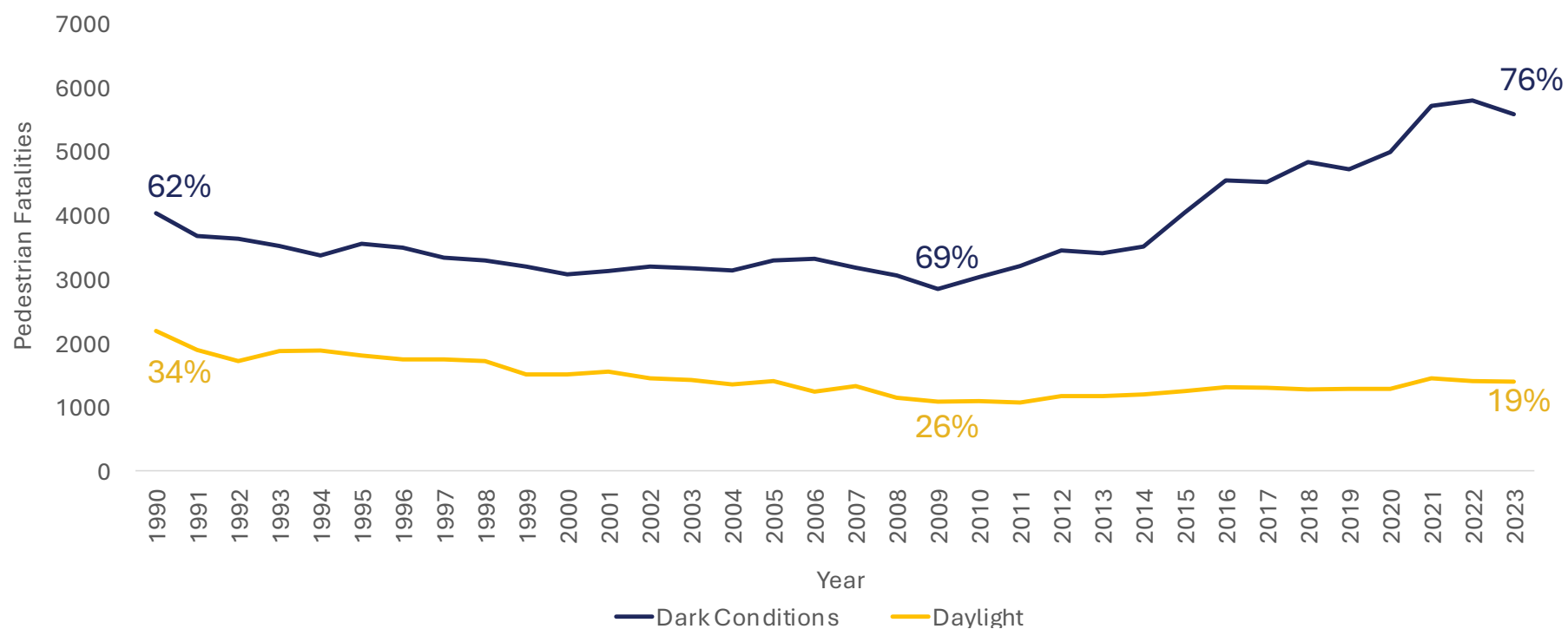
U.S. Pedestrian Fatalities, 1990-2009



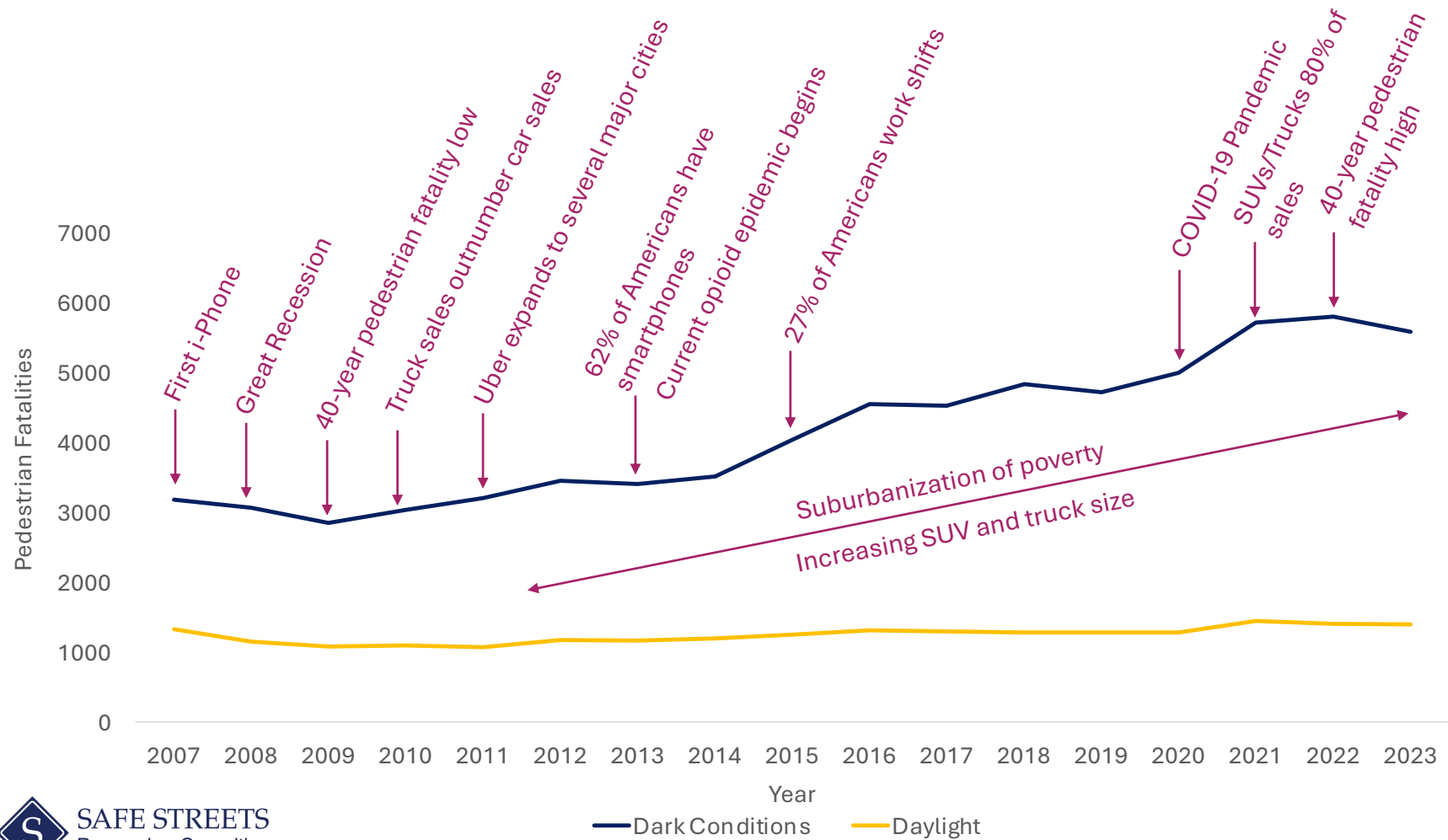
U.S. Pedestrian Fatalities, 1990-2023



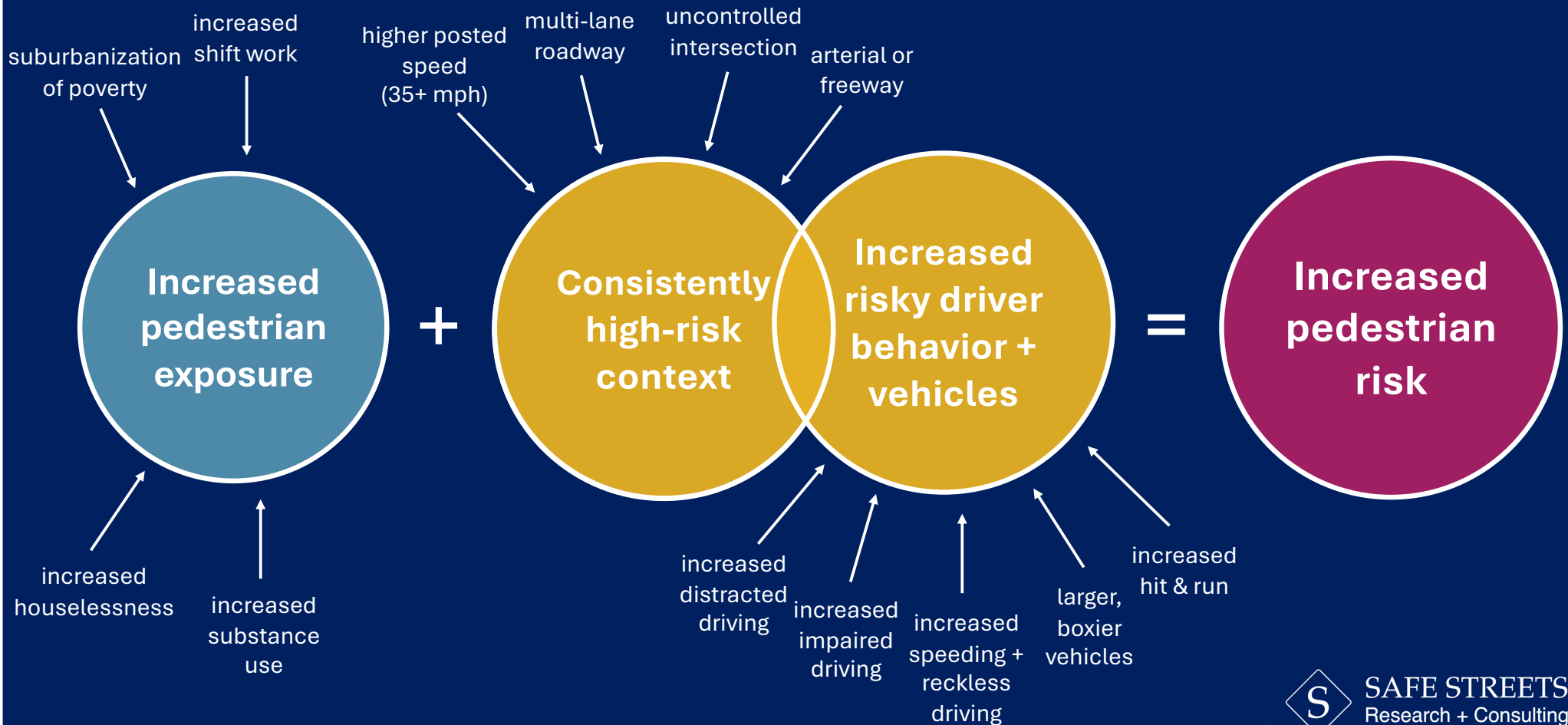
U.S. Pedestrian Fatalities in Daylight and Dark Conditions, 1990-2023



Factors Impacting Pedestrian Safety Over Time



Factors Associated with Increased Pedestrian Fatality Risk in Darkness

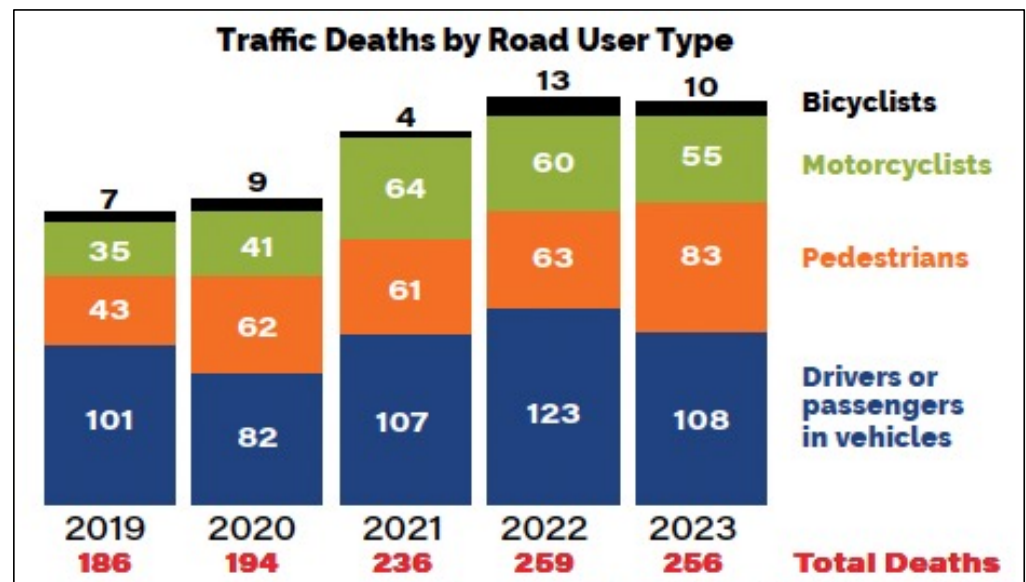


Southern Nevada Fatal and Severe Crashes, 2019-2023

1,131 Deaths

- 43 people riding bicycles
- 255 people riding motorcycles
- 312 people walking
- 521 people in vehicles

2,058 Serious Injury Crashes



Data source: NHTSA; Image credit: RTC SS4A

Southern Nevada – Top Contributing Factors

Fatal Crashes

- Speeding
- Unsafe lane change
- Driving drunk or high
- Reckless driving
- Failure to Yield



**We can do something about
this problem**

Safe System Approach

1. Death/Serious Injury is Unacceptable
2. Humans Make Mistakes
3. Humans are Vulnerable
4. Safety is Proactive
5. Redundancy is Crucial
6. Responsibility is Shared



Image credit: Washington DOT

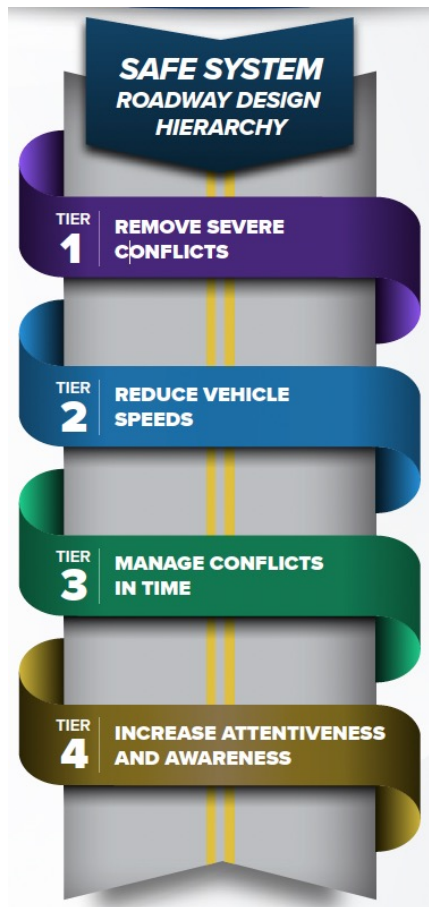
Safe System Pyramid



Image credit: Vision Zero Network

Adapted from: Ederer, D.J., Panik, R.T., Botchwey, N., & Watkins, K. 2023. The Safe Systems Pyramid: A new framework for traffic safety, *Transp Res Interdisciplinary Perspectives*, 21, 100905.

Safe System Roadway Design Hierarchy



Proven Safety Countermeasure	Tier 1 Remove Severe Conflicts	Tier 2 Reduce Vehicle Speeds	Tier 3 Manage Conflicts in Time	Tier 4 Increase Attentiveness and Awareness
Speed Management				
<u>Appropriate Speed Limits for All Road Users</u>		✓		
<u>Speed Safety Cameras</u>		✓		
<u>Variable Speed Limits</u>		✓		✓
Pedestrian/Bicyclist				
<u>Bicycle Lanes</u>	✓			
<u>Crosswalk Visibility Enhancements</u>				✓
<u>Leading Pedestrian Interval</u>			✓	
<u>Medians and Pedestrian Refuge Islands</u>	✓	✓		
<u>Pedestrian Hybrid Beacons</u>			✓	
<u>Rectangular Flashing Beacons (RRFB)</u>				✓
<u>Road Diets</u>	✓	✓		
<u>Walkways</u>	✓			
Roadway Departure				
<u>Enhanced Delineation for Horizontal Curves</u>				✓
<u>Longitudinal Rumble Strips and Stripes</u>				✓
<u>Median Barriers</u>	✓			

Image credits: FHWA

**To improve safety for all roadway users, we
must design for the most vulnerable –
pedestrians walking at night.**

Improving safety

- at night**
- for pedestrians**

also benefits

- daytime**
- other road users**



Photo credit: Bob Schneider

FHWA's Elements of Risk

- Exposure
 - The presence or potential presence of someone to be involved in a crash, and the length of time they are exposed,
- Likelihood
 - Elements that impact the probability of crash occurrence, and
- Severity
 - Factors that impact the potential for a severe outcome

Source: FHWA Safe System Approach to Speed Management

Reduce Exposure

- Reduce the amount of time the pedestrian spends in the roadway
 - Rethink roadway space
- Essential at night when driver visibility is limited due to darkness
- Employ countermeasures:
 - Daylighting/curb extensions
 - Crossing islands
 - Sidewalks, walkways, shared paths



Photo credit: Safe Streets Research & Consulting

Tier 1 - Remove Severe Conflicts

Pedestrian/Bicyclist



[Bicycle Lanes](#)



[Medians and Pedestrian Refuge Islands in Urban and Suburban Areas](#)



[Road Diets \(Roadway Reconfiguration\)](#)



[Walkways](#)

Intersections



[Corridor Access Management](#)



[Roundabouts](#)



[Dedicated Left- and Right-Turn Lanes at Intersections](#)



[Reduced Left-Turn Conflict Intersections](#)

Roadway Departure



[SafetyEdgeSM](#)



[Median Barriers](#)



[Roadside Design Improvements at Curves](#)

Crosscutting



[Local Road Safety Plans](#)



[Road Safety Audit](#)



[Pavement Friction Management](#)

Provide Sidewalks



Provide Separated Bikeways



Photo credit: Jonathan Maus/bikeportland.org



Photo credit: NYCDOT

Reduce Severity by Managing Vehicle Speed

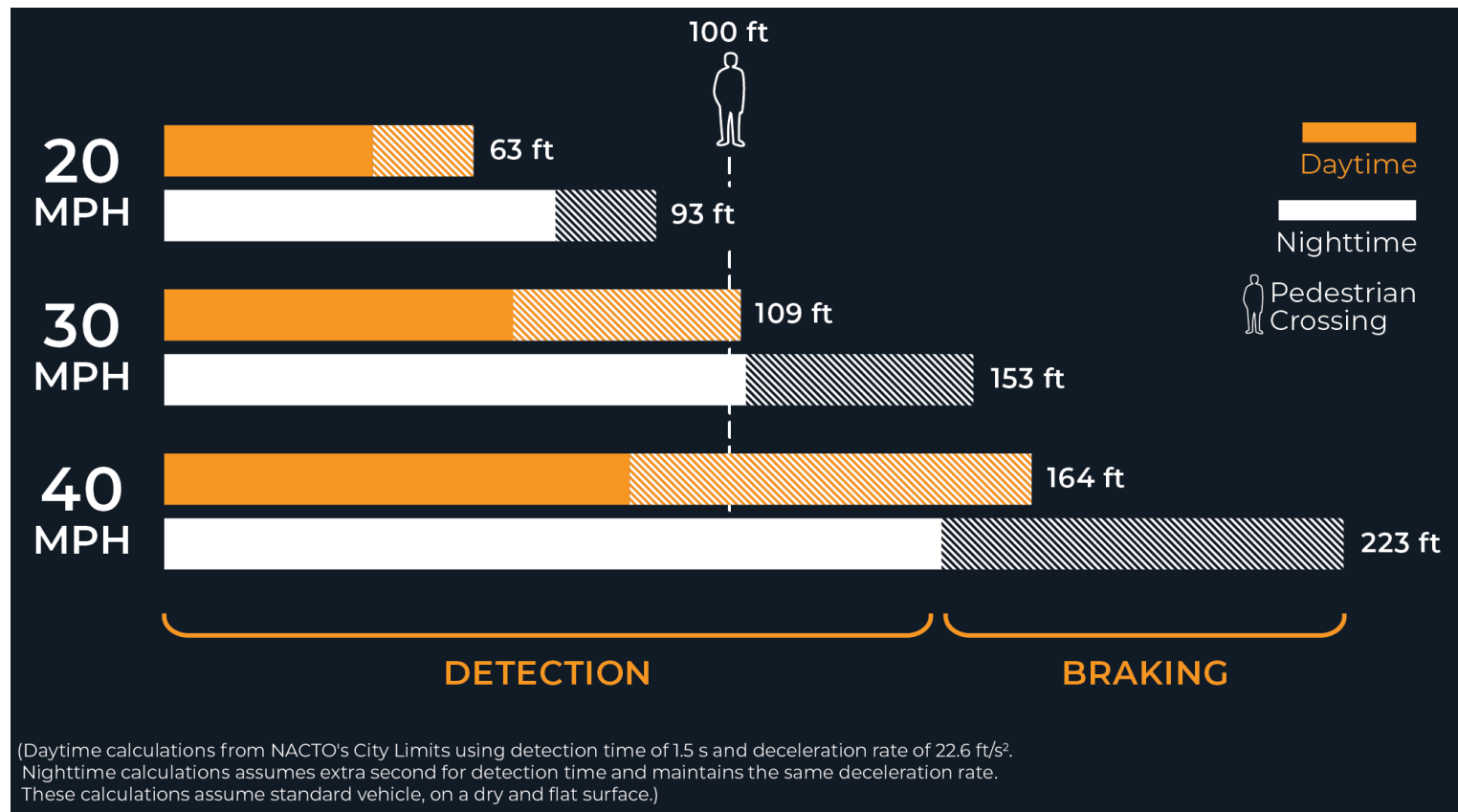


Image credit: NCHRP 17-97

Tier 2 - Manage Vehicle Speeds

Speed Management



[Appropriate Speed Limits for All Road Users](#)



[Speed Safety Cameras](#)



[Variable Speed Limits](#)

Pedestrian/Bicyclist



[Medians and Pedestrian Refuge Islands in Urban and Suburban Areas](#)



[Road Diets \(Roadway Reconfiguration\)](#)

Intersections



[Roundabouts](#)

Crosscutting



[Local Road Safety Plans](#)



[Road Safety Audit](#)



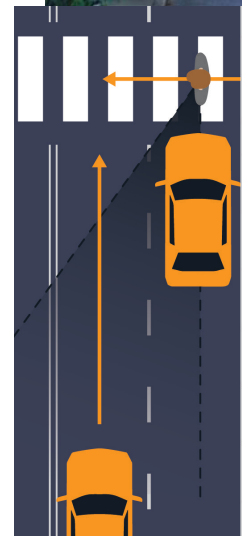
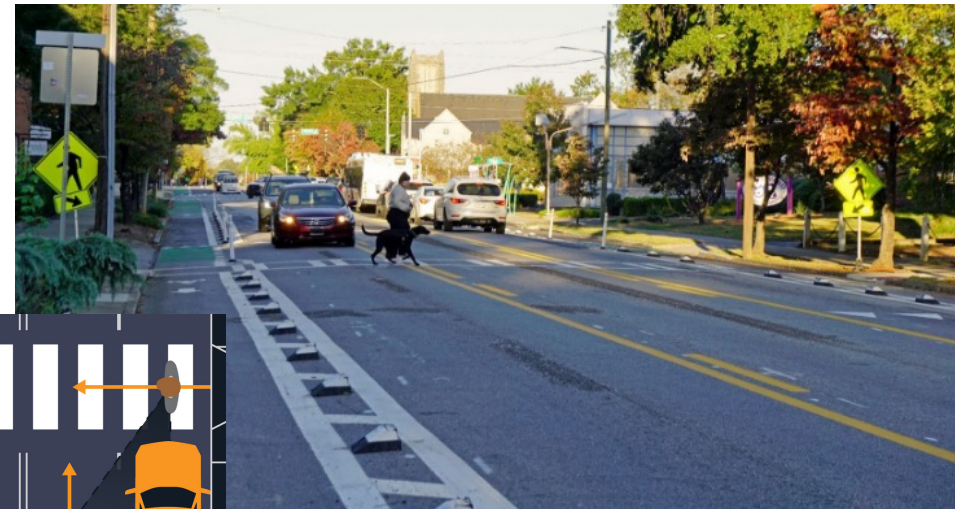
[Pavement Friction Management](#)



SAFE STREETS
Research + Consulting

Manage Vehicle Speeds

- Appropriate speed limits
 - Self-enforcing roadway design
- Roadway reallocations
- Speed feedback signs
- Automated speed enforcement
- Lower speed limits
- Variable speed limits
- Other traffic calming countermeasures



W13-20



R2-3P

Images: NCHRP 17-97 (above), MUTCD (both signs); Photo: NCHRP 17-97/Toole Design

Decrease Likelihood (Enhance Visibility)

- Increase pedestrian visibility and the potential for driver detection
- Slow driver speed to allow for detection



Photo credit: NCHRP 17-97/Toole Design



Photo credit: Safe Streets Research & Consulting

Tier 3 - Manage Conflicts in Time

Pedestrian/Bicyclist



[Pedestrian Hybrid Beacons](#)



[Leading Pedestrian Interval](#)

Intersections



[Yellow Change Intervals](#)

Crosscutting



[Local Road Safety Plans](#)



[Road Safety Audit](#)

Tier 4 - Increase Attentiveness & Awareness

Pedestrian/Bicyclist



[Crosswalk Visibility Enhancements](#)



[Rectangular Rapid Flashing Beacons \(RRFB\)](#)

Speed Management



[Variable Speed Limits](#)

Intersections



[Backplates with Retroreflective Borders](#)



[Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections](#)

Roadway Departure



[Enhanced Delineation for Horizontal Curves](#)



[Longitudinal Rumble Strips and Stripes on Two-Lane Roads](#)



[Wider Edge Lines](#)

Crosscutting



[Lighting](#)



[Local Road Safety Plans](#)



[Road Safety Audit](#)



SAFE STREETS
Research + Consulting

Source: FHWA Proven Safety Countermeasures 30

Use Traffic Control Devices



Photo credit: NCHRP 17-97/Toole Design



Photo credit: Flickr/Oregon DOT



Photo credit: Safe Streets Research & Consulting

...and Markings and Beacons

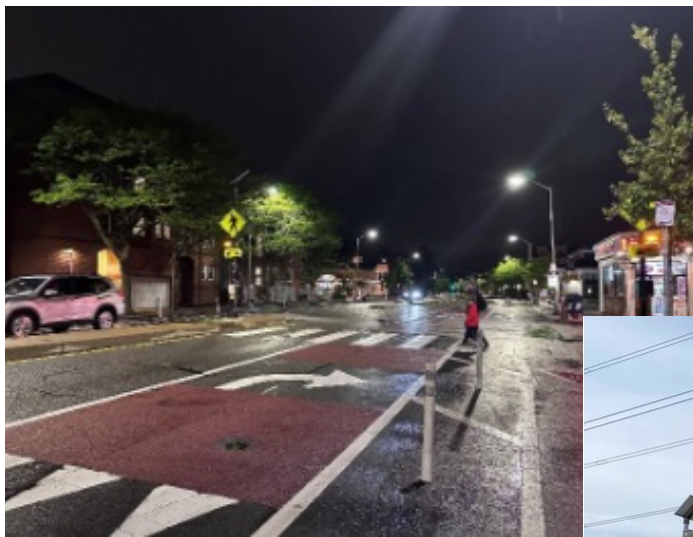


Photo credit: NCHRP 17-97/Toole Design



Photo credit: David Veselenak/hometownlife.com

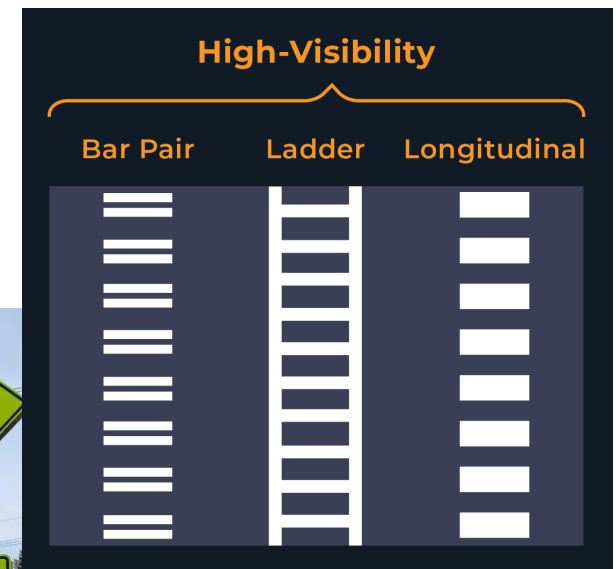


Image credit: NCHRP 17-97

...and Corridor and Spot Lighting



Photo credits: NCHRP 17-97/Toole Design

**Lighting is necessary but not sufficient in
high-risk environments.**

Use Countermeasures to Help Address Higher-risk Vehicles

Install countermeasures to help address higher-risk vehicle designs, including:

- Widened crosswalks
- Recessed stop bars
- Restricted right turn on red
- Leading pedestrian and bike intervals
- Daylighting areas
- Tightened curb radii
- Centerline hardening
- Truck aprons



Photo credit: NYC DOT

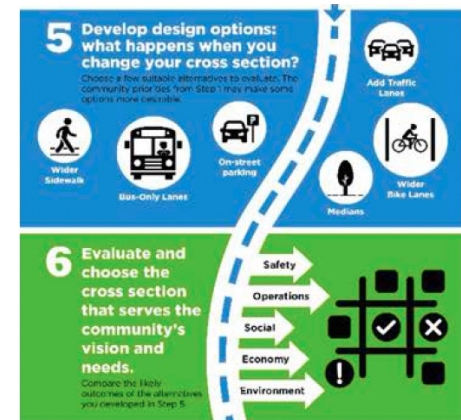
Rethink Project Evaluation & Strategic Planning

DESIGNING SAFE ROADWAYS FOR EVERYONE



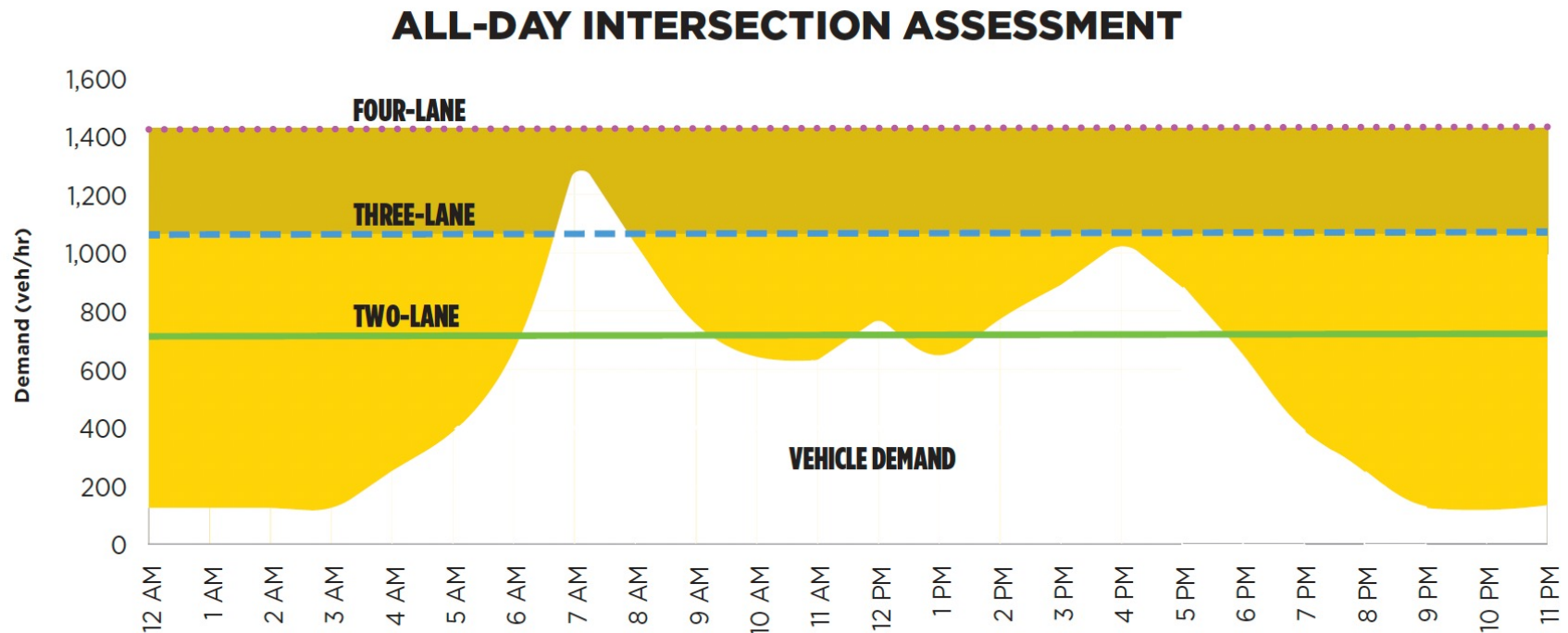
A NEW APPROACH TO ALLOCATING ROADWAY SPACE

Streets make up more than 80 percent of public space in cities and towns. Who gets to use this space and how they can use it affects a community's mobility, safety, economy, and quality of life. For many years, streets have been designed to emphasize mobility for vehicles over the needs and safety of other street users. This tool will help you think through how to allocate roadway space to reflect your community's true priorities.



Source: NCHRP 1036 Roadway Reallocation Guidance

Rethink Project Evaluation & Strategic Planning



The four-lane cross section is the only one in which demand never exceeds capacity—but for the three-lane cross section, demand never exceeds capacity outside the AM peak period.

Source: NCHRP 1036 Roadway Reallocation Guidance

Putting it Together

- Prioritize high-risk corridors
 - Especially higher-speed, multilane roads that lack pedestrian and bicyclist infrastructure
- Implement countermeasures that manage speeds, reduce exposure for people walking and bicycling, and enhance visibility
- Consider land use and context
 - Particularly activity generators for pedestrians at night

Change Traffic Safety Culture



Photo credits: Bob Schneider



**We can make different choices to
experience different future outcomes.**

Questions?

Rebecca L. Sanders, PhD, RSP_{2B}

Founder & President, Safe Streets Research & Consulting

rebecca@safestreetsresearch.com,

[linkedin.com/in/rebecca-l-sanders/](https://www.linkedin.com/in/rebecca-l-sanders/)

Pedestrian & Bicyclist Safety Resources

- 2005 Zegeer Marked Crosswalk Study
- FHWA Safe Transportation for Every Pedestrian (STEP)
- NCHRP 926
- NHTSA “Countermeasures that Work”
- NCHRP Synthesis 535
- FHWA PEDSAFE / BIKESAFE
- Vision Zero Network

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	1 2 4 5 6	1 2 5 6 7 9	1 2 5 6 7 9	1 2 4 5 6	1 2 5 6 7 9	1 2 5 6 7 9	1 2 4 5 6 7 9	1 2 5 6 7 9	1 2 5 6 7 9
3 lanes with raised median (1 lane in each direction)	1 2 3 4 5	1 2 3 5 6 7 9	1 2 3 5 6 7 9	1 2 3 4 5 6	1 2 3 5 6 7 9	1 2 3 5 6 7 9	1 2 3 4 5 6 7 9	1 2 3 5 6 7 9	1 2 3 5 6 7 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	1 2 3 4 5 6 7 9	1 2 3 5 6 7 9	1 2 3 5 6 7 9	1 2 3 4 5 6 7 9	1 2 3 5 6 7 9	1 2 3 5 6 7 9	1 2 3 4 5 6 7 9	1 2 3 5 6 7 9	1 2 3 5 6 7 9
4+ lanes with raised median (2 or more lanes in each direction)	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 5 6 7 8 9	1 2 3 5 6 7 8 9

Given the set of conditions in a cell,

Hermeasure is a candidate uncontrolled crossing location.
Hermeasure should always be adopted or required, based upon at a marked uncontrolled

visibility enhancements should cation with other identified

signifies that the countermeasure rate treatment, but exceptions may engineering judgment.

- 1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
- 2 Raised crosswalk
- 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
- 4 In-Street Pedestrian Crossing sign
- 5 Curb extension
- 6 Pedestrian refuge island
- 7 Rectangular Rapid-Flashing Beacon (RRFB)**
- 8 Road Diet
- 9 Pedestrian Hybrid Beacon (PHB)**

Image credits: FHWA

PEDSAFE

Pedestrian Safety Guide and Countermeasure Selection System

Guide: Background | Statistics | Analysis | Implementation | Countermeasures: List | Tool | Matrices | Case Studies | Resources

The Pedestrian Safety Guide and Countermeasure Selection System is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location.

GUIDE

Background
Understand what is needed to create a viable pedestrian system.

Statistics
Learn about the factors related to the pedestrian crash problem.

Analysis
How crash typing can lead to the most appropriate countermeasures.

Implementation
Needed components for treatments.

COUNTERMEASURES

Selection Tool
Find countermeasures based on desired objectives.

Selection Matrices
Find countermeasures based on crash types and performance objectives.

Countermeasure List
A comprehensive list of all countermeasures.

CASE STUDIES

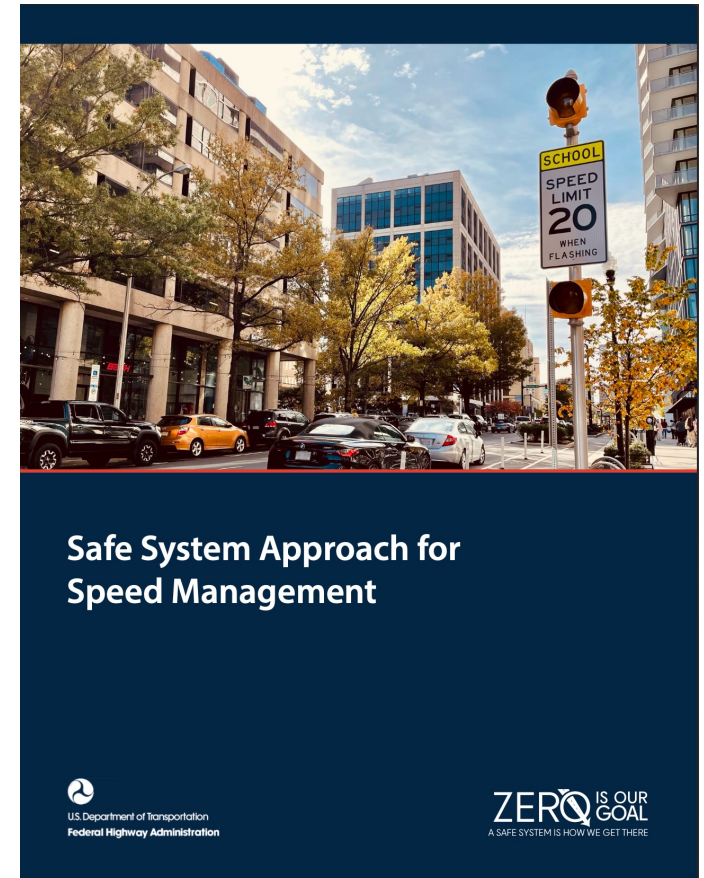
RESOURCES & GUIDELINES

Authors and Acknowledgements

U.S. Department of Transportation
Federal Highway Administration

Safe System Resources

- Safe System Approach for Speed Management
- Safe System Project-Based Alignment Tool
- Safe System Policy-Based Alignment Tool
- Primer on Safe System Approach for Pedestrians and Bicyclists
- Safe System Roadway Design Hierarchy
- Safe System Based Framework and Analytical Methodology for Assessing Intersections
- Integrating the Safe System Approach with the Highway Safety Improvement Program



Lighting Resources

