



SAFE SYSTEM APPROACH

Zero is our goal. A Safe System is how we get there.



U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

NOTE TO PRESENTERS

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Others are welcome to use it in whole or in part as appropriate to their purposes.

Thank you.

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Imagine our country as a place where *nobody* has to die from vehicle crashes.



Source: Fehr & Peers

TOP 3 TAKEAWAYS

- The Safe System Approach is “Principles Based”
- Achieving a Safe System requires all five elements to be strengthened
- Safe Roads is a continuum, not an absolute

Presentation Overview

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Introduction

Assessment of our current situation and introduction to the Safe System approach

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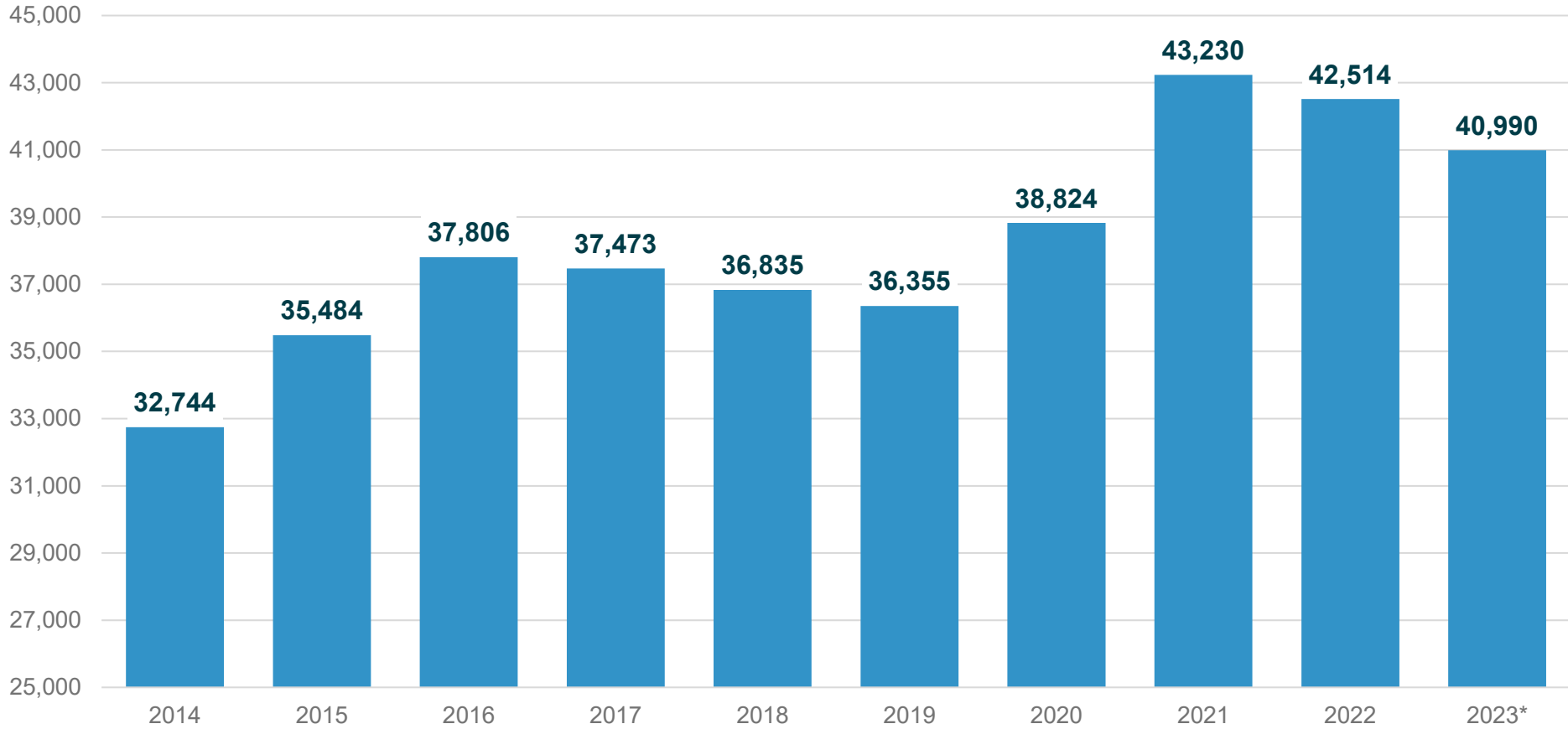
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Case Studies

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Conclusion & Resources

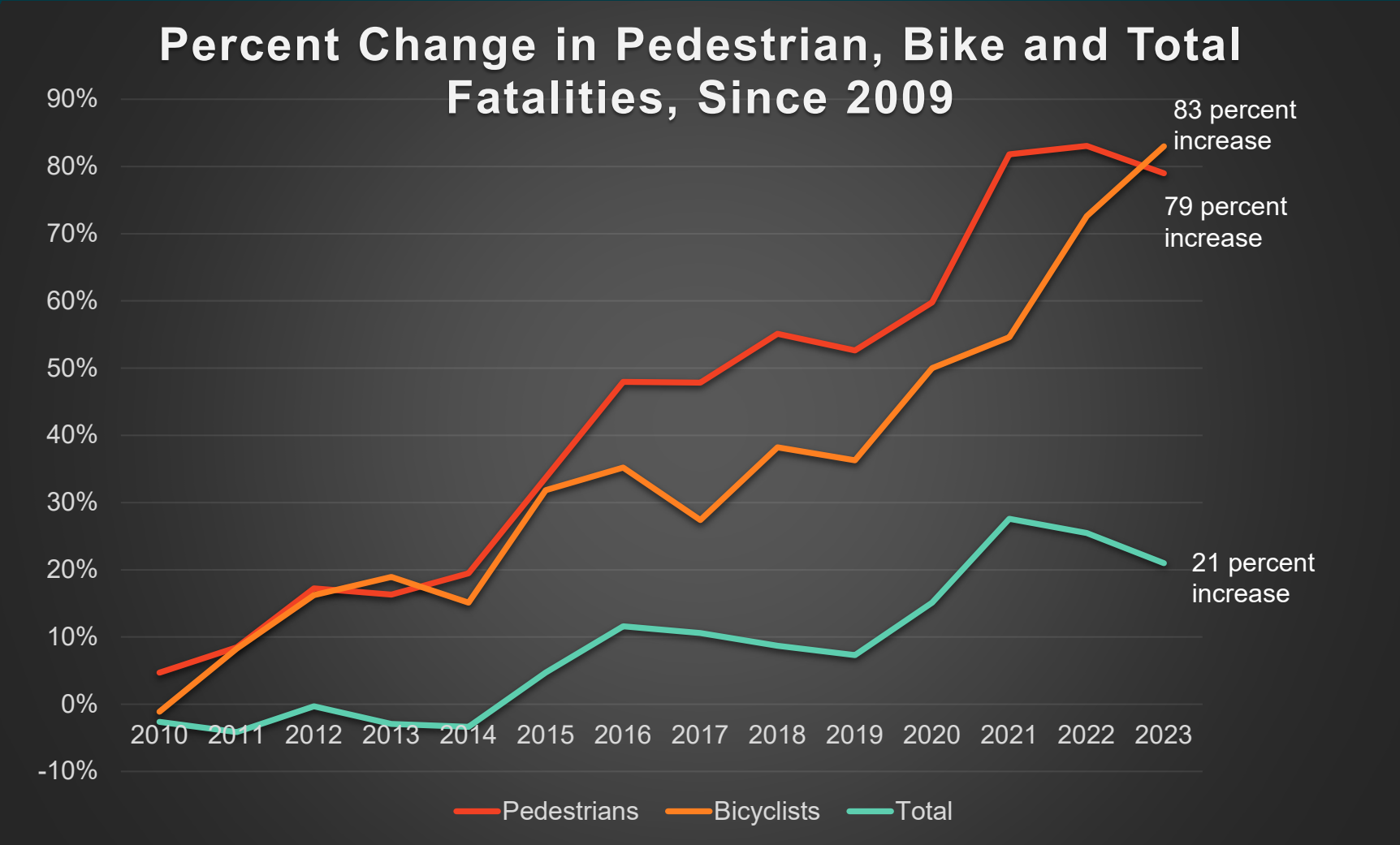
THOUSANDS OF LIVES ARE LOST EACH YEAR



Total US Traffic Fatalities 2014-2023

* 2023 number is preliminary

WE HAVE A NATIONAL ROADWAY SAFETY PROBLEM

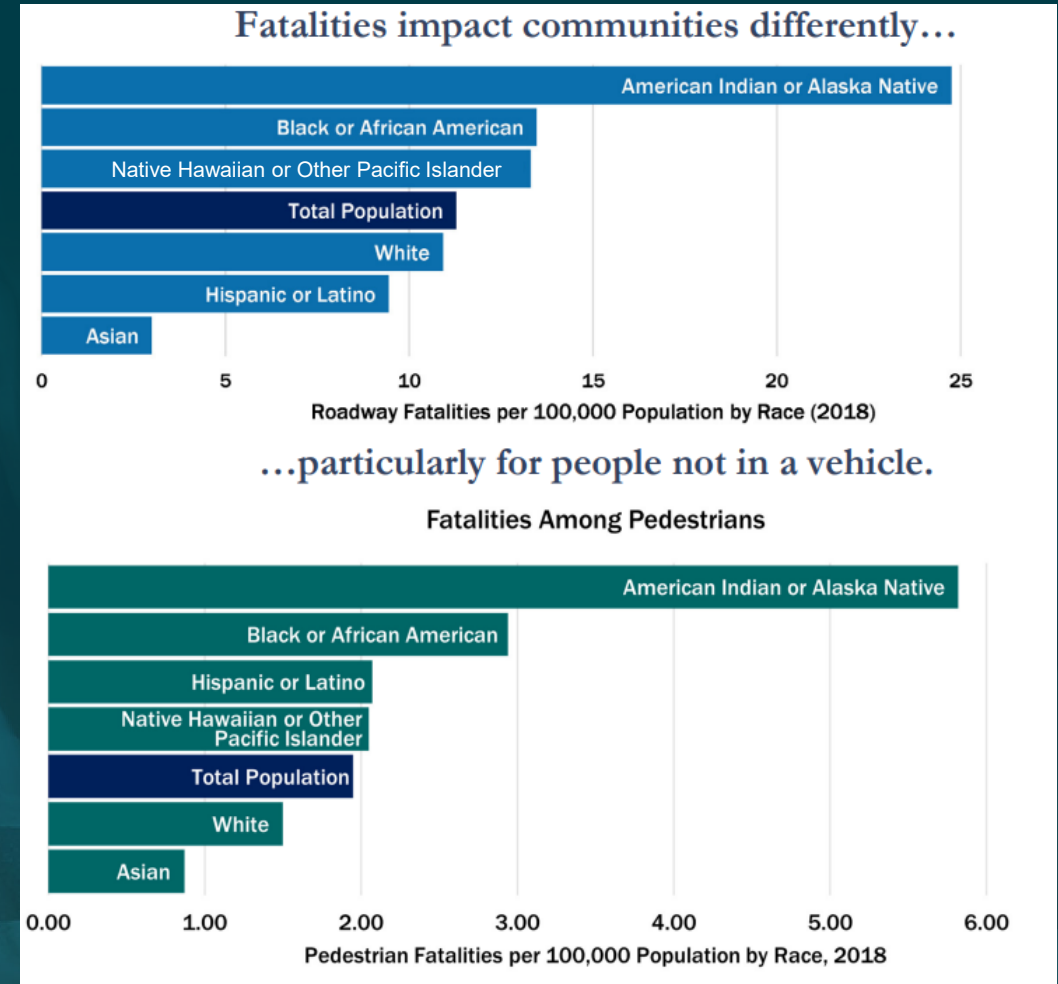


Source: US DOT

EQUITY

Opportunities to Simultaneously Address Safety, Equity, and Climate
Safety is and will always be the Department's top priority. Roadway safety is also a foundational pre-requisite to our success in addressing two other major priorities: equity and climate.

“Traffic crashes are a leading cause of death for teenagers in America, and disproportionately impact people who are Black, American Indian, and live in rural communities. We face a crisis on our roadways; it is both unacceptable and solvable.”



Equality



Equity



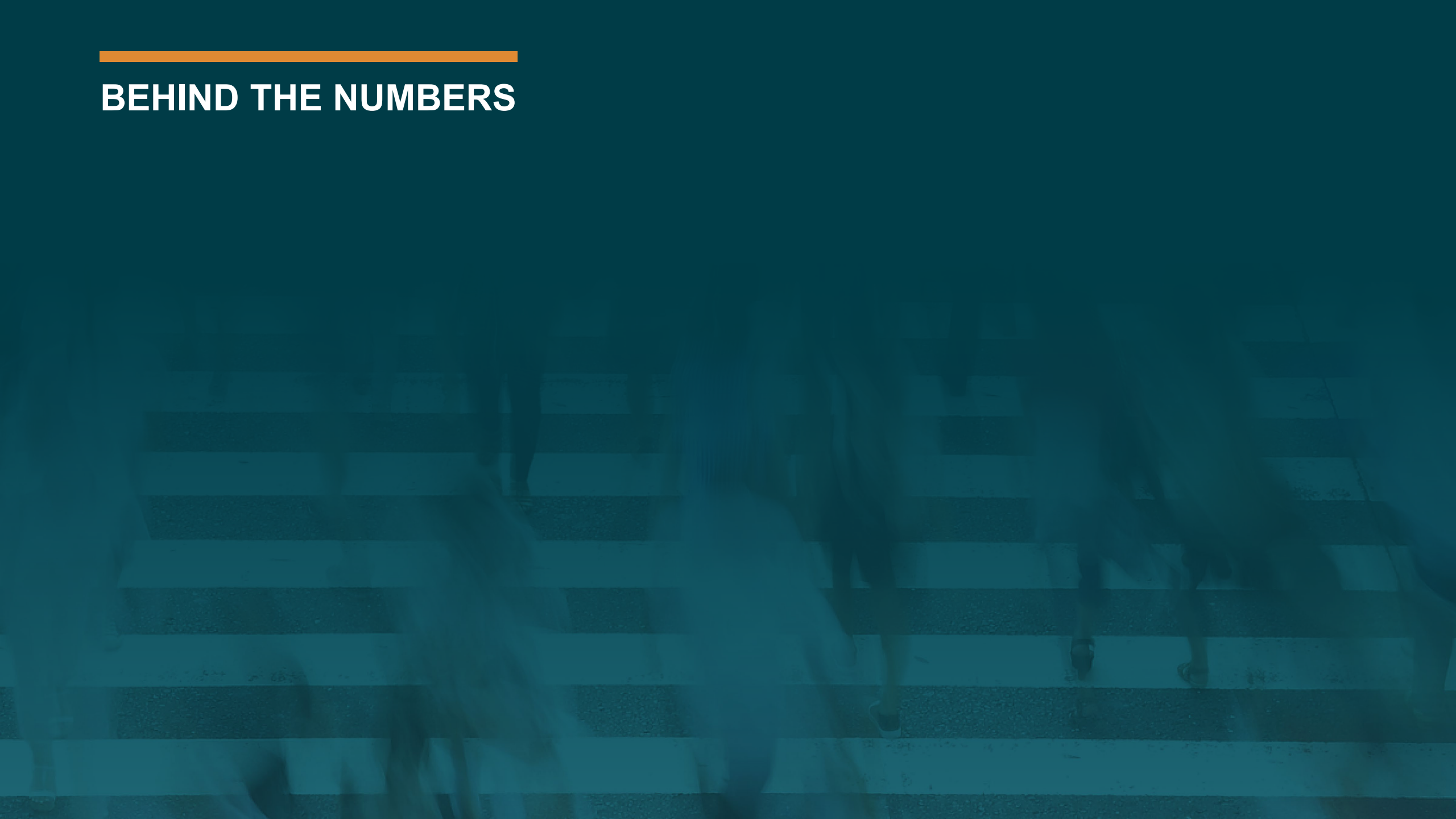
Source: FHWA. Modification with permission of © 2017 Robert Wood Johnson Foundation.

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We will make more rapid progress toward the goal of zero deaths by addressing disparate traffic safety outcomes in underserved communities.



BEHIND THE NUMBERS



How does the United States *reach zero deaths?*



Source: Fehr & Peers

THE SAFE SYSTEM APPROACH AS A GUIDING PRINCIPLE

PARADIGM SHIFT



It involves a paradigm shift to improve safety culture, increase collaboration across all safety stakeholders, and refocus transportation system design and operation on anticipating human mistakes and lessening impact forces to reduce crash severity and save lives.

A NEW PARADIGM

The Safe System approach aims to eliminate fatal and serious injuries for all road users by:



**Accommodating
human mistakes**

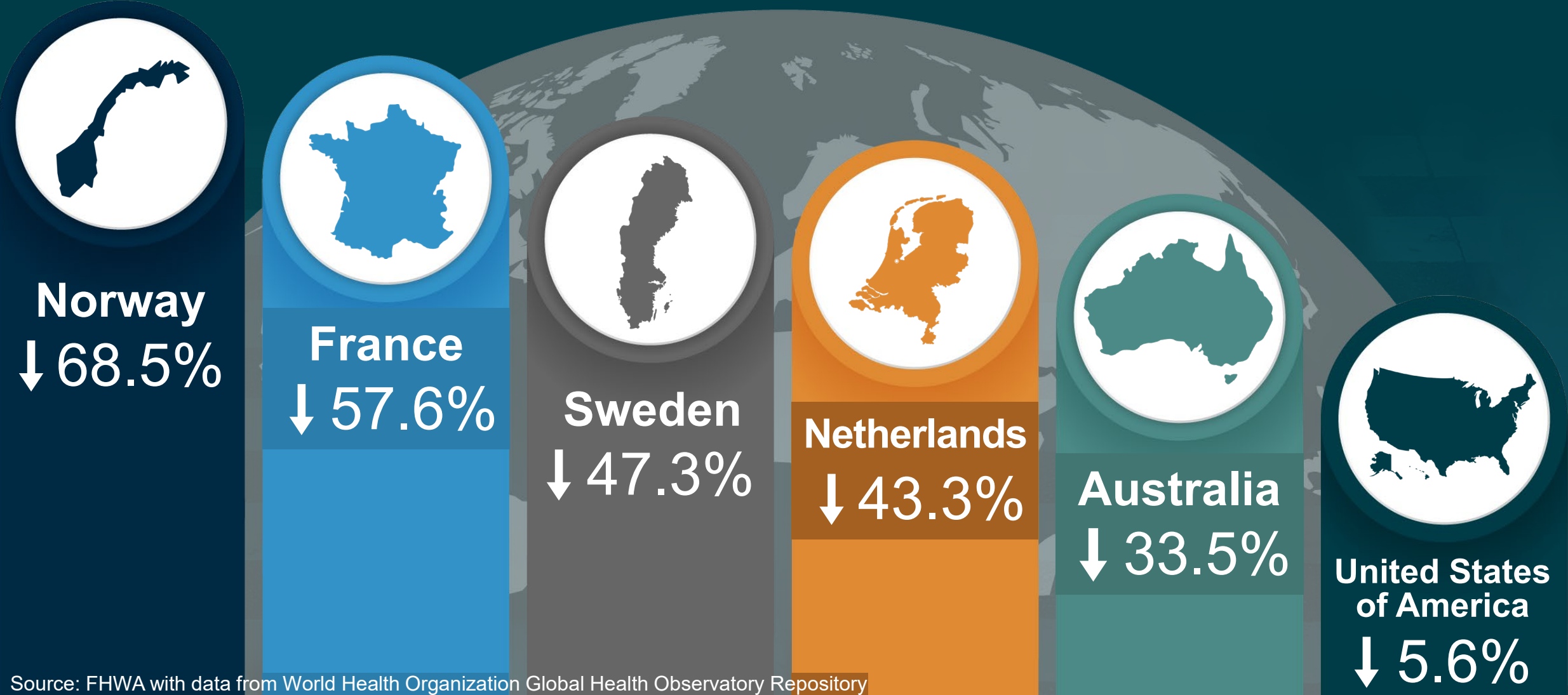
PARADIGM SHIFT ||



**Keeping impacts on the human
body at tolerable levels**

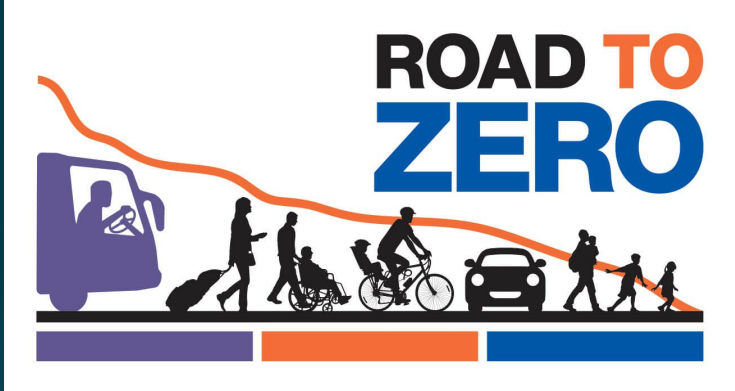
SUCCESSFUL SAFE SYSTEM ADOPTERS

Changes from 2000 to 2019.



Source: FHWA with data from World Health Organization Global Health Observatory Repository

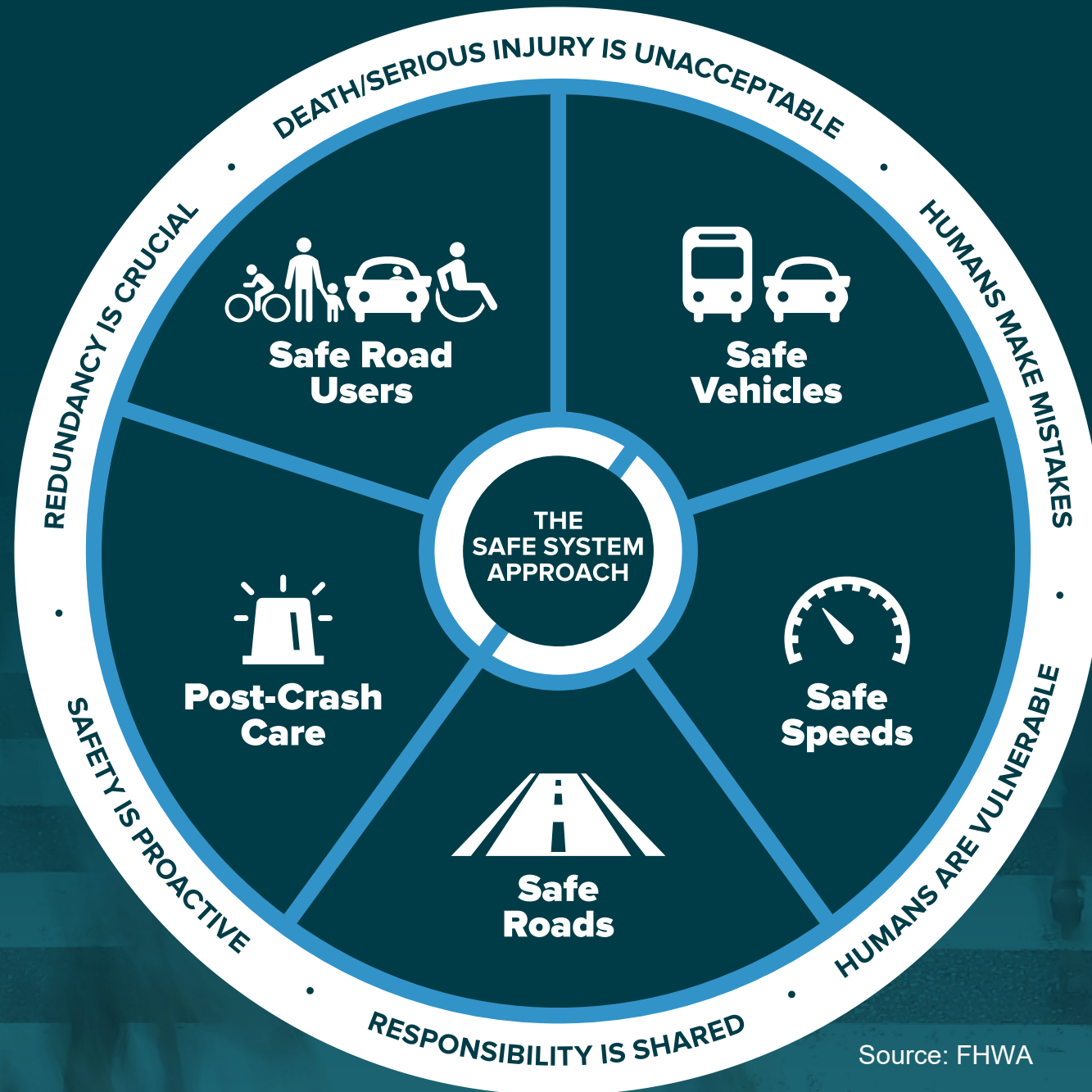
SAFE SYSTEM IN THE UNITED STATES



Toward Zero Deaths[®]
National Strategy on Highway Safety

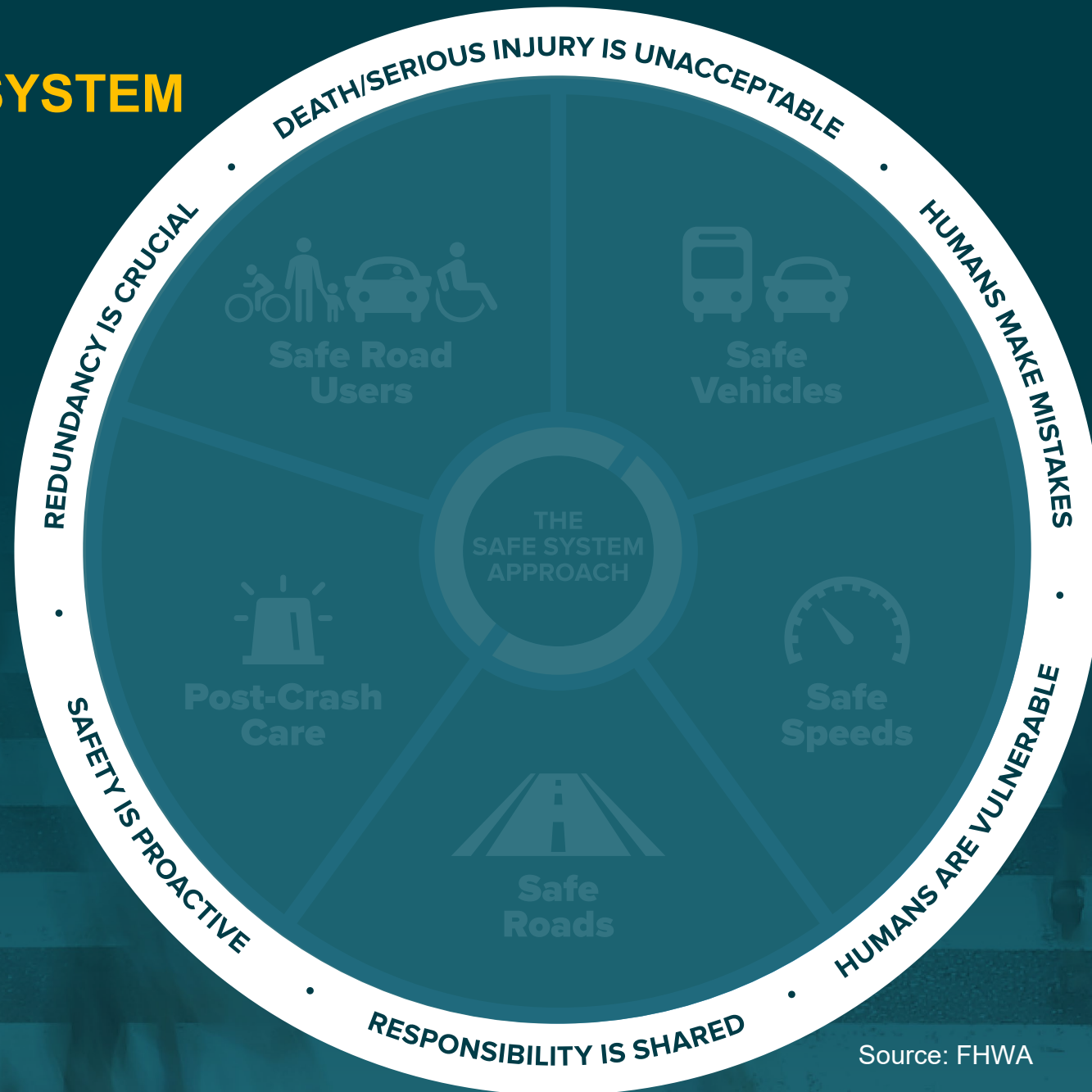
VISION 4 ERONETWORK

THE SAFE SYSTEM APPROACH



Source: FHWA

THE 6 SAFE SYSTEM PRINCIPLES



Death/Serious Injury is unacceptable



Humans make mistakes



Humans are vulnerable



Responsibility is shared



Safety is proactive



Redundancy is crucial

THE 5 SAFE SYSTEM ELEMENTS



Source: FHWA

Safe System Principles

Overview of the 6 principles of the Safe System approach

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THE SAFE SYSTEM PRINCIPLES



Death/serious injury
is unacceptable



Humans make
mistakes



Humans are
vulnerable



Responsibility is
shared



Safety is proactive



Redundancy
is crucial

DEATH/SERIOUS INJURY IS UNACCEPTABLE



HUMANS MAKE MISTAKES

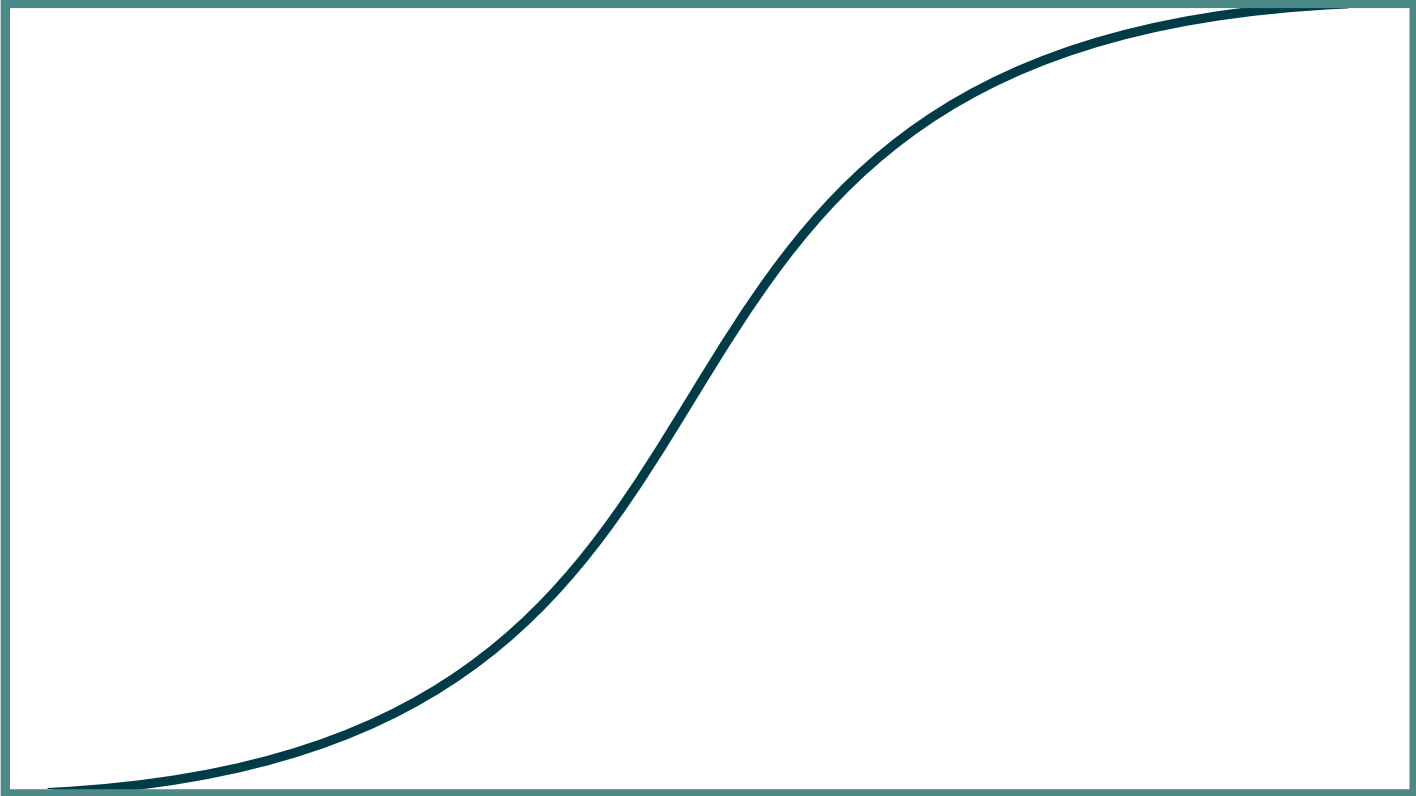


HUMANS ARE VULNERABLE



Risk of Fatality and Serious Injury

100%
0%



Crash Kinetic Energy →

RESPONSIBILITY IS SHARED



- **System managers**

- Planners, designers, builders, operators, maintenance workers



- **Vehicle manufacturers**



- **Law enforcement personnel**

- **Traffic Incident Management personnel**



- **System users**



SAFETY IS PROACTIVE



Identify risks



Mitigate risks

REDUNDANCY IS CRUCIAL



**Safe road
users**



**Safe
vehicles**



**Safe
speeds**



**Safe
roads**



**Post-crash
care**

Safe System Elements

Overview of the 5 elements of the Safe System approach

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THE SAFE SYSTEM ELEMENTS



Safe road users



Safe vehicles



Safe speeds



Safe roads



Post-crash care

SAFE ROAD USERS



Walk



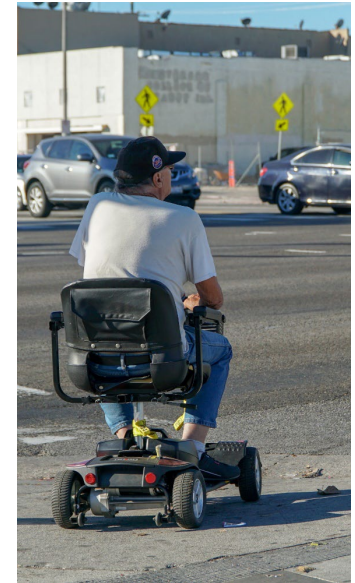
Bike



Drive

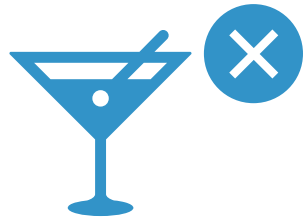


Transit

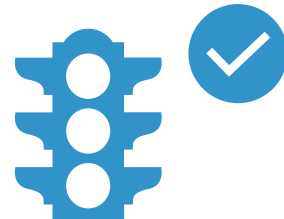


Other

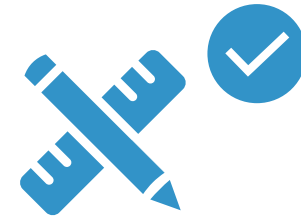
SAFE ROAD USERS – CONTINUED



**Not distracted
or impaired**



Follow rules



**Act within the
limits of the
road design**

SAFE VEHICLES



Active safety

Measures to reduce the chance of a crash occurring

- Lane departure warning
- Autonomous emergency braking

Passive safety

Protective systems for when crashes do occur

- Seatbelts and airbags
- Crash-absorbing vehicle crumple zones

SAFE VEHICLES - CONTINUED



Other road user safety

Measures that protect other road users

- Bicyclist and pedestrian detection
- Vehicle size and design

New technology

Leveraging connected and automated vehicle (CAV) technology to improve safety

SAFE SPEEDS



“ Speed is at the heart of a forgiving road transport system. It transcends all aspects of safety: without speed there can be no movement, but with speed comes kinetic energy and with kinetic energy and human error come crashes, injuries, and even deaths.”

Organization for Economic Co-operation and Development

SAFE SPEEDS: REDUCING PEDESTRIAN FATALITIES

Hit by a vehicle traveling at

23

MPH

10% risk of death



Hit by a vehicle traveling at

42

MPH

50% risk of death



Hit by a vehicle traveling at

58

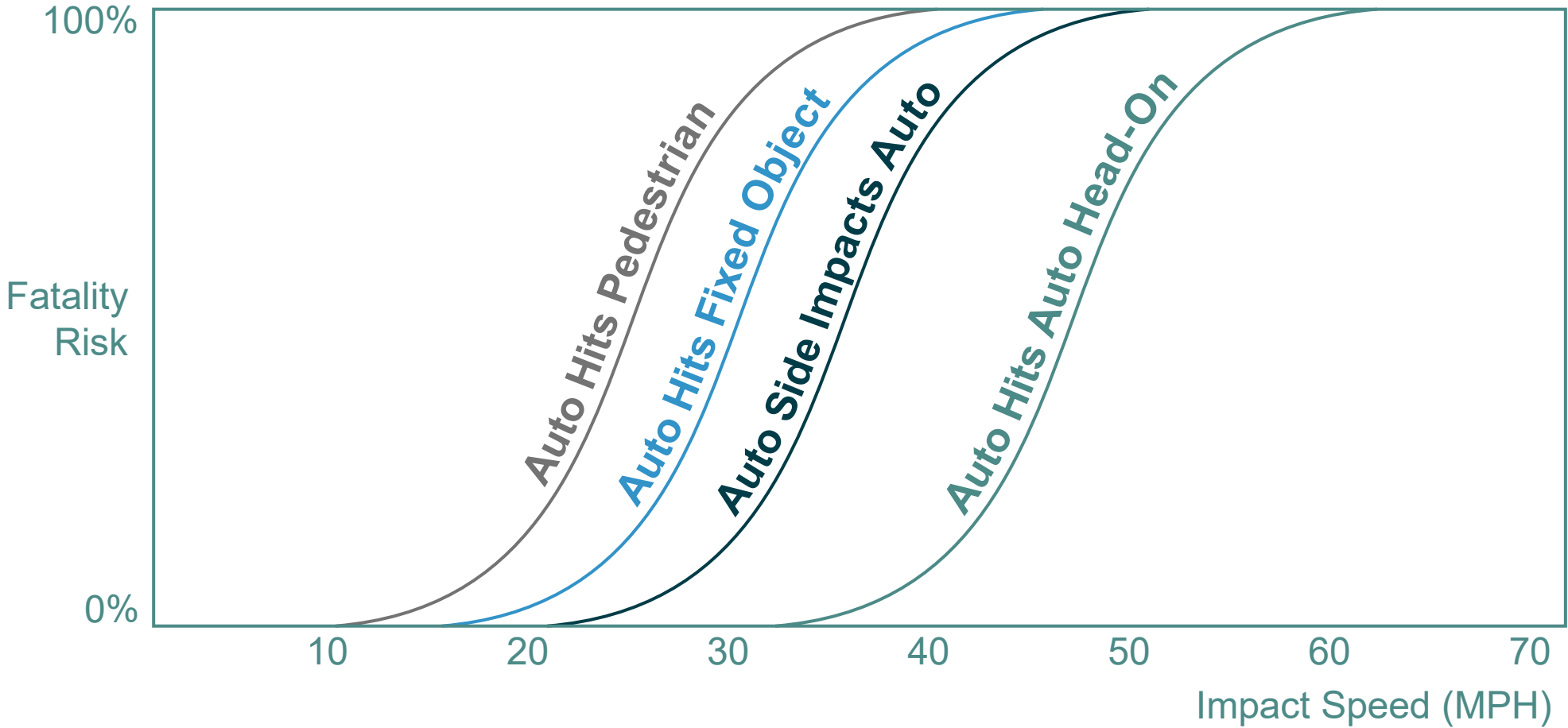
MPH

90% risk of death



Source: FHWA. Adapted from USDOT Pedestrian Safety Action Plan

SAFE SPEEDS: FATALITY RISKS



Source: FHWA. Adapted from graphic created by Australian Roads and Traffic Authority of New South Wales.

SAFE SPEED: TREATMENTS THAT MINIMIZE INJURIES

Speed through typical intersection



Source: Fehr & Peers

Speed through Safe System intersection



Source: City of Carmel, IN

SAFE ROADS



Safe roads are designed and operated to:

- 1. Prevent crashes among all users**
- 2. Keep impacts on the human body at tolerable levels**



THOUGHTS ON THE SAFE ROADS ELEMENT

Think of “Safe Roads” as a continuum – not an absolute

- The aim is to design and operate roads to continuously approach toward creating a Safe System by implementing features appropriate for the intended and actual road use and speed environment
 - Reduce the likelihood of error
 - Reduce the consequences of error



Source: FHWA

SAFE ROADS: AVOIDING CRASHES



Avoiding crashes involves:



Separating users in space



Separating users in time



Increasing attentiveness and awareness

SAFE ROADS: CRASH KINETIC ENERGY



Managing crash kinetic energy involves:



Managing speed



Managing crash angles



Managing crash energy distribution

SAFE ROADS: ALL ASPECTS OF THE ROADWAY SYSTEM



Safe roads include all aspects of the roadway system:



Design



Construction

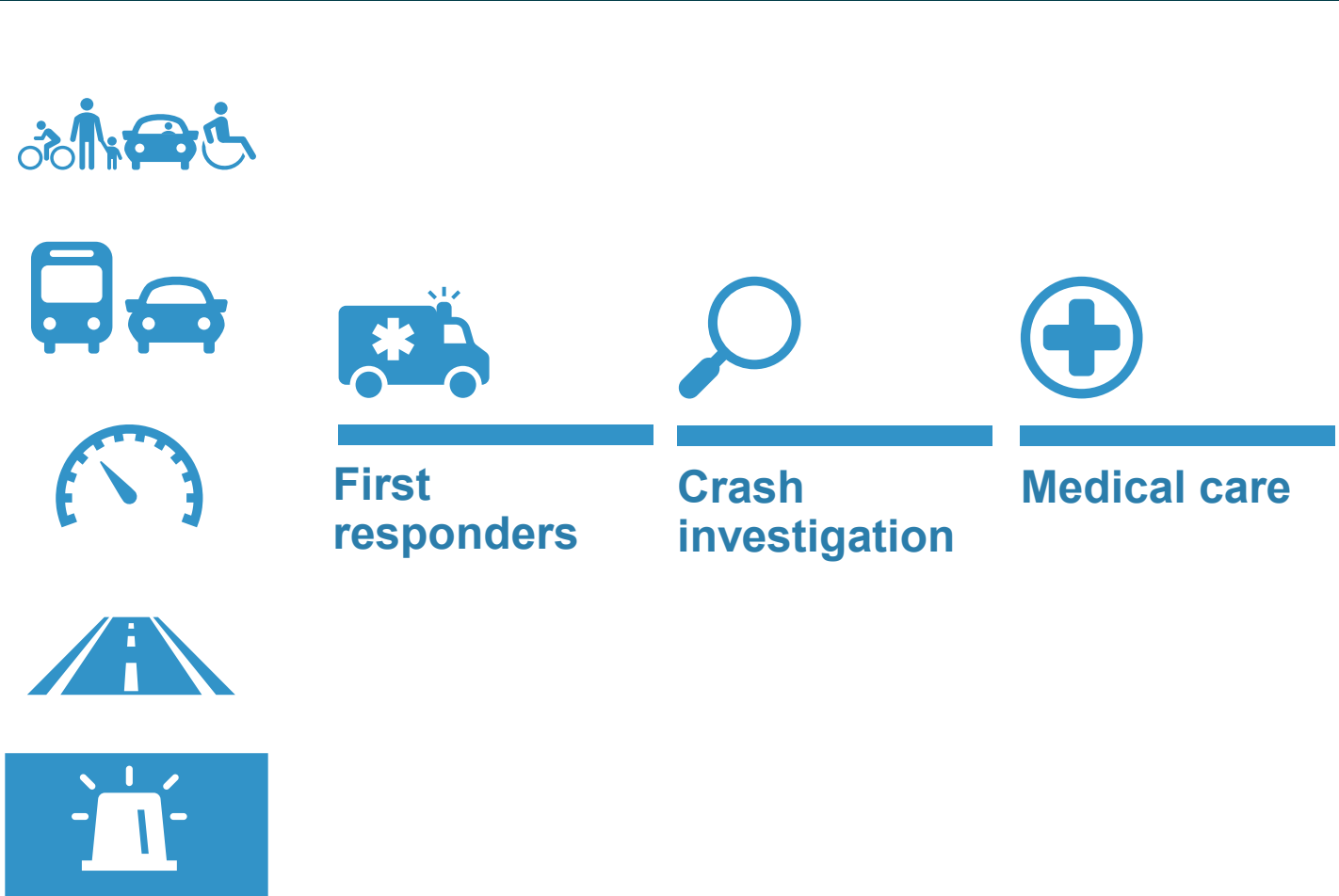


Maintenance



Operation

POST-CRASH CARE: TRAFFIC INCIDENT MANAGEMENT



POST-CRASH CARE: OTHER ASPECTS



Post-crash care extends to actions after TIM returns a crash scene to normal conditions:



Media



Engineering

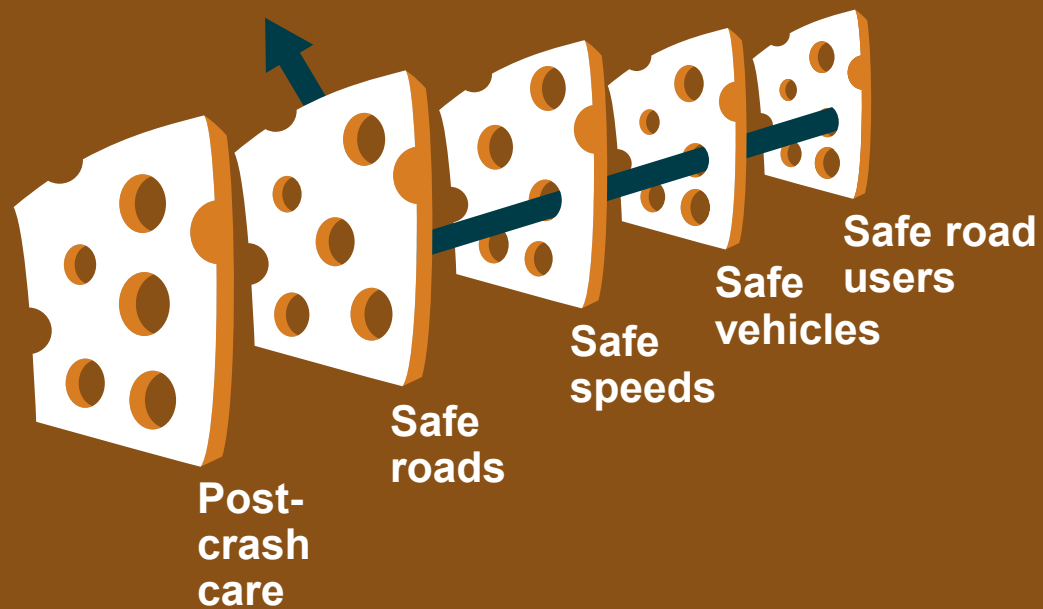


Justice

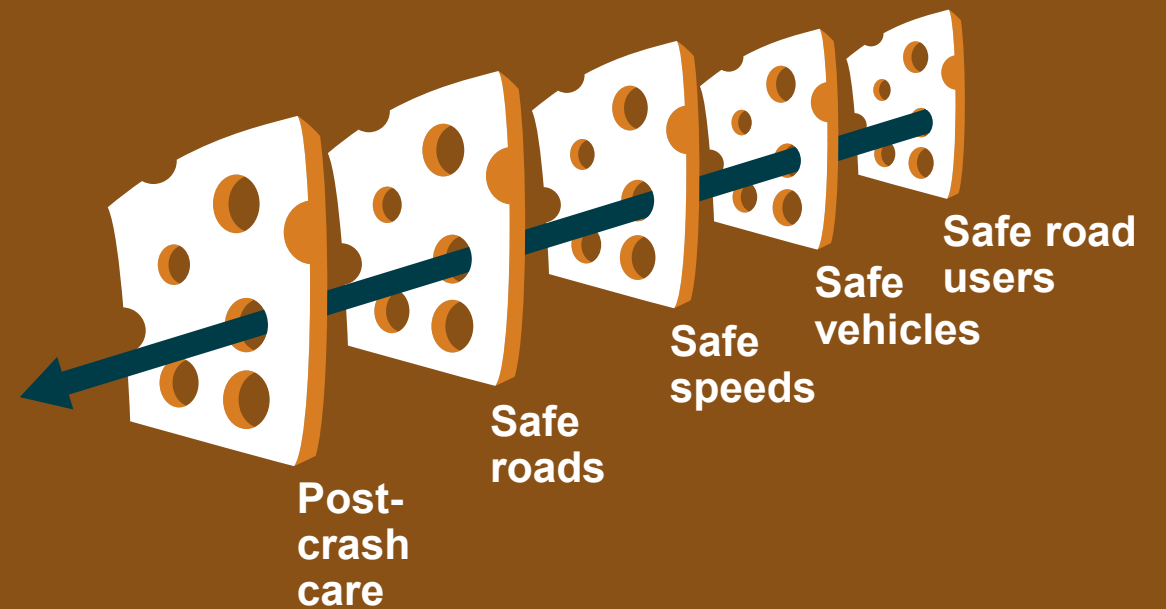


THE 5 SAFE SYSTEM ELEMENTS CREATE REDUNDANCY

The “Swiss Cheese Model” of redundancy creates layers of protection



Death and serious injuries only happen when all layers fail





MAKING OUR ROADS SAFER | One Countermeasure at a Time

28 Proven Safety Countermeasures that offer significant and measurable impacts to improving safety



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<https://safety.fhwa.dot.gov/>

“Double-Down” on what works

Transportation agencies are strongly encouraged to consider widespread implementation of PSCs to accelerate the achievement of local, State, and National safety goals.

Case Studies

Examples of the Safe System approach in the United States

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ROUNDBABOUTS: CARMEL, IN

Safe System Elements Covered



Source: City of Carmel, IN

QUEENS BLVD: NEW YORK, NY

Safe System Elements Covered



Source: NYCDOT

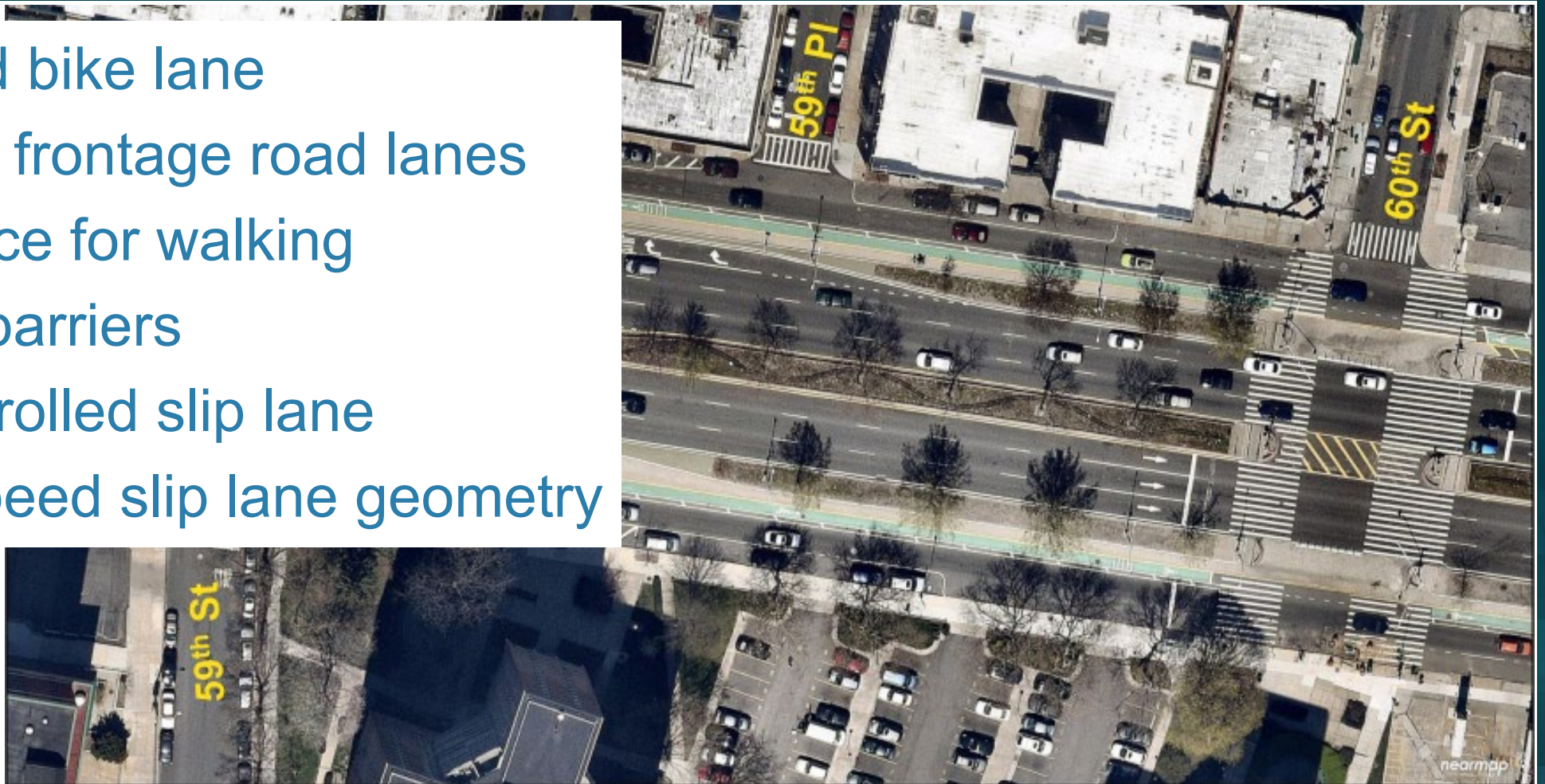
QUEENS BLVD: BEFORE

- High speed slip lanes
- No bike facilities
- Multiple lane frontage road



QUEENS BLVD: AFTER

- Dedicated bike lane
- Removed frontage road lanes
- More space for walking
- Physical barriers
- Stop controlled slip lane
- Slower speed slip lane geometry



QUEENS BLVD: RESULTS

Crashes and Injuries One-Year After Analysis, Queens Blvd (Roosevelt Ave. to Eliot Ave.)

Crashes and Injuries	Before Average (2012-2015)	After Average (2017-2018)	Change	
			Average	Percent
Total Crashes	798.7	648.0	-150.7	-19%
Crashes w/ Injuries	148.3	123.0	-25.3	-17%
Motor Vehicle Occupant	149.3	118.0	-31.3	-21%
Pedestrian	40.3	18.0	-22.3	-55%
Cyclist	14.0	18.0	4.0	29%
Total Injuries	203.7	154.0	-49.7	-24%

Each before year period is the 24-month period beginning July 1 and ending June 30.
The 1-yr after period is January 1, 2017 to December 31, 2017.
The implementation period of July 1, 2015 to December 31, 2016 is excluded.

Conclusion & Resources

Tools to bring the Safe System approach to your community

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WHERE ARE YOU ON THE SAFE SYSTEM JOURNEY?

Traditional approach

Prevent crashes →

Improve human behavior →

Control speeding →

Individuals are responsible →

React based on crash history →

Safe System approach

Prevent death and serious injuries

Design for human mistakes/limitations

Reduce system kinetic energy

Share responsibility

Proactively identify and address risks



Safe System Materials

Find more resources at: safety.fhwa.dot.gov/zerodeaths

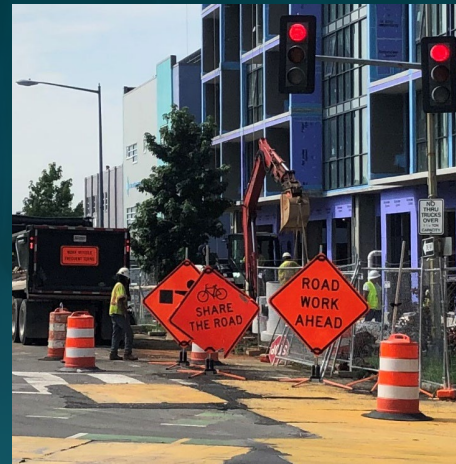
Implementing the Safe System approach is our shared responsibility, *and we all have a role.*



Source: Fehr & Peers



Source: Arlington County, VA



Source: Fehr & Peers



Source: Fehr & Peers

**Zero is our goal.
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Questions?