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Special Investigation Report Wrong-Way Driving

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Overview of Investigations

Mark Bagnard

Major Investigations

- Baker, CA — March 7, 1968
- Dulles, VA — June 9, 1970
- Carrollton, KY — May 14, 1988

- 49 Fatalities
- 60 Injuries
- Wrong-way driver BAC 0.15 or more

SIR Investigations

- Arlington, TX
- Fountain, CO
- Carlisle, PA
- Dallas, TX
- Beloit, WI
- Fernley, NV

- 8 Fatalities
- 8 Injuries
- Wrong-way driver BAC 0.18 or more

SIR Investigations

- Examination of human performance issues
- Highway design issues
  - Interchange design
  - Lane management
- Traffic control devices
  - Type in use
  - Number of devices

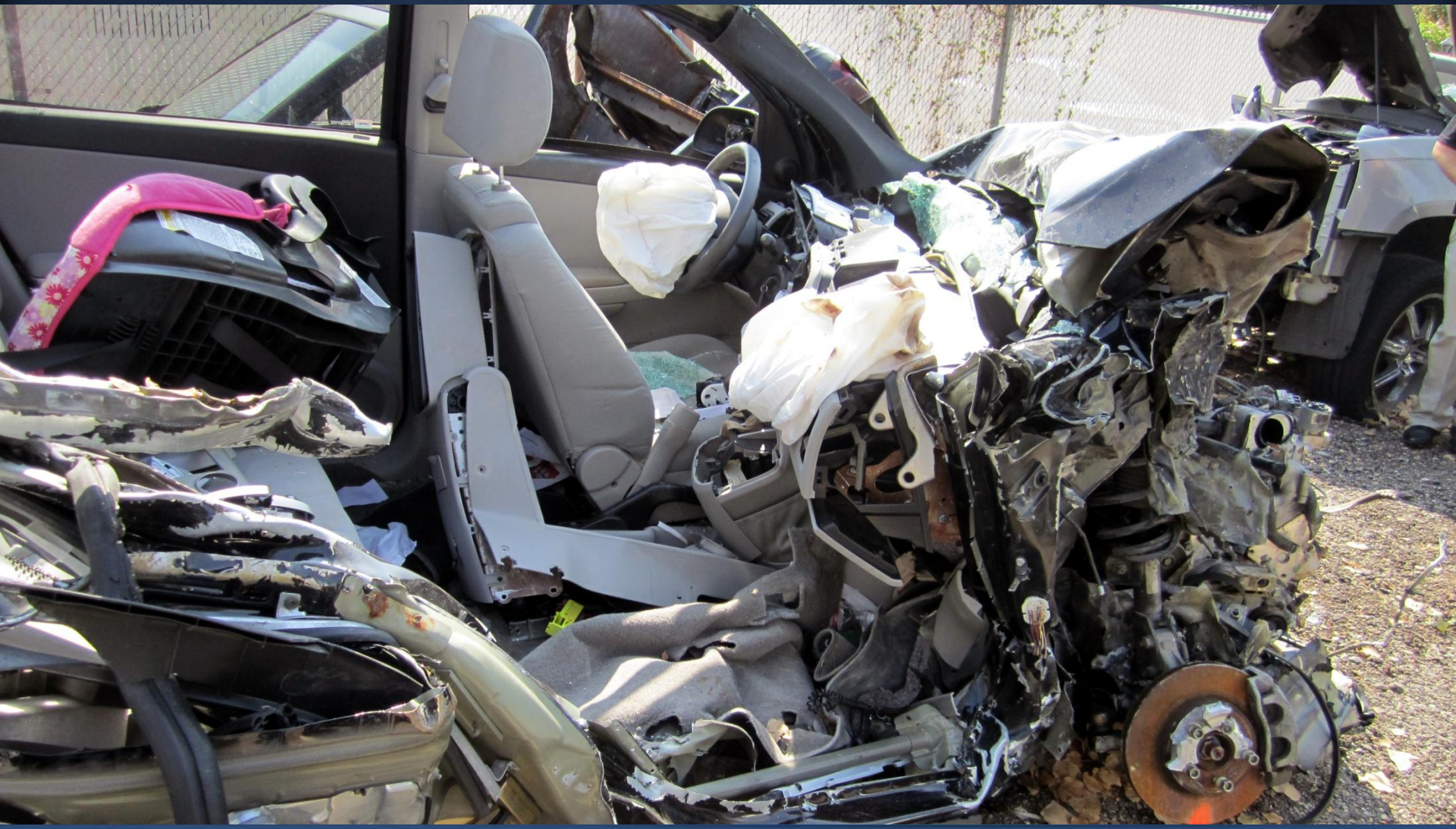
Crash Elements vs. Data Results

- Majority of wrong-way drivers were intoxicated
- Older drivers
- Potential medical impairment
- Improper ramp use
- Crash severity typically resulted in fatalities

Fountain, Colorado

Beloit, Wisconsin

Arlington, Texas



Investigative Team

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- Dennis Collins
- Jennifer Morrison
- Jana Price, Ph.D.
- Steven Prouty
- David Rayburn
- Gary Van Etten
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Report Development Team

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- Jana Price, Ph.D. — Project Manager
- Dan Filiatrault — Project Manager
- Gwynne O'Reagan — Editor
- Ivan Cheung, Ph.D. — FARS Analysis
- Jefferson McMillan — FARS Analysis

Safety Issues

- Driver impairment
- Highway design and traffic control devices to prevent wrong-way movements, and wrong-way driver monitoring programs
- Wrong-way navigation alerts in vehicles

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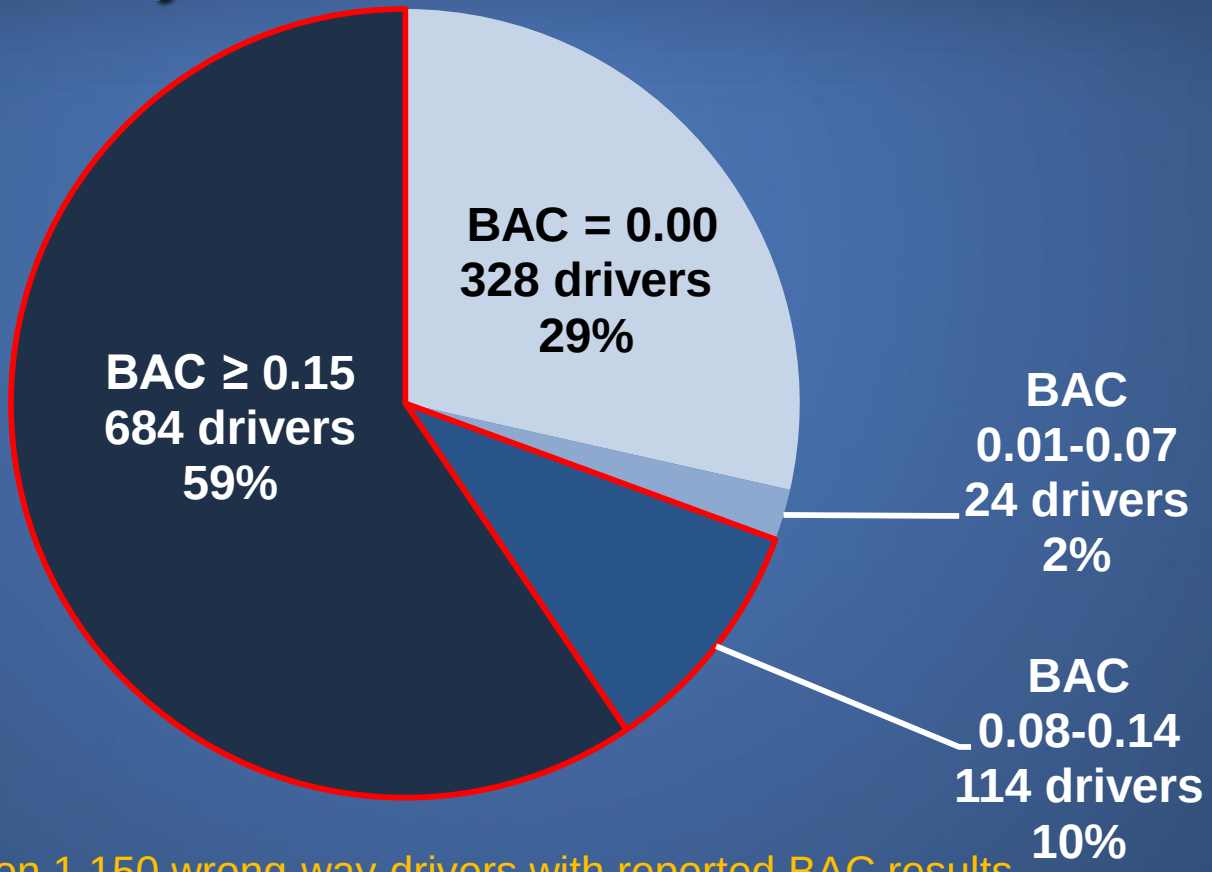
Data Analysis

Ivan Cheung, Ph.D.
Office of Research and Engineering

Fatality Analysis Reporting System (FARS)

- National Highway Traffic Safety Administration data
- Between 2004 and 2009, there were 1,566 wrong-way fatal crashes on high-speed divided highways
- 2,139 fatalities
- 1,566 wrong-way drivers and 1,934 right-way drivers

Alcohol Impairment Among Wrong-Way Drivers, 2004–2009

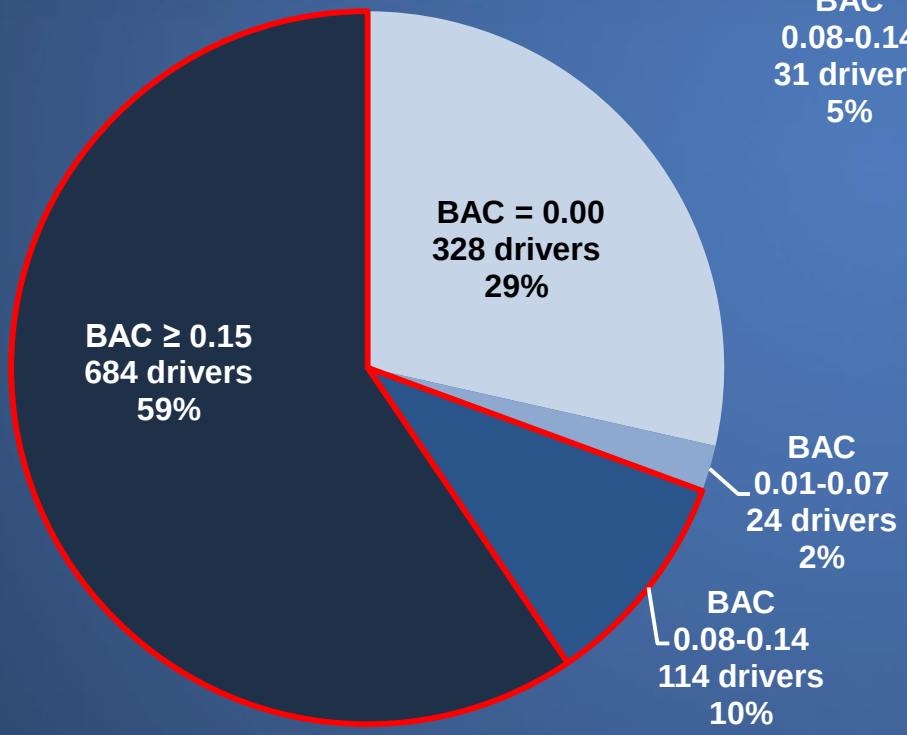


Analysis based on 1,150 wrong-way drivers with reported BAC results

Alcohol Impairment Among Wrong-Way Drivers, 2004–2009

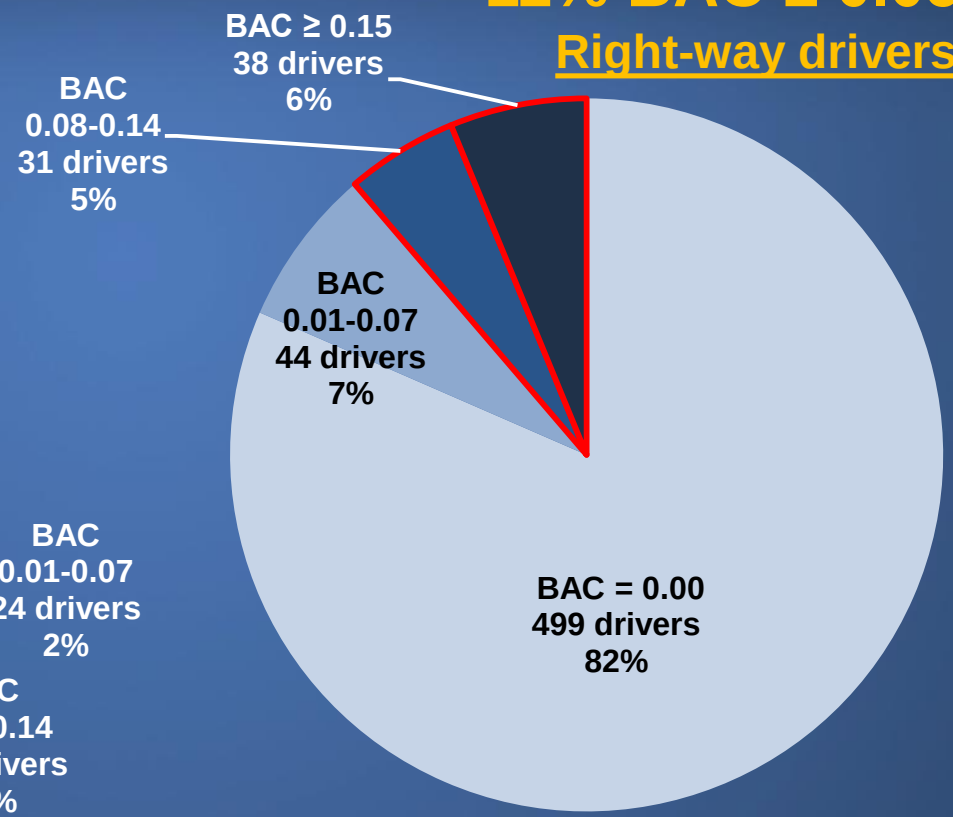
69% BAC ≥ 0.08

Wrong-way drivers



11% BAC ≥ 0.08

Right-way drivers



Analysis based on 1,150 wrong-way and 612 right-way drivers with reported BAC results

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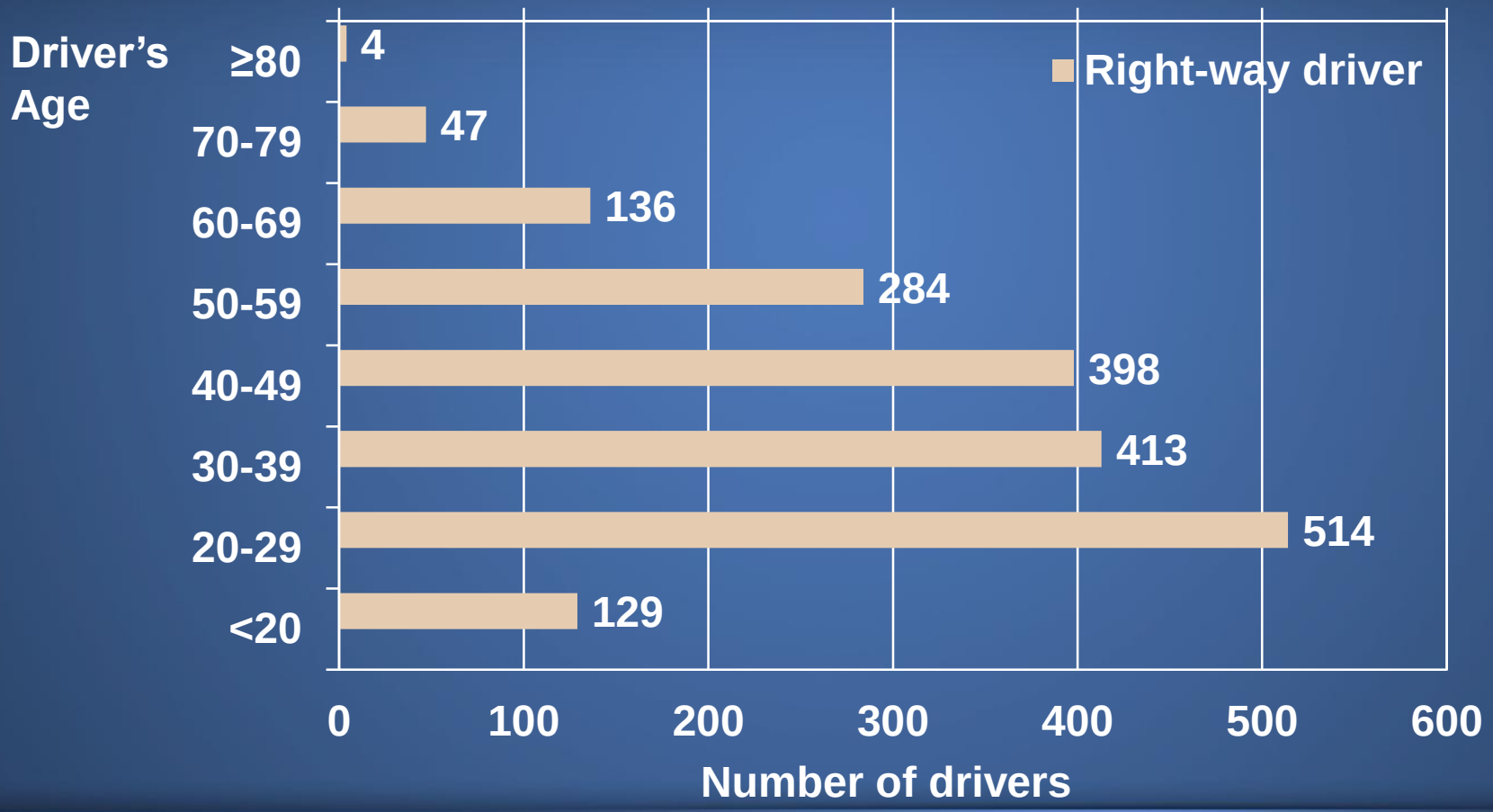
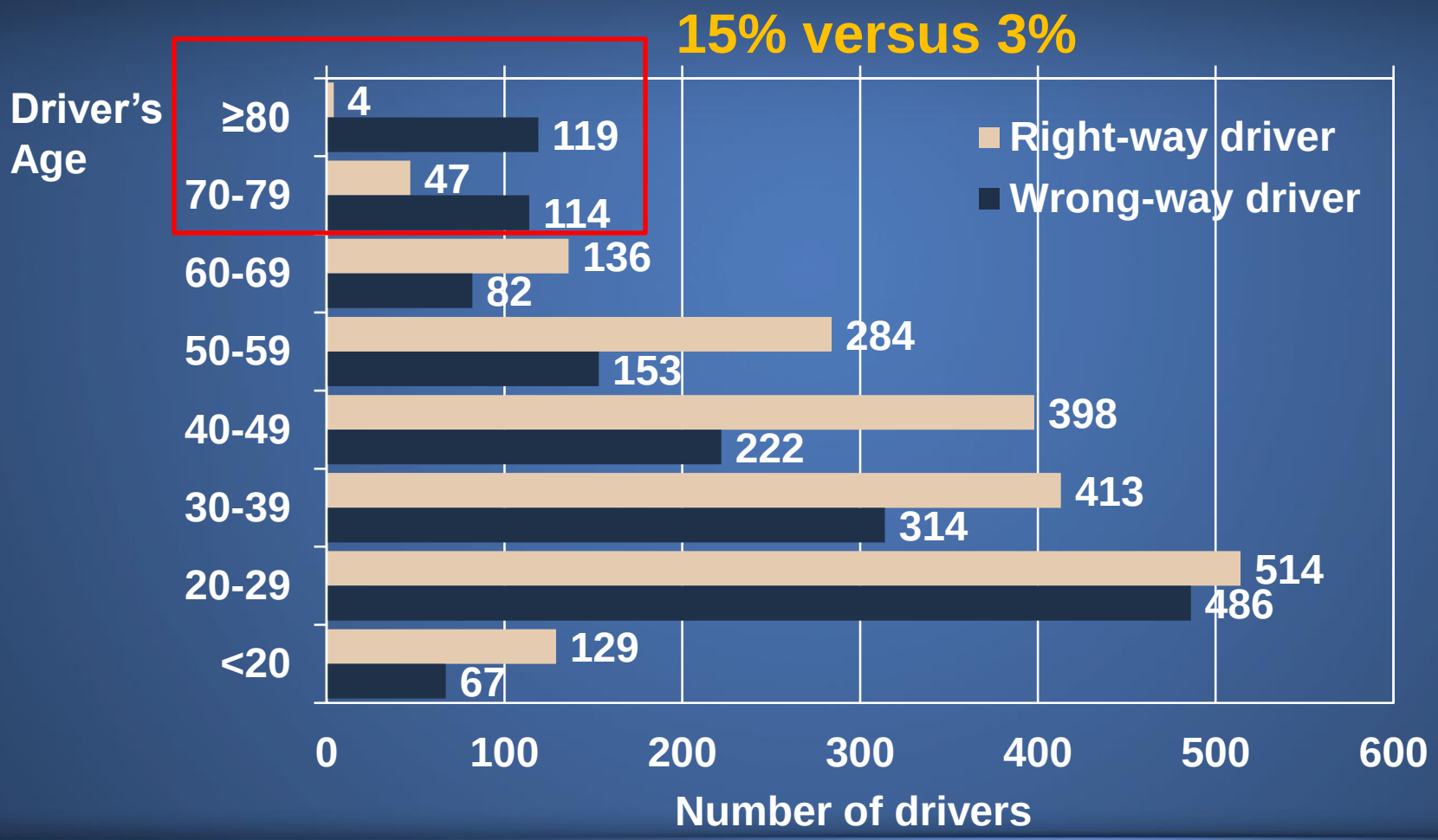
Over-Representation of Older Drivers, 2004–2009



NTSB

Over-Representation of Older Drivers, 2004–2009



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Driver Impairment

Jana Price, Ph.D.

Overview

- Alcohol impairment
  - Alcohol ignition interlock devices
  - Emerging in-vehicle alcohol detection technologies
- Older drivers

Alcohol Impairment

- Leading factor in wrong-way driving collisions
  - 7 of 9 had BAC $\geq$ 0.15
  - 60–70% of all wrong-way drivers impaired by alcohol
- 10,228 people died in crashes involving alcohol-impaired drivers in 2010
  - 31% of all highway fatalities

Eliminating Substance-Impaired Driving

- On NTSB Most Wanted List
- Over 120 safety recommendations since 1968
- 2012 Forum on Actions to Eliminate Substance-Impaired Driving

Alcohol Ignition Interlocks

- Prevent engine start until breath sample is analyzed
- Running retests ensure driver remains unimpaired

Source: www.dui-usa.drinkdriving.org

- Reduce recidivism; use by all offenders estimated to save over 1,000 lives/year
- 17 states and 4 California counties require interlocks for all offenders

New In-Vehicle Alcohol Detection Technologies

- Most fatal alcohol impairment accidents involve drivers with no prior DWIs
- Driver Alcohol Detection System for Safety (DADSS) Program
  - Breath-based system
  - Touch-based device
- Prototype research vehicle currently in development

Older Drivers

- Drivers over age 70 over-represented in fatal wrong-way crashes
- Aging associated with loss of functional abilities such as visual processing and cognition
- Drivers retaining licenses longer

Older Drivers

- NHTSA Program Guideline #13
  - Medical review
  - Education
  - Roadway design
- MAP-21

Summary

- Alcohol impairment is the primary cause of wrong-way collisions
  - In-vehicle technologies can prevent driving based on driver BAC level
- Drivers over 70 are over-represented in wrong-way collisions
  - Guideline #13 provides comprehensive approach to older driver safety

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Highway Design, Traffic Control Devices, and Wrong-Way Driver Monitoring Programs

Dan Walsh, P.E.

Overview

- Where wrong-way maneuvers occur
- Traffic control devices used to discourage wrong-way movements
- Improvements to signage and exit ramp design
- FHWA role


Arlington, Texas
N
Mansfield Highway
I-20 Westbound Lanes
I-20 Eastbound Lanes

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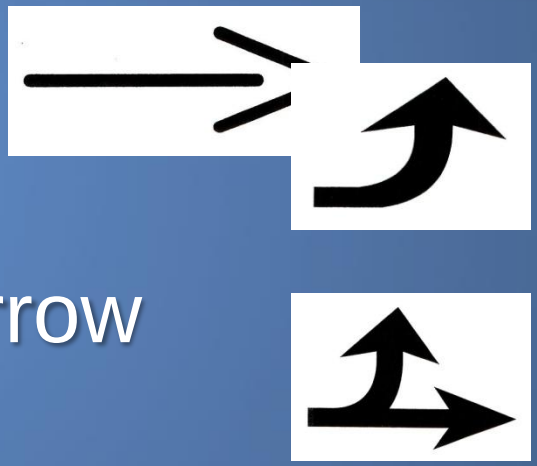
Wrong-Way Signage

- Standard signage in the MUTCD to deter Wrong-Way Entry
  - ‘ONE WAY’ sign
  - ‘DO NOT ENTER’ sign
  - ‘WRONG WAY’ sign

Wrong-Way Pavement Markings

- Standard pavement markings in the MUTCD to deter Wrong-Way Entry
  - Wrong-Way Arrow
  - Turn Lane-Use Arrow
  - Turn/Through Lane-Use Arrow



Improvements to Signage

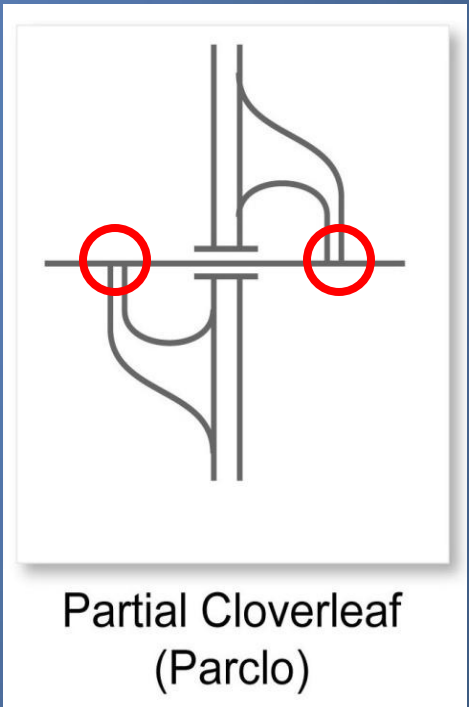
- State DOT and local jurisdiction improvements to signage at exit ramps
  - Lowering sign height
  - Using oversized signs
  - Mounting multiple signs on the same post
  - Implementing standard wrong-way sign package
  - Applying red retro-reflective tape to the vertical posts

Improvements to Signage

Courtesy of the New York State Department of Transportation

Improvements to Exit Ramp Design

- Majority of wrong-way entries occur at partial cloverleaf interchanges
- Change ramp geometrics
  - Obtuse angle
  - Sharp corner radii
  - Non-traversable medians
- Provide roadway lighting



Partial Cloverleaf (Parclo)

Wrong-Way Monitoring Programs

- States that have conducted projects to monitor wrong-way drivers on freeways
  - California
  - Texas
  - Arizona
- Provided an effective means of identifying wrong-way accident trends

FHWA Role

- FHWA has taken a limited role on the issue of wrong-way driving
  - Primarily has focused on guidance in the MUTCD and Green Book
- Identify the approaches by which states assess wrong-way driving
  - Identify problematic intersections
  - Identify countermeasures

Summary

- Improvements to highway signage and highway design
  - Reduce the incidence of wrong-way accidents
- Better and more visible signage
- Resource manual would help state efforts to counter wrong-way entry
  - Proven strategies to prevent wrong-way movements

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Wrong-Way Navigation Alerts

Steven Prouty

Overview

- Global Positioning System (GPS) and detailed map-based systems that alert drivers to wrong-way movement
- Need for consistent and intuitive messages and alerts from all devices

GPS-Based Navigation Alerts

- Geospatial position data
- Detailed map data
- Navigation systems
  - Built-in navigation systems
  - Aftermarket navigation systems
- Audible and visual warnings

Summary

- Use existing GPS navigation technologies to provide wrong-way movement alerts
- Provide consistent messages or alerts that are intuitive to the driver

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