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FOR HIGHWAY SAFETY

HIGHWAY LOSS
DATA INSTITUTE

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Protecting Vulnerable Road Users

2014 Michigan Traffic Safety Summit
Lansing, MI • March 26, 2014

David S. Zuby

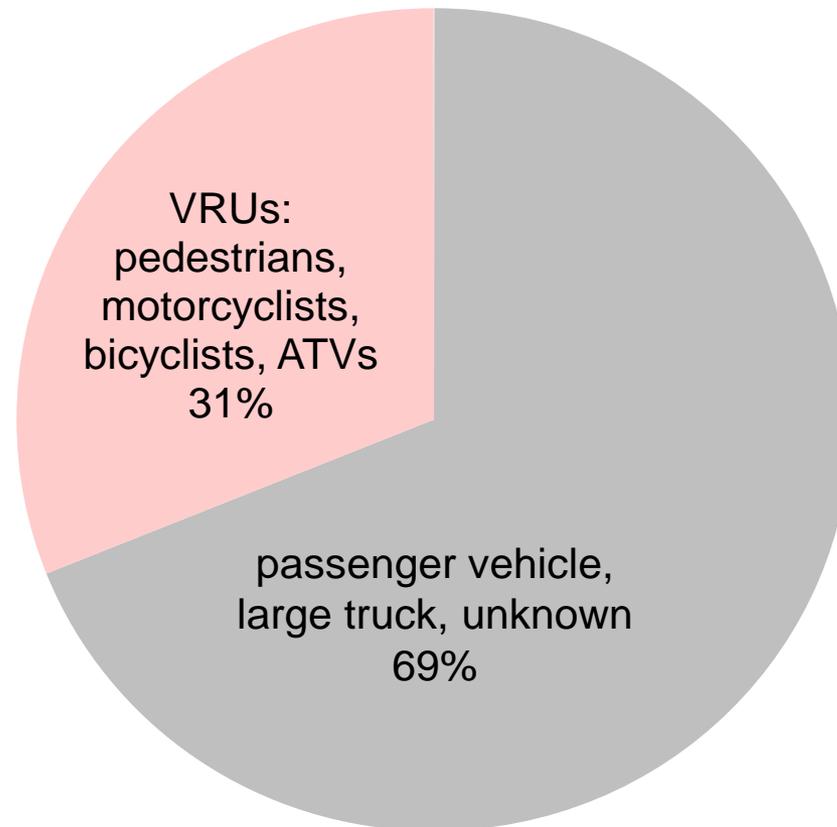
Vulnerable road users

Not just pedestrians



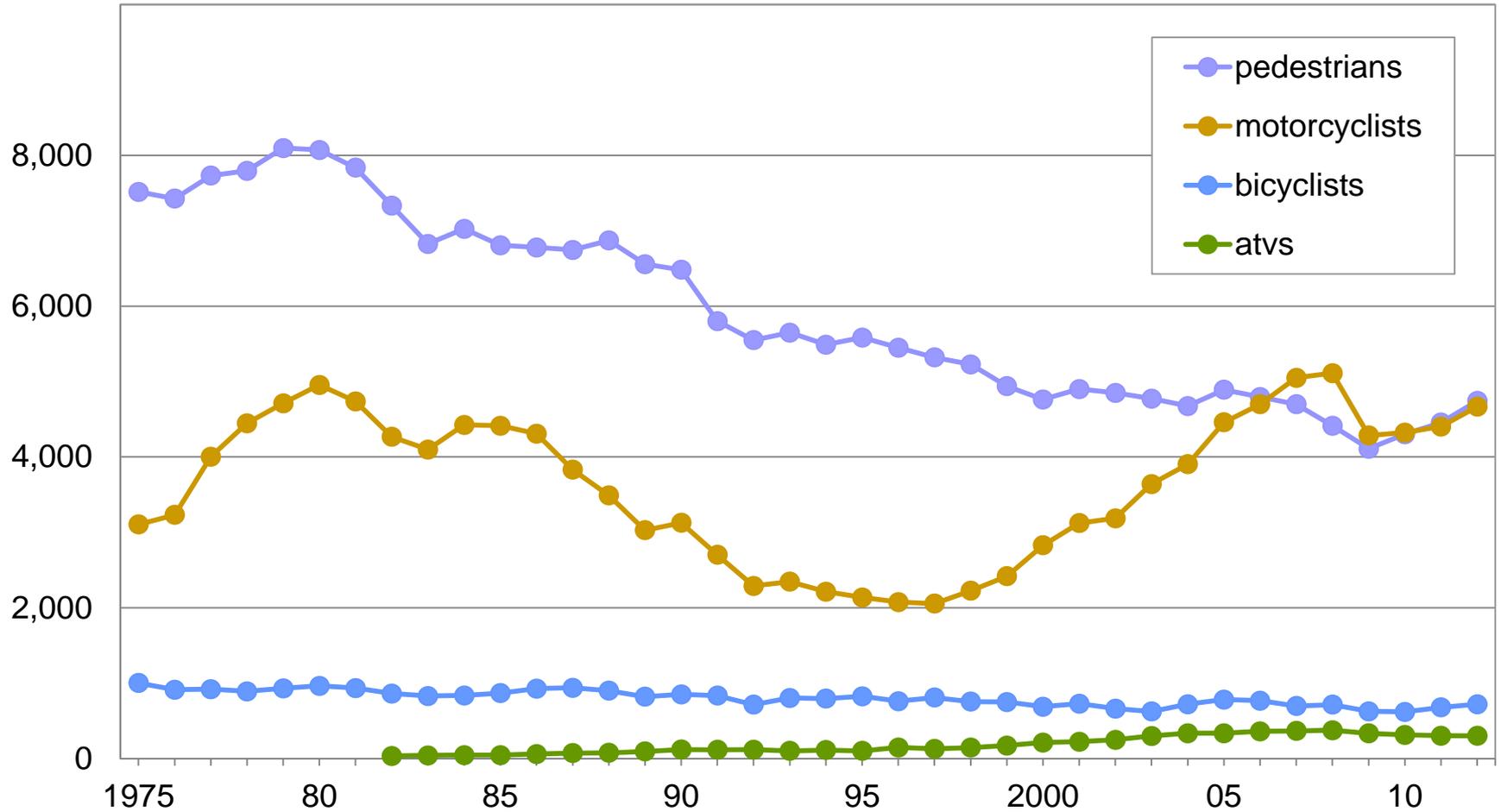
Highway fatalities in 2012

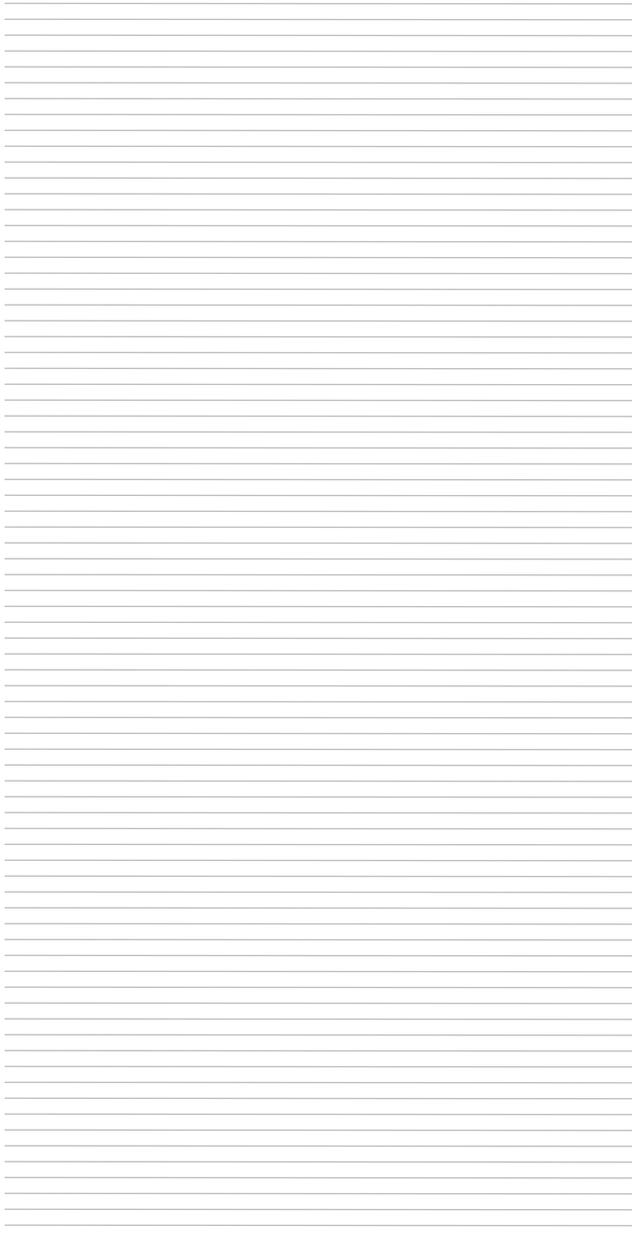
By road user type



Crash deaths by road user

1975-2012

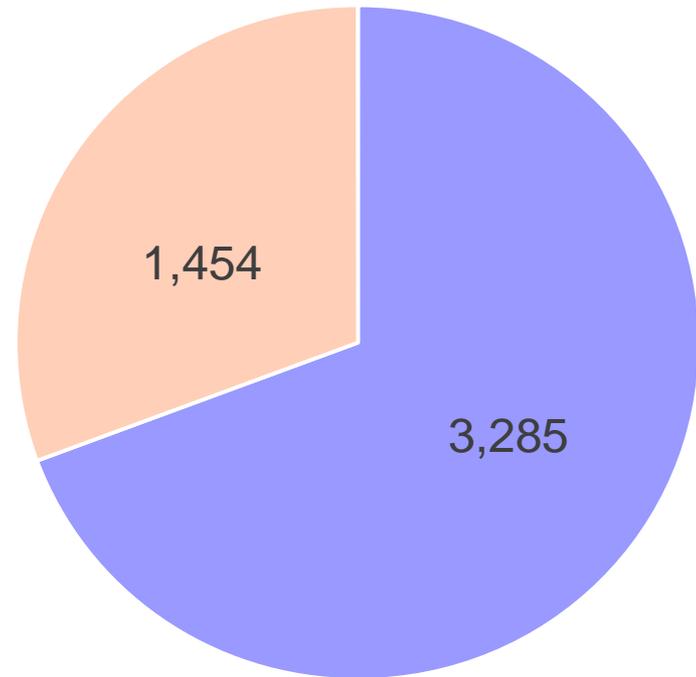
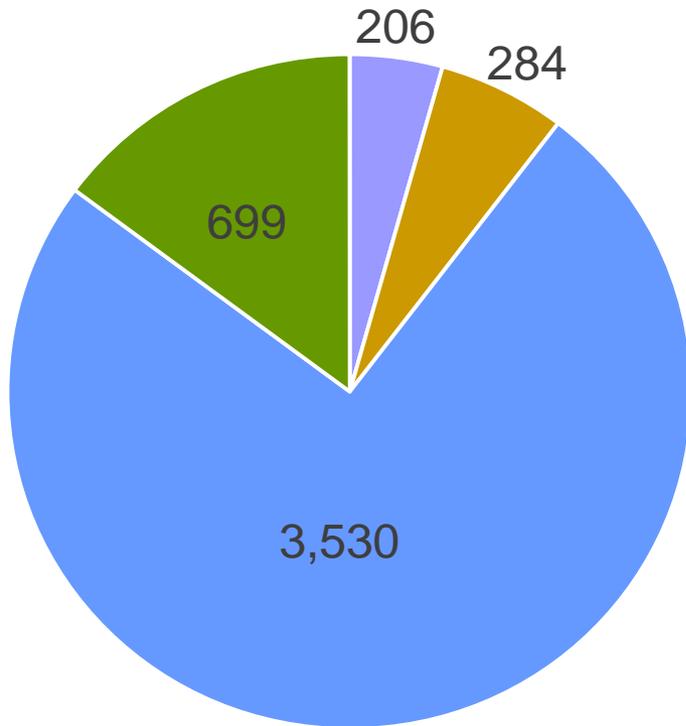




Characteristics of pedestrian crashes

4,743 pedestrian deaths in U.S. in 2012

By age and gender

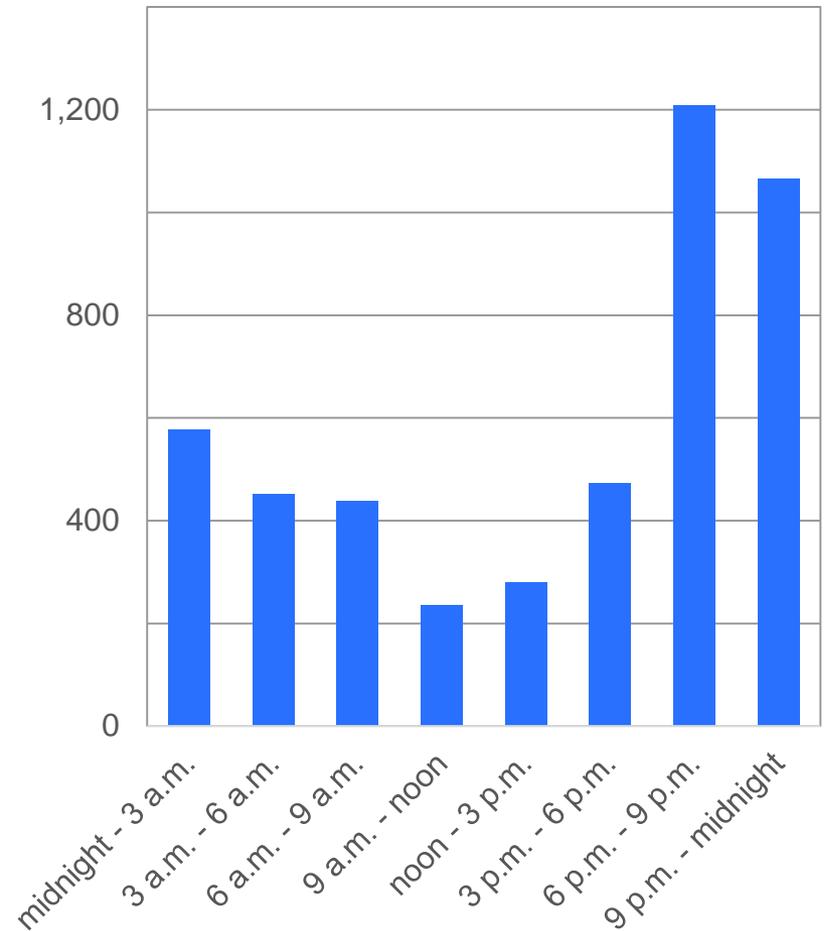
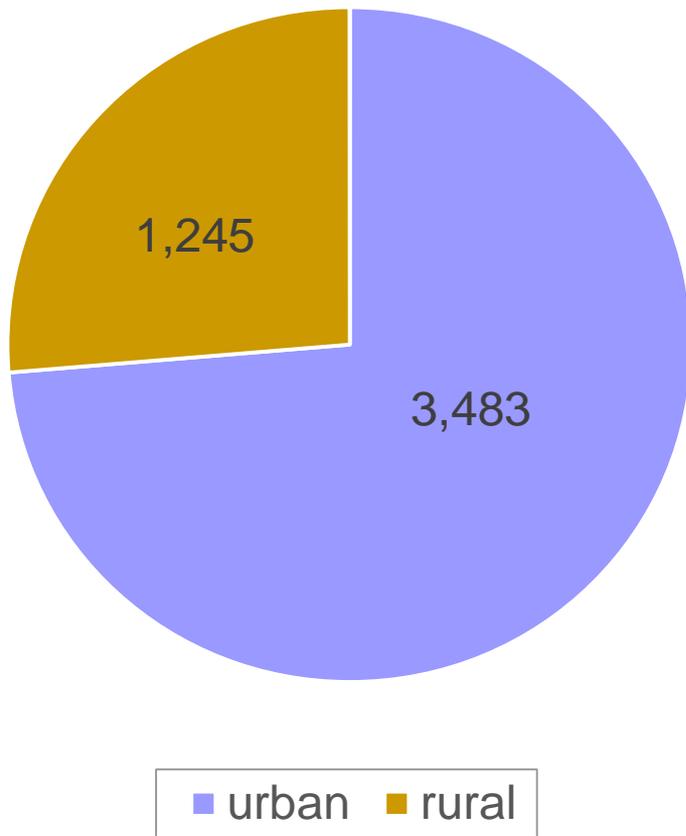


■ < 13 ■ 13 - 19 ■ 20 - 69 ■ ≥ 70

■ male ■ female

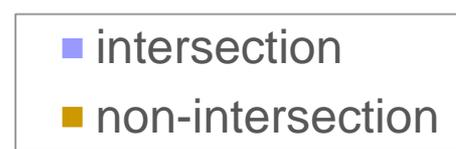
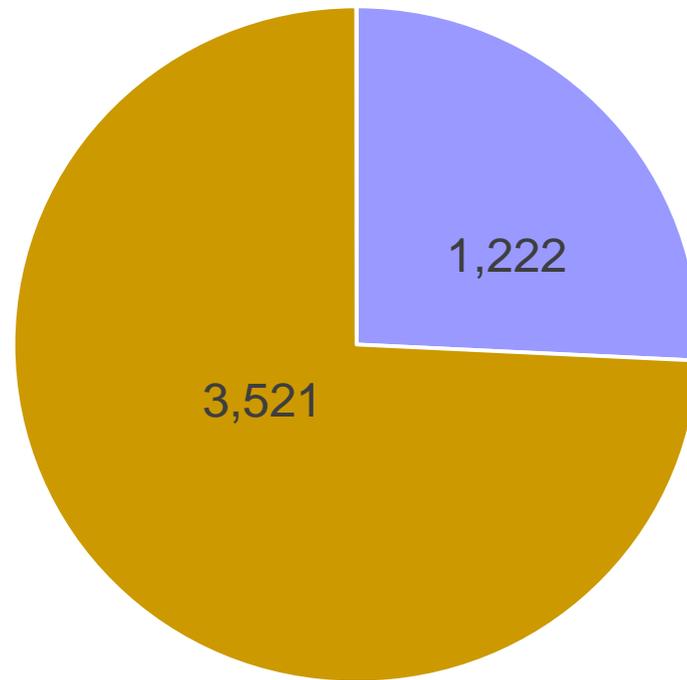
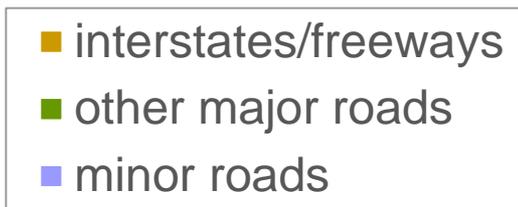
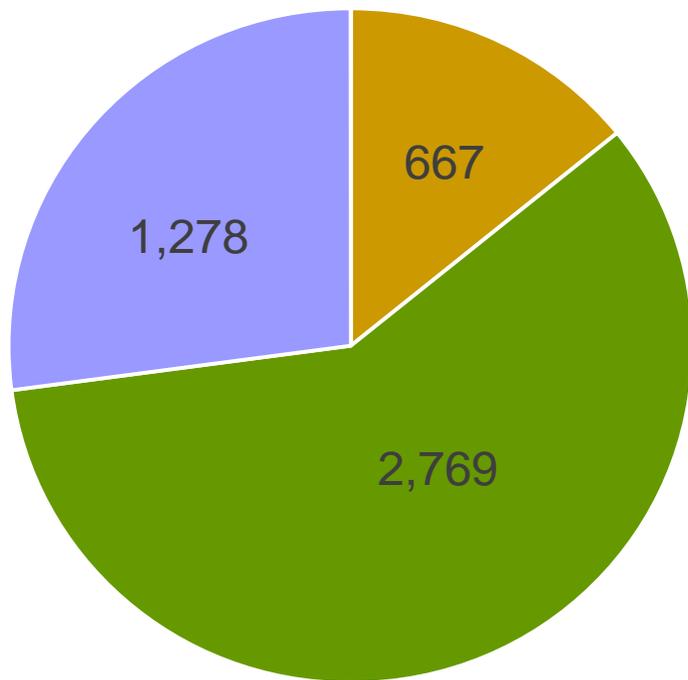
U.S. pedestrians deaths in 2012

By land use and time of day



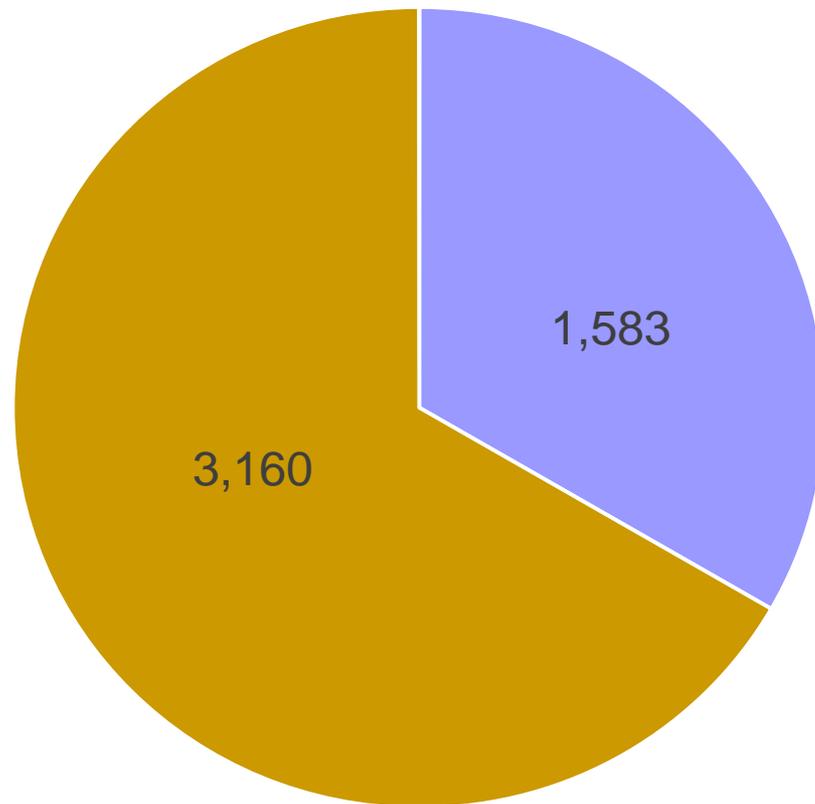
U.S. pedestrians deaths in 2012

By road type and relation to intersection



Estimated number of pedestrians killed in 2012

By blood alcohol content

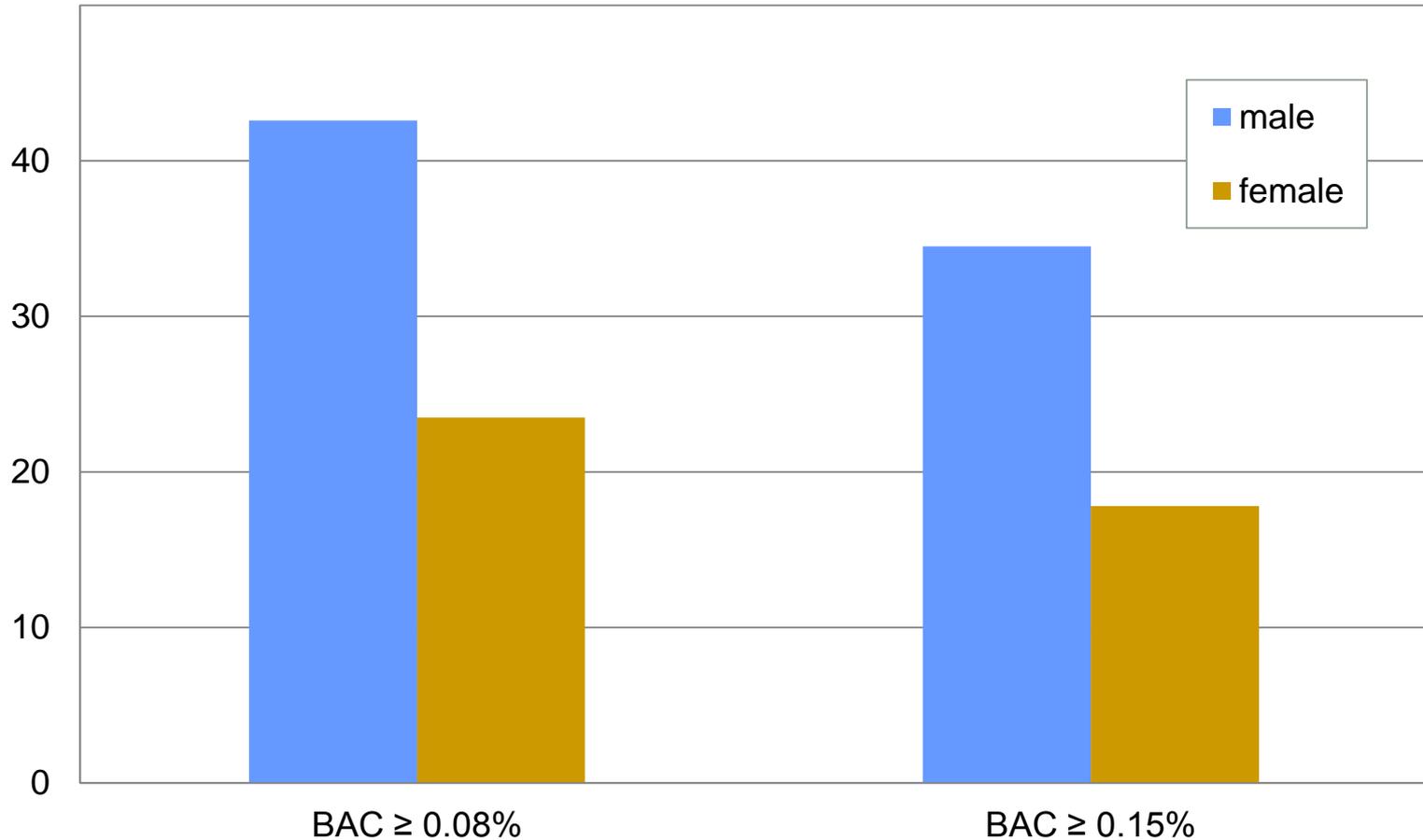


■ BAC > 0.08 percent

■ BAC ≤ 0.08 percent

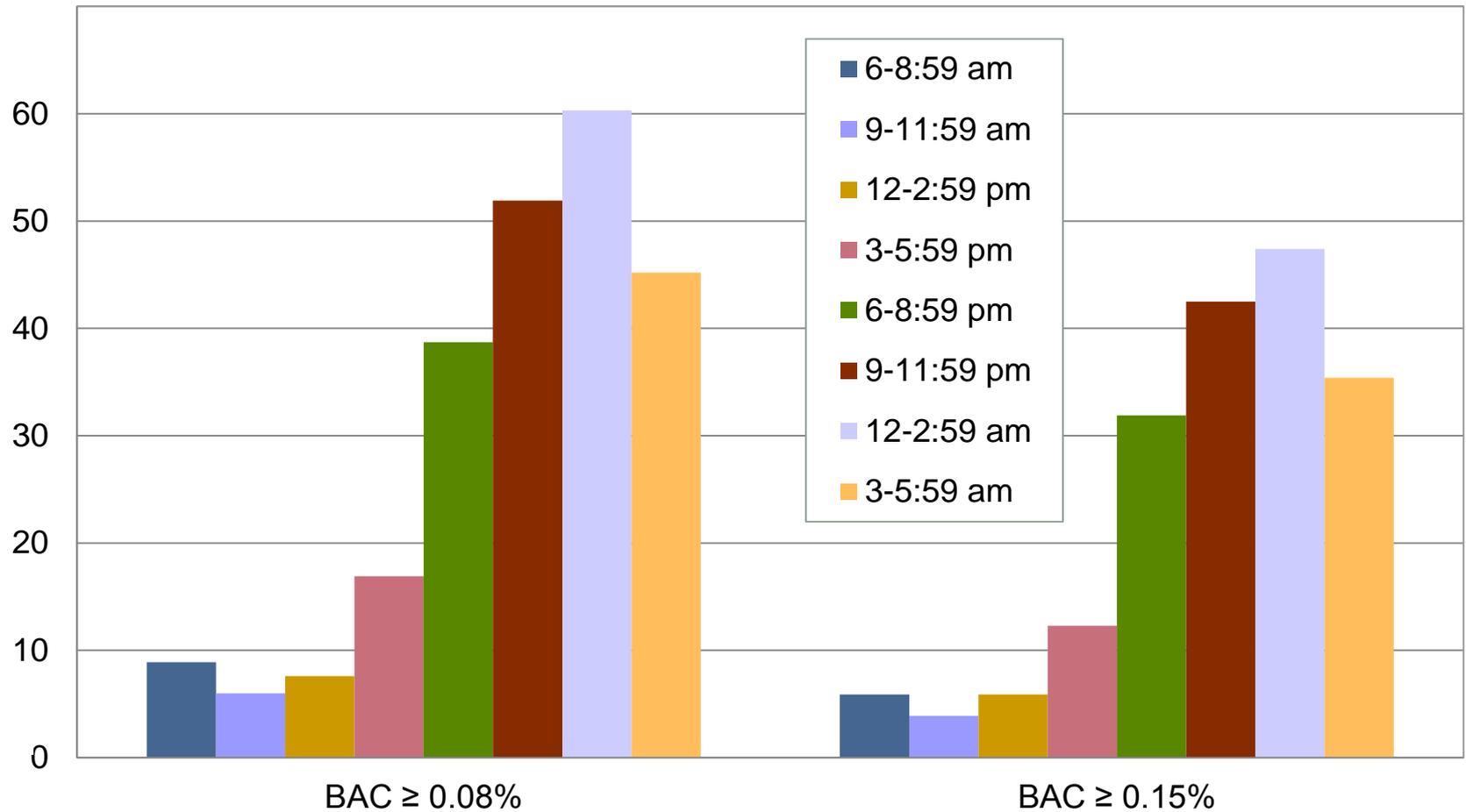
Percent of pedestrian deaths 16 and older with high BACs by gender

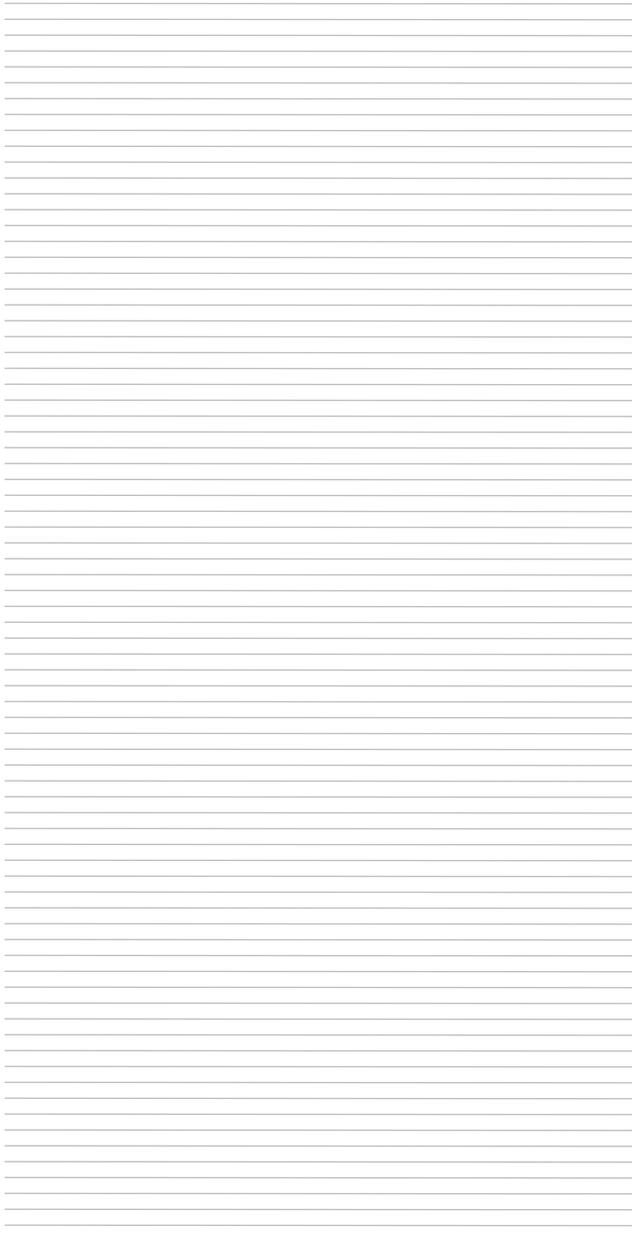
United States, 2007-11



Percent of pedestrian deaths 16 and older with high BACs by time of crash

United States, 2007-11

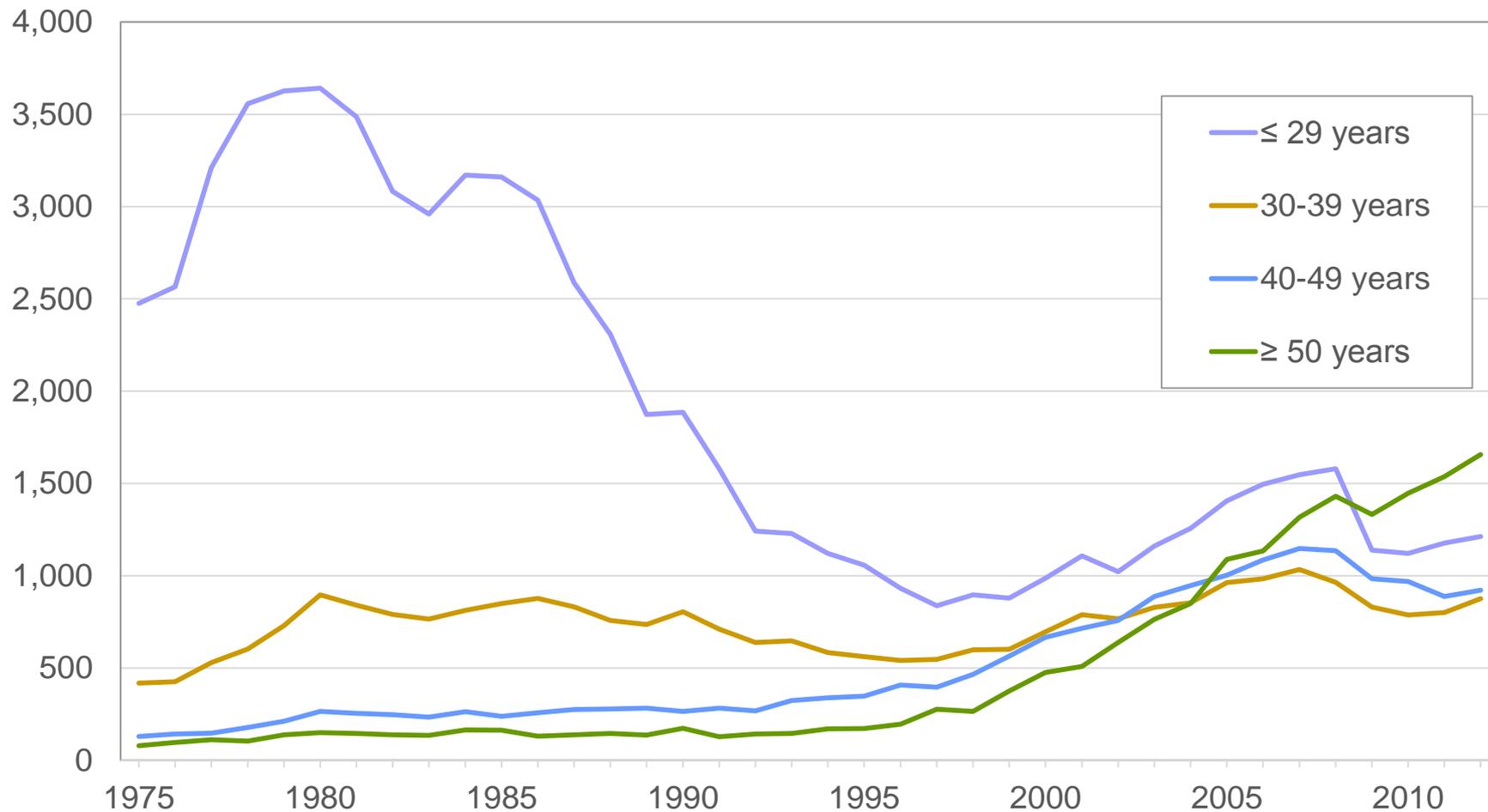




Characteristics of motorcycle crashes

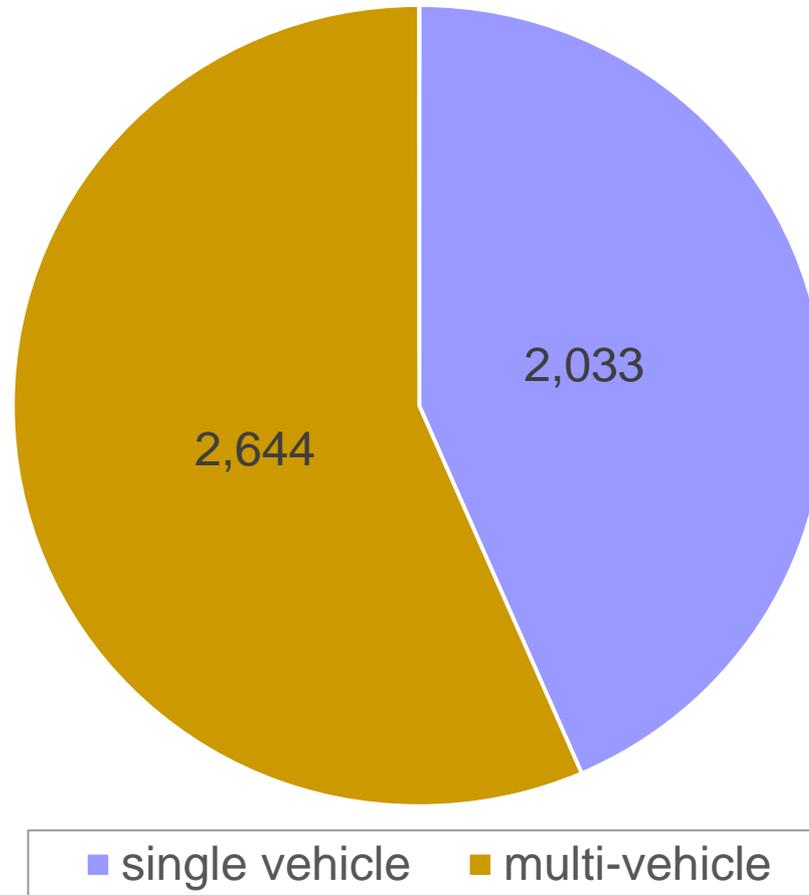
U.S. motorcyclist deaths 1975-2012

By age



4,667 Motorcyclist deaths in U.S. in 2012

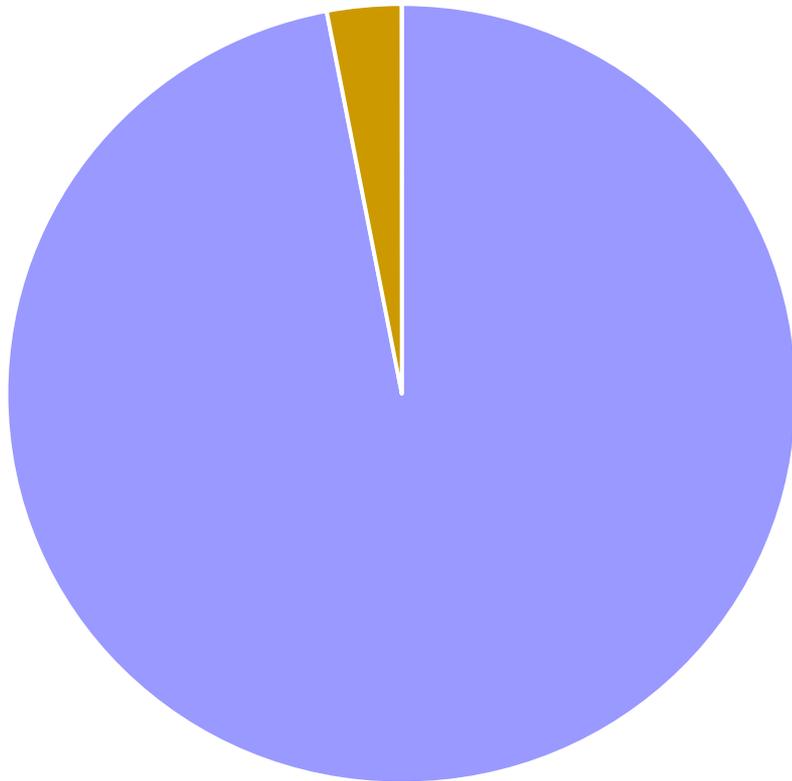
By crash type



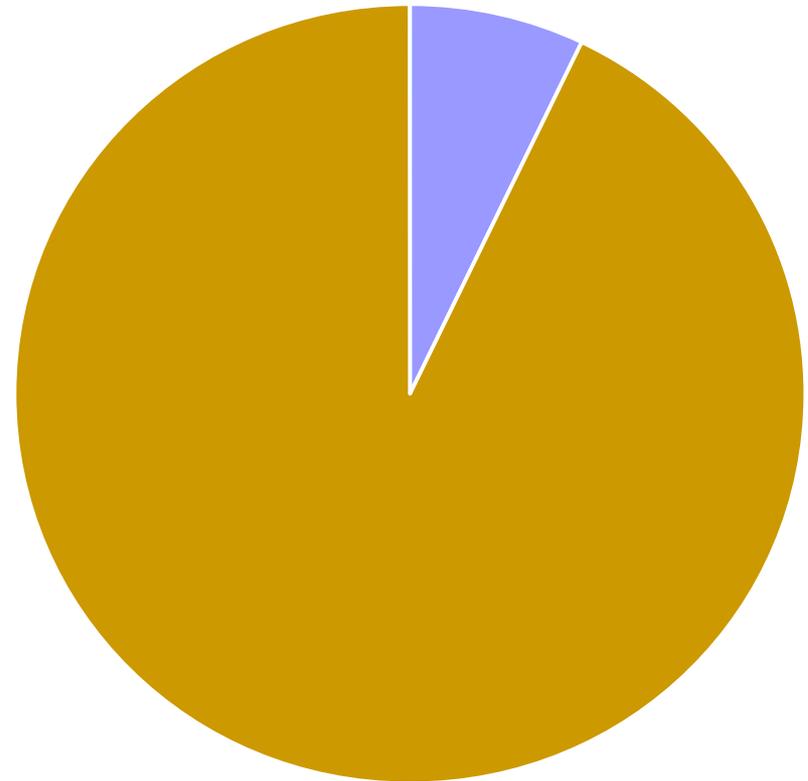
U.S. motorcyclist deaths in 2012

By rider type and gender

4,255 drivers



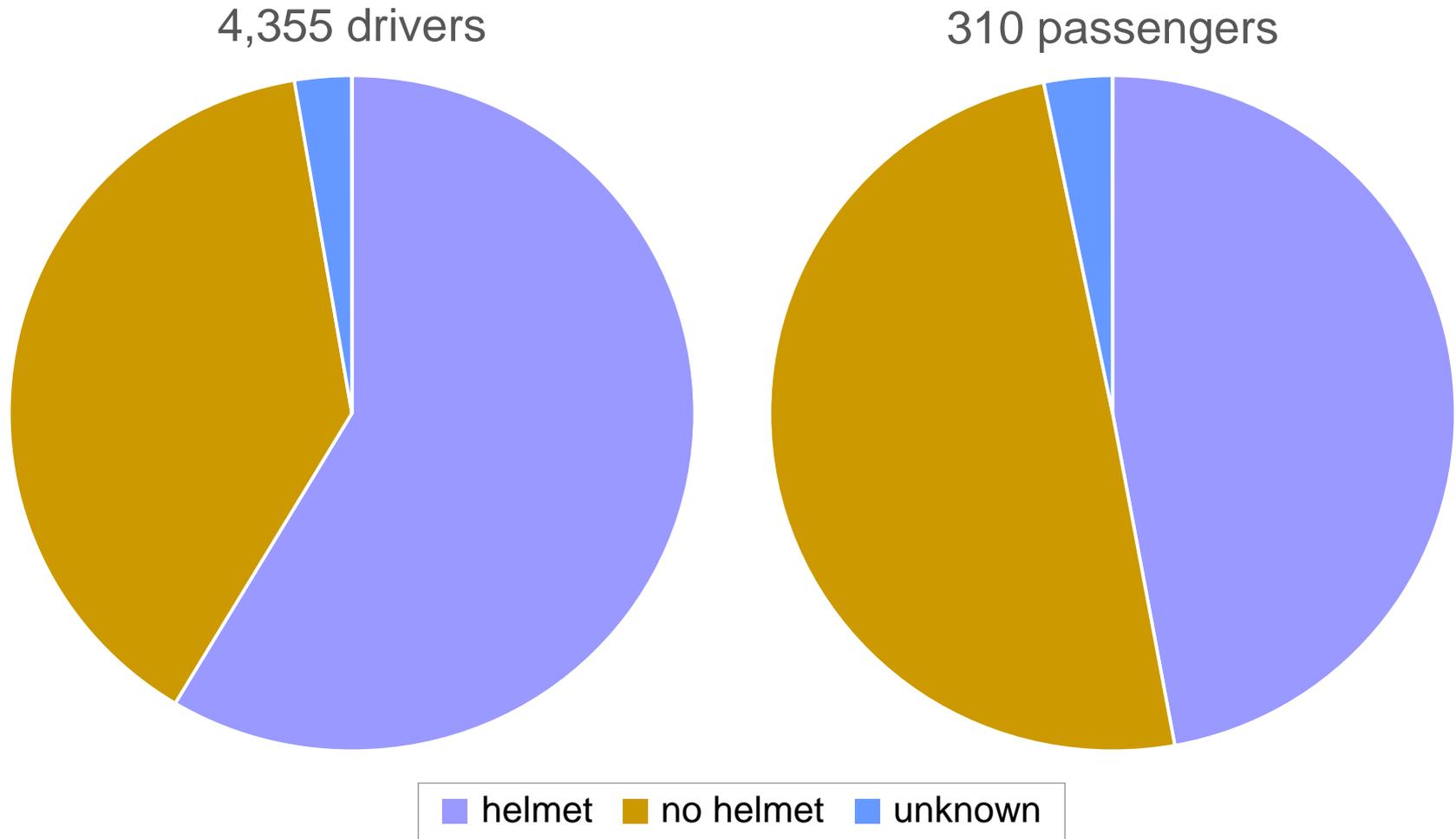
308 passengers



■ male ■ female

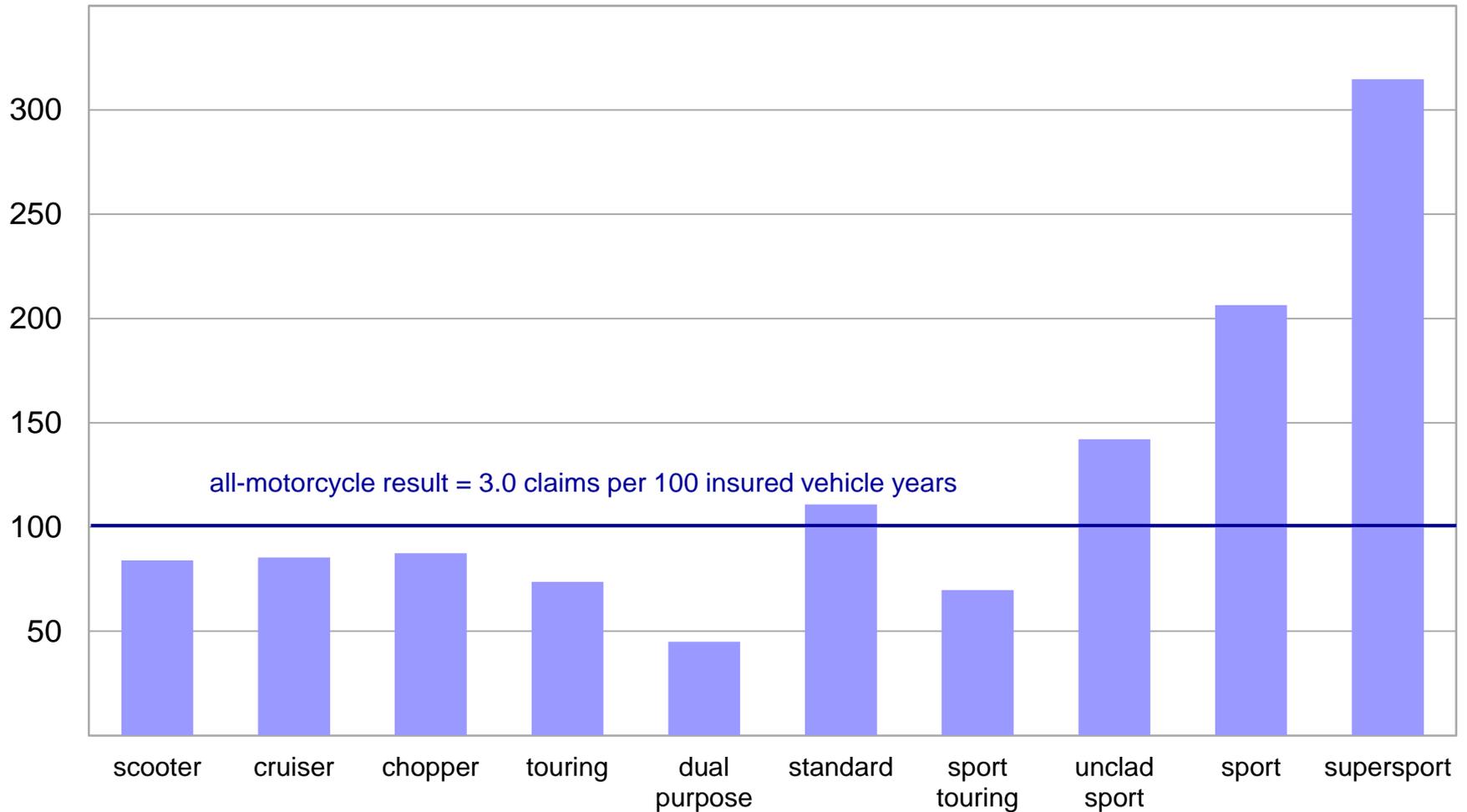
U.S. motorcyclist deaths in 2012

By rider type and helmet use



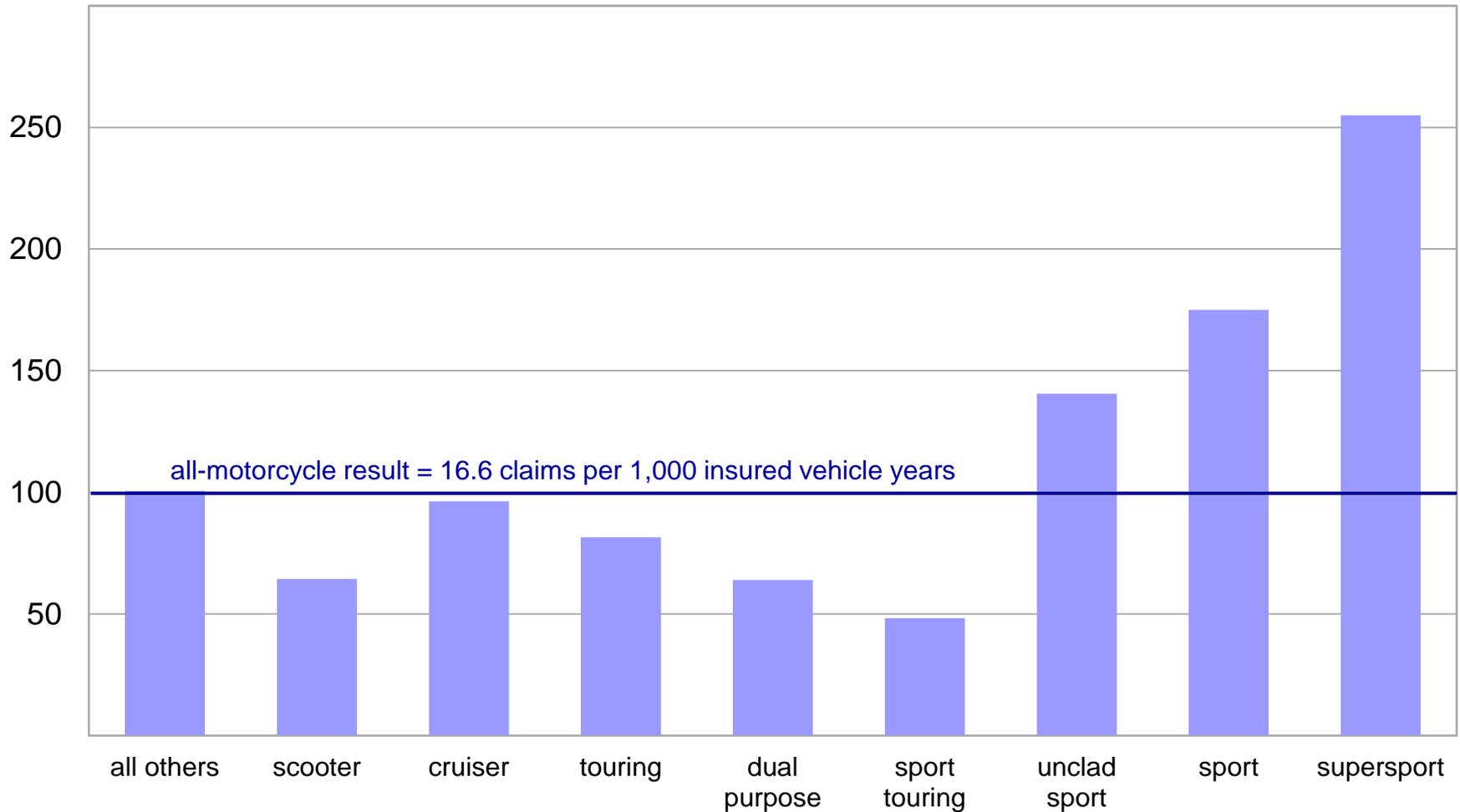
Relative collision claim frequencies

By motorcycle class, 2008-12 models



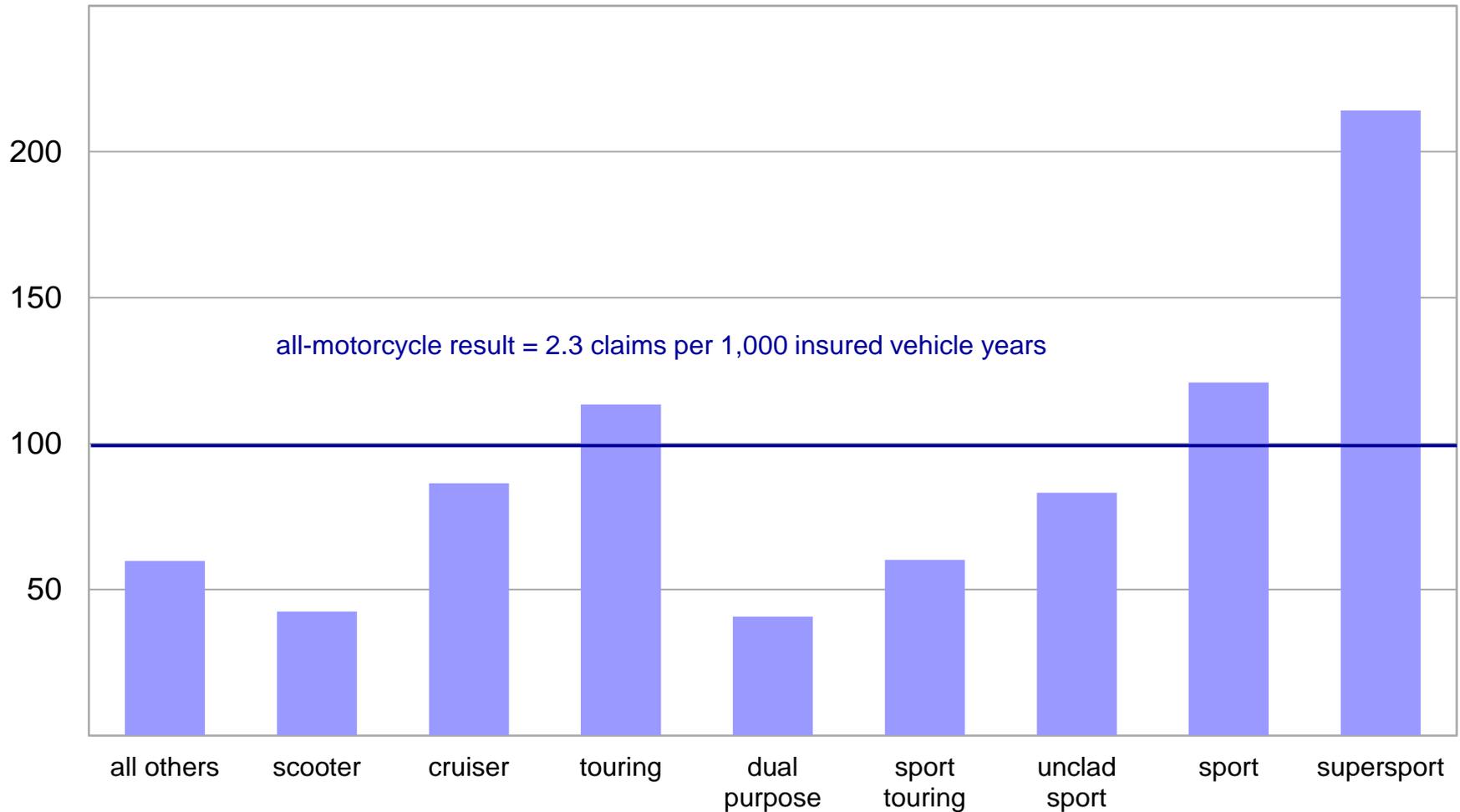
Relative medical payments claim frequencies

By motorcycle class, 2008-12 models



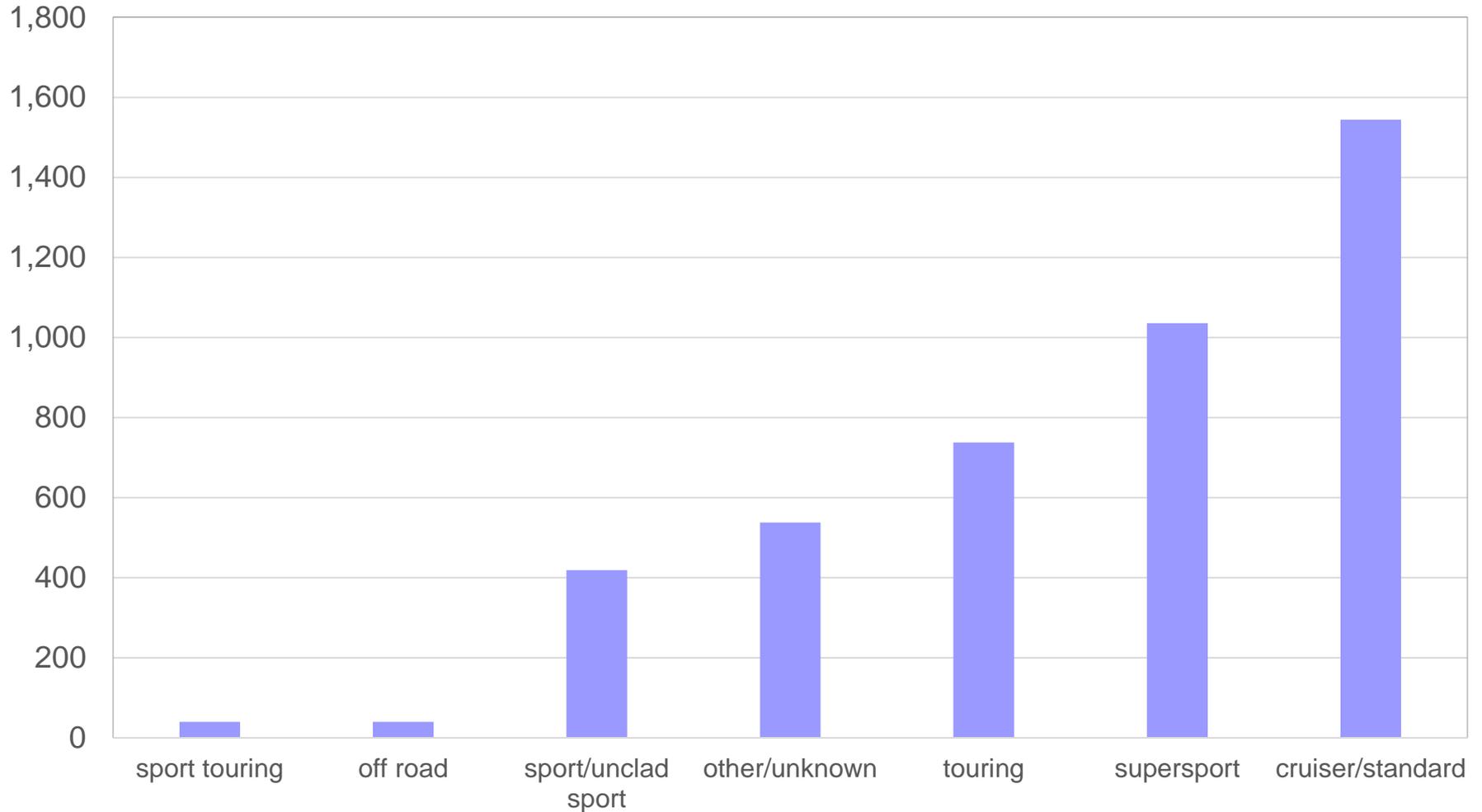
Relative bodily injury liability claim frequencies

By motorcycle class, 2008-12 models



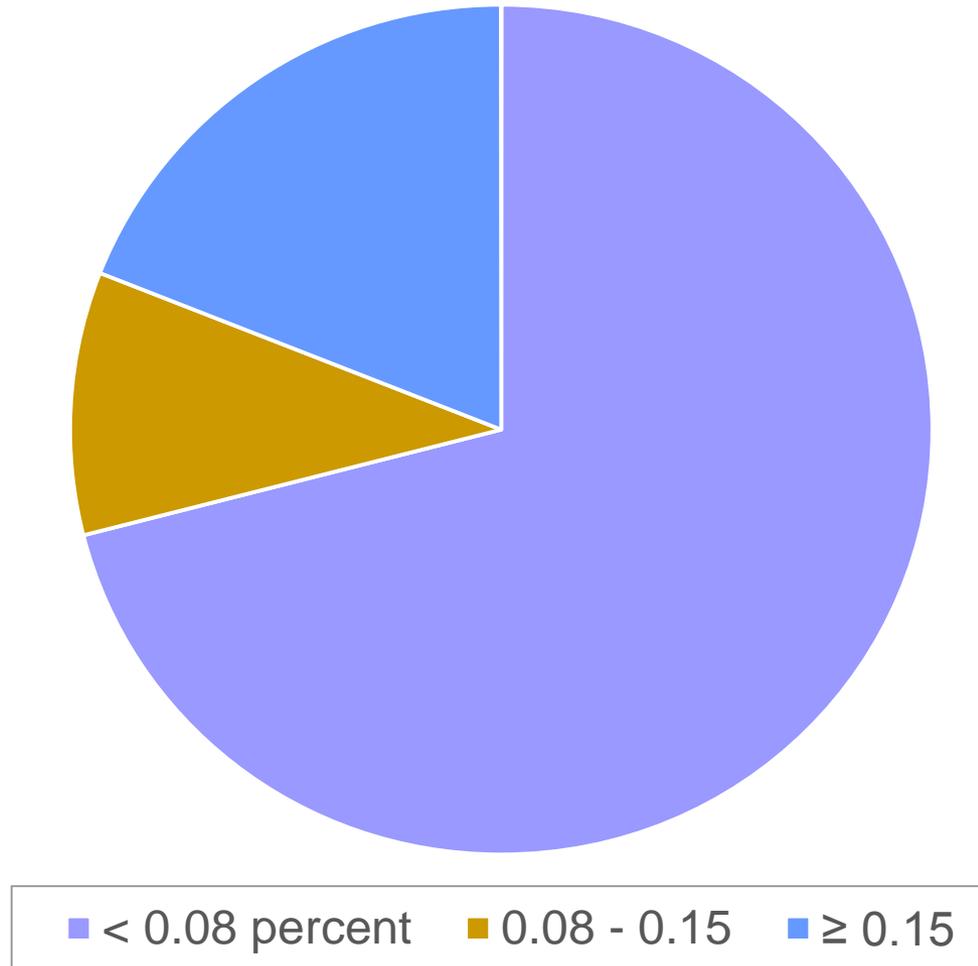
U.S. motorcyclist deaths 2012

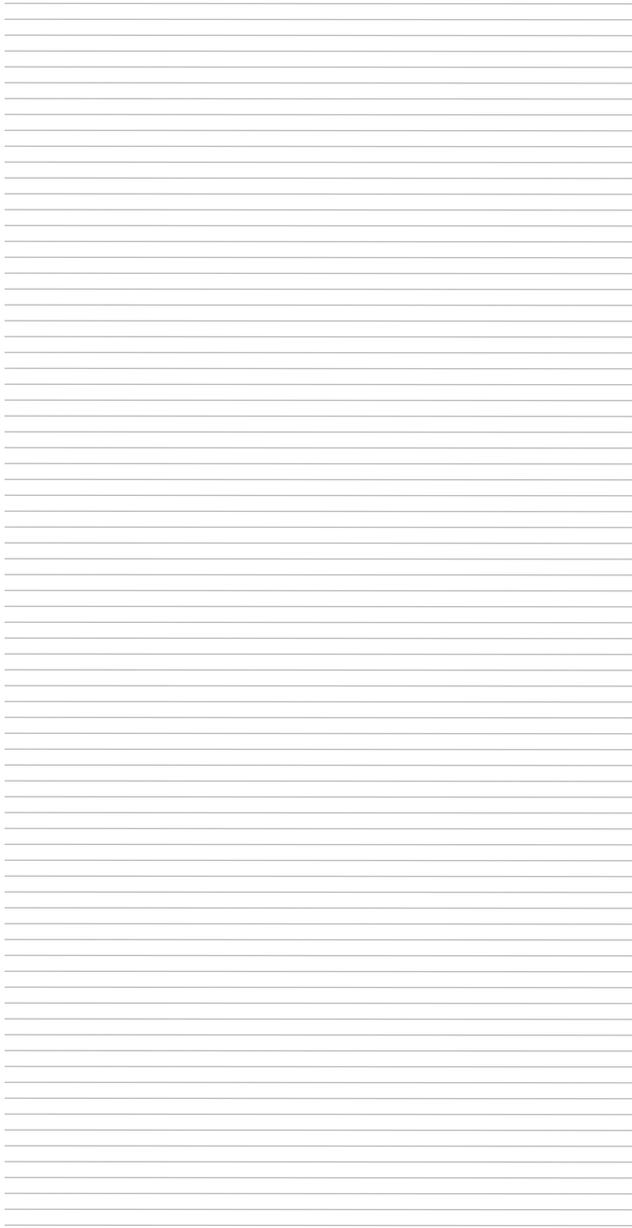
By motorcycle type



U.S. motorcyclist deaths in 2012

Percentage by blood alcohol content

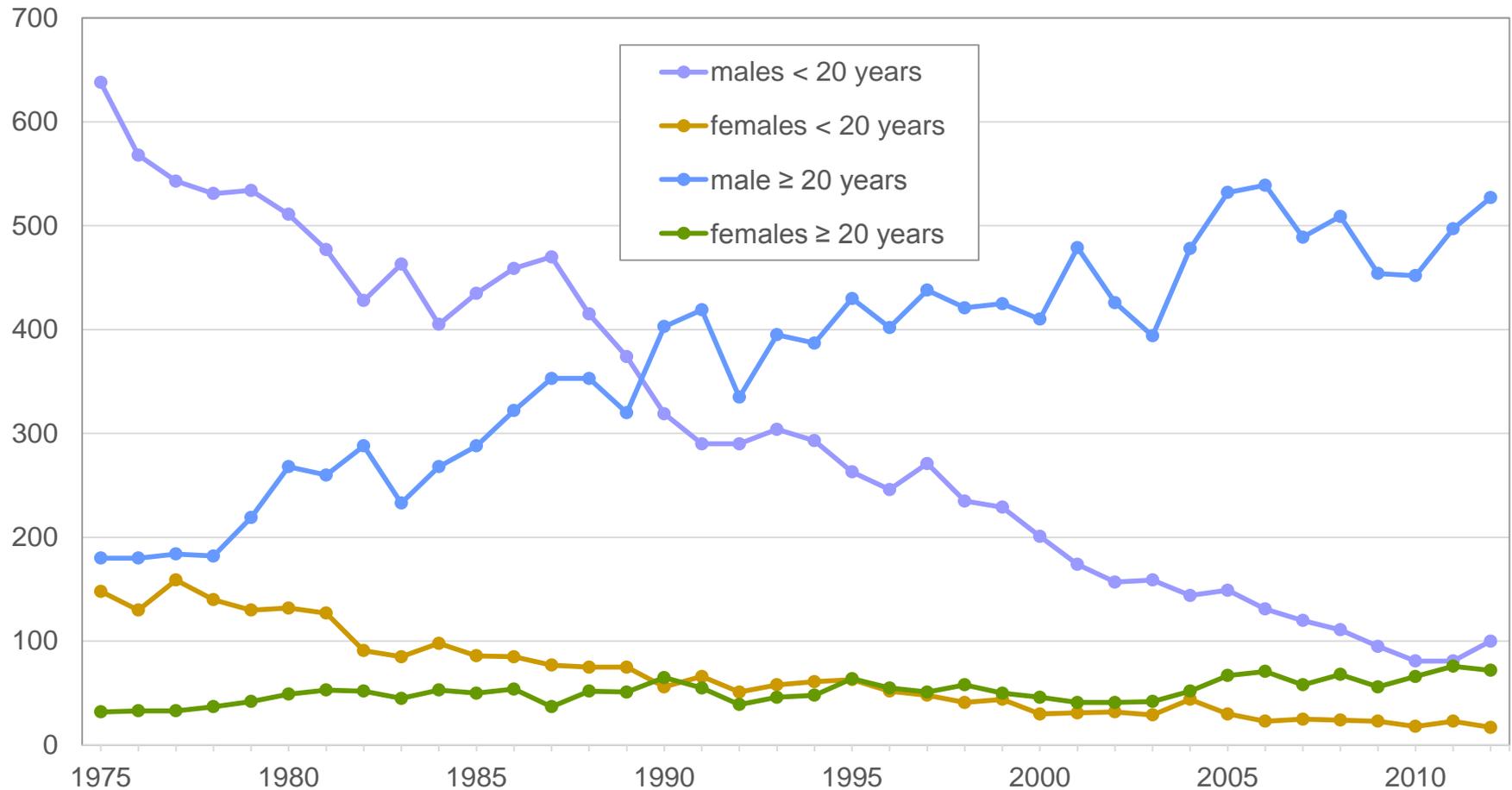




Characteristics of bicycle crashes

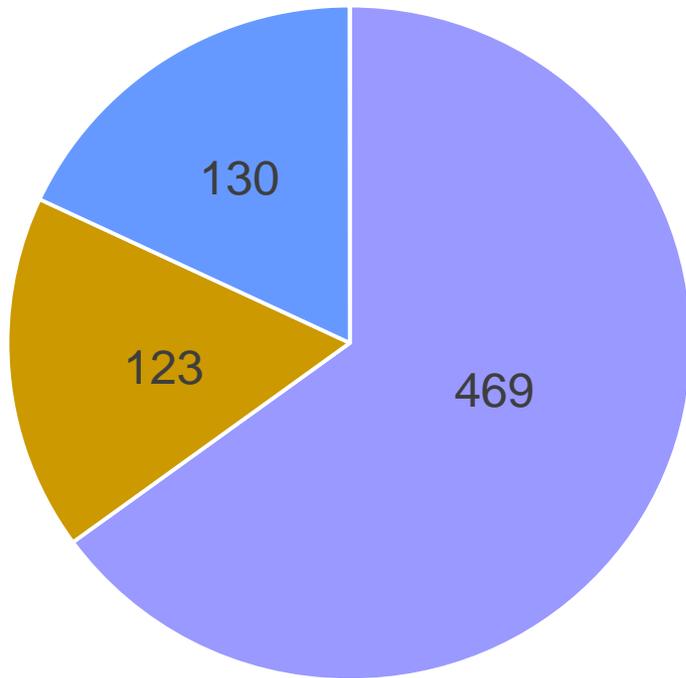
Bicyclist deaths 1975-2012

By age and gender

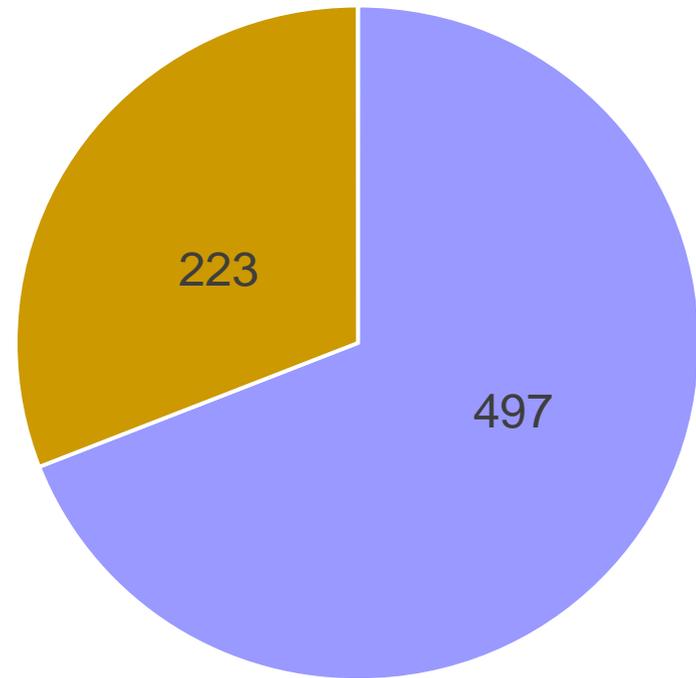


722 U.S. bicyclist deaths in 2012

By helmet use and land use



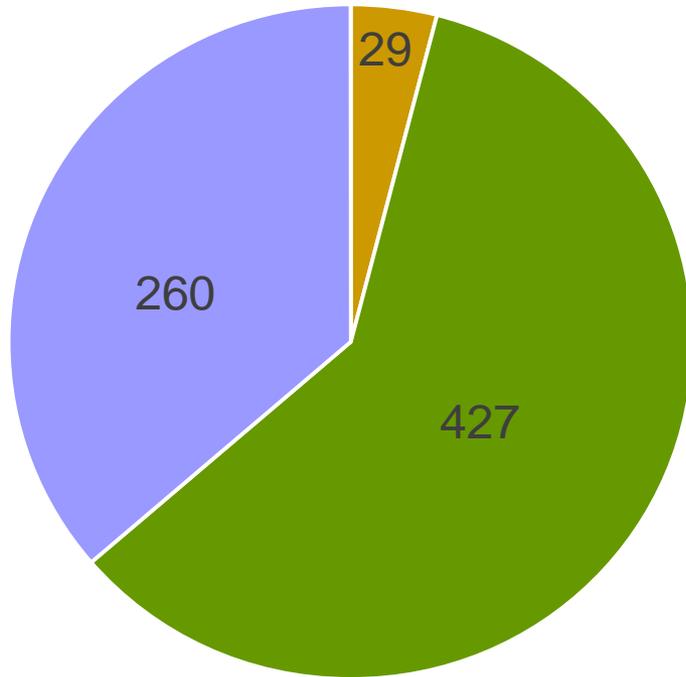
■ no helmet ■ helmet ■ unknown



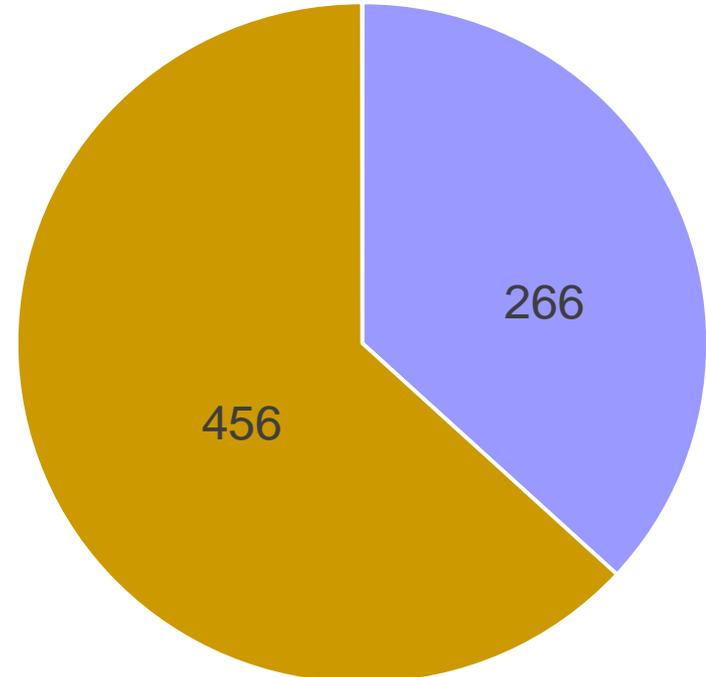
■ urban ■ rural

U.S. bicyclists deaths in 2012

By road type and relation to intersection



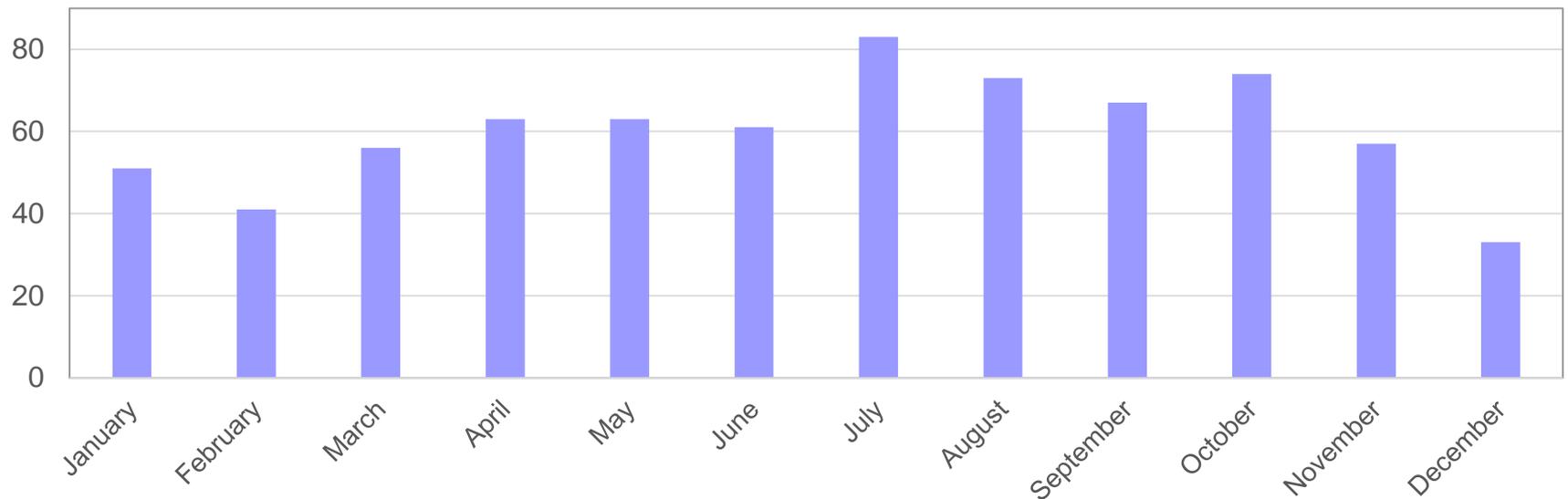
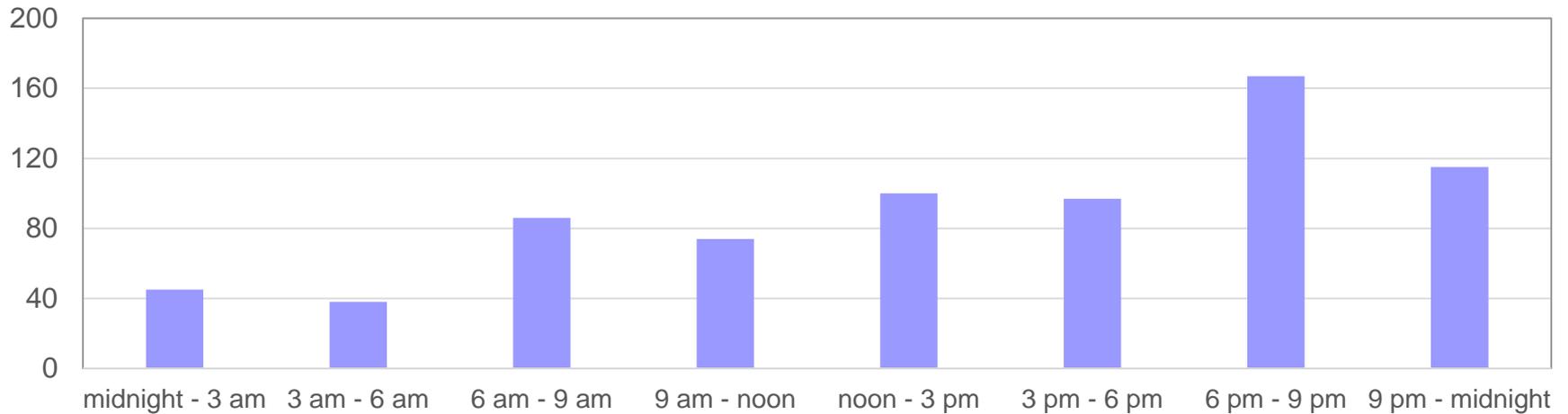
- interstates/freeways
- other major roads
- minor roads



- intersection
- non-intersection

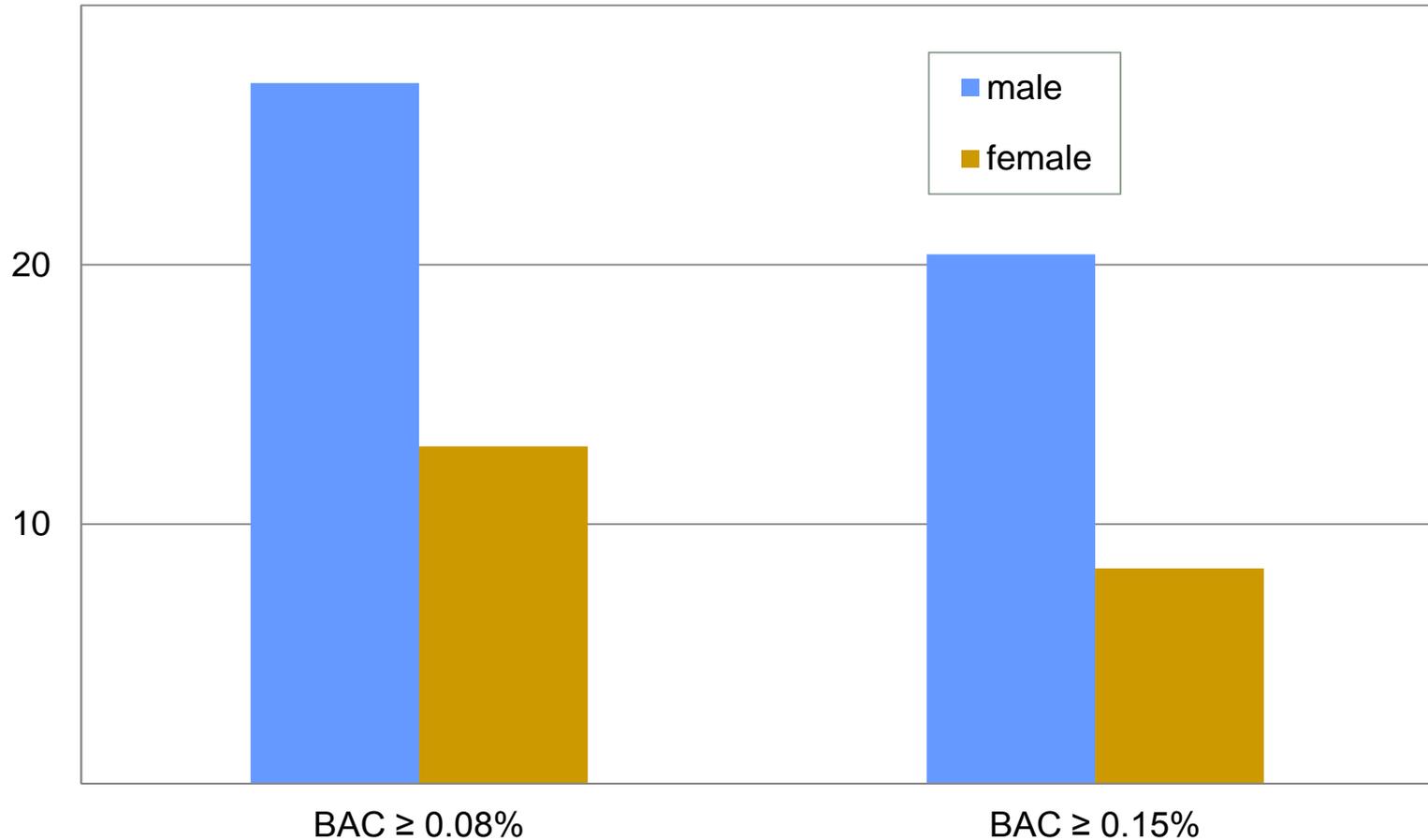
U.S. bicyclist deaths in 2012

By month and time of day



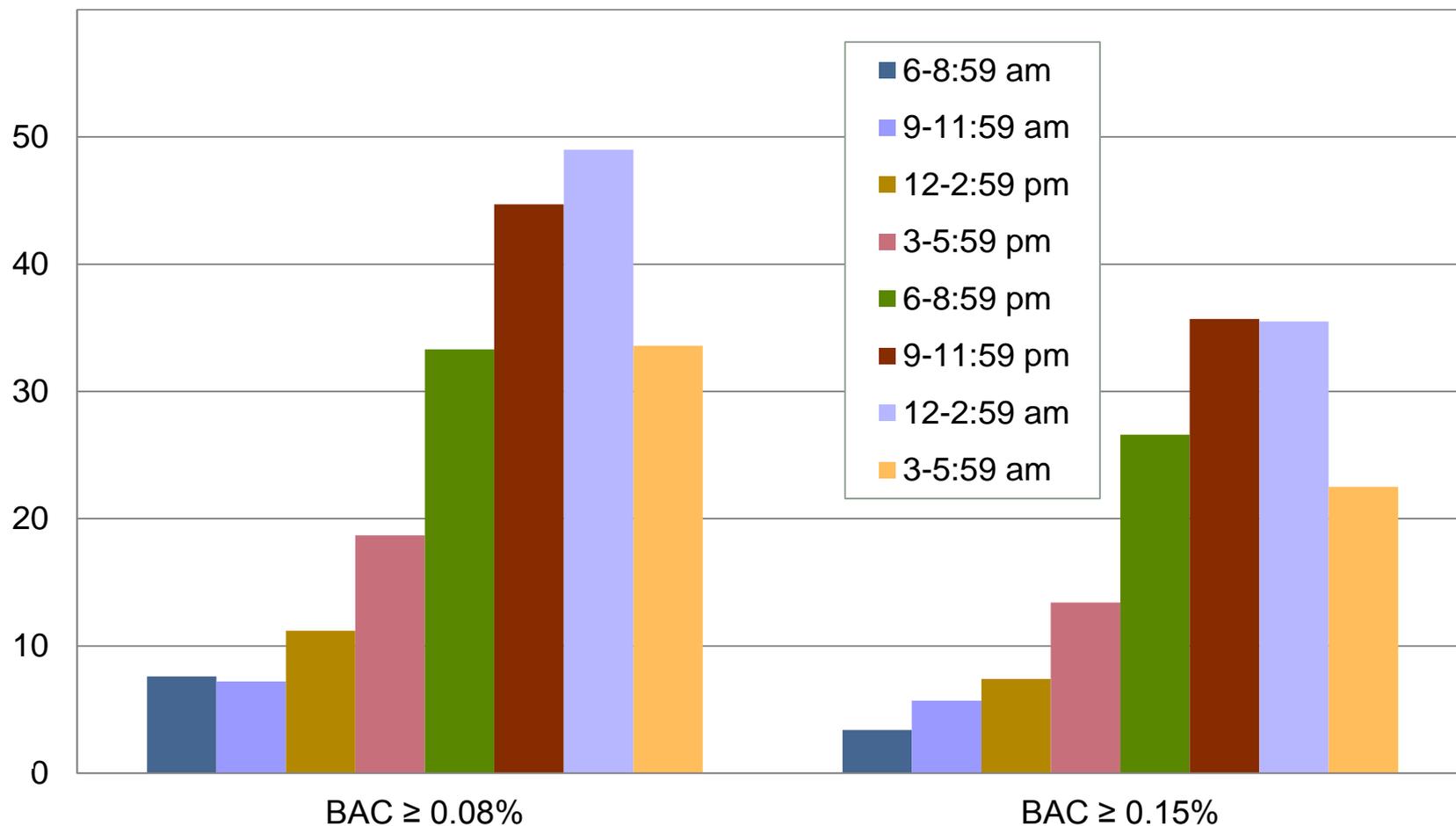
Percent of bicyclist deaths 16 and older with high BACs by gender

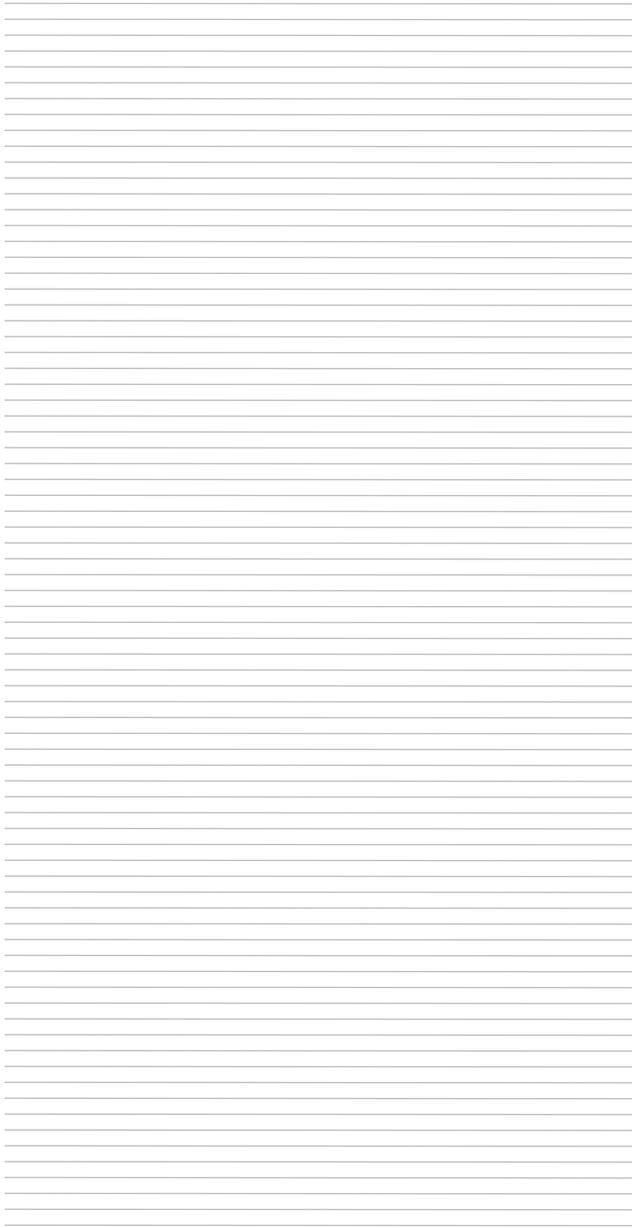
United States, 2007-11



Percent of bicyclist deaths 16 and older with high BACs by time of crash

United States, 2007-11





ATVs and LSVs

All-terrain vehicles (ATVs)

Four-wheel vehicle designed for off-road use



ATV

UTV

- Estimated 10.6 million operating in the U.S. in 2010
- Short wheelbase, narrow track width, high center of gravity
- Typically designed for 1 occupant

⚠ WARNING

Improper use of ATVs can cause SEVERE INJURY OR DEATH.

| | | | |
|---|---|---|---|
|  |  |  |  |
| ALWAYS USE AN APPROVED HELMET AND PROTECTIVE GEAR | NEVER USE ON PUBLIC ROADS | NEVER CARRY PASSENGERS | NEVER USE WITH DRUGS OR ALCOHOL |

NEVER operate:

- without proper training or instruction
- at speeds too fast for your skills or the conditions
- on public roads - a collision can occur with another vehicle
- with a passenger - passengers affect balance and steering and increase risk of losing control

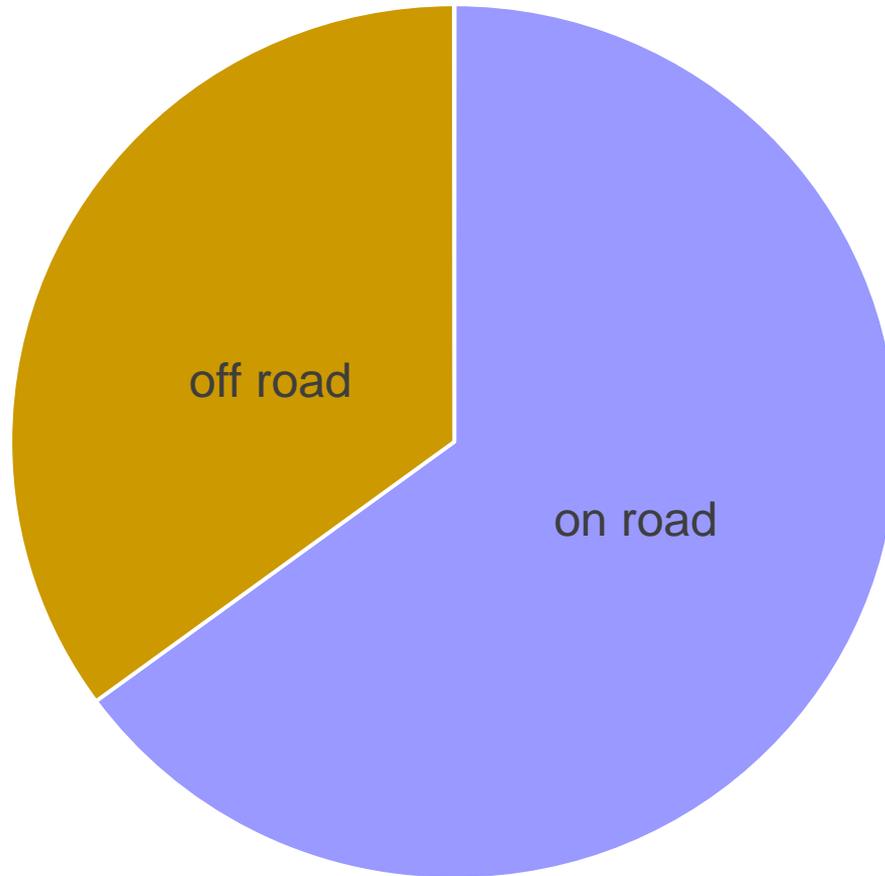
ALWAYS:

- use proper riding techniques to avoid vehicle overturns on hills and rough terrain and in turns.
- avoid paved surfaces - pavement may seriously affect handling and control

LOCATE AND READ OWNER'S MANUAL.
FOLLOW ALL INSTRUCTIONS AND WARNINGS.

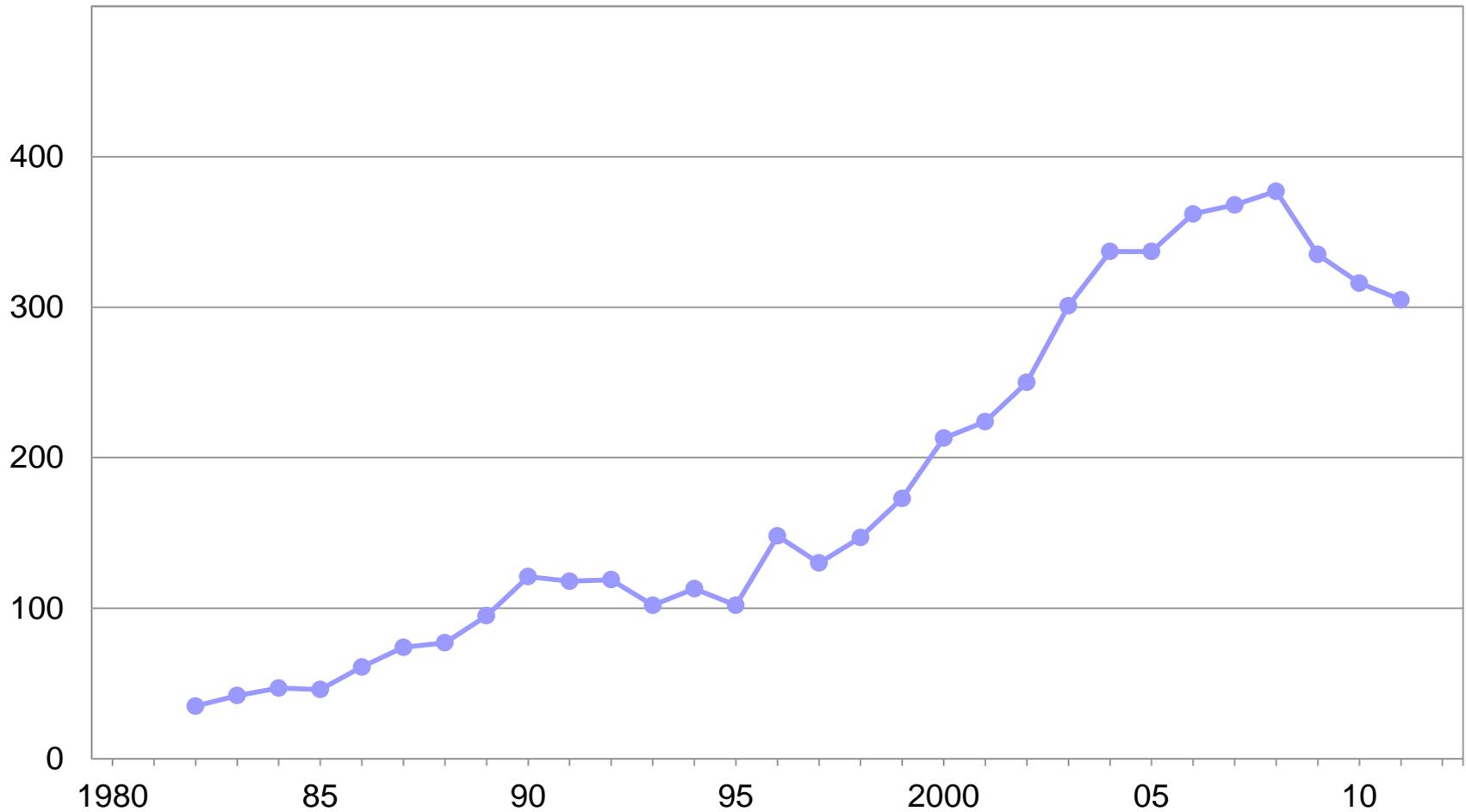
ATV deaths by location if known, 2007

Consumer Product Safety Commission



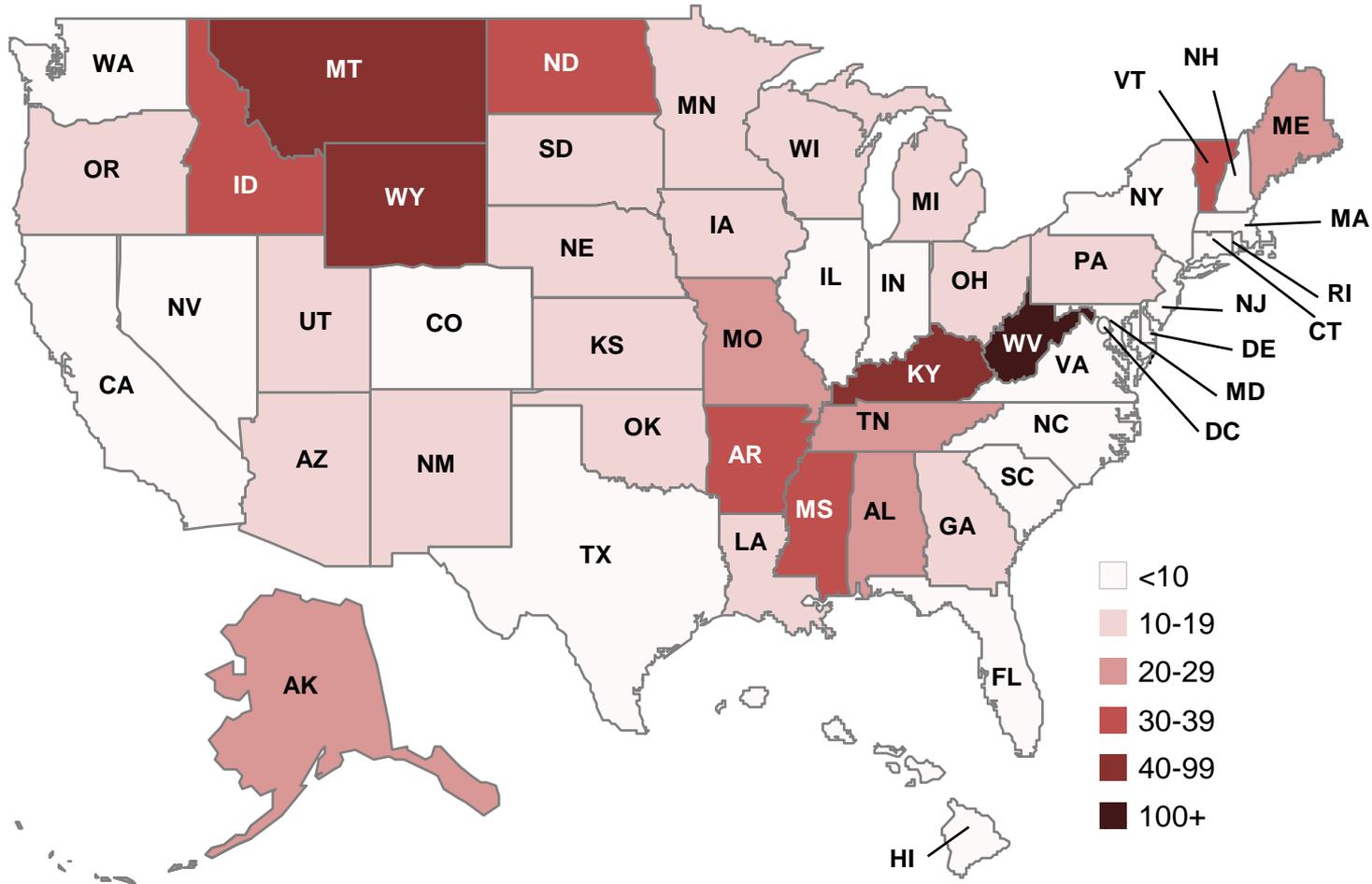
ATV rider on-road deaths 1982-2012

A growing problem



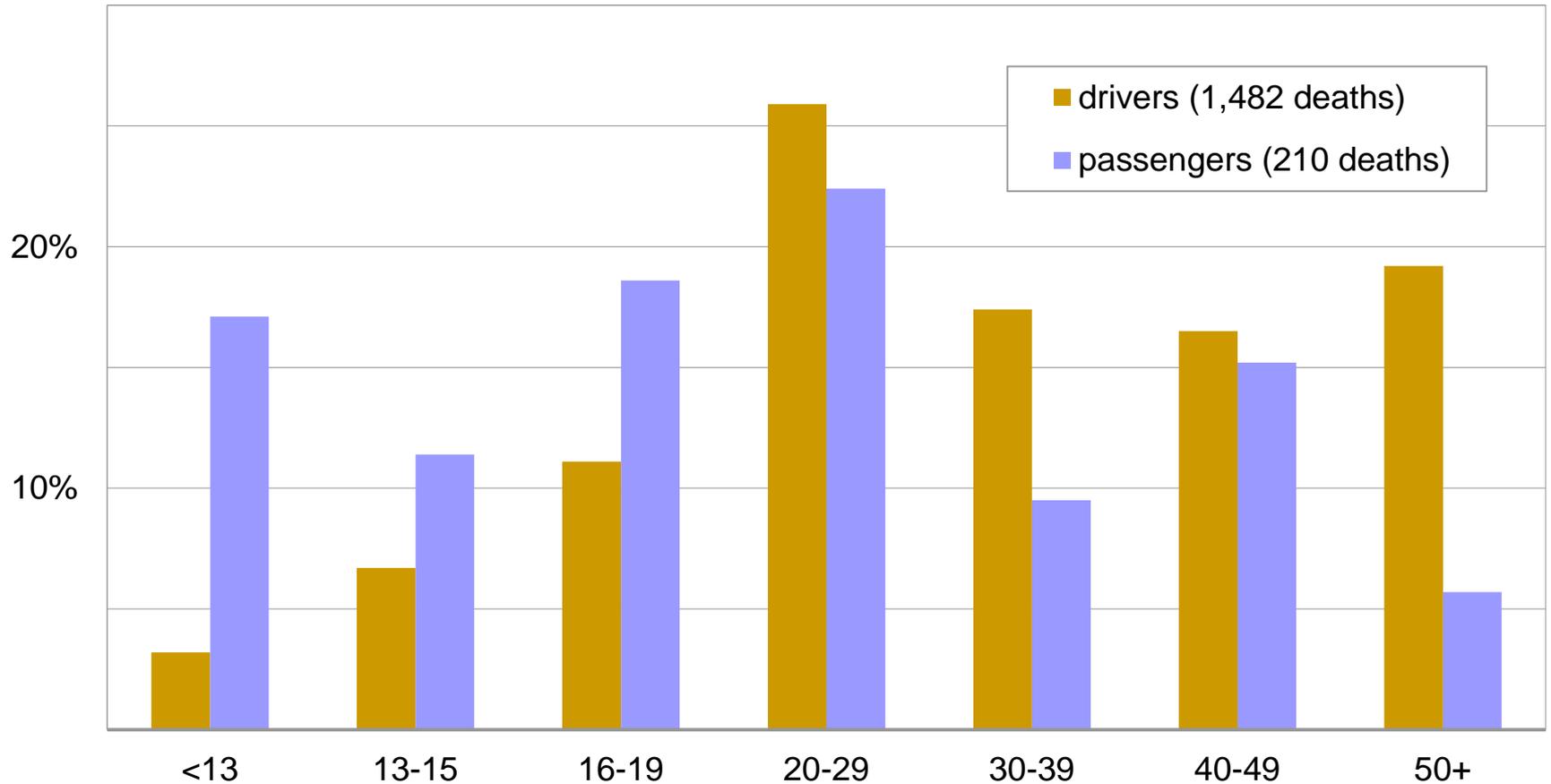
ATV rider deaths per 10 million people

2007-11



Age distribution of fatally injured ATV riders

By occupant type, 2007-11



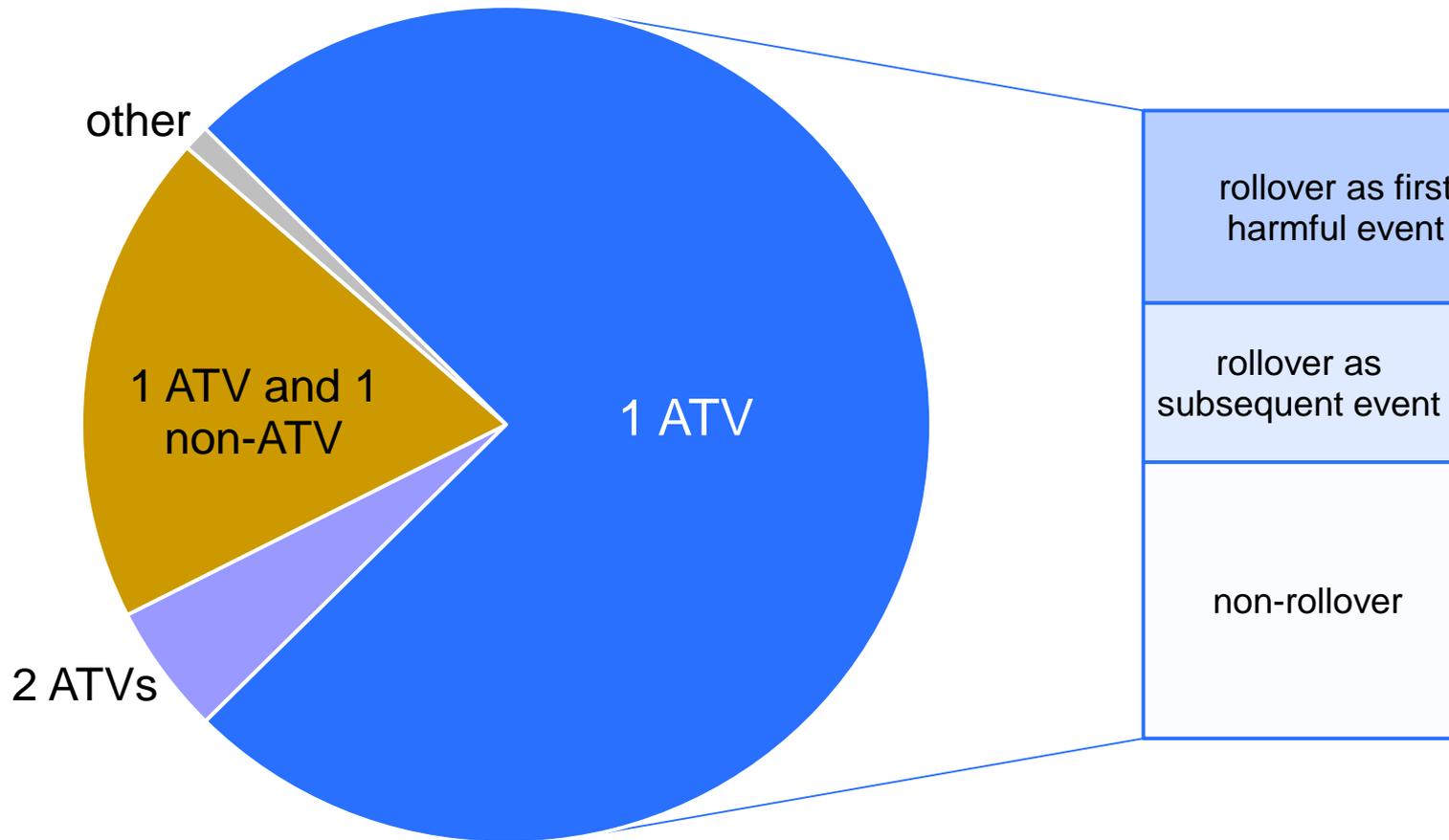
Percentage distribution by type of road

Fatally injured ATV riders, 2007-11

| | urban | rural |
|---------------------------|-------|-------|
| interstate | 0 | <1 |
| non-interstate major road | 2 | 19 |
| minor road | 11 | 65 |
| unknown road type | <1 | 2 |

ATV deaths by number and type of vehicles

Fatal ATV crashes, 2007-11



Characteristics of fatally injured ATV drivers

2007-11

| | percent |
|----------------------|---------|
| male | 90 |
| unhelmeted | 87 |
| BAC \geq 0.08 g/dL | 43 |
| speeding | 37 |

Low-speed vehicles

Type defined by NHTSA in 1998

“to make short trips for shopping, social, and recreational purposes primarily within retirement or other planned communities with golf courses”

- 4 wheels and top speed of at least 20 mph but not more than 25 mph
- Exempt from most federal motor vehicle safety standards
- Not required to meet any criteria for vehicle crashworthiness
- Must be equipped with headlights, taillights, stoplights, reflectors, mirrors, parking brake, windshield, and safety belts

Low-speed vehicles



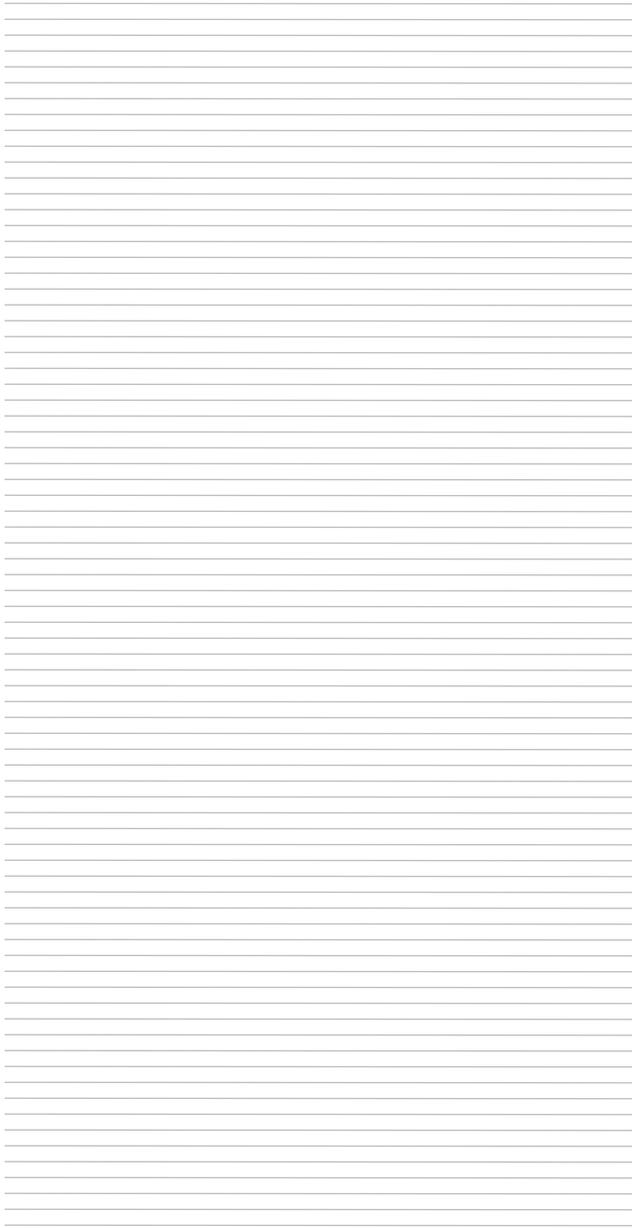
Low-speed-vehicle crash tests



with Smart Fortwo



with moveable
deformable barrier

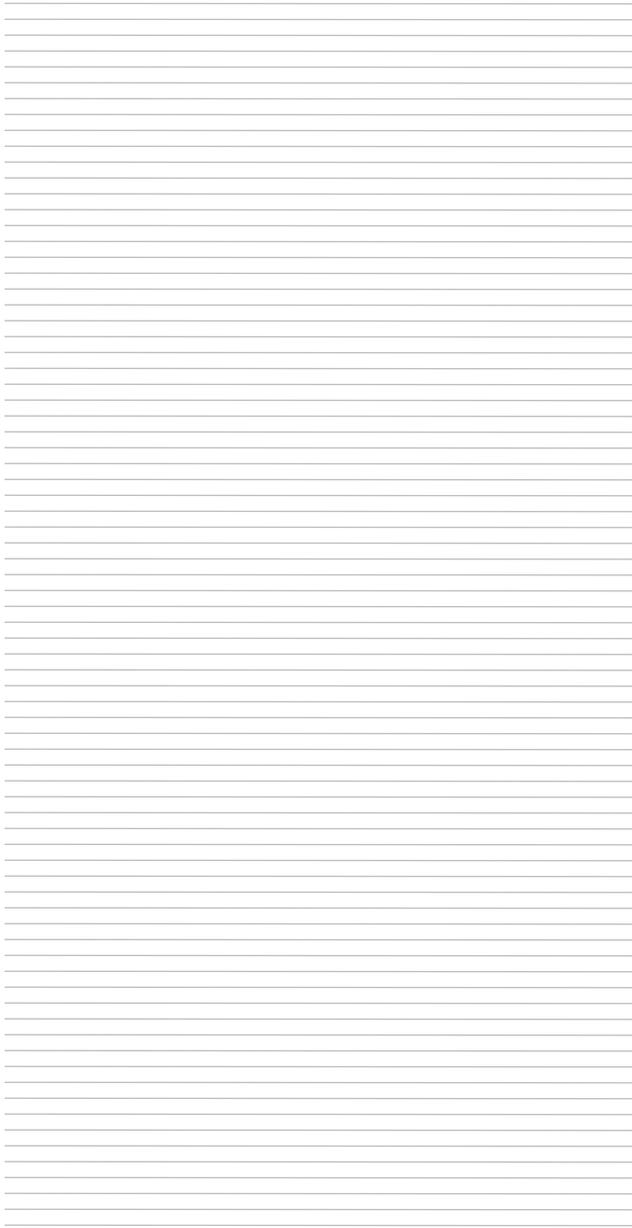


Protecting vulnerable road users

Haddon matrix

Recognizing opportunities to make a difference

| changes in... | crash phase | | |
|---------------|---|--|---|
| | before | during | after |
| people | <ul style="list-style-type: none"> •graduated licensing •impaired driving laws •distracted driving •red light cameras •speed cameras | <ul style="list-style-type: none"> •restraint use •helmets •seat position •speed cameras | <ul style="list-style-type: none"> •alcohol interlocks |
| vehicles | <ul style="list-style-type: none"> •autobrake •collision warning •electronic stability control •motorcycle ABS | <ul style="list-style-type: none"> •Airbags •autobrake •truck underride guards •bumpers | <ul style="list-style-type: none"> •automatic collision notification •fuel system integrity |
| environment | <ul style="list-style-type: none"> •roundabouts •trouble spot treatment •bicycle lanes/paths | <ul style="list-style-type: none"> •roundabouts •breakaway poles | <ul style="list-style-type: none"> •emergency medical services |



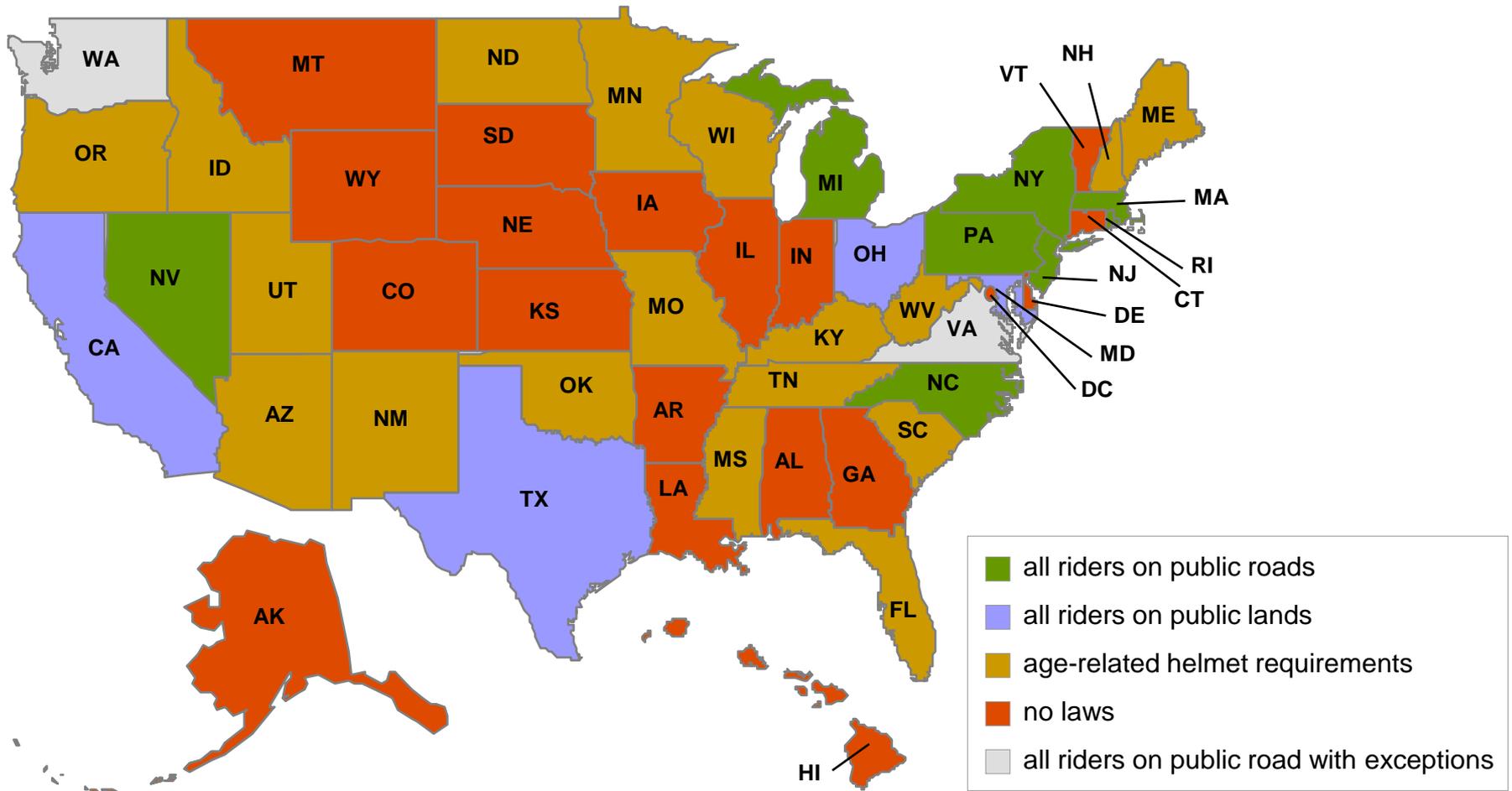
Helmet

Helmets save lives

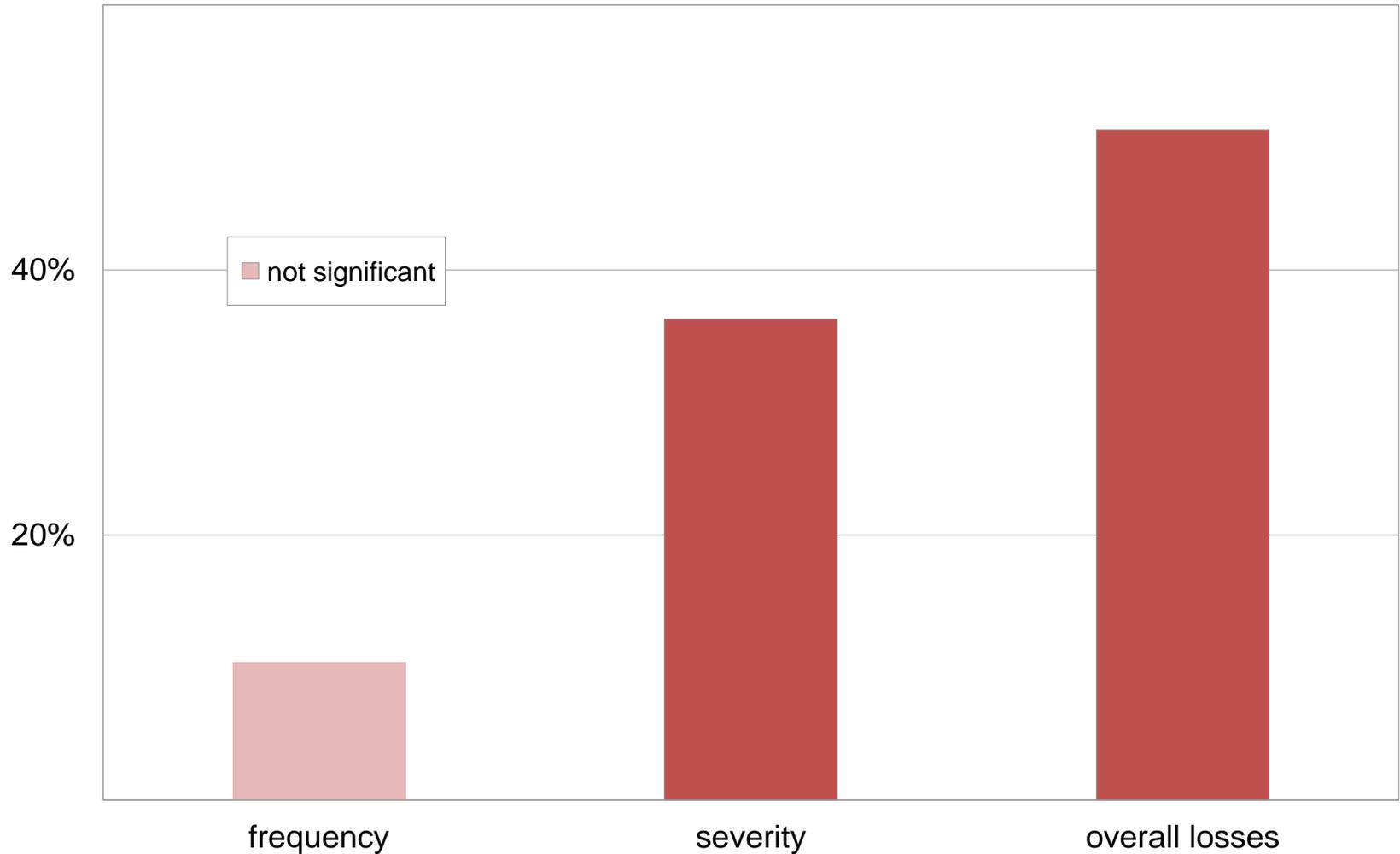
- In a crash, helmets on motorcyclists reduce...
 - Risk of a head injury by 69%
 - Risk of a fatality by 42%
- NHTSA estimates that bicycle helmets are 85-88% effective at preventing brain injury

ATV helmet laws

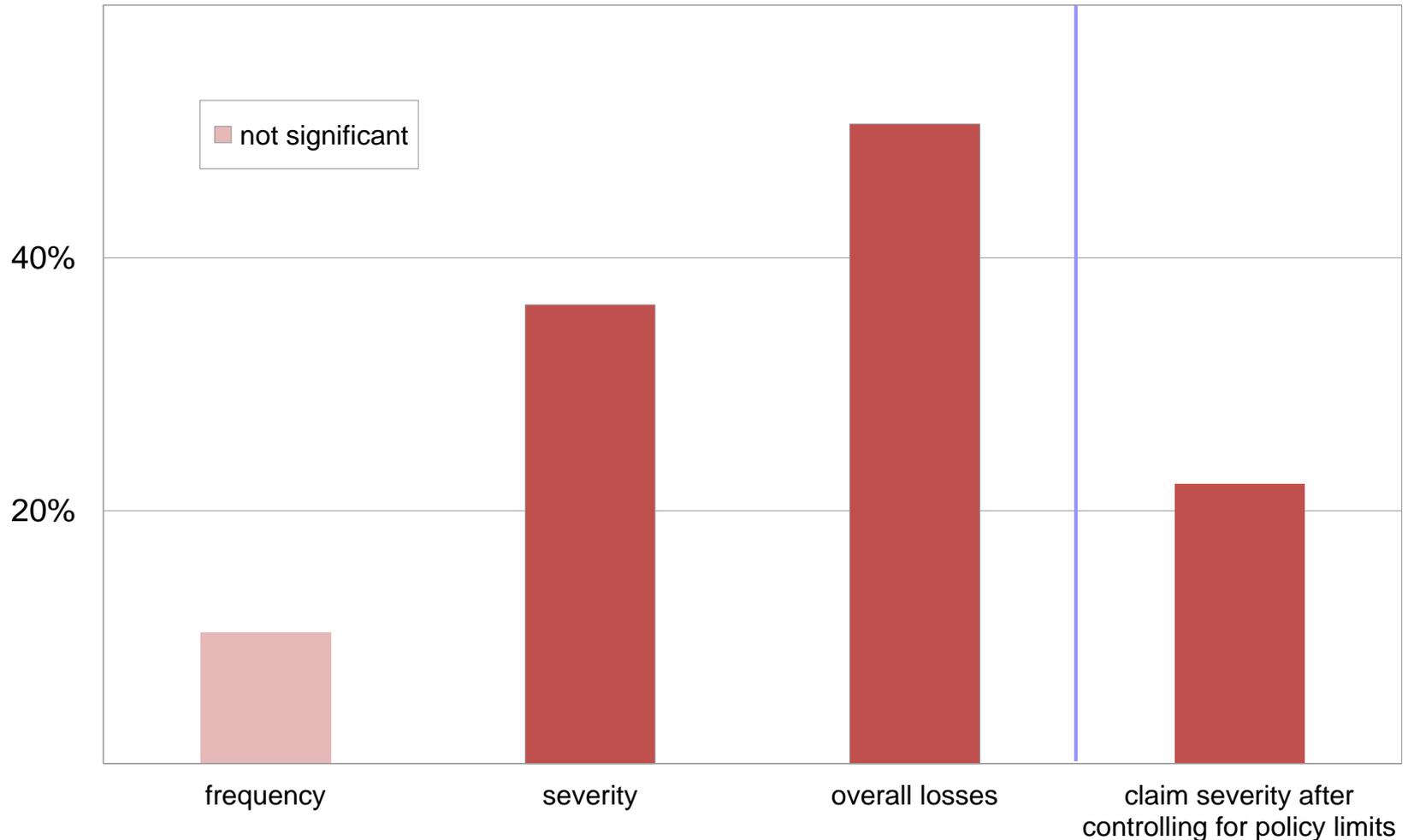
18 states & D.C. have no laws requiring helmet use

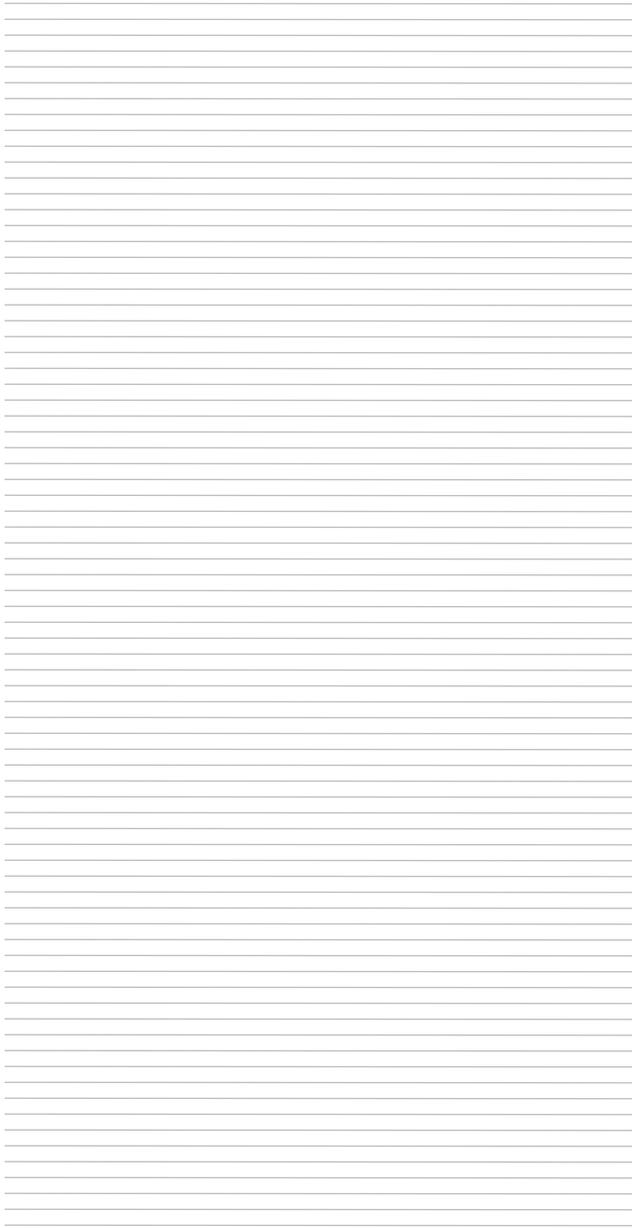


Effects of helmet law change on Michigan MedPay losses, estimates of control states pooled



Effects of helmet law change on Michigan MedPay losses, estimates of control states pooled





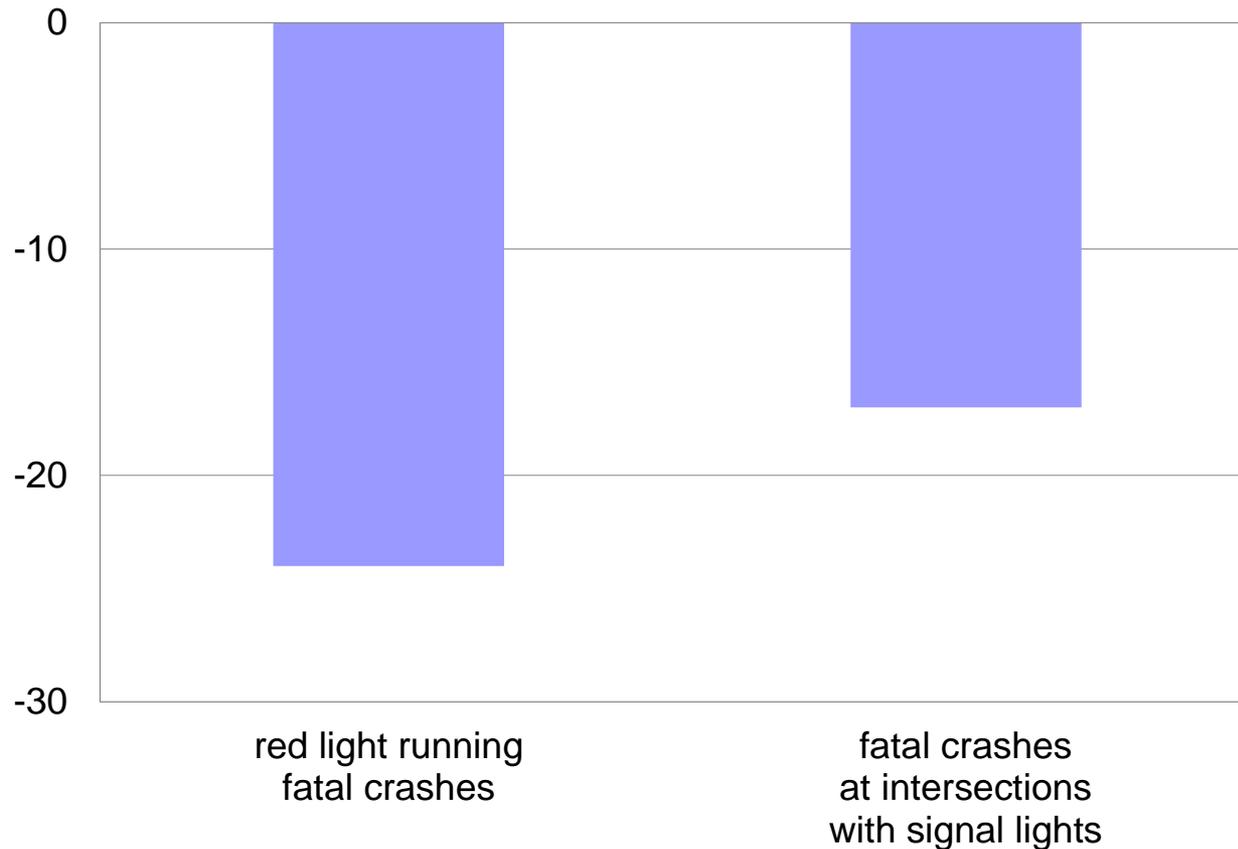
Automated enforcement of traffic laws

Fatalities in red light running crashes

2011

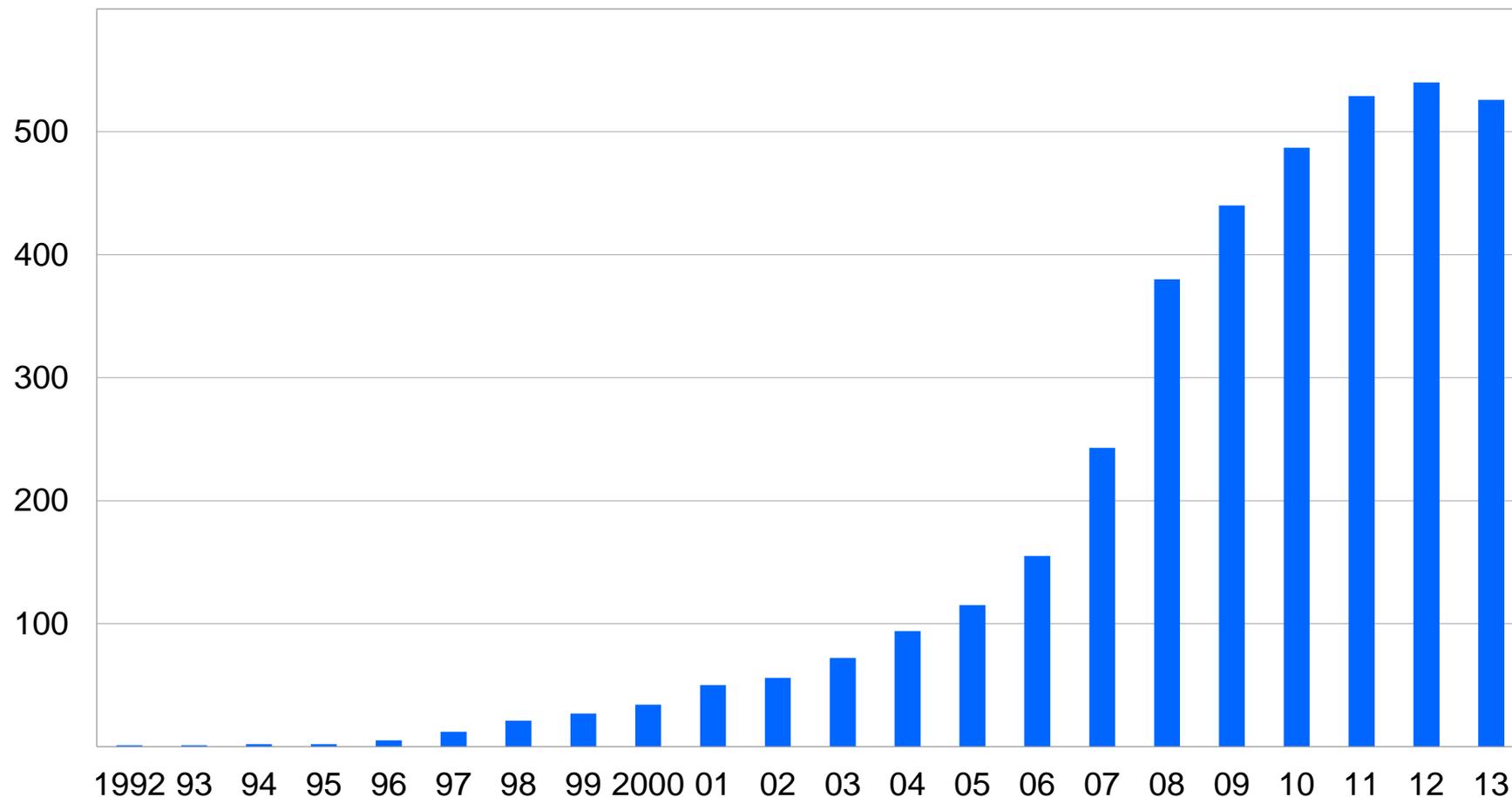
| | number |
|--|-----------|
| Driver in red light running vehicle | 247 |
| Passenger in red light running vehicle | 83 |
| Occupants non-red light running vehicle | 341 |
| Pedestrian, bicyclist and personal conveyance | 43 |
| TOTAL | 714 |

Percent difference in actual fatal crash rates during 2004-08 in 14 large cities with red light cameras vs. expected rates without cameras



US communities with red light cameras

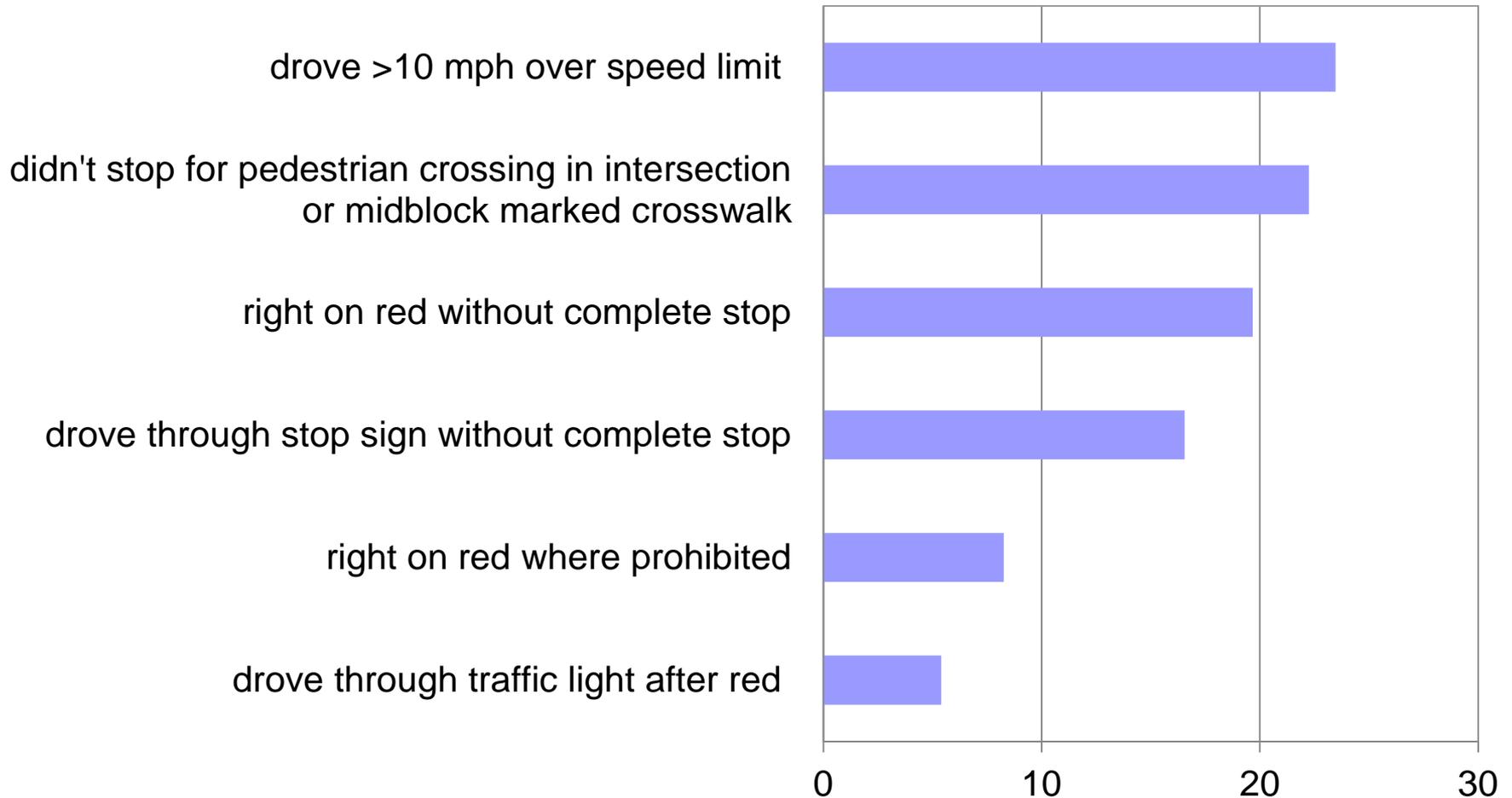
1992-2013



Automated enforcement in Washington, D.C.

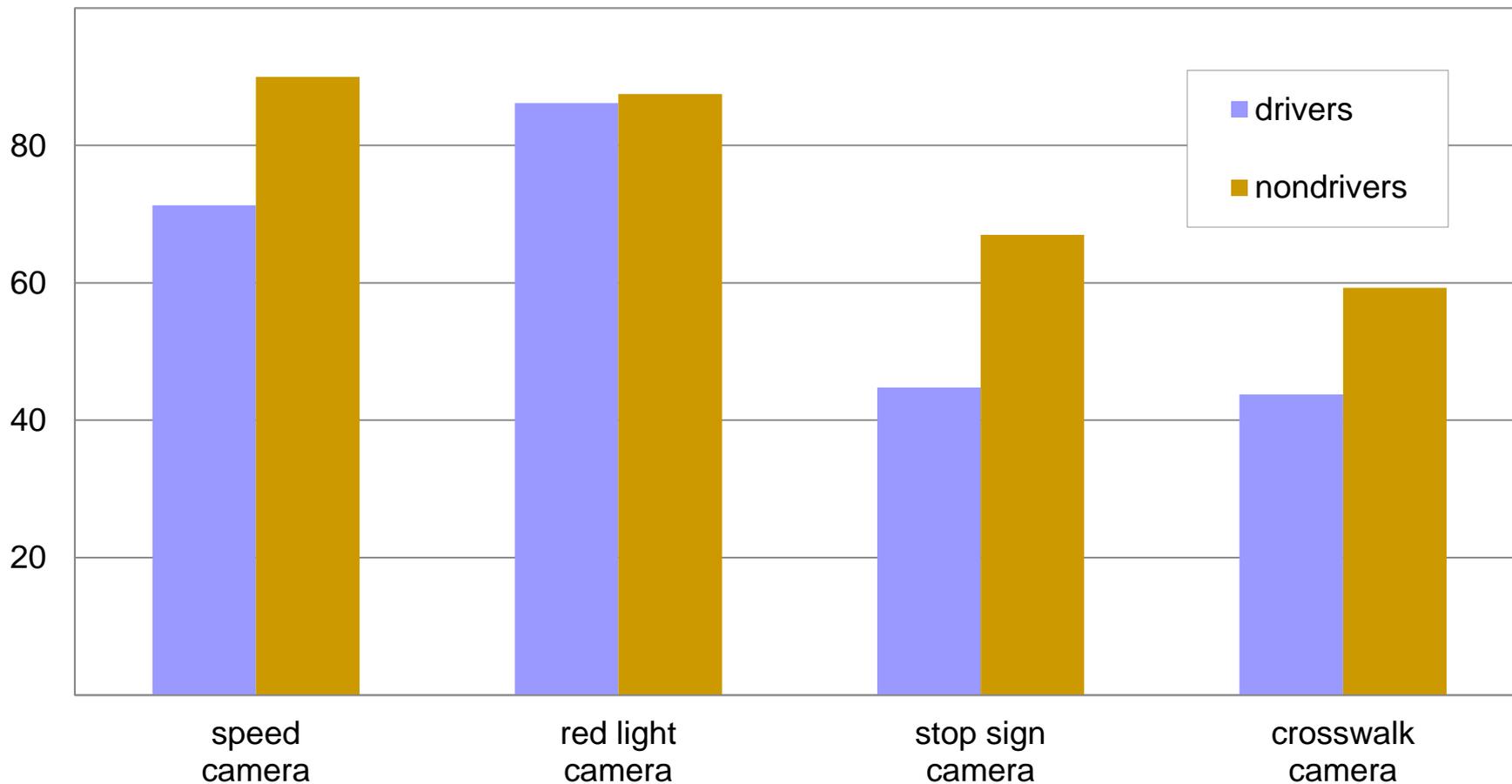
- Red light cameras since 1999, speed cameras since 2001
- Attitudes of D.C. drivers toward cameras
 - 78 percent favored red light cameras in 2011 survey
 - 51 percent favored speed cameras in 2002 survey
- Planning new camera enforcement in 2013 to improve pedestrian safety
 - Initially located near schools
 - Institute evaluating effectiveness of stop sign and crosswalk cameras
- Little known about pedestrian views on safety and camera enforcement

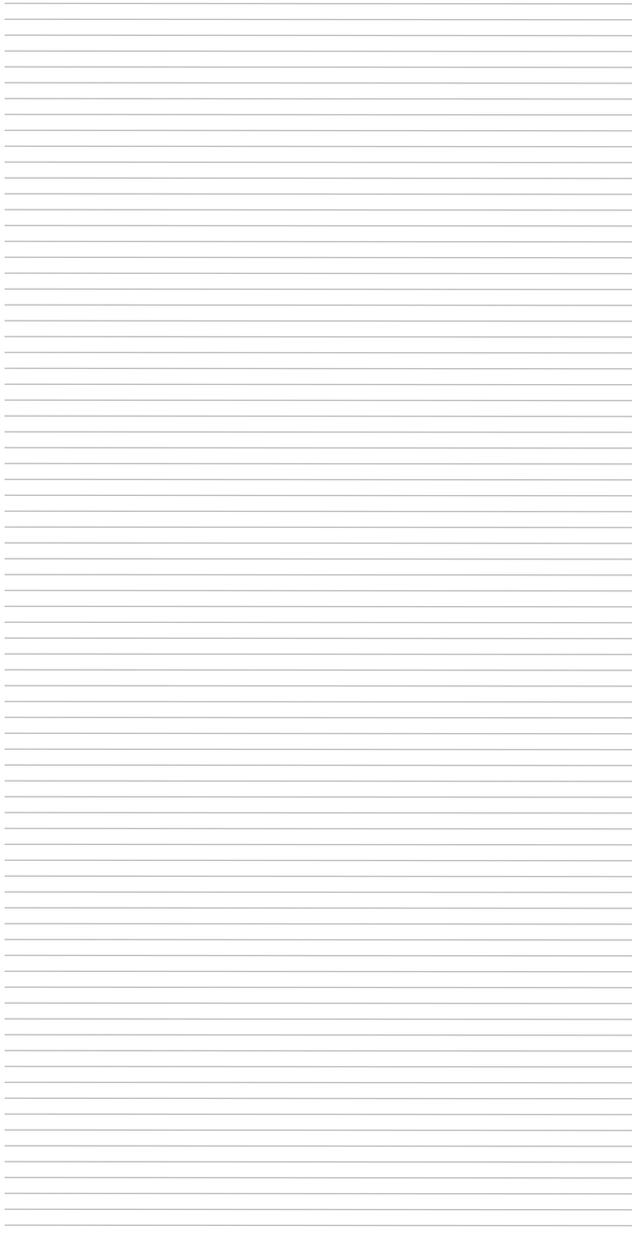
Percent of drivers who reported various behaviors in past month



Percent who favor camera enforcement

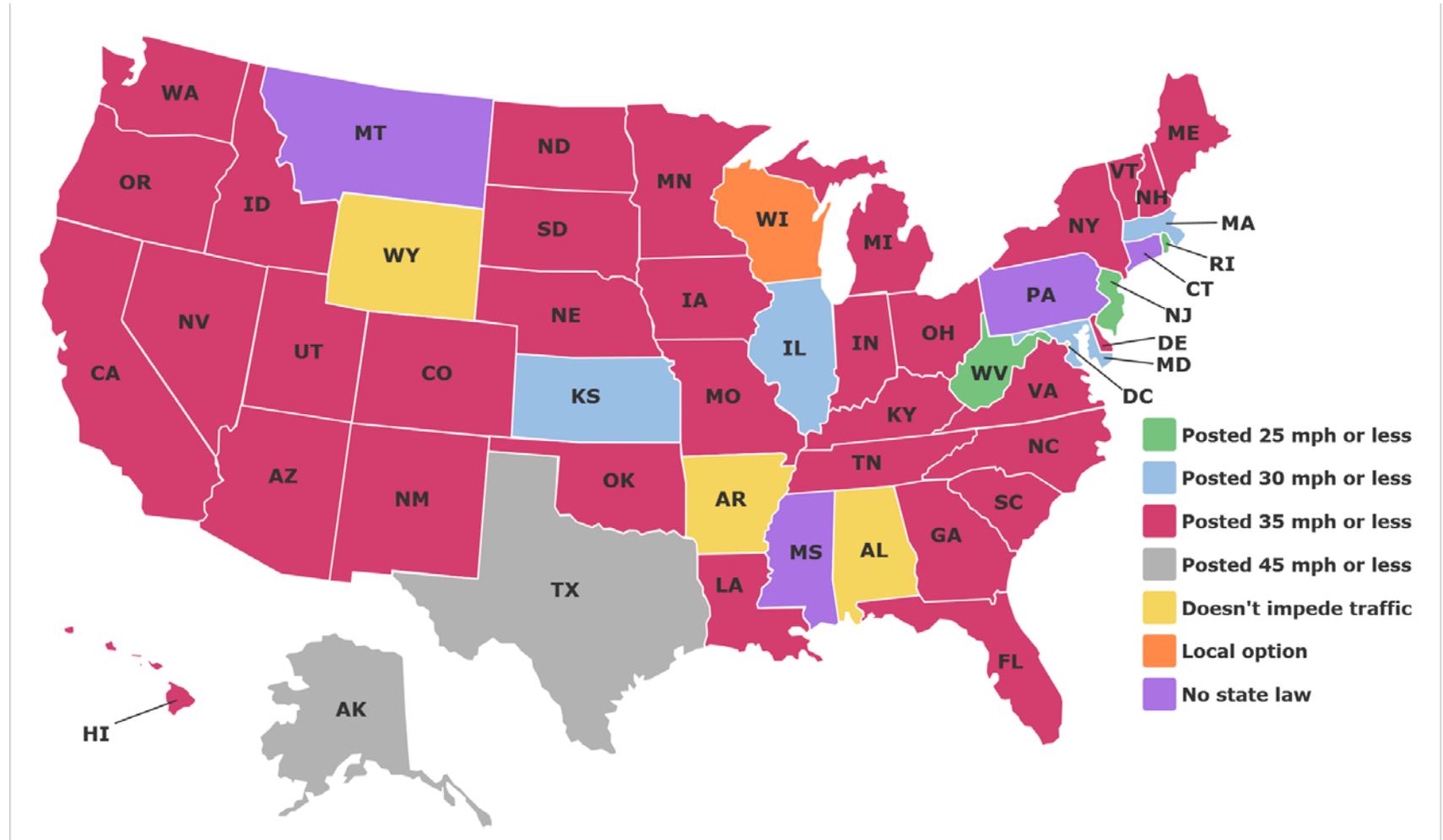
By driver status





Separating VRUs from other motor vehicle traffic

Roads where low-speed vehicles are permitted

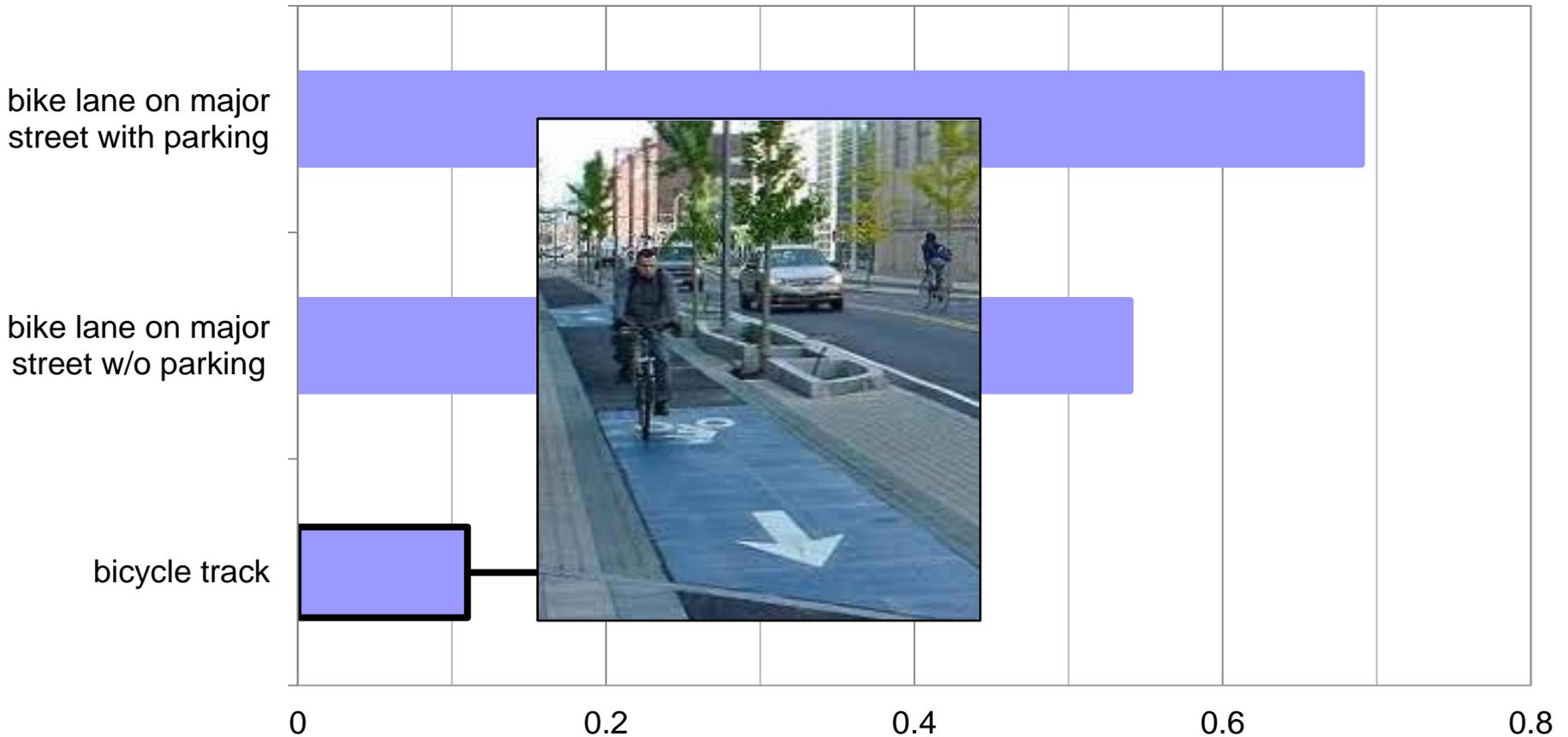


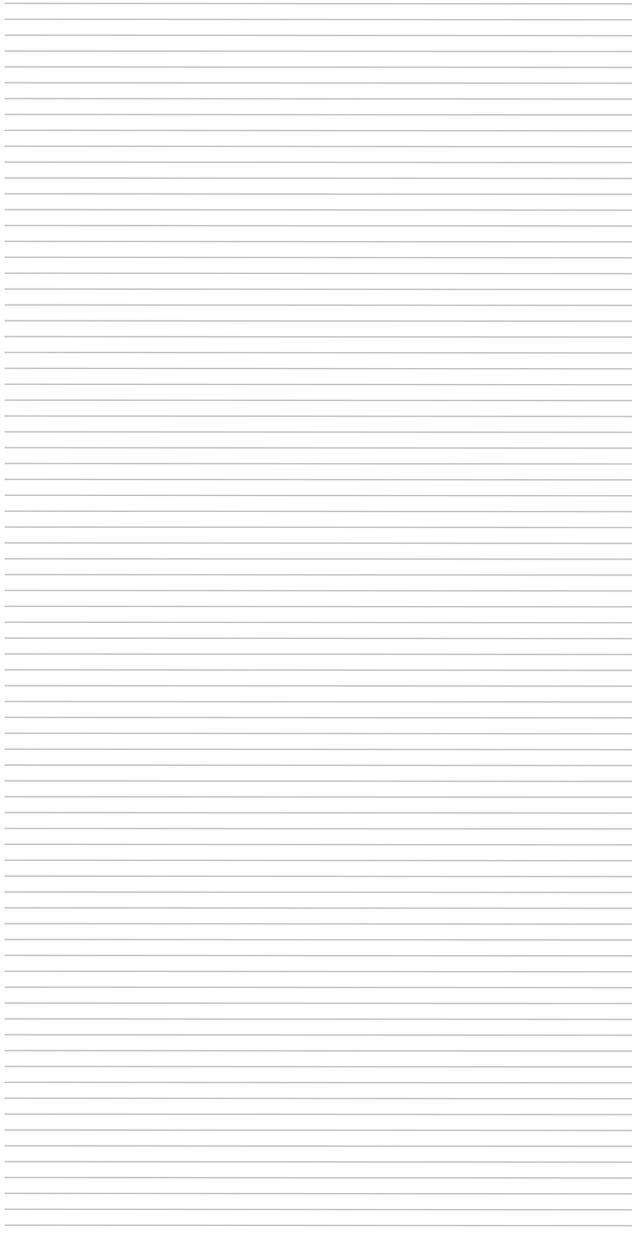
Use of ATVs on roads

- MS and DC do not permit ATVs on public roads
- AL, HI & SC do not regulate on-road ATV use
- 46 other states permit limited on-road use for specified reasons including –
 - Local ordinance
 - Farming or hunting
 - Law enforcement activity
 - On public right of ways adjacent to roadway
 - Crossing roads
 - Utility or maintenance

Benefit of bicycle lanes and paths

Odds of an injurious crash relative to major street with parking and no bicycle facility

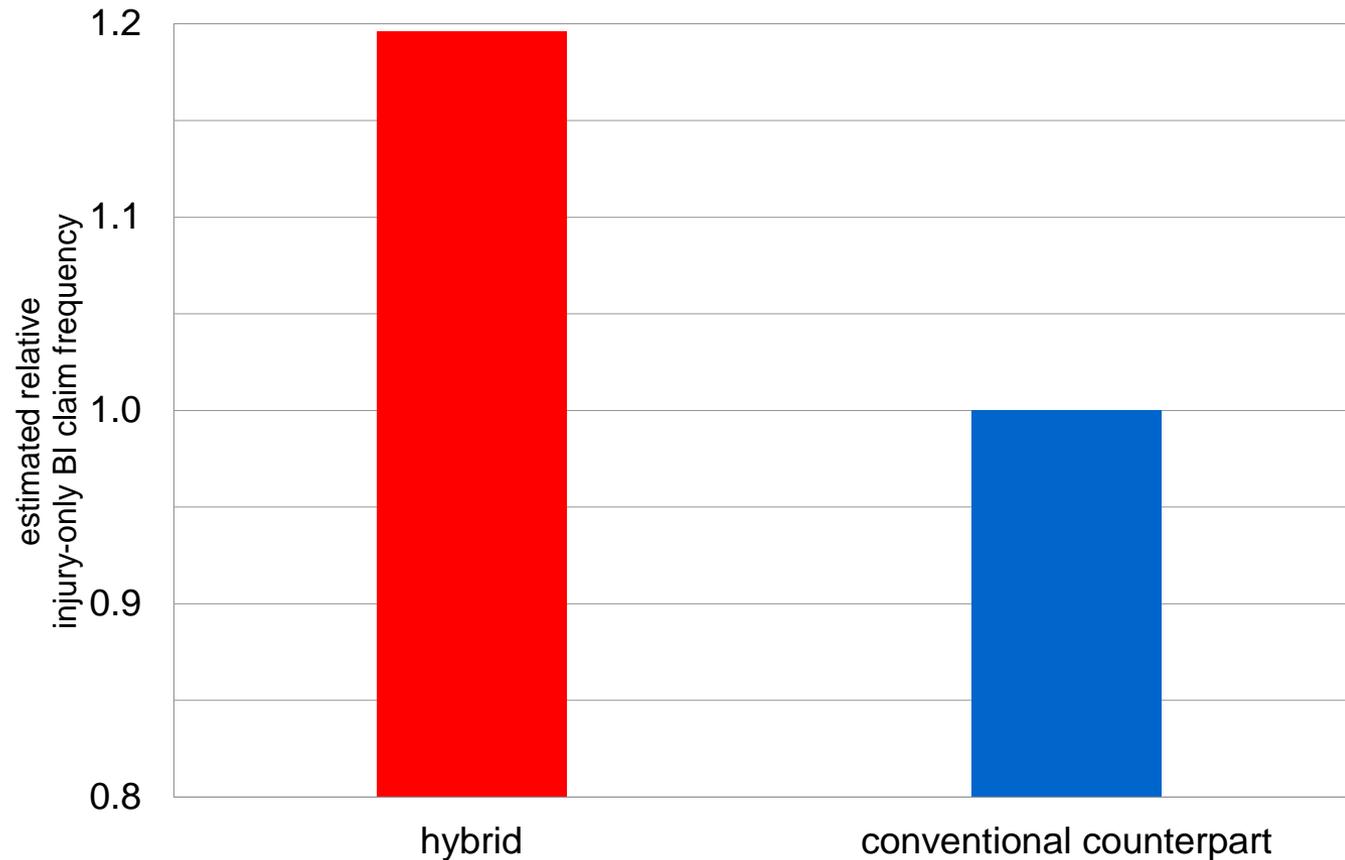




Vehicles that mitigate consequences of crashes

Hybrids have higher injury-only bodily injury liability claim rate than non-hybrid counterparts

Proposed FMVSS to require vehicles to emit minimum sound levels



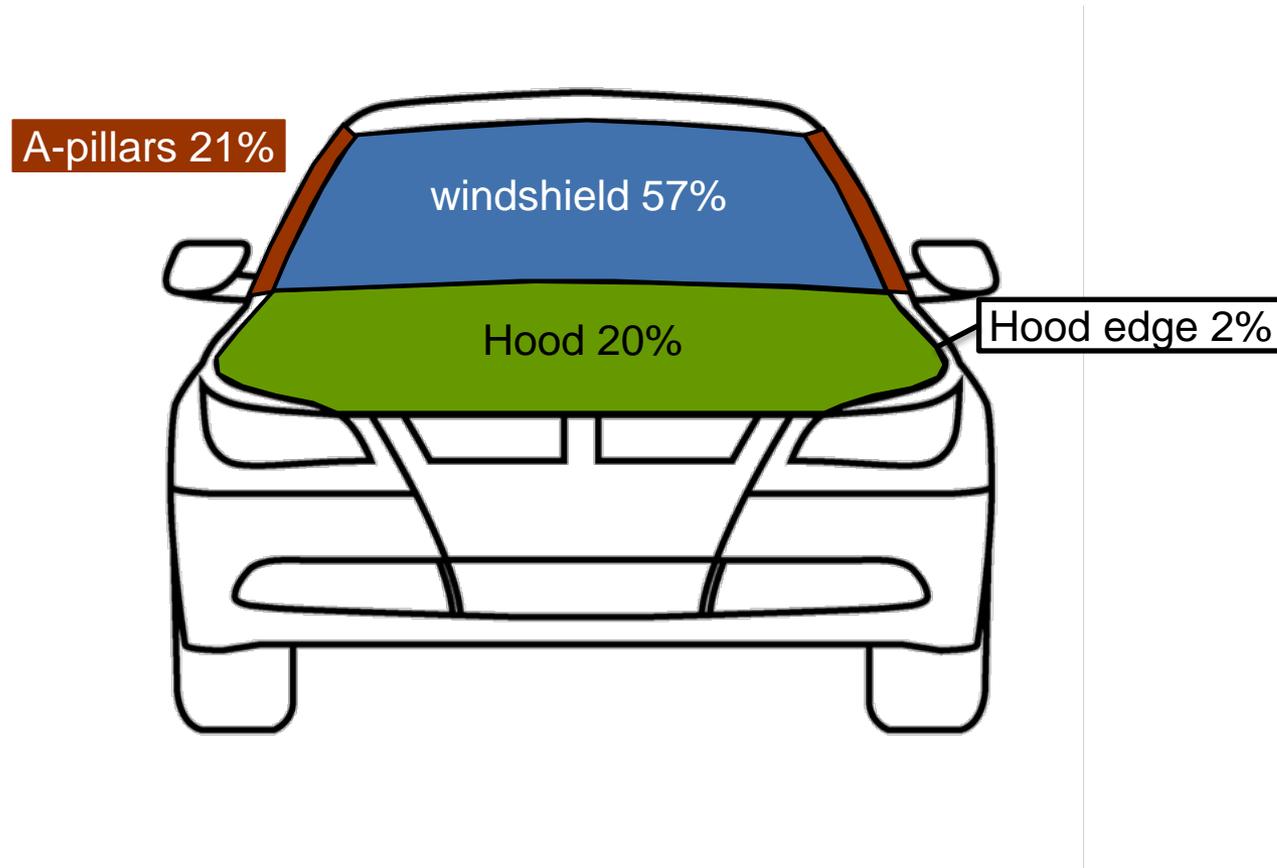
Rollover protection and crush prevention systems for ATVs



Rechnitzer G, Grzebieta R, McIntosh A, Simmons K, *Reducing All Terrain Vehicle Injuries (ATVs) and Deaths – A Way Ahead*, Proc. 23rd Int. Technical Conf. on the Enhanced Safety of Vehicles 2013

Pedestrian head injuries

From vehicle sources



Vehicle tests

Dodge Neon

Hood impact



HIC = 641

Less than 25% risk of head injury

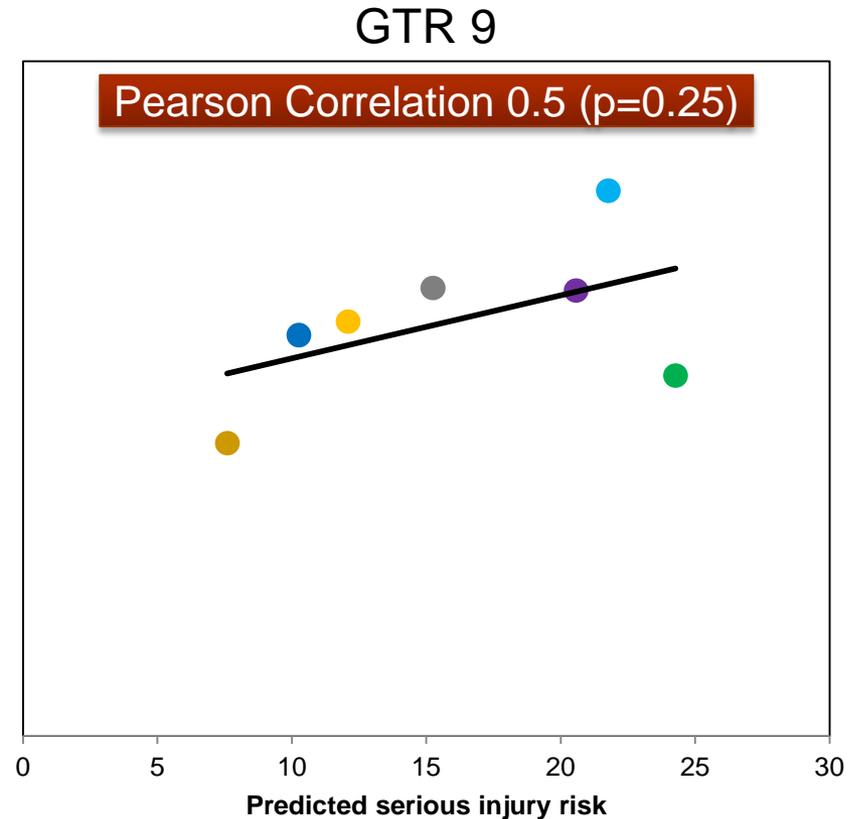
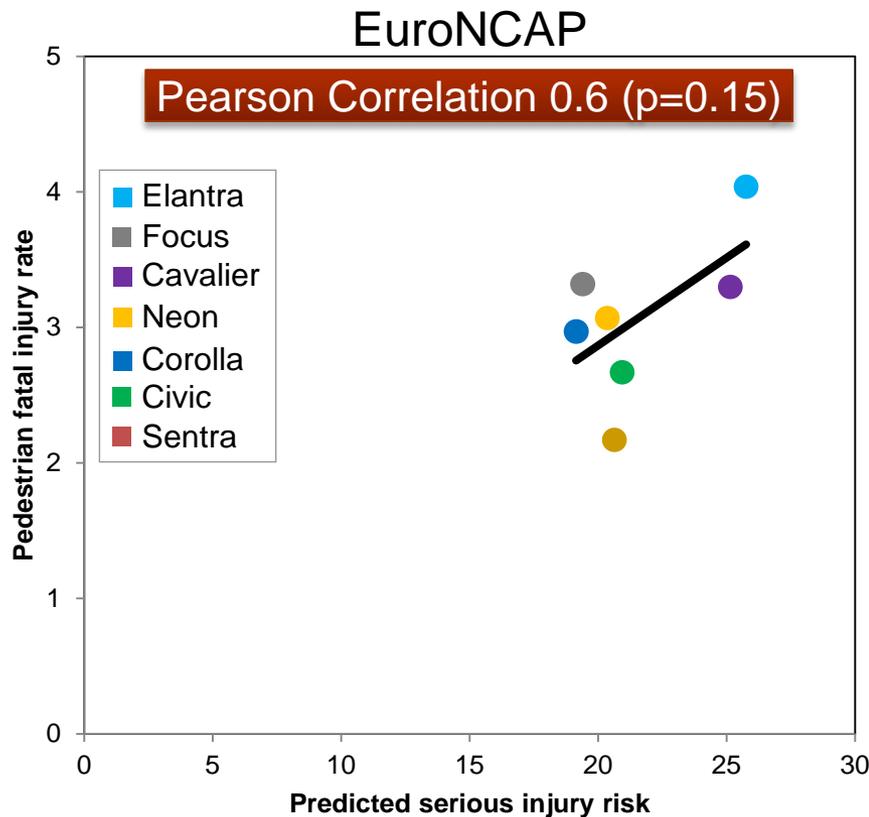
A-pillar impact

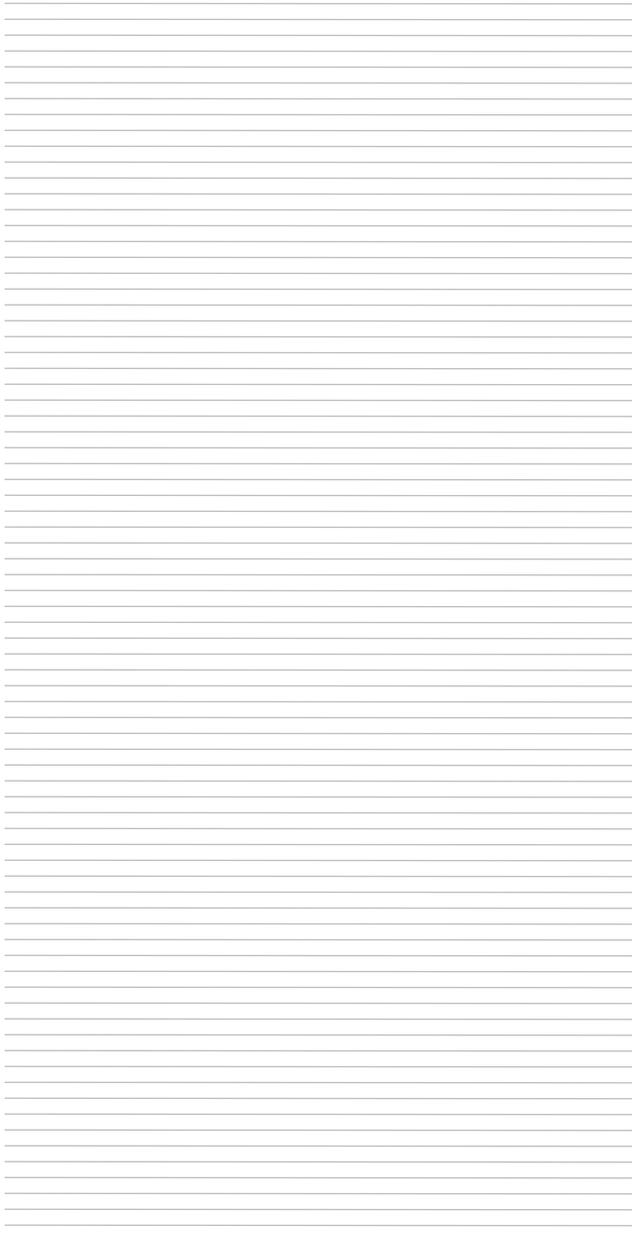


HIC = 6,508

100% risk of head injury

Correlations of pedestrian fatality rates to estimated risk of severe head injury

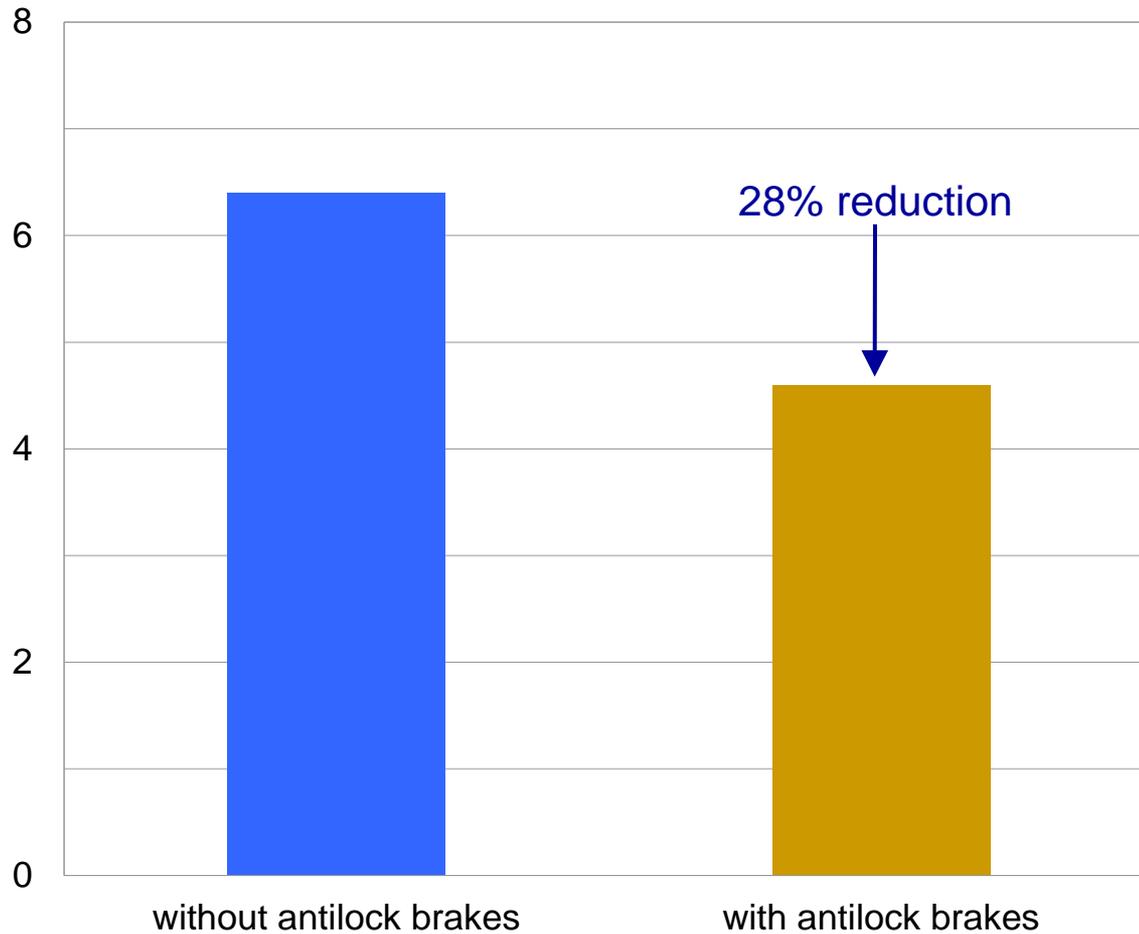




Vehicle designs that help prevent crashes

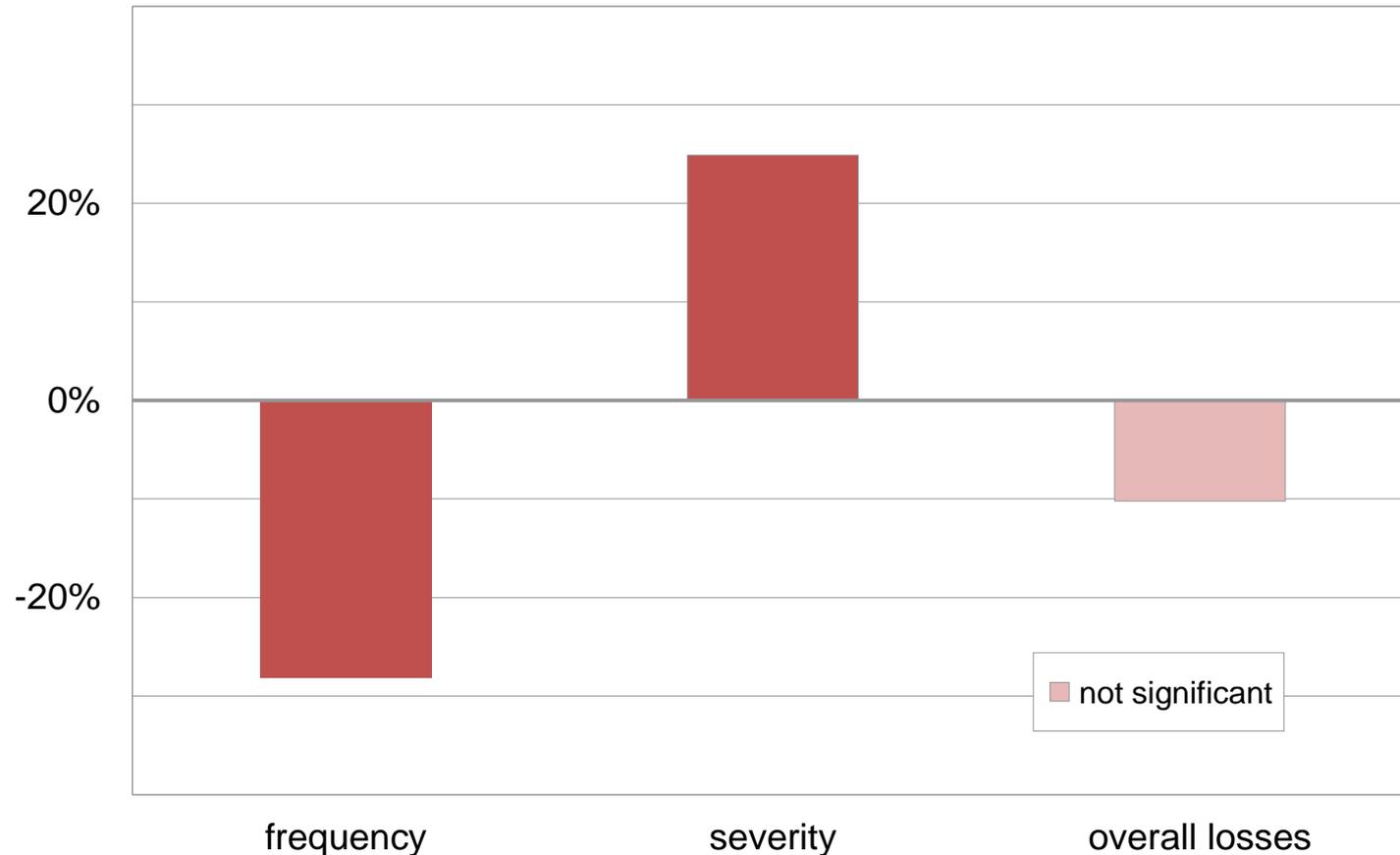
Fatal crashes per 10,000 registrations

2003-07



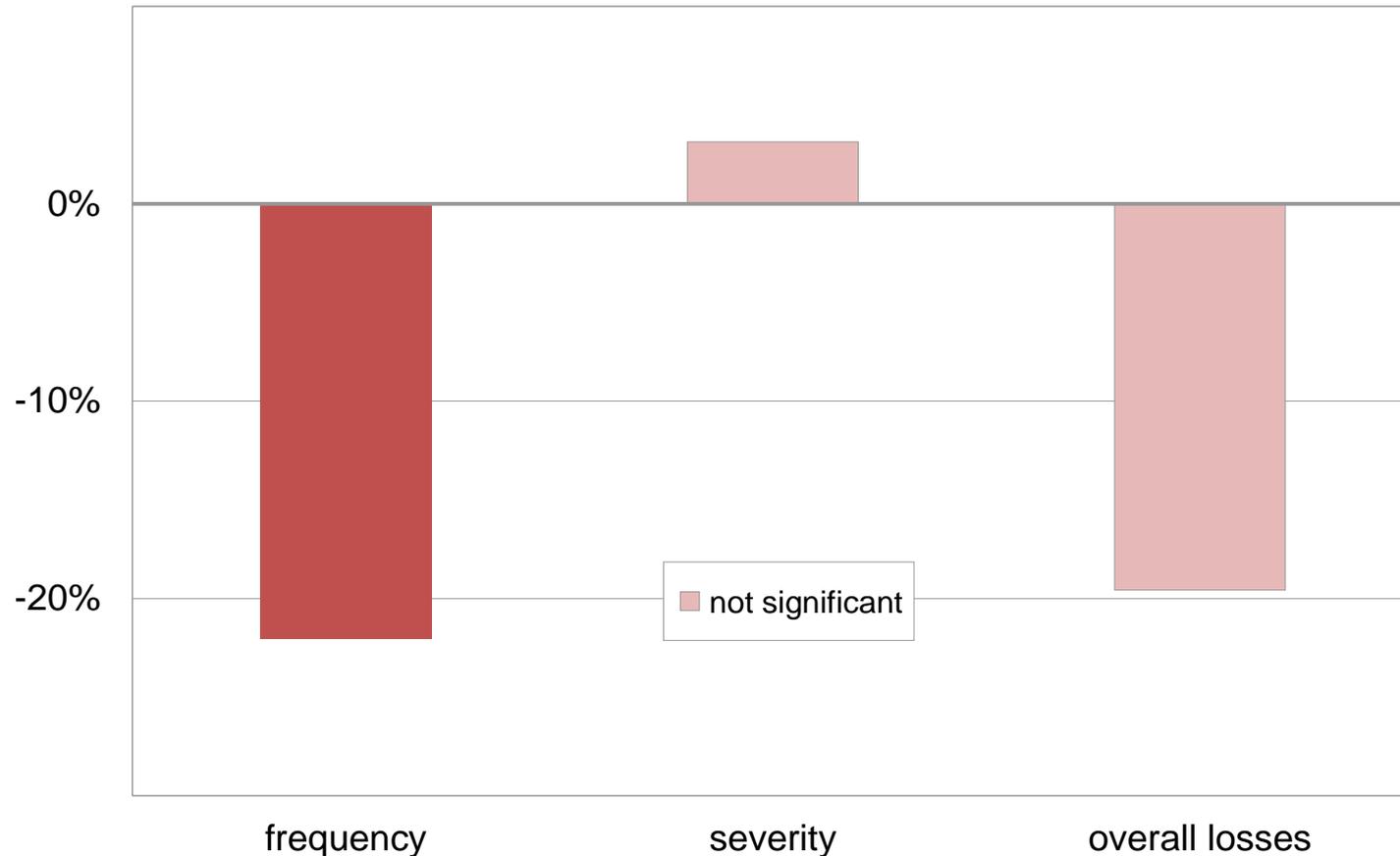
Percent changes in medical payment losses for motorcycles with antilock brakes

2003-13 models



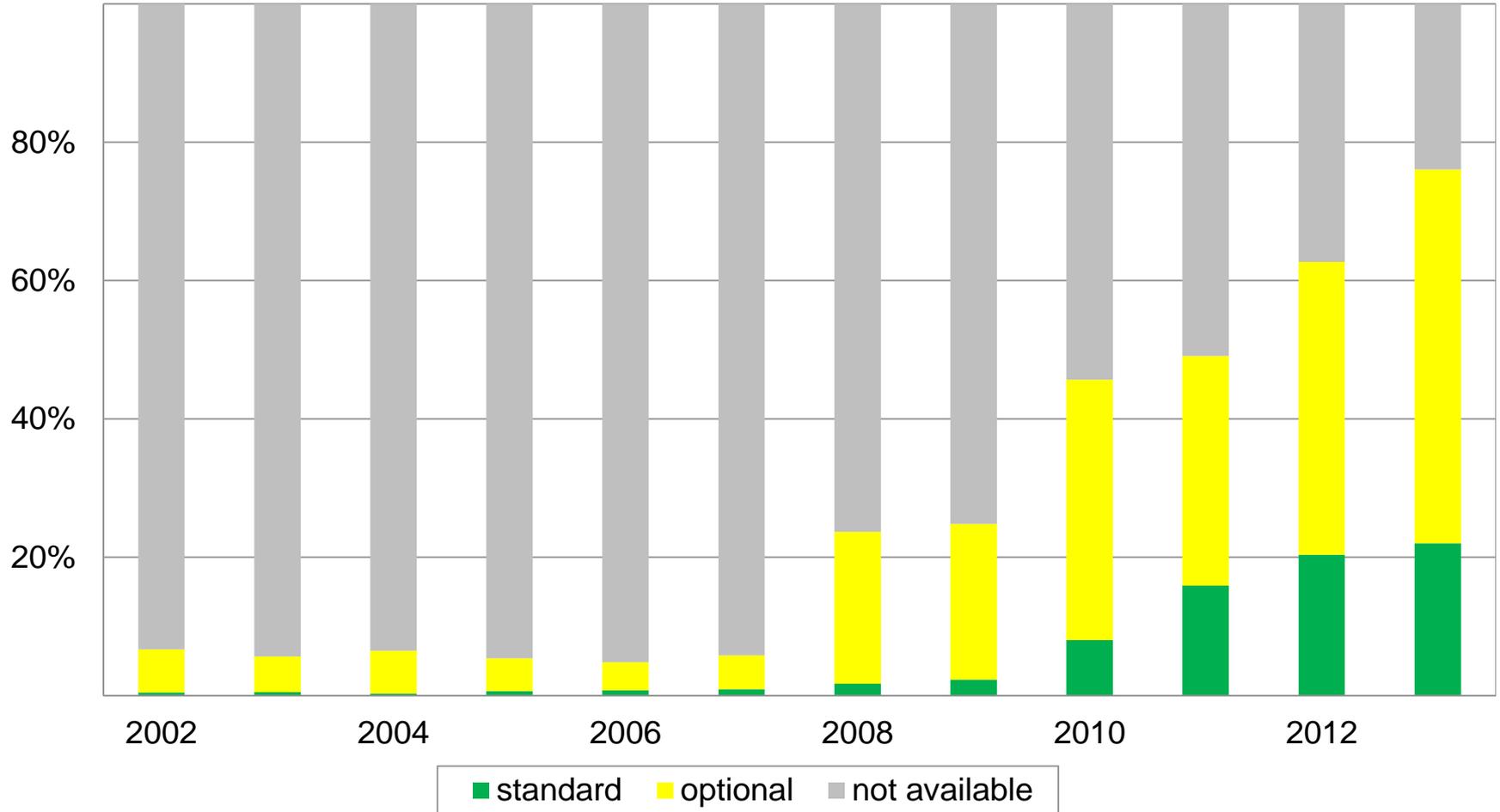
Percent changes in bodily injury liability losses for motorcycles with antilock brakes

2003-13 models



Motorcycle ABS availability by model year

2002-13 models



Rearview cameras helped prevent collisions



- Participants used camera instead of mirrors or glancing over shoulder
- Characteristics of backing situation affected benefits of cameras
 - Cameras reduced collisions with stationary objects by 44%
 - No measurable benefit for moving object – drivers saw it by other means
 - Shade greatly reduced benefit of camera
- Parking sensors were not an effective countermeasure
 - Half of participants who received a warning did not respond to it
 - People looked at cameras less when combined with sensors



www.iihs.org

**Dedicated to reducing deaths, injuries,
and property damage on the highway**

Helmet laws

ATVs

- 18 states and DC have no law
- 8 states require helmet for all riders on public roads
- 4 states require helmet for all riders on public lands
- 18 states have age-related helmet requirements
- 2 states require helmets for all riders on public roads with exceptions

Bicycles

- 29 states have no law
- 21 states and DC have age-related use requirements

Motorcycles

- 3 states have no law
- 19 states and DC have universal law
- 28 states have partial law