National Transportation Safety Board

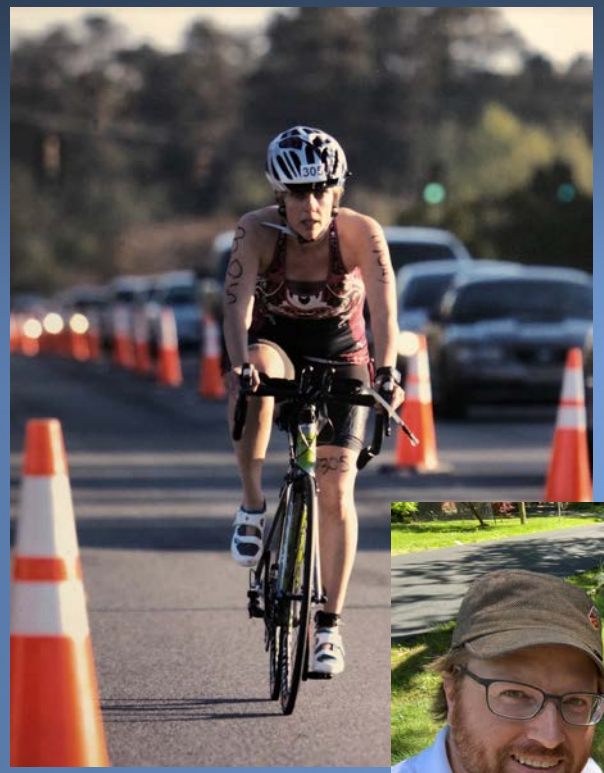
Bicycle Safety on U.S. Roadways: Crash Risks and Countermeasures

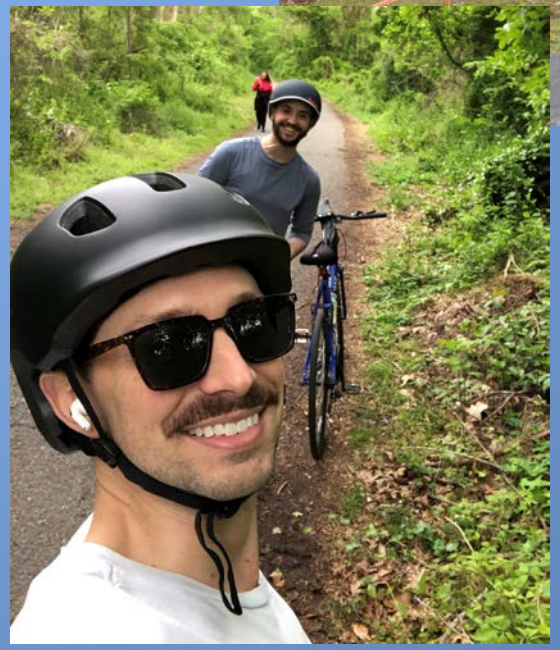
The Honorable Jennifer Homendy

Webinar for the Association of Pedestrian and Bicycle Professionals

June 24, 2020

The Team





AVIATION

HIGHWAY

MARINE

RAILROAD

PIPELINE

OUR MISSION

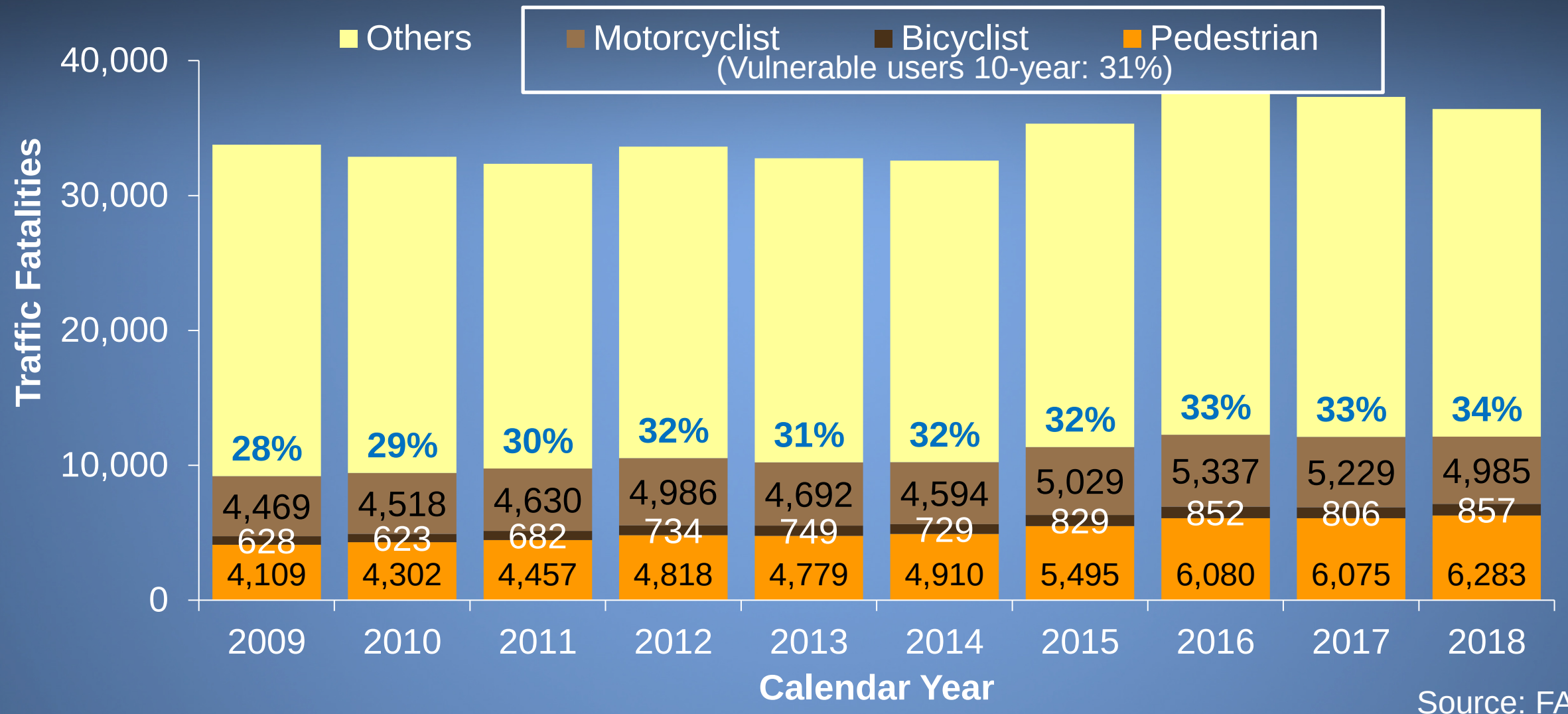
The NTSB is an independent Federal agency charged by Congress with **investigating** every civil aviation accident in the United States and significant accidents in the other modes of transportation – highway, marine, railroad, and pipeline – and **issuing safety recommendations** aimed at preventing future accidents.

2019–2020 NTSB

MOST WANTED LIST OF TRANSPORTATION SAFETY IMPROVEMENTS

- Eliminate Distractions
- End Alcohol and Other Drug Impairment
- Ensure the Safe Shipment of Hazardous Materials
- Fully Implement Positive Train Control
- Implement a Comprehensive Strategy to Reduce Speeding-Related Crashes
- Improve the Safety of Part 135 Aircraft Flight Operations
- Increase Implementation of Collision Avoidance Systems in All New Highway Vehicles
- Reduce Fatigue-Related Accidents
- Require Medical Fitness—Screen for and Treat Obstructive Sleep Apnea
- Strengthen Occupant Protection

US Vulnerable Road User Fatalities, 2009-2018



Source: FARS

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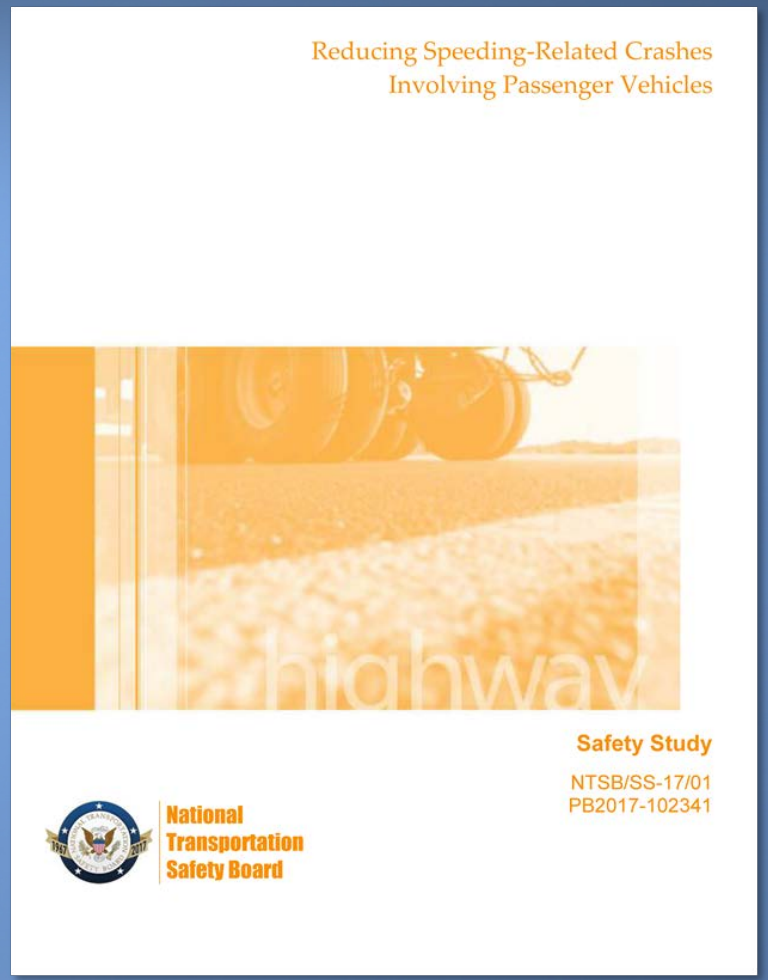
NTSB Reports on Vulnerable Road Users

- 2013: Single-Unit Trucks
- 2013: Eliminating Alcohol-Impaired Driving
- 2017: Speeding
- 2018: Motorcyclists and Pedestrians
- 2019: Bicyclist

Reducing Speeding-Related Crashes Involving Passenger Vehicles

Safety Issues

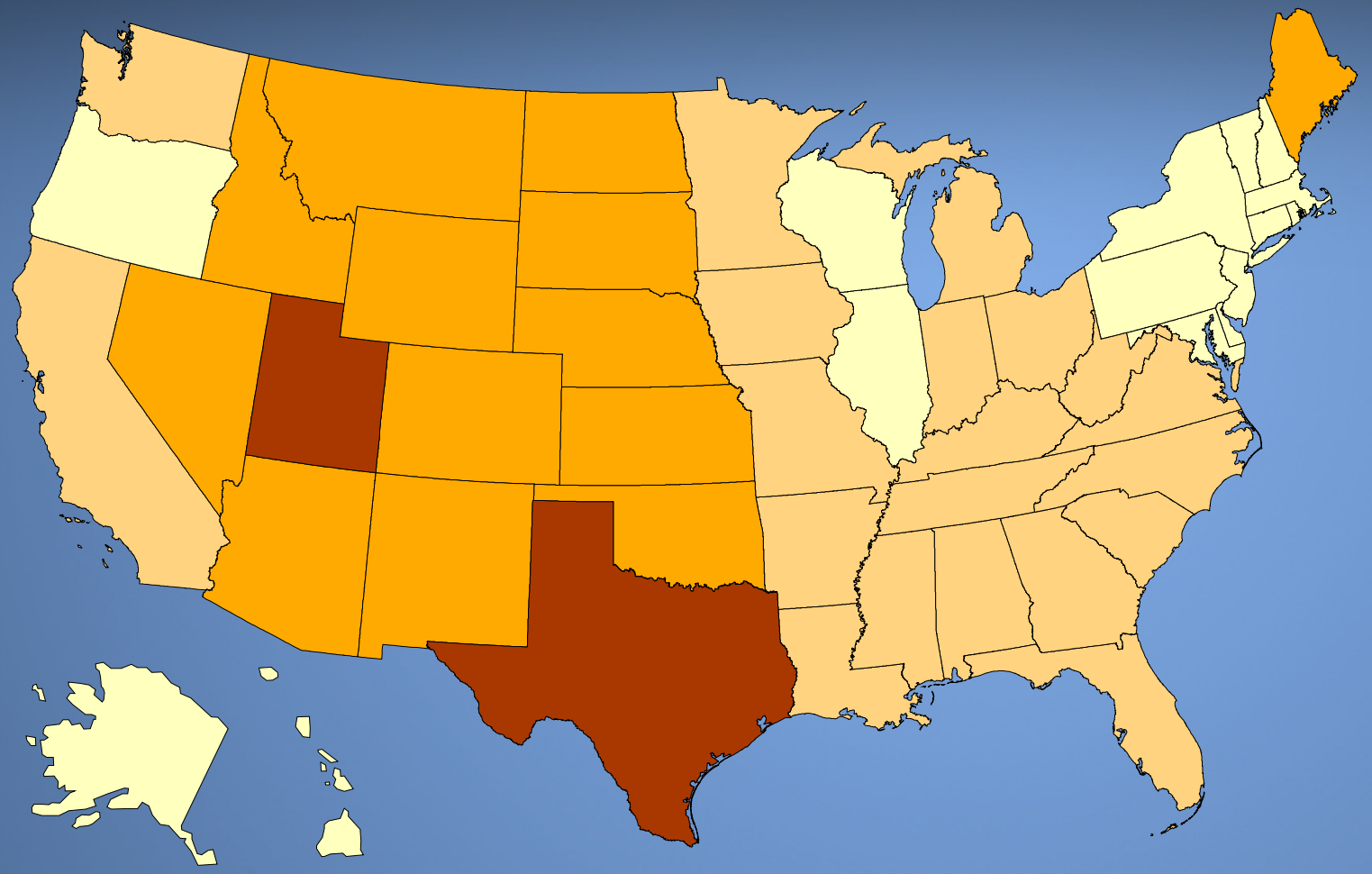
- Changing how we set speed limits
- Automated speed enforcement
- In-vehicle technology
- National leadership

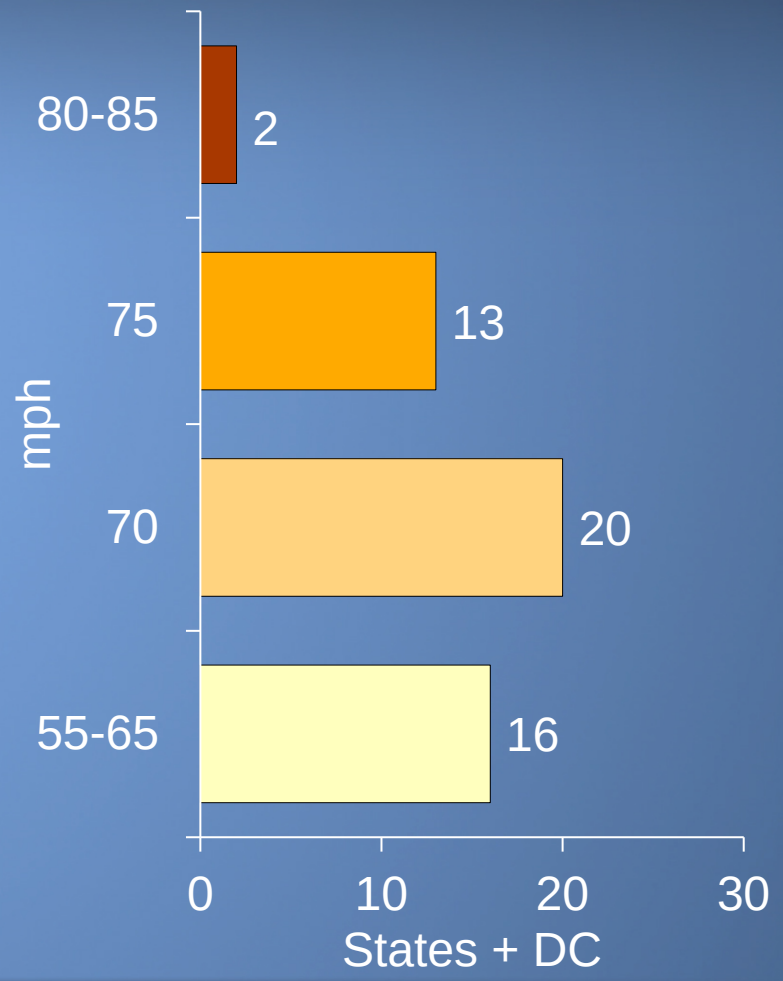


In 2018, speeding related crashes killed 9,378 people
Over 2,000 were vulnerable road users

NTSB

Maximum Speed Limits by State, 2012





Source: GHSA

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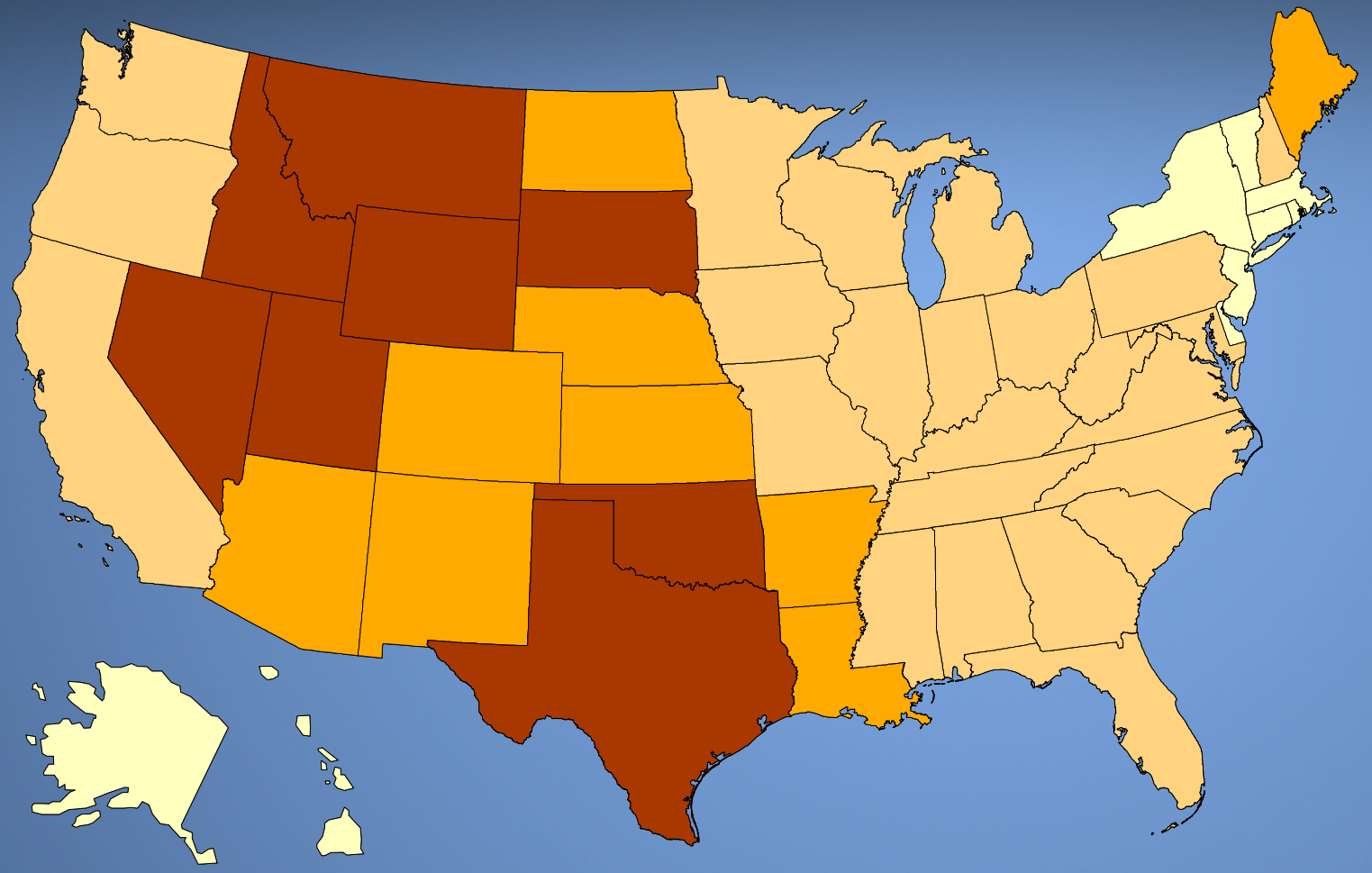
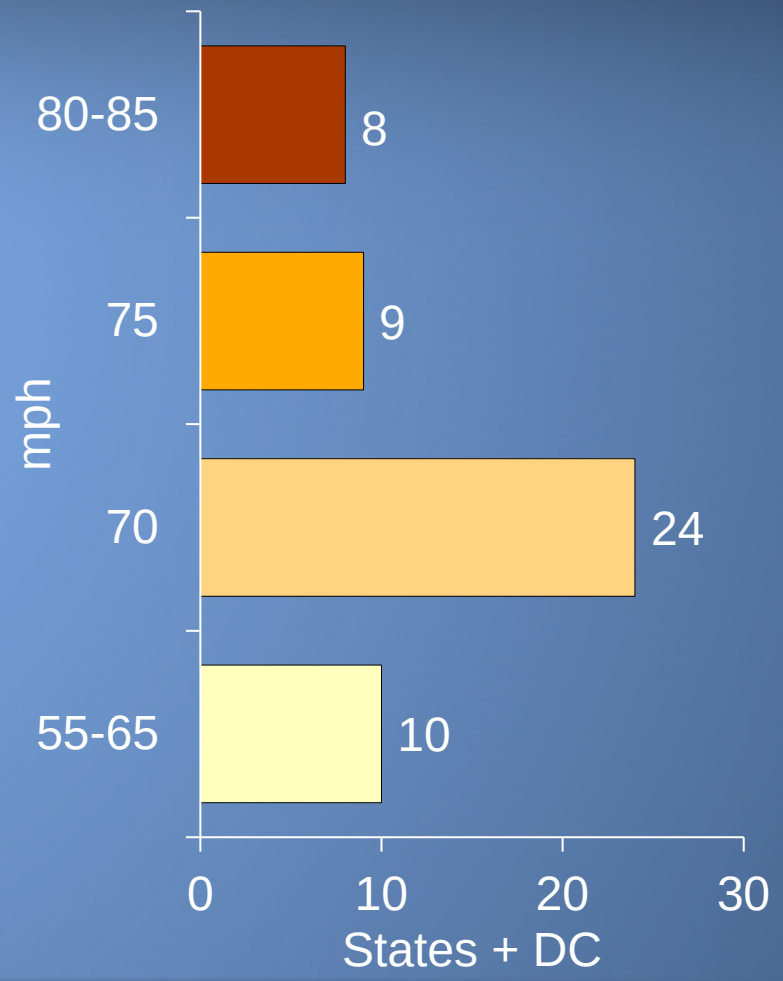
Maximum Speed Limits by State, 2020





Source: IIHS

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Risk of a pedestrian being severely injured in a motor vehicle crash

- 10% at impact speed of 16 mph
- 25% at impact speed of 23 mph
- 50% at impact speed of 31 mph
- 75% at impact speed of 39 mph
- 90% at impact speed of 46 mph

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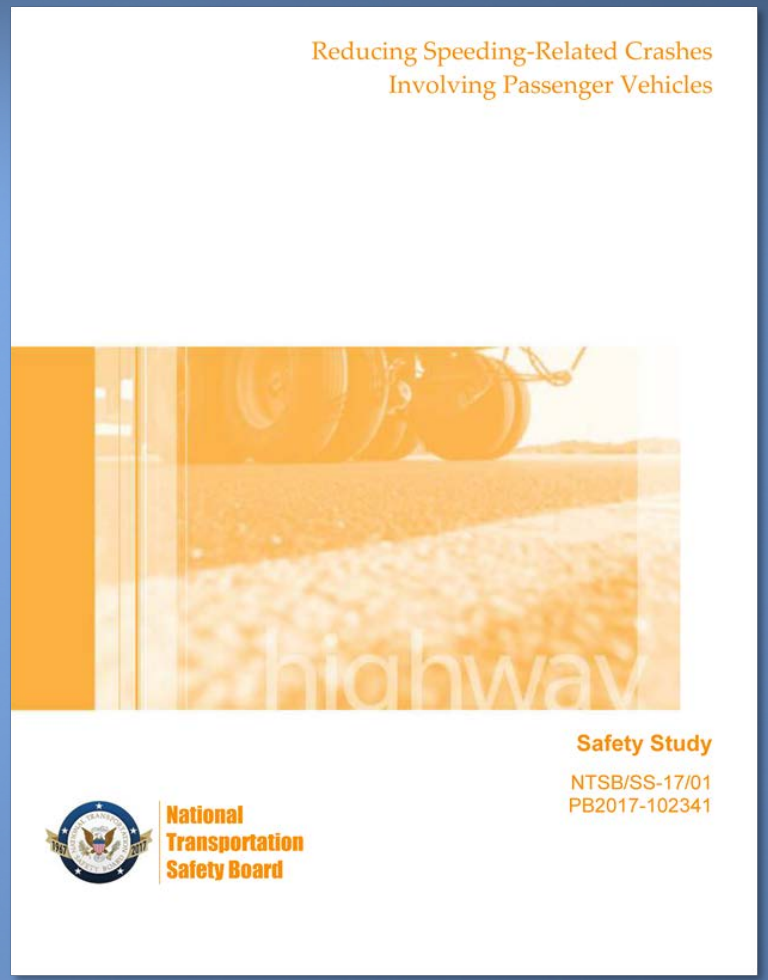

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Pedestrian Safety

2018 deadliest year since 1990

6,283 pedestrian fatalities nationwide

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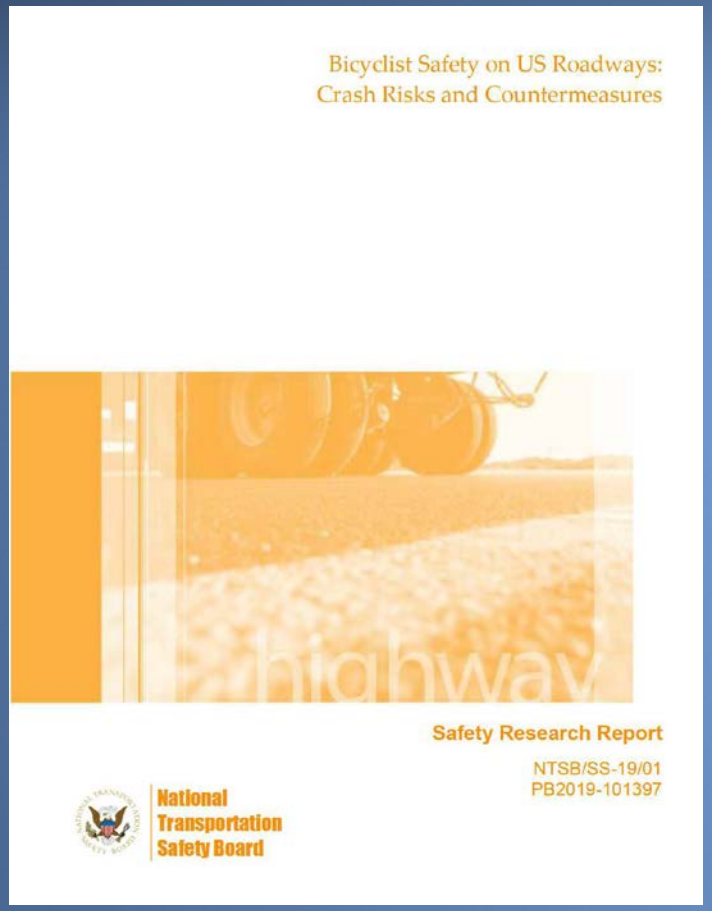
Bicyclist Safety Report



- Comprehensive report with 22 safety recommendations
  - 12 new safety recommendations and 10 reiterated safety recommendations
    - ITS Joint Program Office
    - NHTSA
    - FHWA
    - CPSC
    - AASHTO
    - States

Why We Did the Study

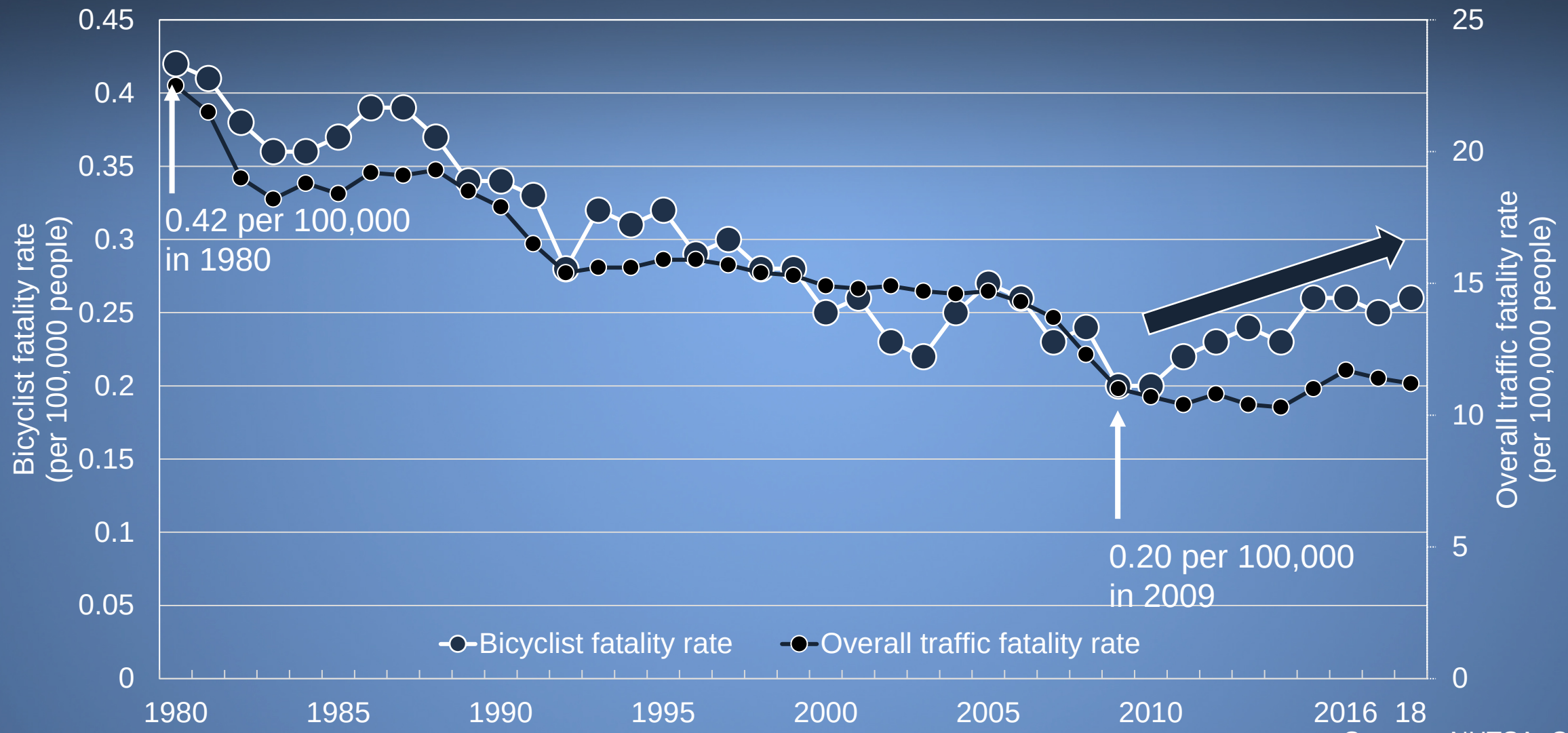
- Growing use of bicycles as a means of transportation
- Bicyclists are vulnerable road users
- Bicycle fatalities are increasing
- Update our understanding of bicycle safety in the U.S.

From 2009-2018, motor vehicle crashes accounted for 7,489 bicyclist fatalities

Year	Bicyclist Fatalities	Total Traffic Fatalities
2009	628	33,883
2010	623	32,999
2011	682	32,479
2012	734	33,782
2013	749	32,894
2014	729	32,744
2015	829	35,485
2016	852	37,806
2017	806	37,473
2018	857	36,560
2009-2018	7,489	346105

Source: NHTSA FARS

Trends of Bicyclist and Overall Traffic Fatality Rates (1980 through 2018)



Sources: NHTSA, Census

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Safety Issues Identified

- Improving data
- Improving roadway infrastructure
- Enhancing conspicuity
- Mitigating head injuries

We Need Better Data!

- Current data is limited and likely underestimate the level of bicycling activity in the United States. Yet, understanding the level of bicycling activity is critical to make data-driven safety improvements.
- Combining traditional and innovative data collection approaches could improve measures of bicycling activity.
- Police crash report data likely underestimate the scope of bicyclist nonfatal injuries.

Injuries: Police Reports vs. ER Records

Year	Bicyclists with Nonfatal Injuries in Motor Vehicle Crashes Based on Police Reports (NASS GES/CRSS)	All Bicyclists with Nonfatal Injuries Based on Emergency Department Records (NEISS-AIP)
2007	44,000	210,000
2008	53,000	204,000
2009	51,000	200,000
2010	52,000	213,000
2011	48,000	229,000
2012	49,000	234,000
2013	48,000	221,000
2014	50,000	225,000
2015	45,000	247,000
2016	64,000	199,000
2007-2016	504,000	2,183,000

Safety Issues Identified

- Improving data
- Improving roadway infrastructure
- Enhancing conspicuity
- Mitigating head injuries

Improving roadway infrastructure

- 56% of fatalities occur at midblock locations (between intersections); 65% of injuries and bicycle crashes occur at intersections
- Separated bike lanes could prevent bicycle crashes involving motor vehicles at midblock locations and, thereby, also reduce the number of fatalities and serious injuries associated with such crashes.
- Intersection treatments
- But guidance to states and local agencies which they rely on to help design streets through AASHTO and FHWA don’t include separated bike lanes.
- Reducing traffic speeds can improve safety.
- Road diets are a proven safety countermeasure.

Separated bike lanes

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Safety Treatments at Intersections: Bicycle Signal Face

Bicycle Signal Face

Safety Treatments at Intersections: Two-Stage Bicycle Turn Box

Road Diet

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Safety Issues Identified

- Improving data
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Enhancing conspicuity

- Improving motor vehicle headlights
- Addressing large vehicle blind spots
- Conspicuity treatments
- Collision avoidance & connected technologies (V2P)
- NCAP improvements

Safety Tests Performed Under the U.S. NCAP Compared to Euro NCAP

General Area	*Specific Area / Technology*	US NCAP	Euro NCAP
Adult Occupant Protection	Frontal Impact	Full Width Rigid Barrier Crash Test	Full Width Rigid Barrier Crash Test
			Cffset Deformable Barrier Crash Test
	Side Impact	Moving Deformable Barrier Crash Test	Moving Deformable Barrier Crash Test
		Pole Impact Crash Test	Pole Impact Crash Test
			Far Side Sled Test
	Rear - Whiplash		Headrest Geometry Evaluation
			Sled Test
Child Occupant Protection	Child Seat		Vehicle Design
			Fit and Ease of Installation
	Frontal Impact		Cffset Deformable Barrier Crash Test
	Side Impact		Moving Deformable Barrier Crash Test
Vulnerable Road Users	Impact Protection		Head Impact Test
			Upper Leg Impact Test
			Lower Leg Impact Test
Rollover Resistance		Static Stability Factor Measurement	
		Handling Dynamic Test	
Driver Assistance Technologies	Forward Collision Warning (FCW) Automatic Emergency Braking (AEB)		City - Dynamic Test
			Interubran - Dynamic Test
			Pedestrian - Dynamic test
			Cyclist - Dynamic Test
	Seatbelt Reminders		Confirmation Test
	Speed Assistance Systems (SAS)		Confirmation Test
	Lane Support Systems (LSS)		Lane Departure Warning - Dynamic Test
			Lane Keeping Assist - Dynamic Test
			Emergency lane Keeping - Dynamic test

Source: Advocates for Highway and Auto Safety

Safety Issues Identified

- Improving data
- Improving roadway infrastructure
- Enhancing conspicuity
- Mitigating head injuries

Mitigating bicyclist head injuries

- Head injury is the leading cause of bicycle-related deaths and injuries.
- Bicycle helmets provide effective protection and mitigate head injuries.
- The underutilization of bicycle helmets has contributed to the incidence of deaths and serious injuries.
- Requiring helmet use is the most effective means for increasing helmet use and reducing injuries.
- A comprehensive strategy that includes both helmet legislation and complementary nonlegislative interventions is most likely to increase overall helmet use among bicyclists of all ages.

Table 10. Number of bicyclists by injury body region and accident type, NEISS data from 2014 through 2017.

	Number of Bicyclists			% of all Bicyclists		
Body	All Cases	In Motor Vehicle Crashes	Not in Motor Vehicle Crashes	All Cases	In Motor Vehicle Crashes	Not in Motor Vehicle Crashes
Extremity	882,000	148,000	735,000	46	38	48
Knee	152,000	33,000	119,000	8	8	8
Wrist	121,000	12,000	108,000	6	3	7
Lower Arm	104,000	29,000	76,000	5	7	5
Elbow	96,000	15,000	81,000	5	4	5
Lower Leg	94,000	11,000	83,000	5	3	5
Ankle	79,000	14,000	66,000	4	4	4
Ear	5,000	1,000	4,000	0	0	0
Torso	435,000	101,000	334,000	22	26	22
Upper Arm	159,000	30,000	129,000	8	8	8
Shoulder	132,000	31,000	101,000	7	8	7
Upper Trunk	122,000	36,000	87,000	6	9	6
Lower Trunk	21,000	4,000	17,000	1	1	1
Others	76,000	20,000	56,000	4	5	4
Neck	29,000	12,000	16,000	1	3	1
25%–50% of Body	21,000	4,000	18,000	1	1	1
Pubic Region	17,000	1,000	16,000	1	0	1
Not Stated/Unknown	9,000	3,000	5,000	0	0	0
Total[a]	1,934,000	388,000	1,546,000	100	100	100

[a] All estimates were rounded to the nearest thousand. The subtotals for each body region and overall total were computed by summing the original estimates before rounding to the nearest thousand. Therefore, they may be different from simply adding the rounded estimates.

Body	All Cases	In Motor Vehicle Crashes	Not in Motor Vehicle Crashes	All Cases	In Motor Vehicle Crashes	Not in Motor Vehicle Crashes
Head and Face	541,000	119,000	422,000	28	31	27

Phased Approach

- NHTSA
  - Convene a bicycle safety coalition of stakeholders to develop a comprehensive national strategy to increase bicycle helmet use among bicyclists of all ages that would include, at a minimum, a model all-ages bicycle helmet law; (2) disseminate the strategy to all states and make it available on your website.
  - After Safety Recommendation 4 is completed, include the model all-ages bicycle helmet law in *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*.
  - States enact model law developed by coalition of stakeholders

apbp ASSOCIATION OF PEDESTRIAN & BICYCLE PROFESSIONALS
Expertise for Active Transportation

January 13, 2020

The Honorable Robert L. Sumwalt, Chairman
The Honorable Bruce Landsberg, Vice Chairman
The Honorable Jennifer Homendy, Member
The Honorable Michael Graham, Member
The Honorable Thomas Chapman, Member
National Transportation Safety Board
490 L'Enfant Plaza, SW
Washington, DC 20594

The Honorable Robert L. Sumwalt, The Honorable Bruce Landsberg, The Honorable Jennifer Homendy, the Honorable Michael Graham, and the Honorable Thomas Chapman,

The Association of Pedestrian and Bicycle Professionals (APBP), our members and organizational partners are writing to respond to your recent bicycle safety report. We thank NTSB for taking on bicycling safety at a time when fatalities are on the rise and support your recommendations on building better infrastructure and improving vehicle design to enhance conspicuity.

However, we are writing today to express our grave concern with your recommendation on mandatory helmet laws and would like to request the opportunity to discuss the issue in person.

APBP is a community of practitioners working to create more walkable, bikeable places. We foster peer knowledge sharing, advance technical expertise, and support the professional development of our members. As professionals in the field, we agree that improving the safety of people walking and biking is paramount. However, we believe mandatory helmet laws have the potential to not only reduce the number of people biking, but to actually make bicycling less safe rather than more safe.

In the hearing on November 5, NTSB staff stated that advocates didn't agree with helmet laws because they could decrease the number of people bicycling. That is only half the story. Multiple studies across North America, Europe and Australia have shown that bicycling safety differs from other modes in one specific way. There is a ***safety in numbers*** effect to bicycling that not only reduces the rate of crashes and fatalities for people biking, but actually reduces the number of crashes, even as the number of bicycling trips increase.

<u>More people bicycling reduces the rate of bicycling fatalities</u>

Conventional wisdom tells us that traffic fatalities increase with the number of miles traveled. While that proves to be true for motor vehicles, that is not true for bicycling and walking. A 2003 report, studying five different data sets across European countries and American cities found that:

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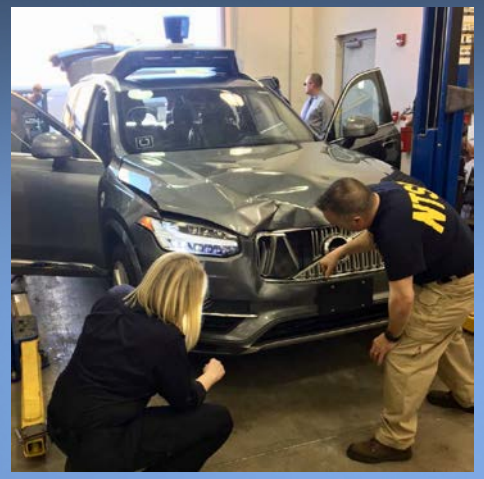
Partial Automation Investigations

Figure 5. Damaged car. Scrapes from the semitrailer's center side-marker lamp are indicated by the yellow arrow. Impact damage associated with the utility pole is indicated by the red arrow. (Source: Florida Highway Patrol)

Williston, FL – 05/07/2016



Tempe, AZ – 03/18/2018

Figure 4. Northbound view of US-101 depicting Tesla postcrash fire. (Source: witness S. Engleman)

Mountain View, CA– 03/23/2018

Figure 1. Scene of minor collision between truck-tractor and autonomous shuttle in downtown Las Vegas (white car in foreground was not involved). (Source: KSNV News 3 Las Vegas)

Las Vegas, NV – 11/08/2017

Figure 2. Overhead view of crash scene showing Tesla and fire truck at final rest on southbound I-405. (Source: CHP)

Culver City, CA– 01/22/2018

Delray Beach, FL– 03/01/2019