Preliminary Analysis of Shoulder Traumas from the CIREN Database

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MEDICAL COLLEGE OF WISCONSIN

CIREN Database Query

- CIREN database query
  - All vehicles MY 2000 or newer
  - Left or right side impact as highest ranked CDC
  - Cases with DV and/or BES estimate
  - No rollover event
  - Belted ‘nearside’ row one occupants
    - Drivers, RF passengers
  - Associated injuries

Case Summaries

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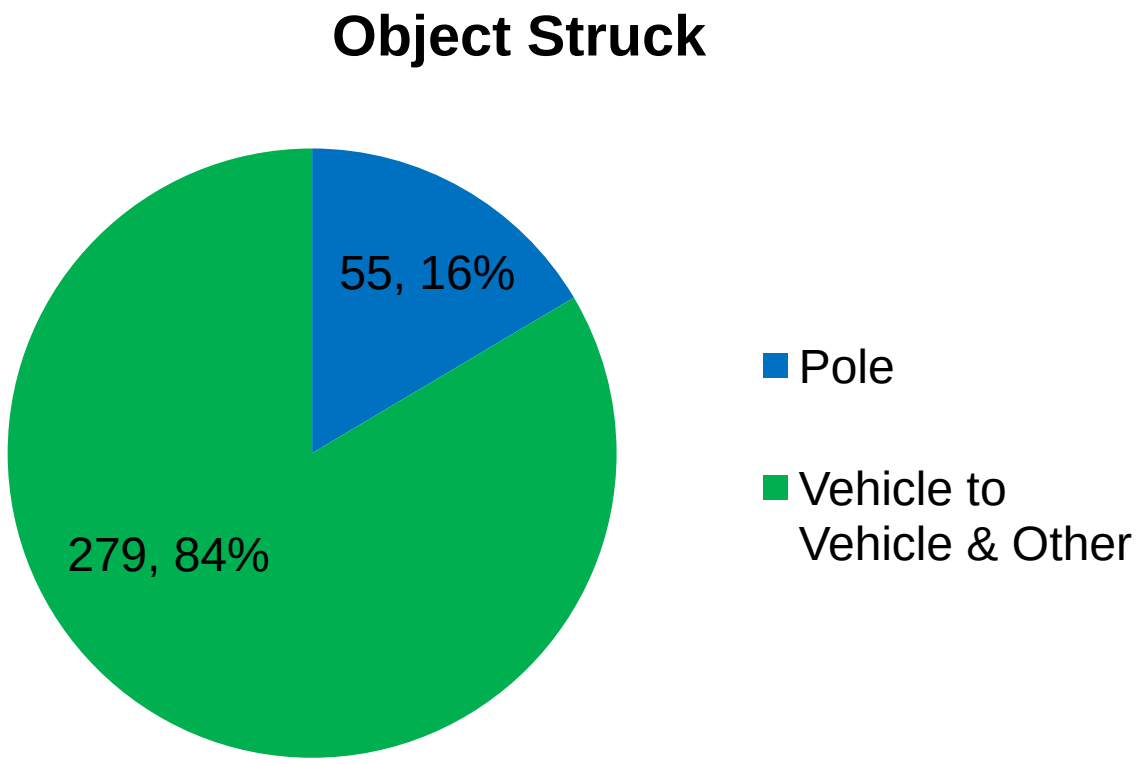
- Injury codes not differentiated by AIS version
- Shoulder injuries include injuries to the shaft of the humerus :
  - The AIS 1998 coding scheme does not distinguish injuries to the proximal humerus
- Pelvis differentiated from LE injuries two ways:
  - By filter for any 1998/2005 code that meets the Bio-tab definition of hip or pelvis
  - By review of radiology data for the 61 cases with shoulder injury
  - No corrections for injuries noted as not coded or miscoded were made
  - 439 pelvis/hip injuries were coded to the AIS 1998 standard
  - 35 pelvis/hip injuries were coded to the AIS 2005 standard

Query Results: 334 Occupants in Nearside Impacts



Query Results: 334 Occupants in Nearside Impacts

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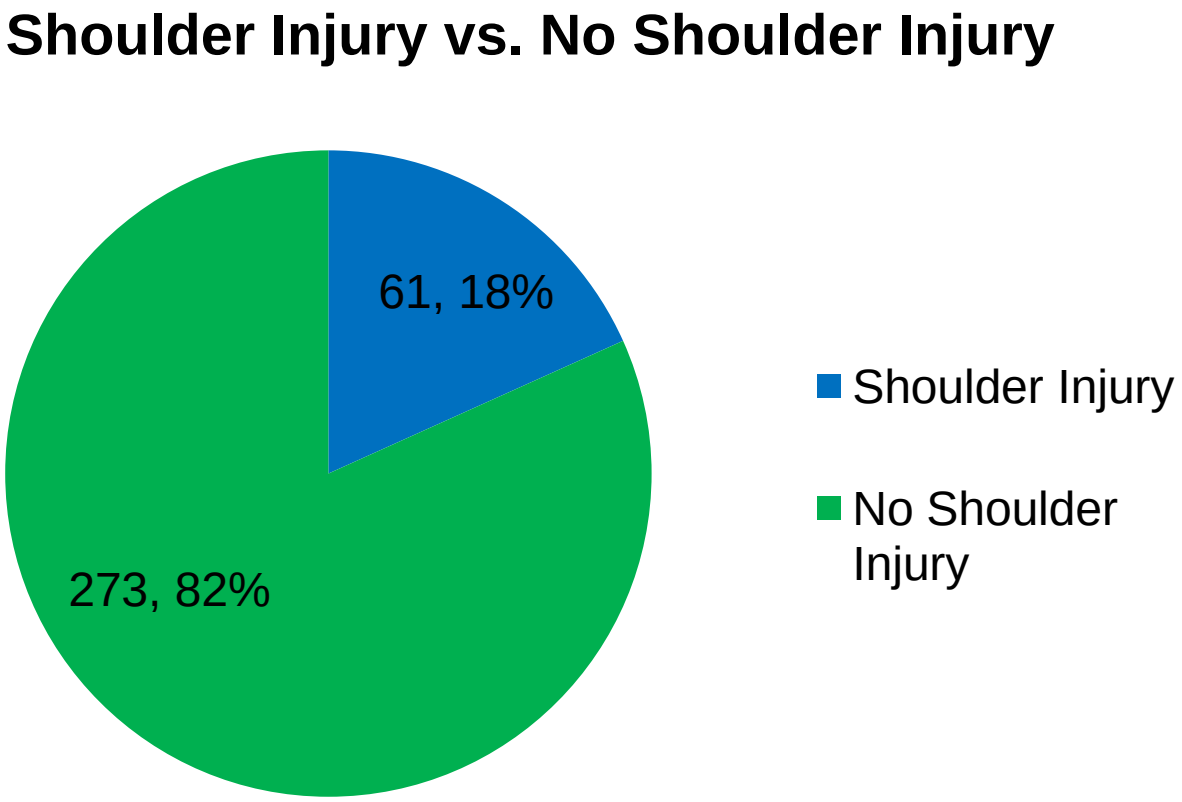
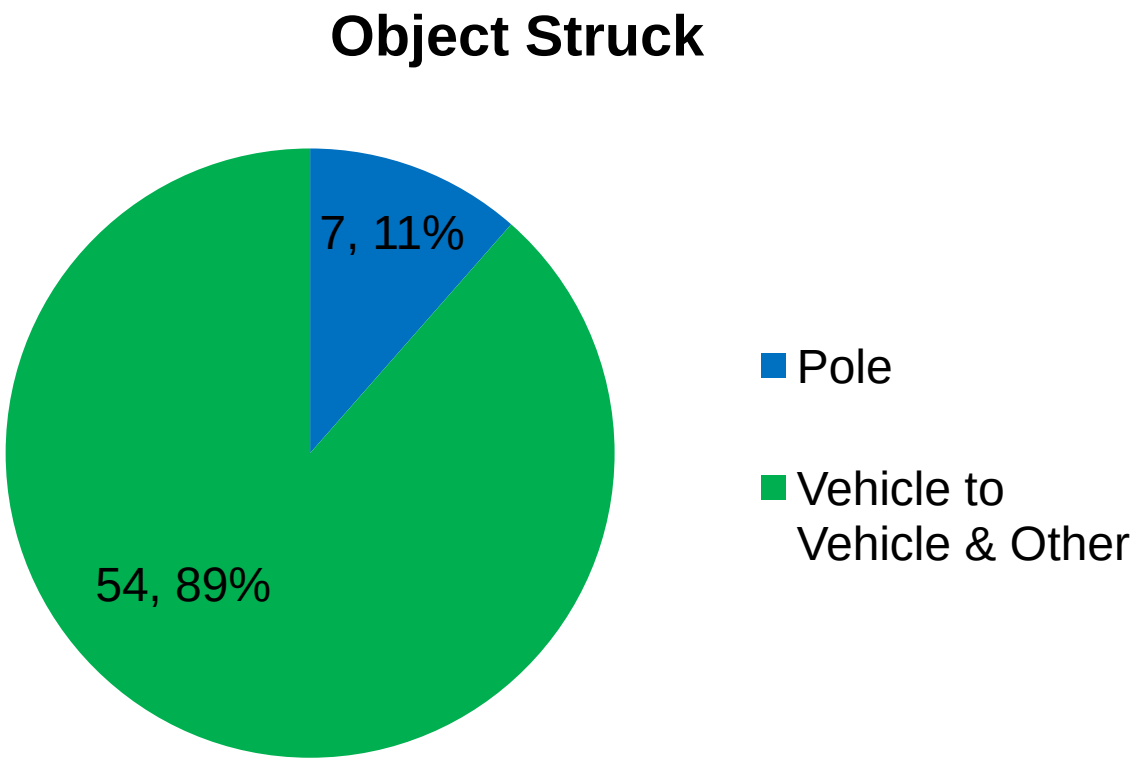
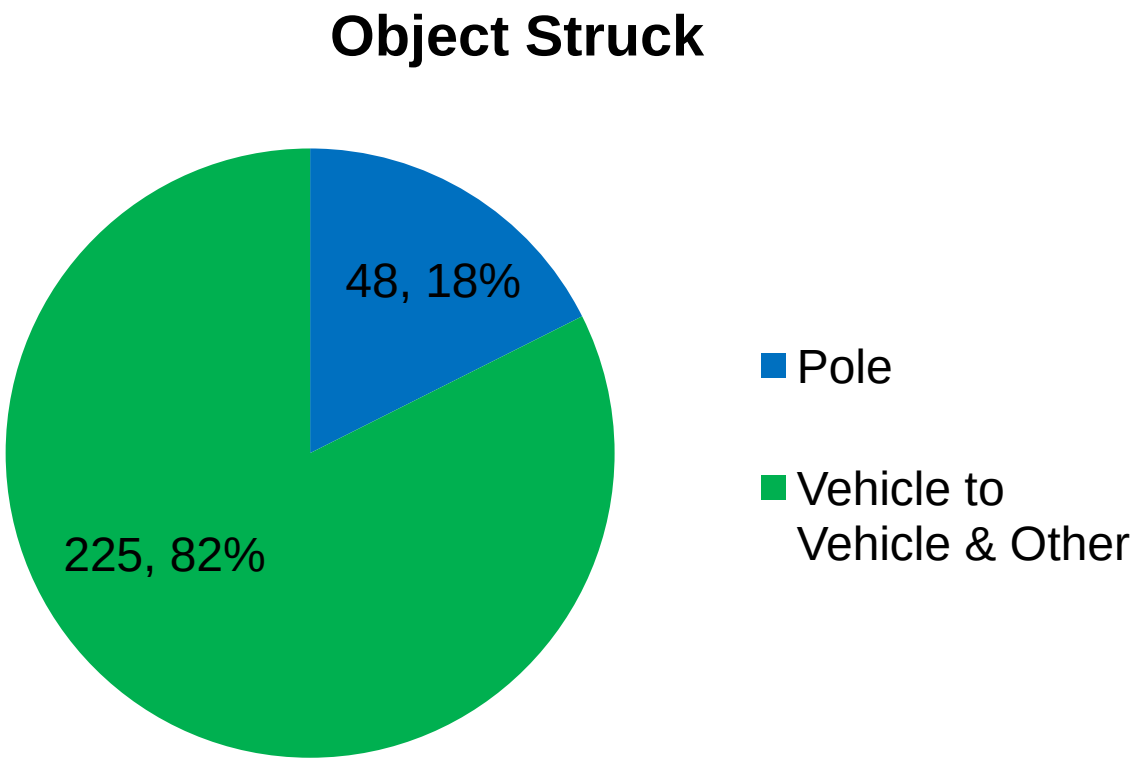


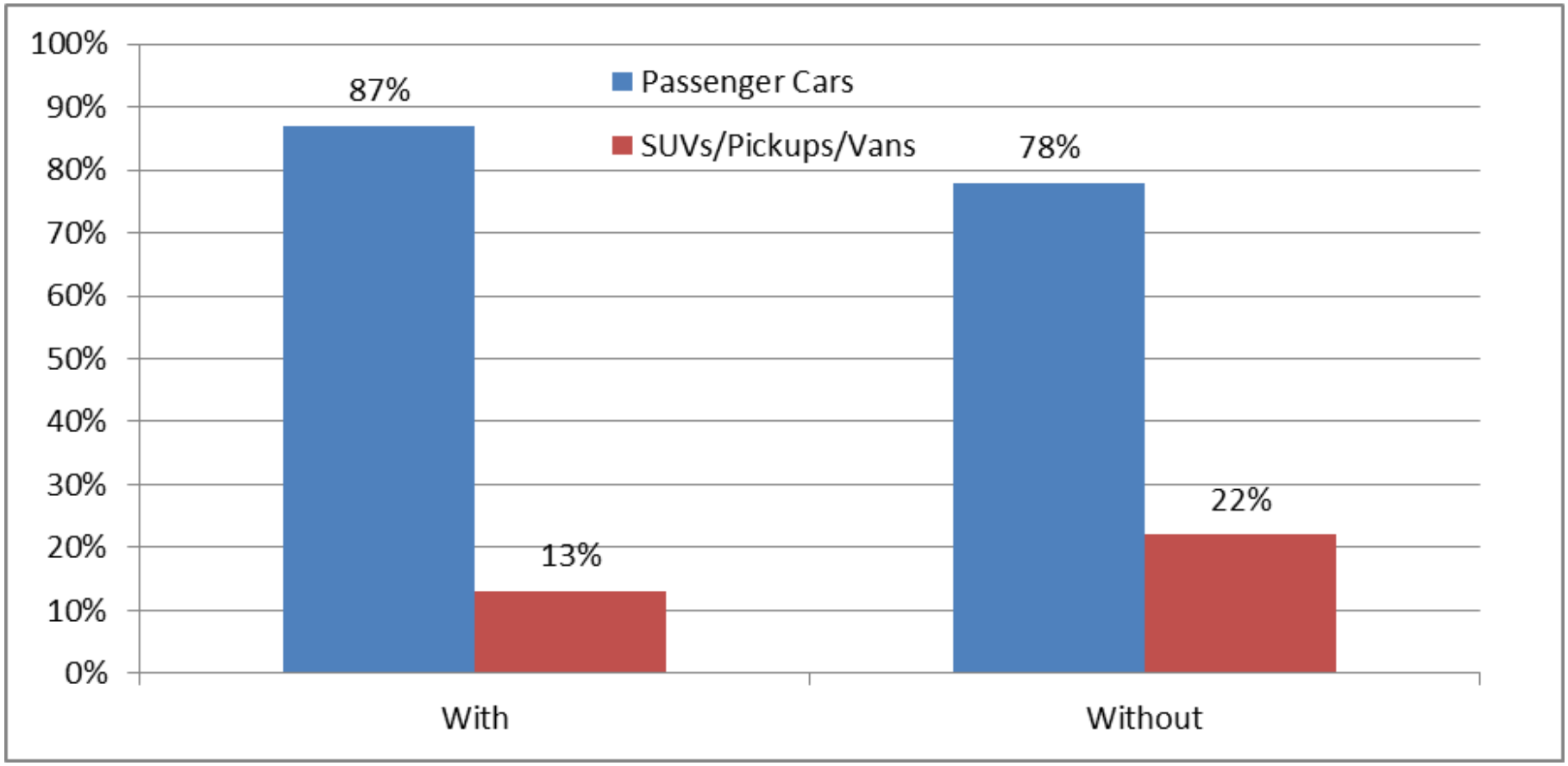
Query Results: 61 Occupants with Shoulder Injury



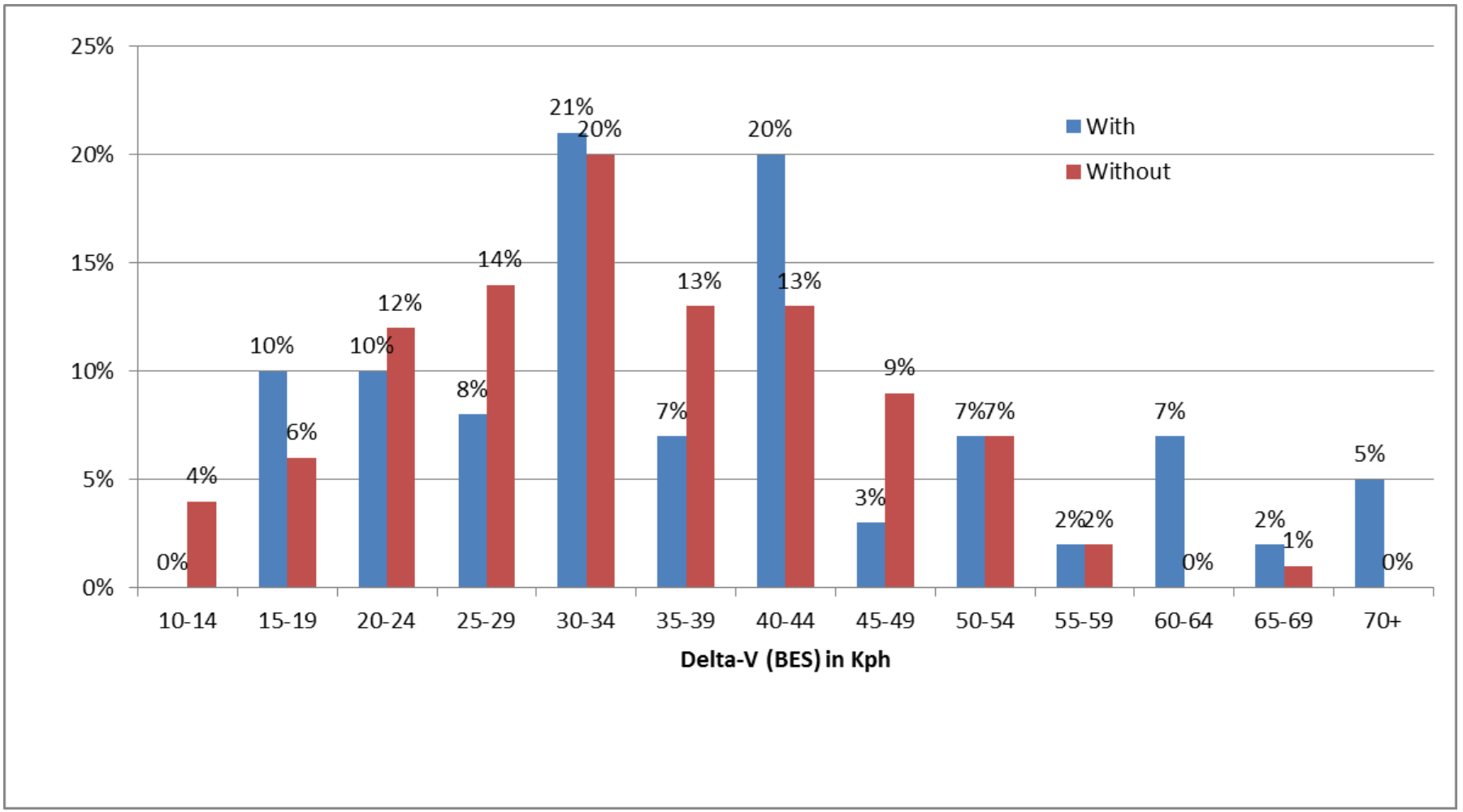
Query Results: 273 Occupants without Shoulder Injury



Vehicle Type, With and Without Shoulder Injury



Delta-V Range, With and Without Shoulder Injury



Mean Delta-V With Shoulder Injury: 39 km/h
Mean Delta-V Without Shoulder Injury: 34 km/h

Occupants w/o Shoulder Injury: MAIS2+ Injuries, by Body Region*

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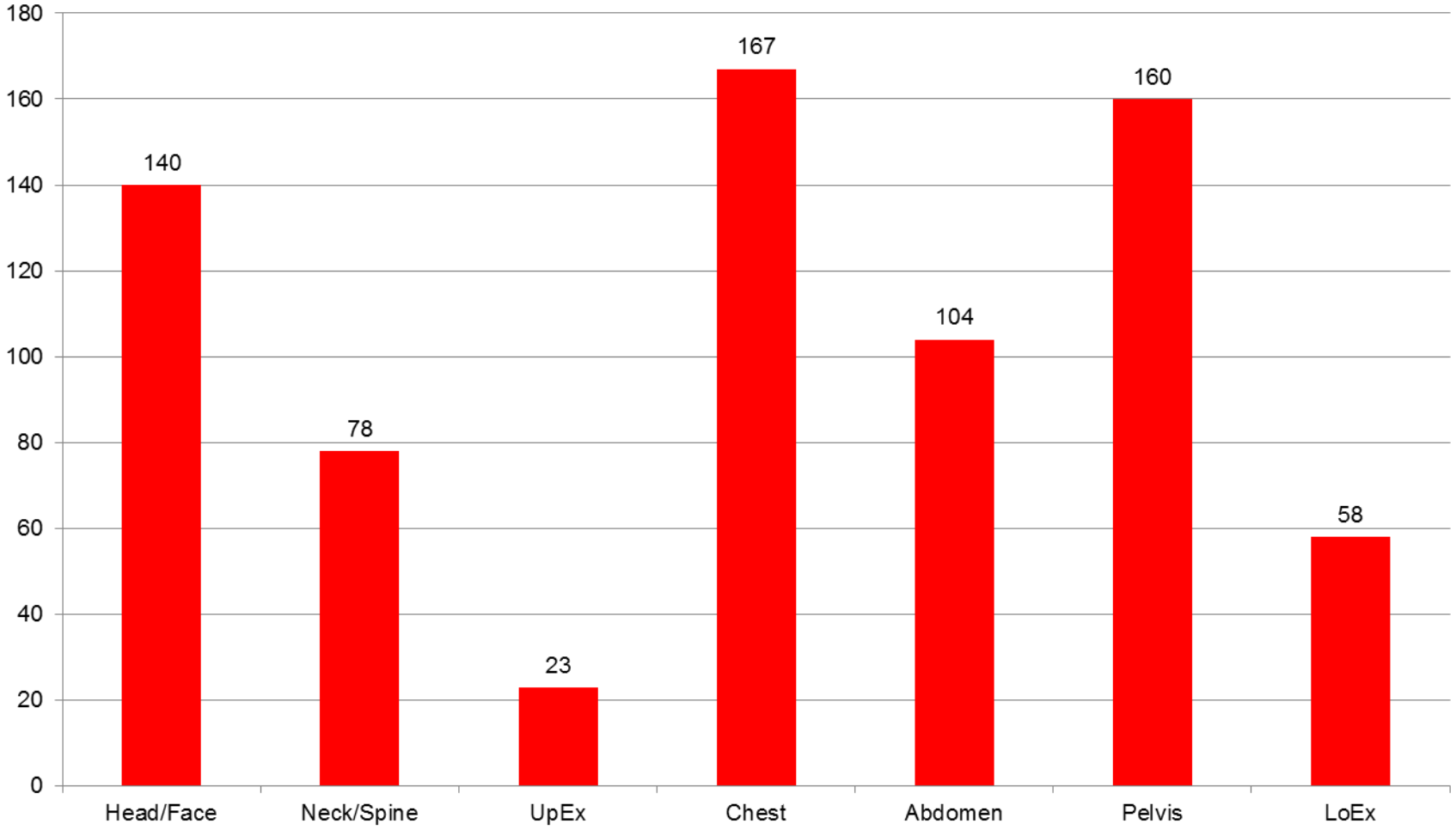
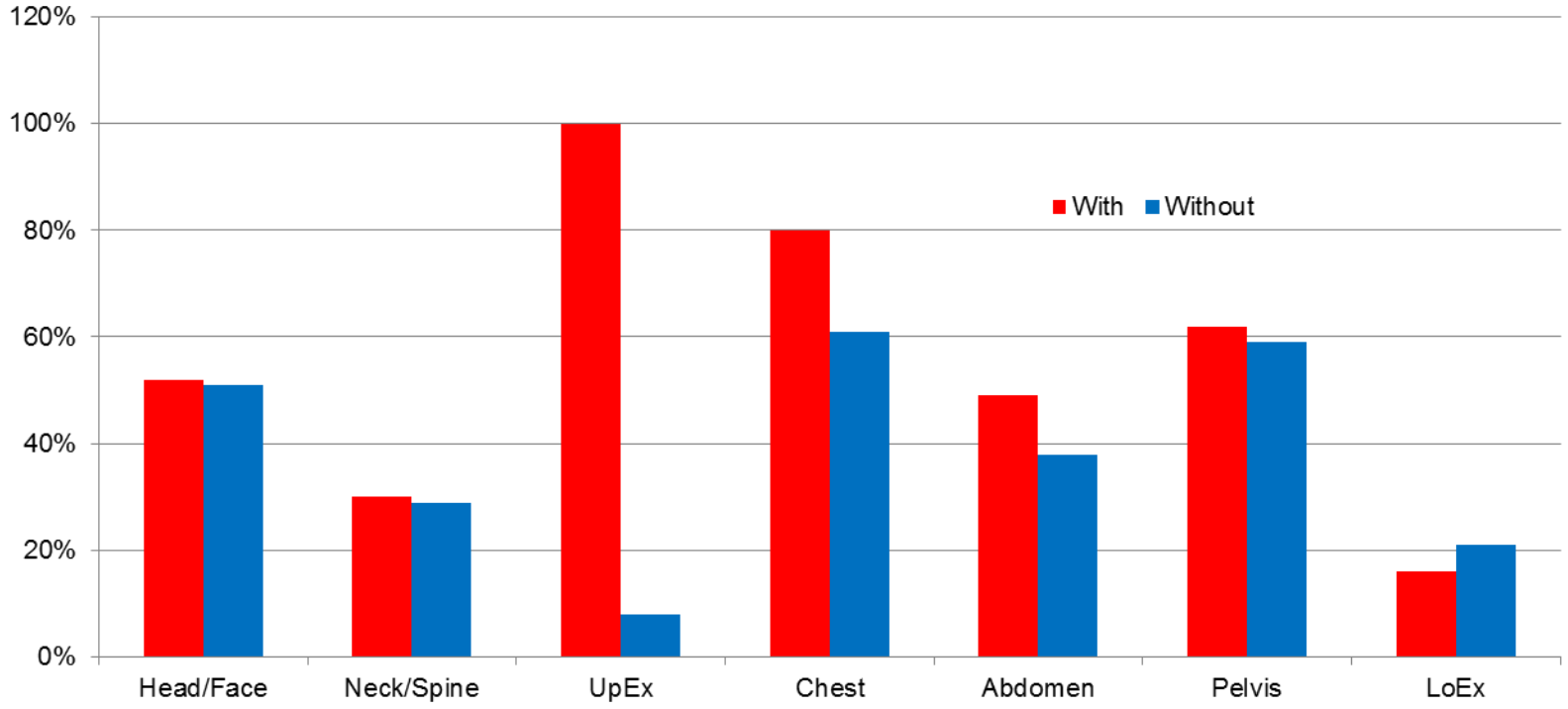


N = 273

*Pelvis Injuries Include Proximal Femur FX

Occupants With and Without Shoulder Injury: AIS2 Injuries by Body Region*



With Shoulder Injury N = 61
Without Shoulder Injury N = 273

*Pelvis Injuries Include Proximal Femur FX

61 CIREN Cases w/ Shoulder Injury

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- **Occupants in passenger cars sustain the great majority of shoulder injuries**
- **30 (49%) of impacts involved a collision partner of a larger size**
- **7 (11.5%) of impacts involved a tree/pole**
- **8 (13%) of impacts were oblique impacts/partial ejection**

61 CIREN Cases: Impact Types

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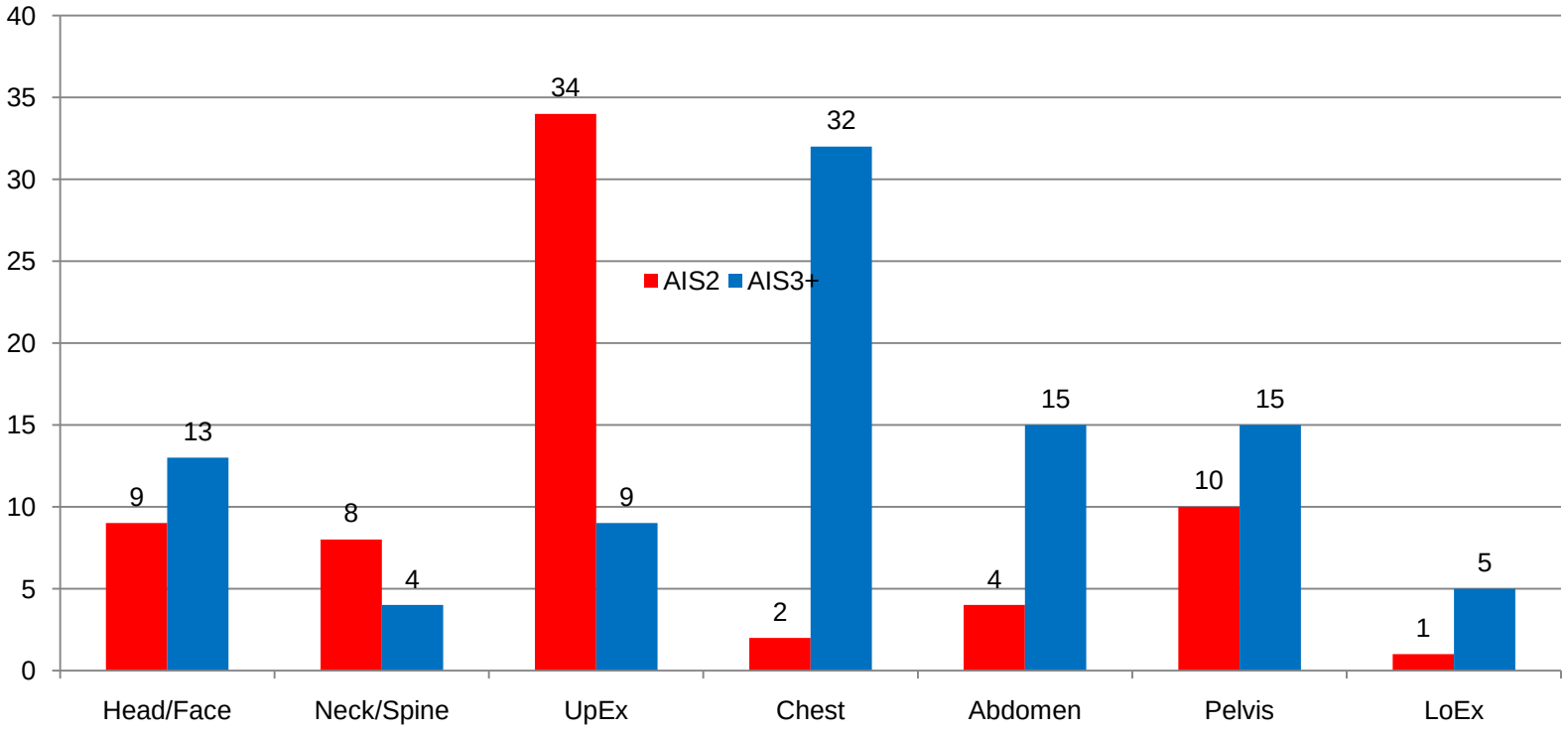
- 43 Drivers with shoulder injury
  - LY SOI and other = 8
  - Pole = 4
  - Mismatch between body size class = 21
  - Equivalent body size class = 10
  - Barrier = 1

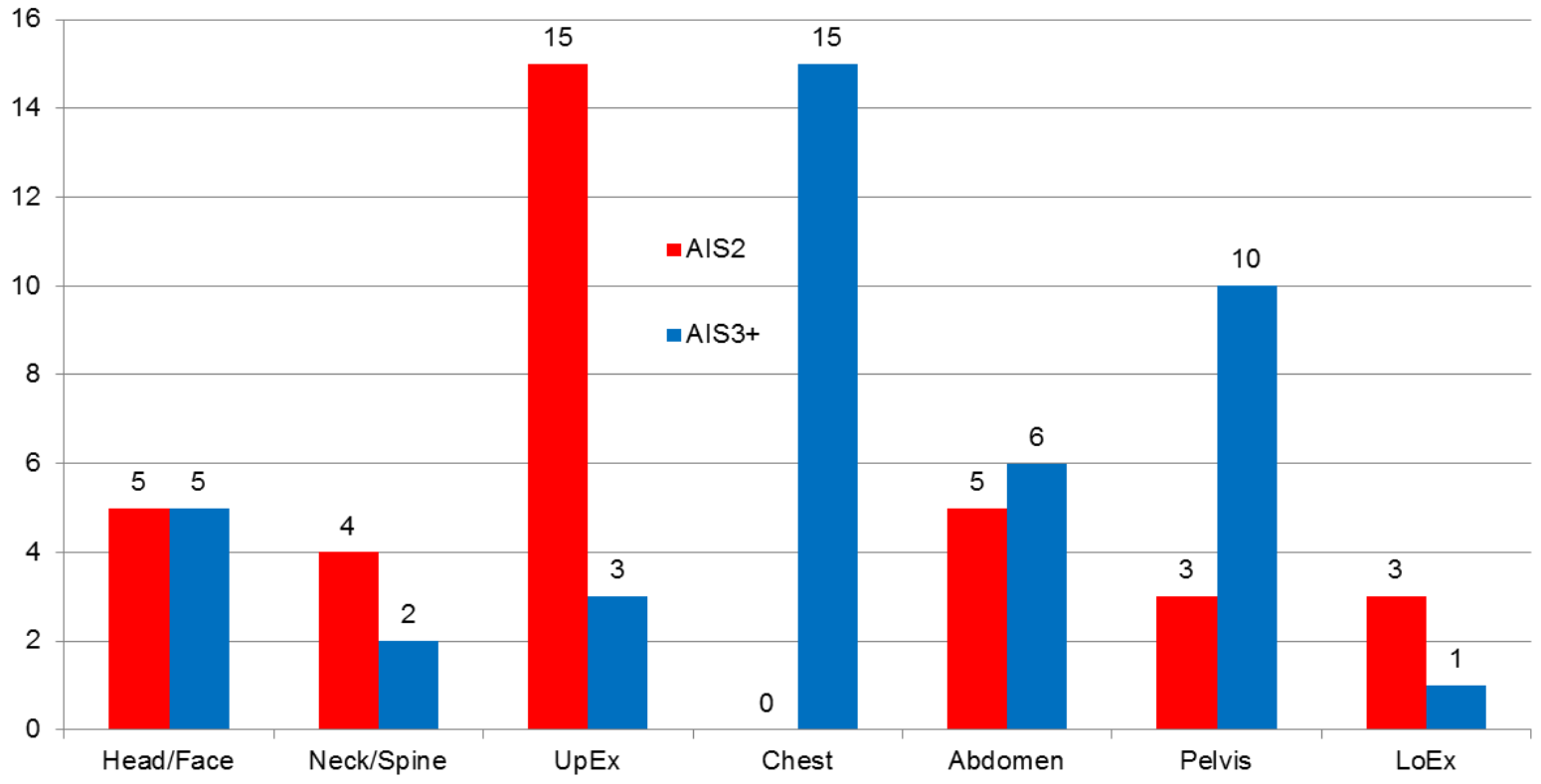
- 18 Passengers with shoulder injury
  - Pole = 3
  - Mismatch between body size class = 9
  - Equivalent body size class = 5
  - Barrier = 1

43 Drivers with Shoulder Injury: MAIS to Each Body Region*



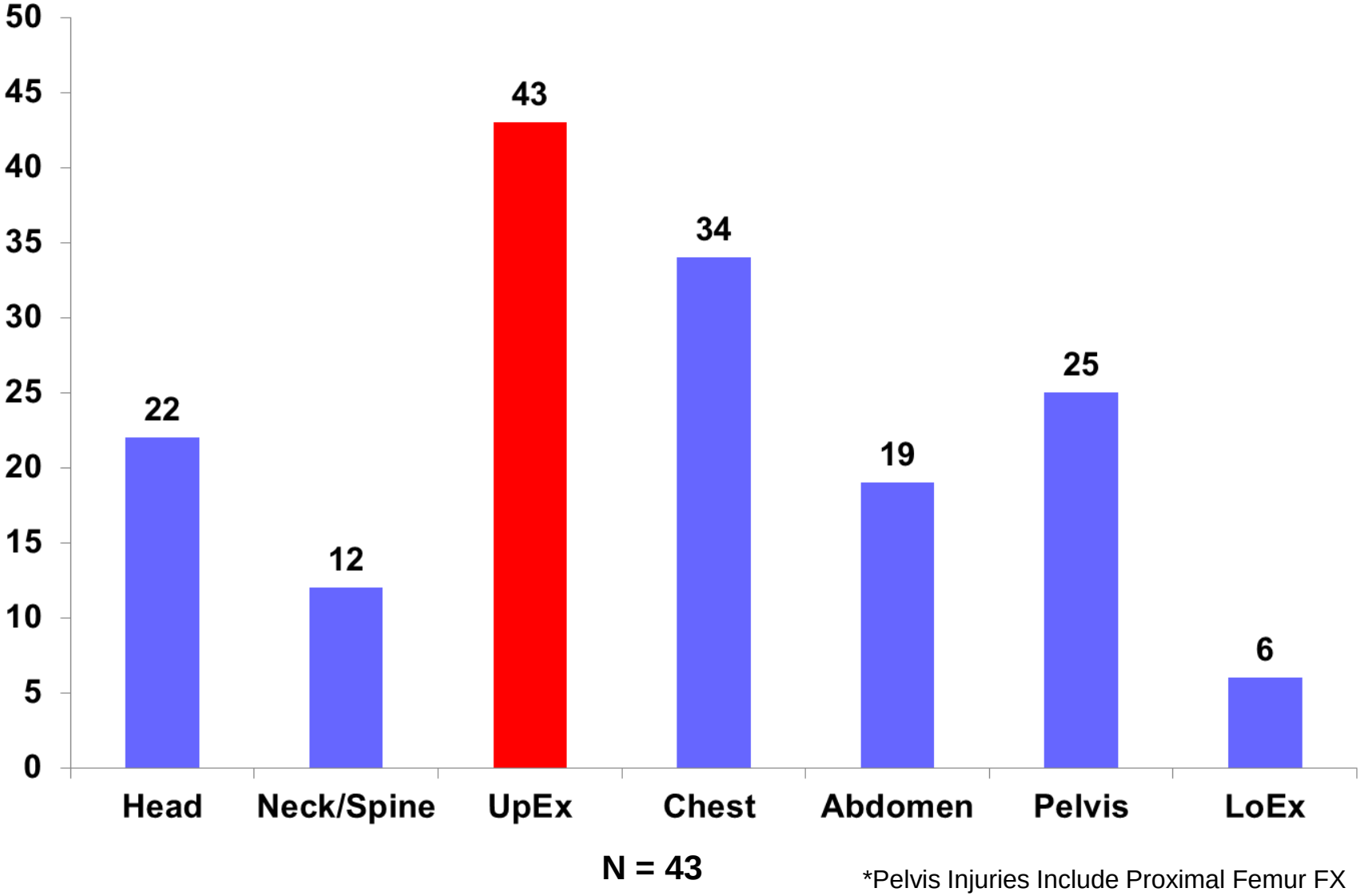
*Pelvis Injuries Include Proximal Femur FX

18 Passengers with Shoulder Injury: MAIS to Each Body Region*



*Pelvis Injuries Include Proximal Femur FX

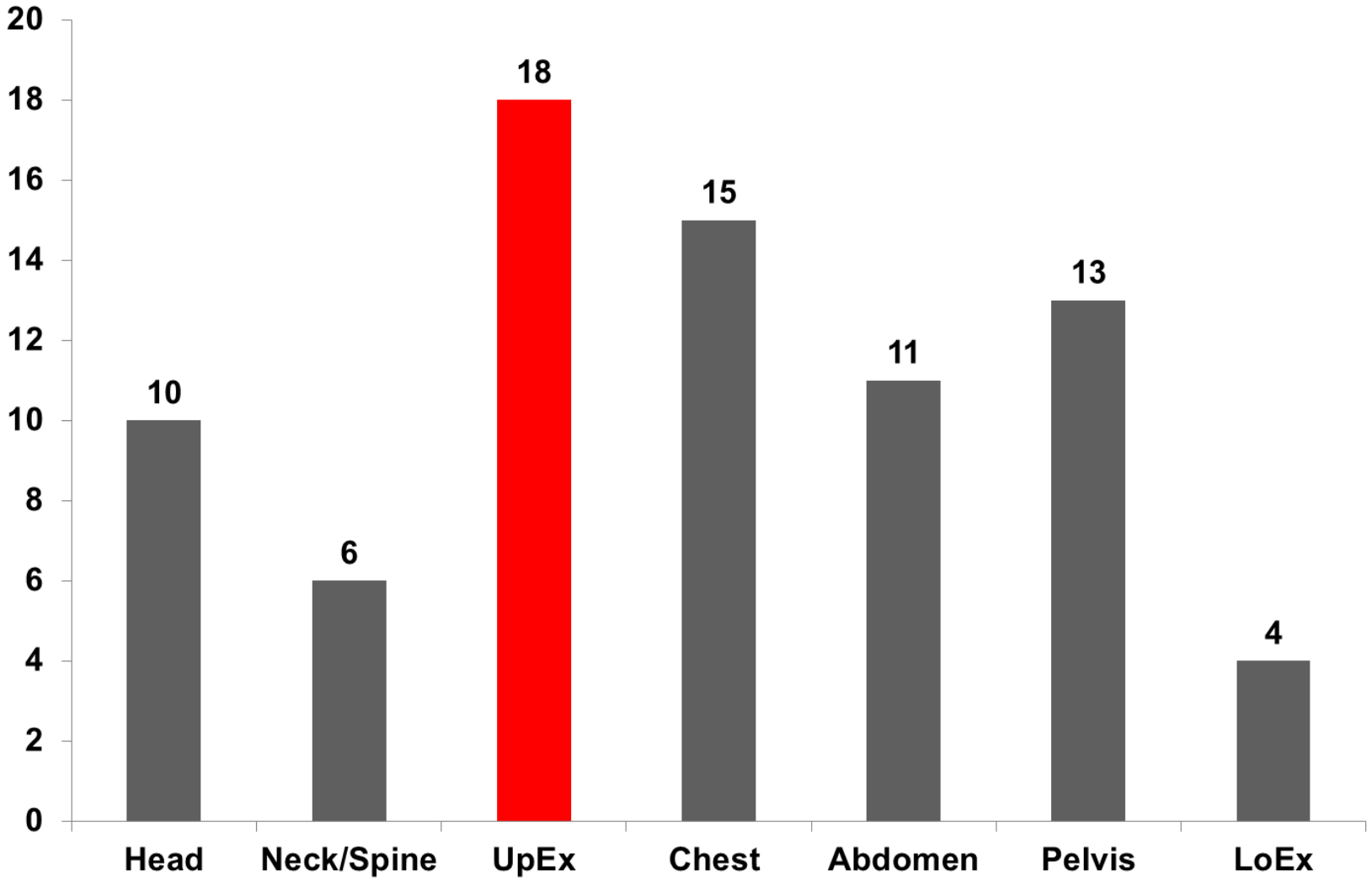
Drivers with MAIS2+ Injuries*



N = 43

*Pelvis Injuries Include Proximal Femur FX

Passengers with MAIS2+ Injuries*



N = 18

*Pelvis Injuries Include Proximal Femur FX

PC vs. Tree Driver Passenger and Composite

N= 7

MEDICAL COLLEGE OF WISCONSIN

Head/Face

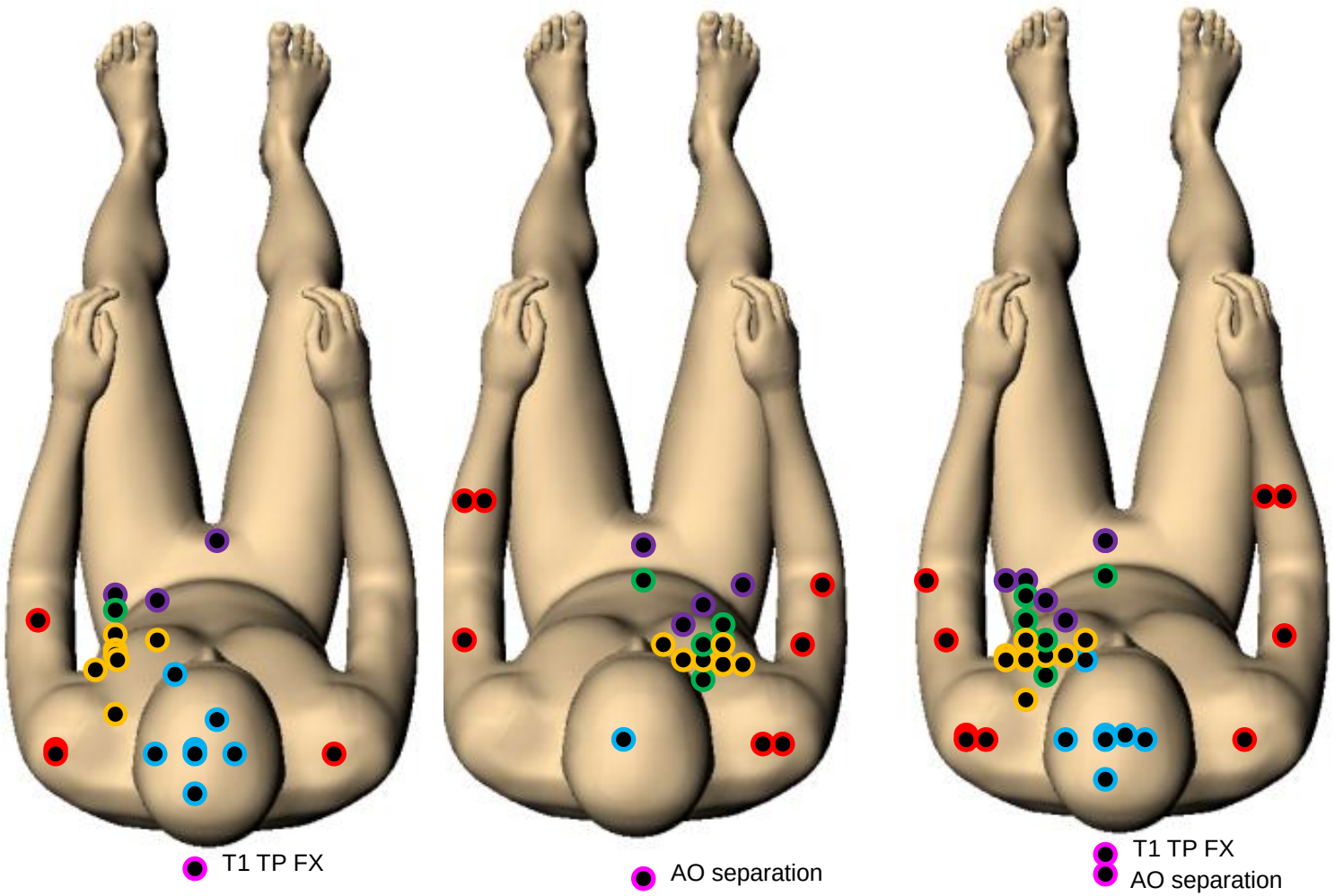
Neck/spine

UE

Thorax

Abdomen

Pelvis/LE



Driver = 4

Passenger = 3

Composite = 7

PC vs. Heavy-Medium Truck/Bus/Semi Drivers

N = 7

MEDICAL COLLEGE OF WISCONSIN

Head/Face

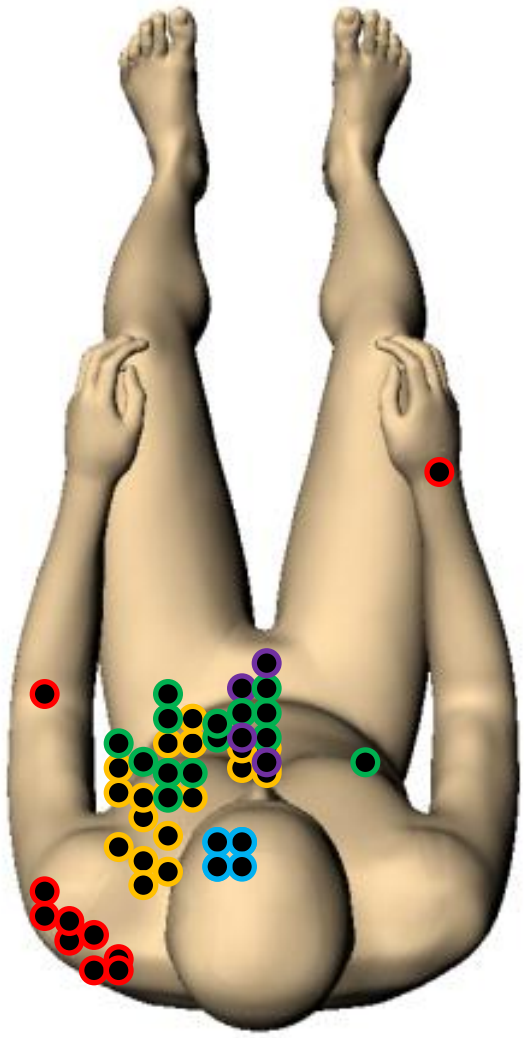
Neck/spine

UE

Thorax

Abdomen

Pelvis/LE



Driver

PC vs. PC Driver, Passenger and Composite

N = 12

MEDICAL COLLEGE OF WISCONSIN

Head/Face

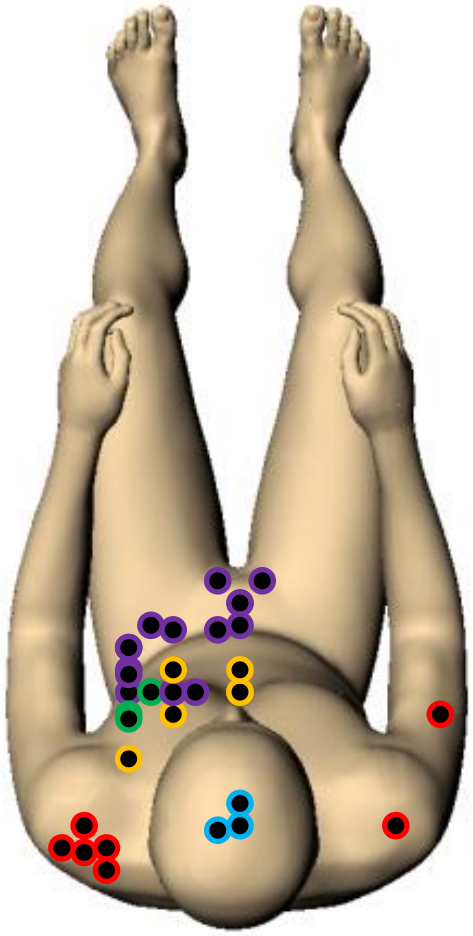
Neck/spine

UE

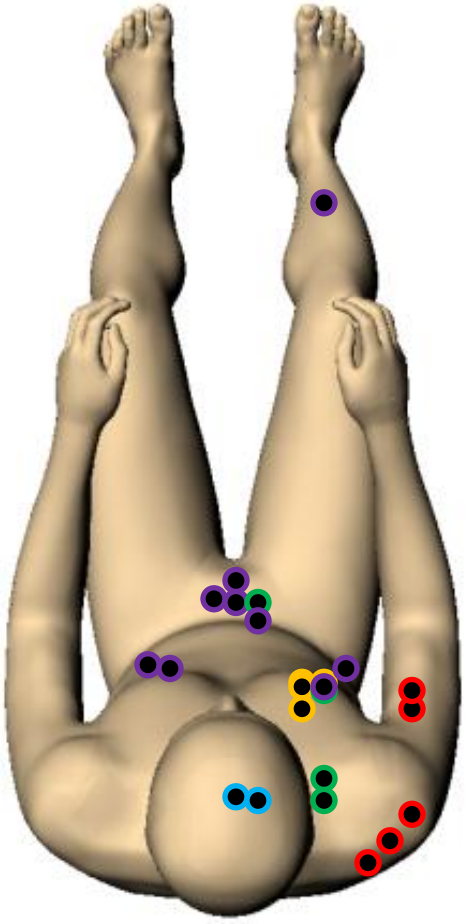
Thorax

Abdomen

Pelvis/LE

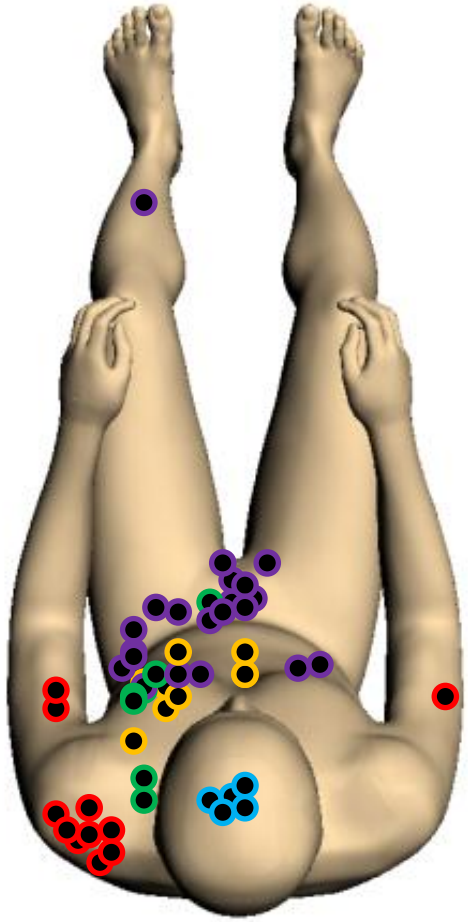


Driver = 7



L3 Body & L1-2 TP FX

Right-front Passenger = 5



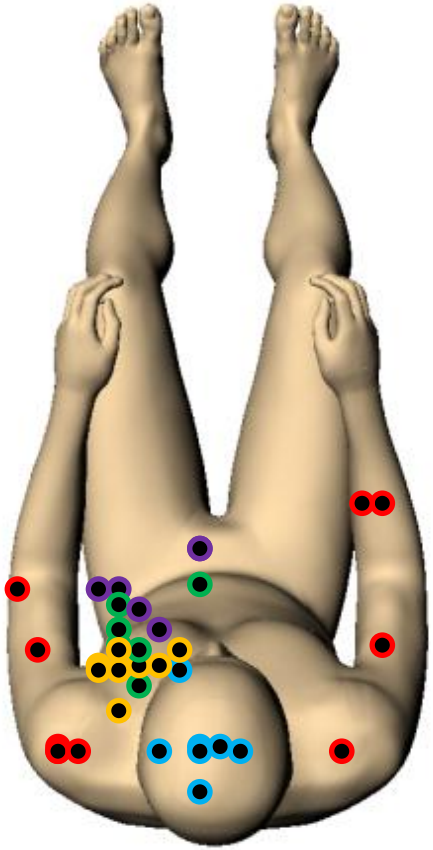
L3 Body & L1-2 TP FX

Composite = 12

PC vs. Tree w/ & w/o Shoulder Injury

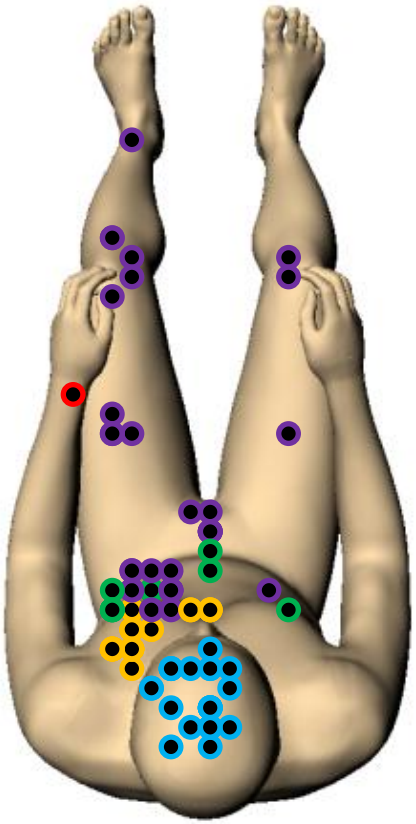
MEDICAL COLLEGE OF WISCONSIN

Head/Face
Neck/spine
UE
Thorax
Abdomen
Pelvis/LE



T1 TP FX
AO separation

w/ SI Composite: N = 7



L2-L5 TP FX
L5 TP FX
L2 & L4-5 TP FX
L5 TP FX (2)
T8 body FX L1-5 TP FX (2)
L3-4 TP FX (2)

w/o SI Driver: N = 15

Conclusion

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- Shoulder may act as a load path:
  - somewhat protects the thorax
  - exposes the abdomen
- Collision partner aggressiveness more relevant than object struck
- More SUV/Pickups/Vans without shoulder injuries (13% versus 22%)
- More passenger cars with shoulder injuries (87% versus 78%)
- CIREN does not provide adequate basis to evaluate SAB/curtains
- Research is needed to gauge relation between height of belt-line w.r.t. occupant shoulder position
- Pelvic injury analyses different in AIS 1998 and 2005
- Dummy measurement implications – shoulder, abdomen, and pelvis