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Characteristics of left- and right-turning single vehicle-pedestrian crashes and what can be done about them

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Key literature review findings

- Walking is low carbon and good for the environment and our ecosystems, and
- Walking is good for human health and social connectedness.
- However, walking is dangerous, and
- Pedestrian deaths disproportionately impact people at the low end of the socioeconomic spectrum.

Lit review: right-turns

Kaya et al., 2018

- used tracking technology to examine visual attention of drivers making right turns off an arterial road.

- 11 of 19 drivers tested (58%) demonstrated some type of attention failure during these right-turns

E.N., Kaya, S. Ayas, S, C. Ponnambalam & B. Donmez (2018), Visual attention failures during turns at intersections: an on-road study, Paper presented at 28th Canadian Association of Road Safety Professionals Conference, Victoria.

Lit review: left-turns

However, left-turns are worse. NYCDOT found that left-turns are more dangerous for pedestrians and cyclists compared to right-turns for three reasons:

- Left-turns can be taken at a wider radius which leads to higher speeds (9.3 mph average speed for left-turns vs. 5.6 mph for right-turns), and greater pedestrian exposure;
- The driver's visibility is more obscured by parked cars, and the vehicle's own left-side A-pillar; and
- Left-turns are more complicated and driver cognitive workload is much higher.

Study

Methodology (1 of 2 slides)

- ❑ Data: BC police crash reports between 2004 and 2015
- ❑ Count and proportion of SVP crashes (single vehicle vs pedestrian) resulting in pedestrian injury or fatality.
- ❑ SVP crash = the police report indicated that only one motor vehicle was involved in the crash, and if the vehicle struck a pedestrian as the first point of contact

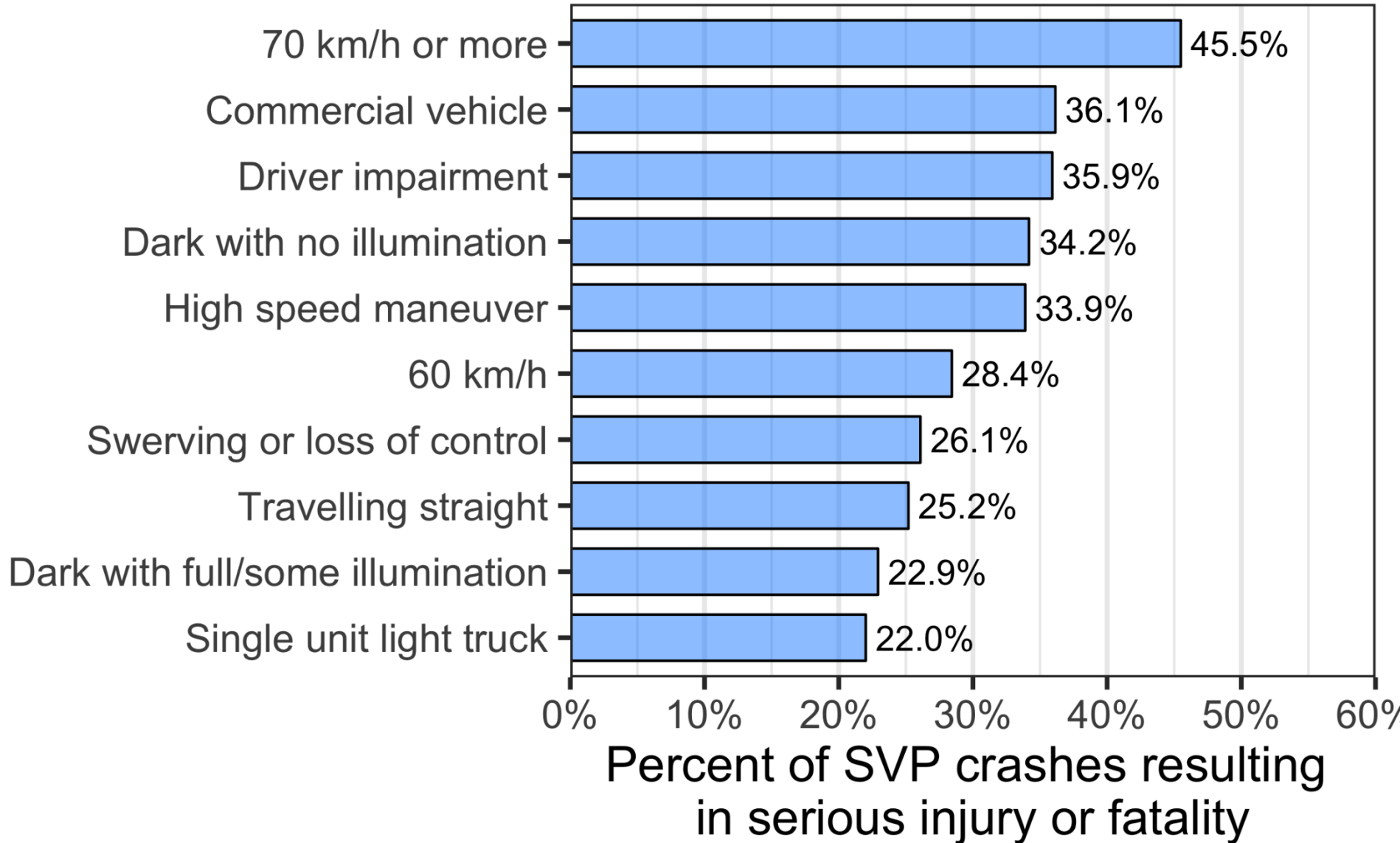
Study

Methodology (2 of 2 slides)

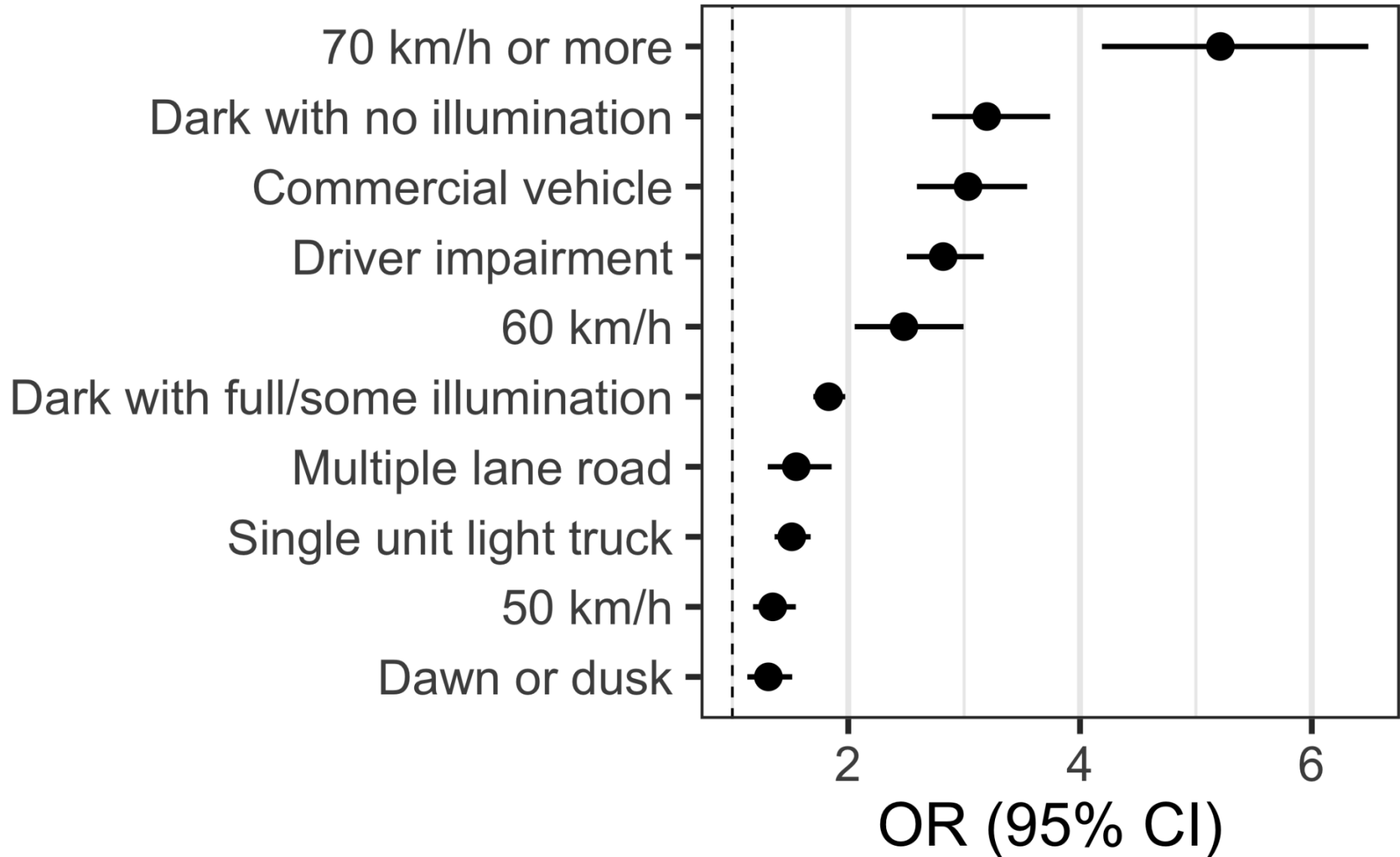
- We explored several factors that might contribute to pedestrian serious injury or fatality.

- Then for each factor, we calculated unadjusted and adjusted ORs for pedestrian serious injury or fatality.

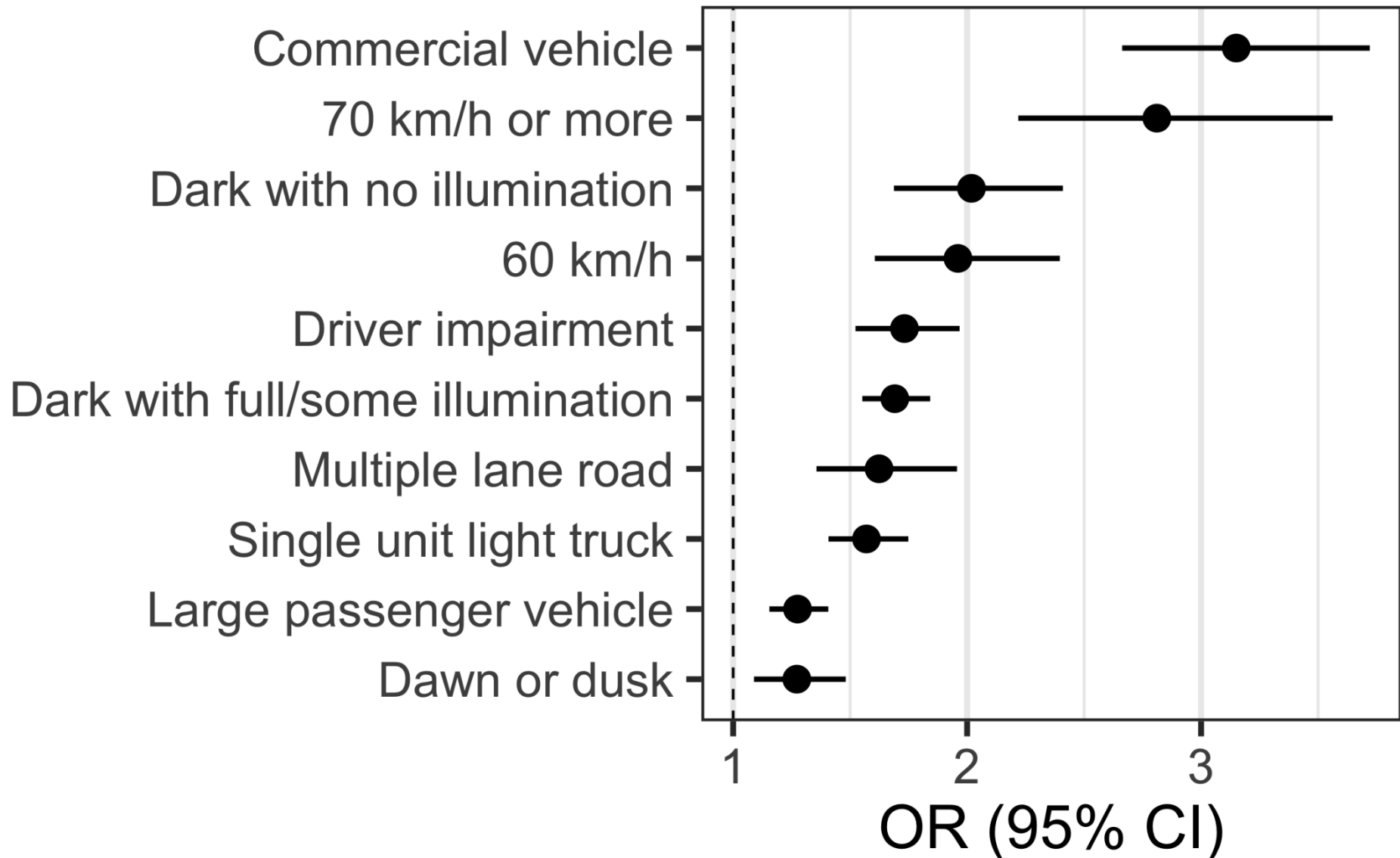
Top 10 risk factors for pedestrian serious injury or fatality in SVP crashes



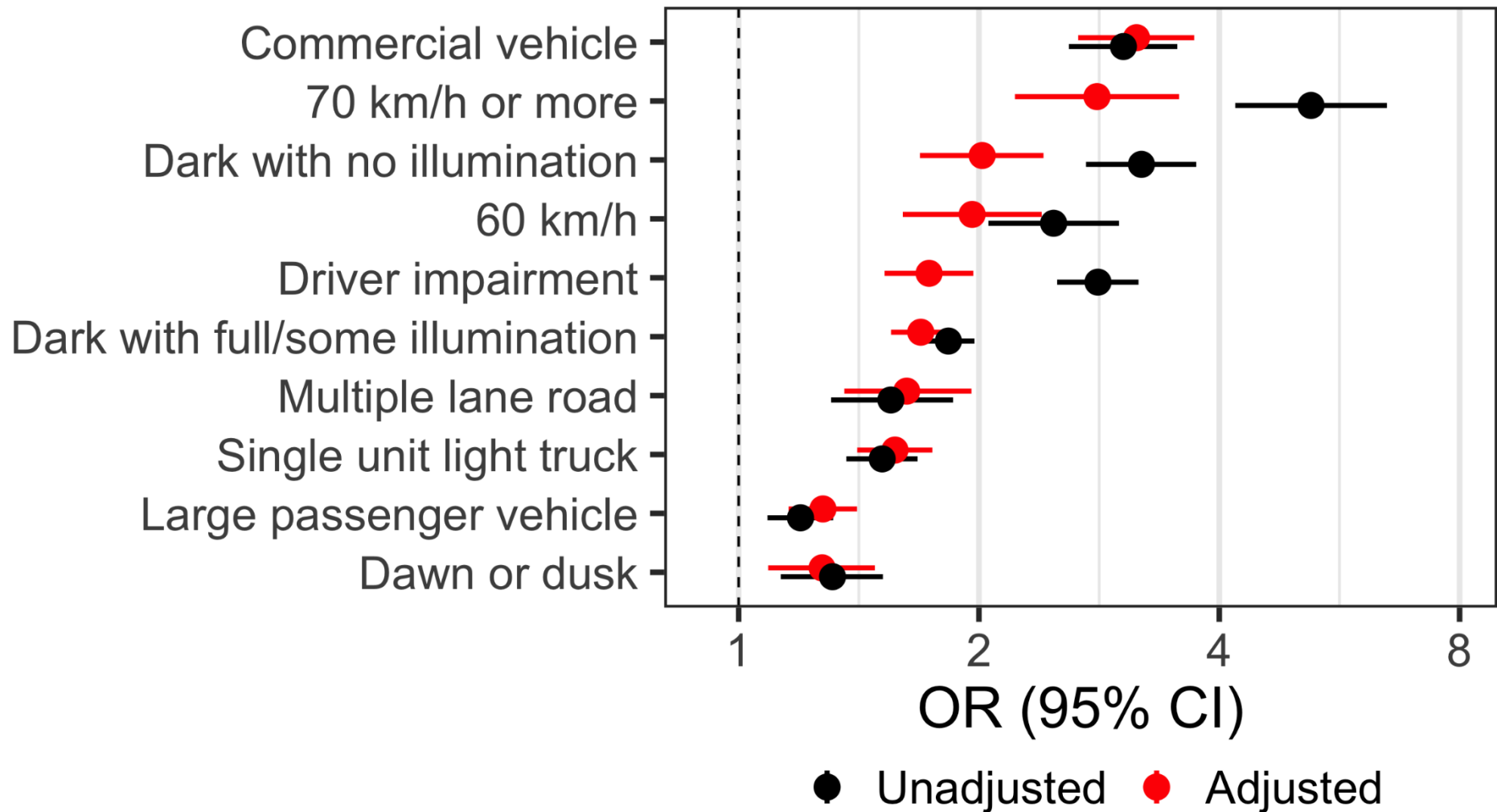
Top 10 unadjusted odds ratios for pedestrian serious injury or fatality in SVP crashes



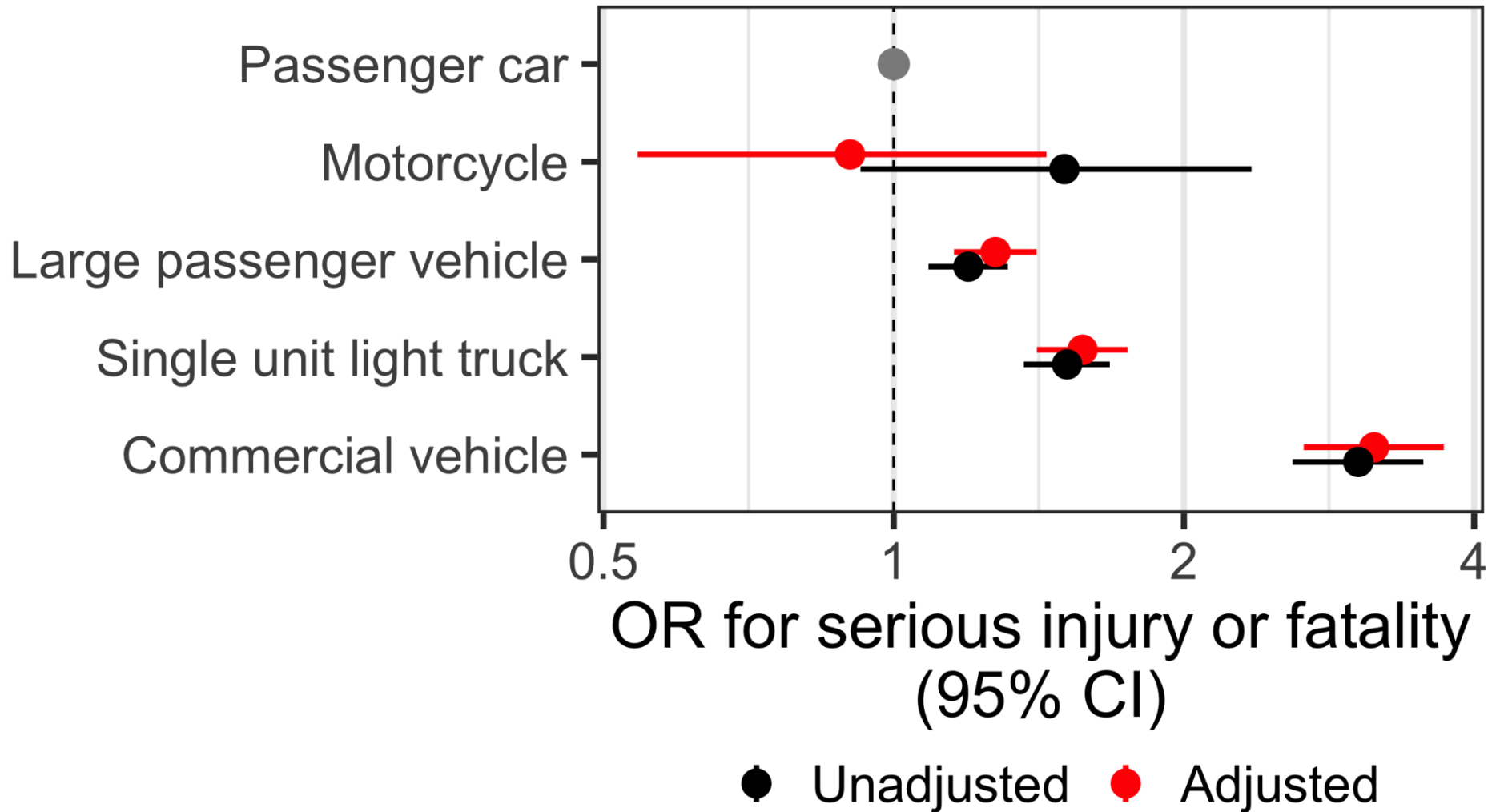
Top 10 adjusted odds ratios for pedestrian serious injury or fatality in SVP crashes



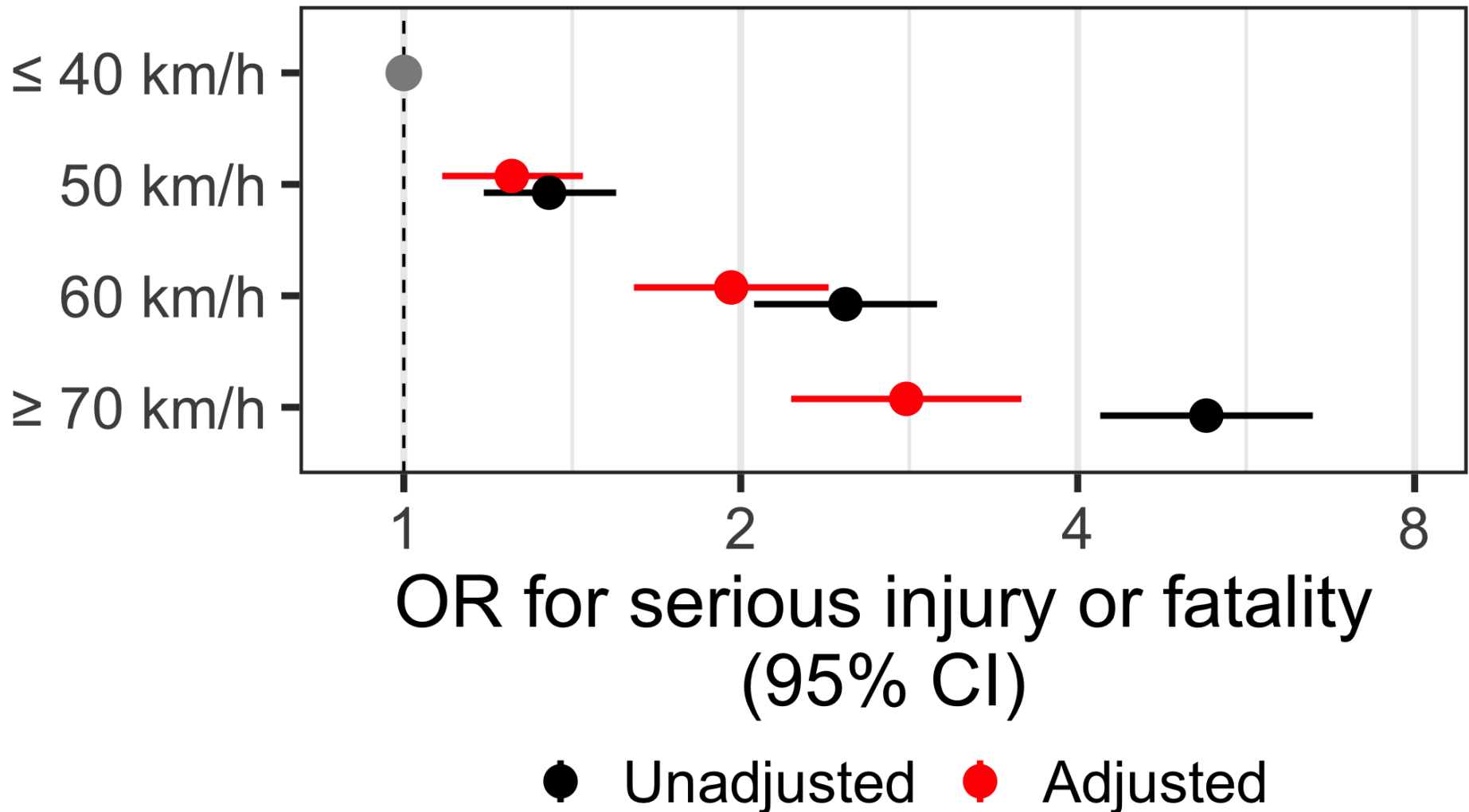
Top 10 adjusted odds ratios for pedestrian serious injury or fatality in SVP crashes



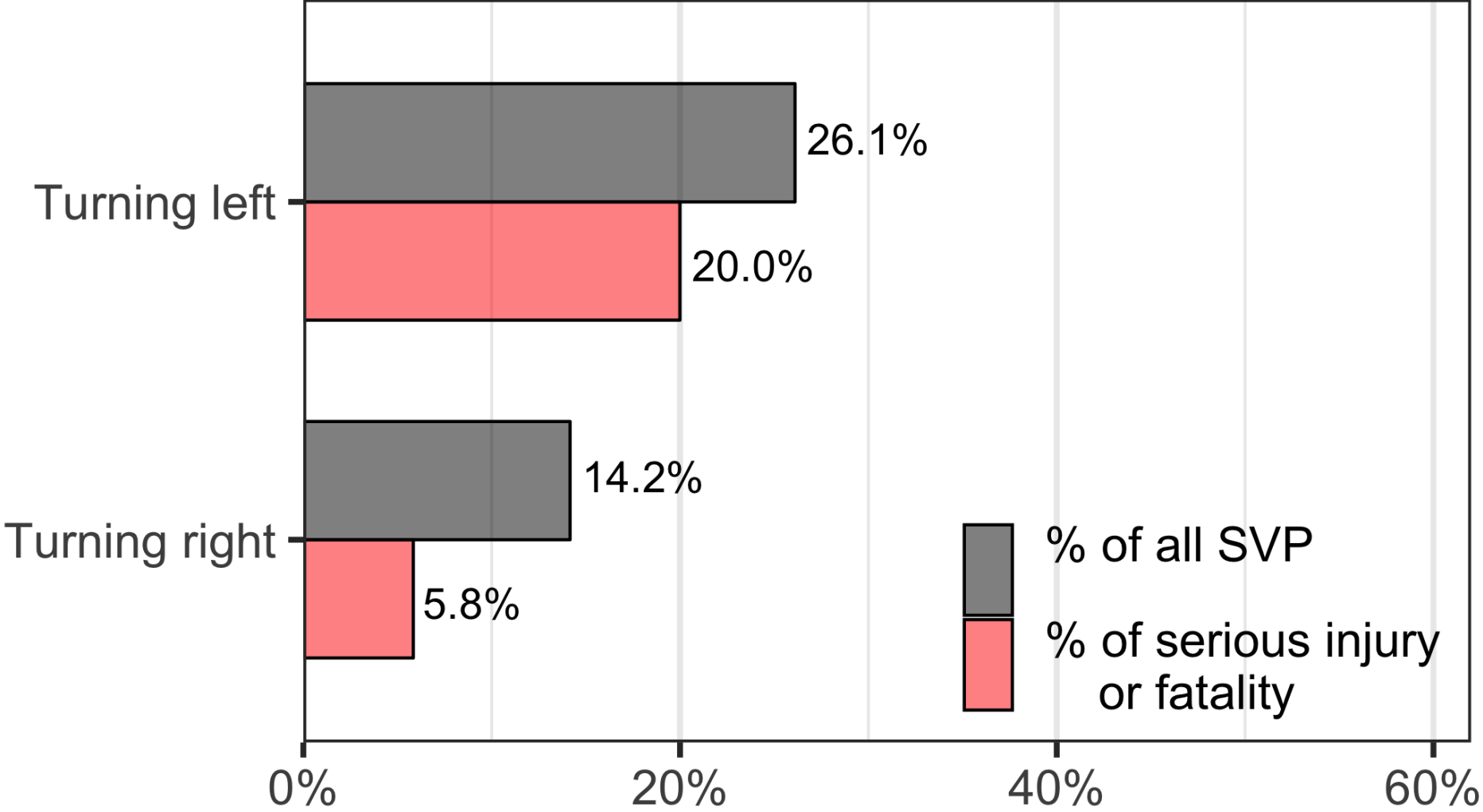
Odds ratios by **vehicle type** in SVP crashes



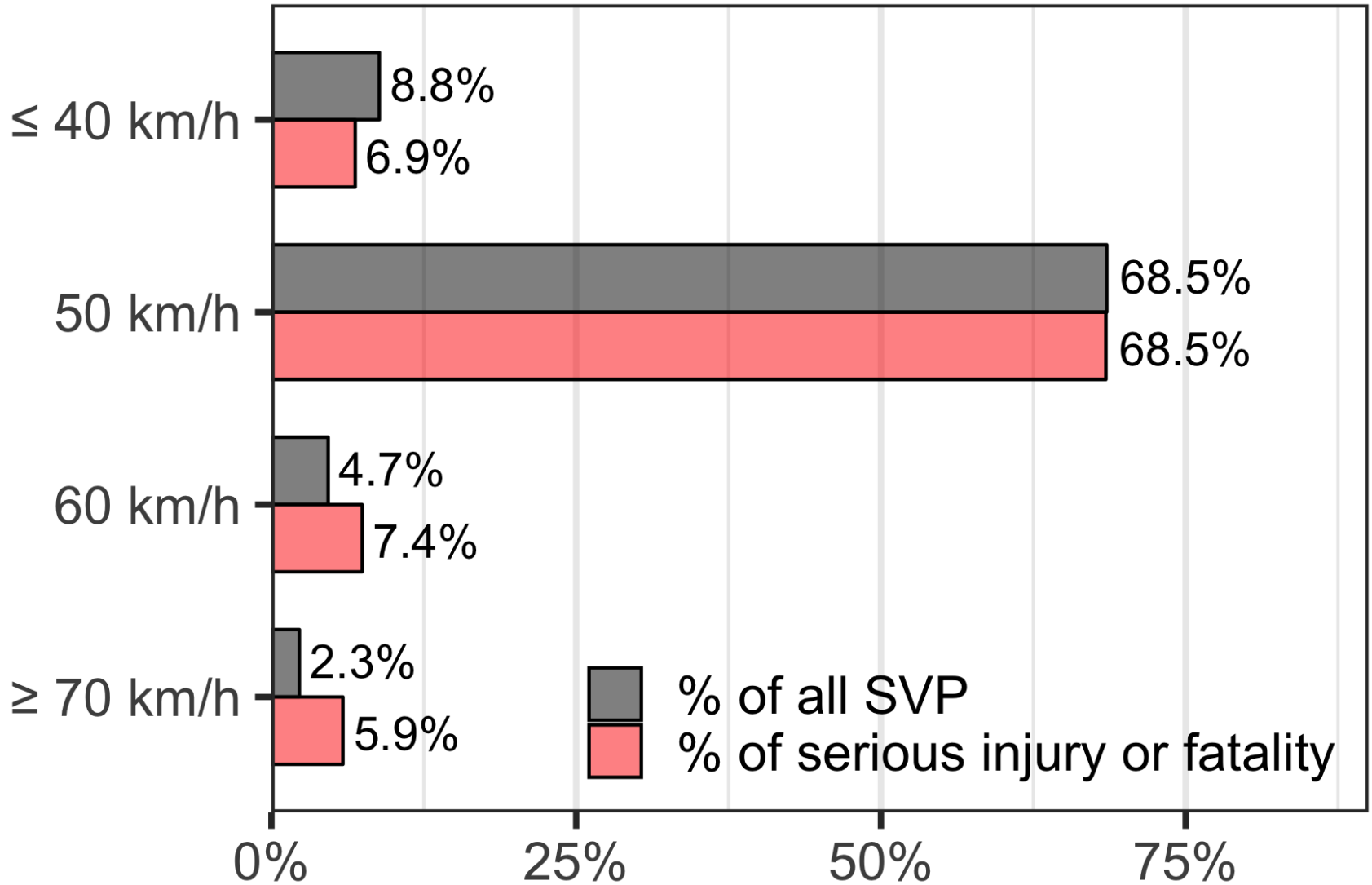
Odds ratios by speed zone in SVP crashes



Percent of SVP crashes by driver pre-collision action



Percent of SVP crashes by speed zone



Discussion/solutions

- ❑ Serious injury and fatality left-turn (20.0%) SVP crashes are almost 4 times more likely to occur than right-turn ones (5.8%).
- ❑ Many countermeasures exist across the safe system approach to respond to the vehicle-turning problem and the overall SVP crash problem.

Safe system pillar: human behavior.

Driver impairment

- ❑ Driver impairment (adjusted OR=1.73, 95% CI: 1.52, 1.97).
- ❑ Despite BC's relatively successful drunk driving legislation introduced in 2010, still more could be done to tackle impaired driving.

Safe system pillar: Vehicle Design.

- ❑ Better commercial truck design to enhance visibility
- ❑ Advanced headlights
- ❑ Mandated active and passive safety measures for motor vehicles.

Safe system pillar: Road Design

Separating road user types from one another through space and time is proven and includes countermeasures such as:

- Protected turning phases for motor vehicles.
- Ban on right-turn-on-red.
- Leading Pedestrian Intervals (LPIs).
- Pedestrian scrambles.
- Protected intersections.
- Other innovative intersection designs.



Photo: Neil Arason



Photo: David Coburn



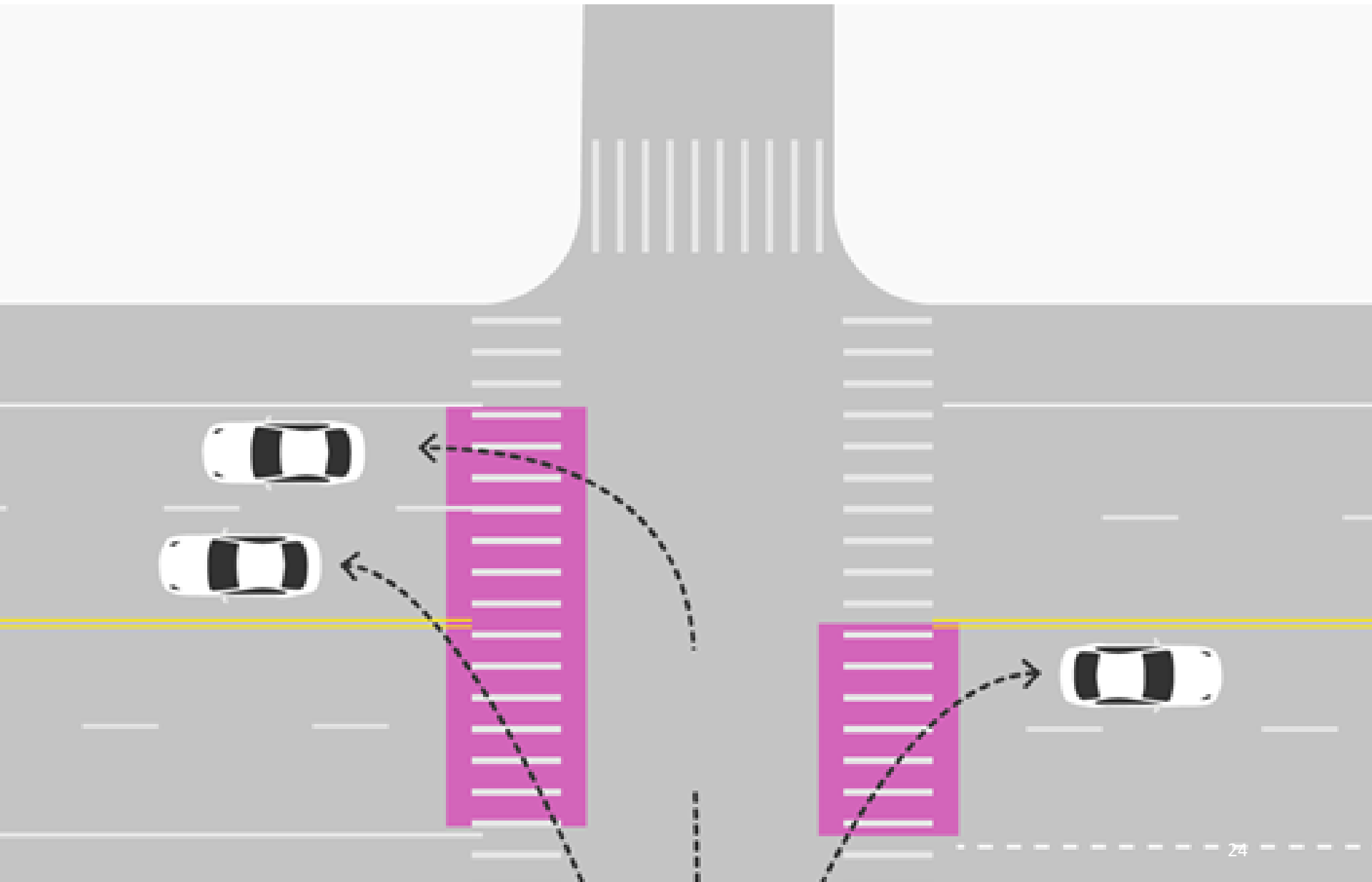
Photo: Neil Arason

Leading
pedestrian
intervals

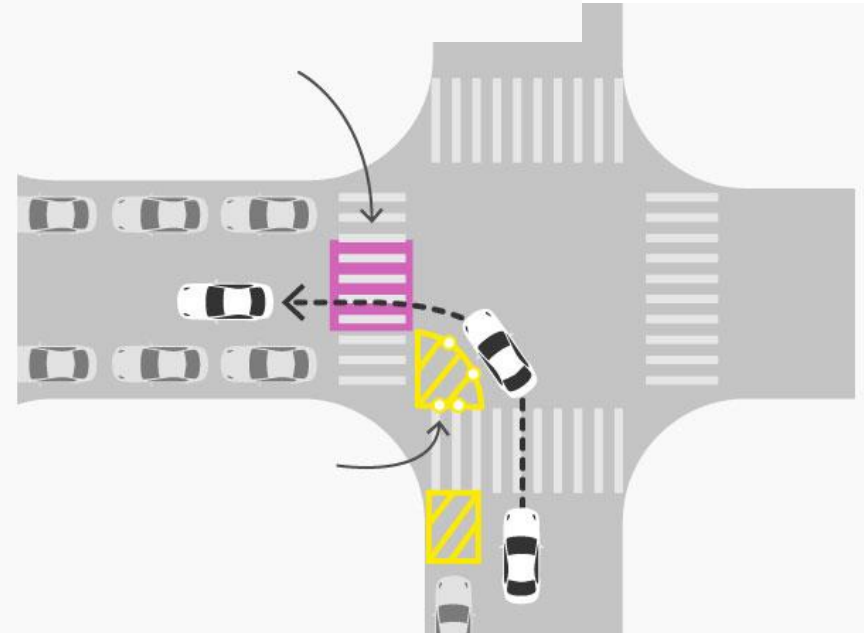
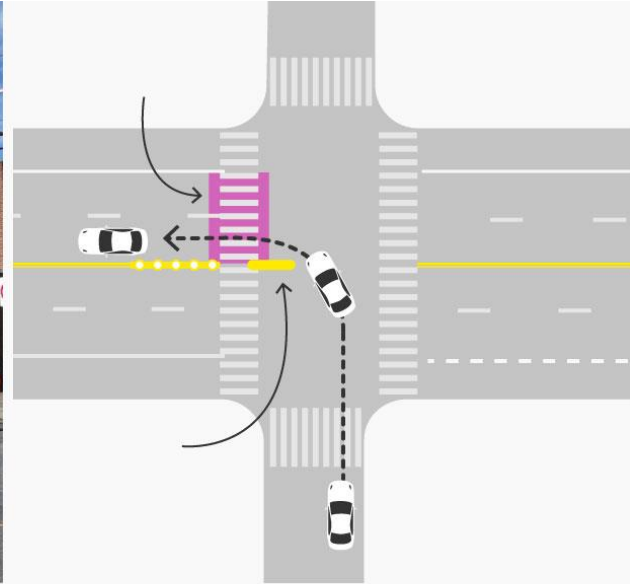




Traditional intersection design



Intersection changes in New York City





Study limitations

- ❑ Our study relied on police data:
 1. Which can contain inaccurate data elements.
 2. May be incomplete as police are not required to attend all MV crashes including vehicle-pedestrian ones.

- ❑ Future studies could explore hospital data, ambulance data or linked data sets.

Conclusions

- ❑ Serious injury and fatal left-turn vehicle-pedestrian crashes happen at a rate almost 4 times that of right-turn vehicle-pedestrian crashes.
- ❑ Our study identified significantly increased odds of serious injury from SVP crashes from:
 1. commercial vehicles.
 2. higher speed roads.
 3. darkness.
 4. driver impairment.
 5. multiple lane roads, and
 6. single-unit light trucks.
- ❑ Countless solutions, including many low-cost ones, exist for this pedestrian safety problem.