Injury severity of vulnerable road users hit by a car

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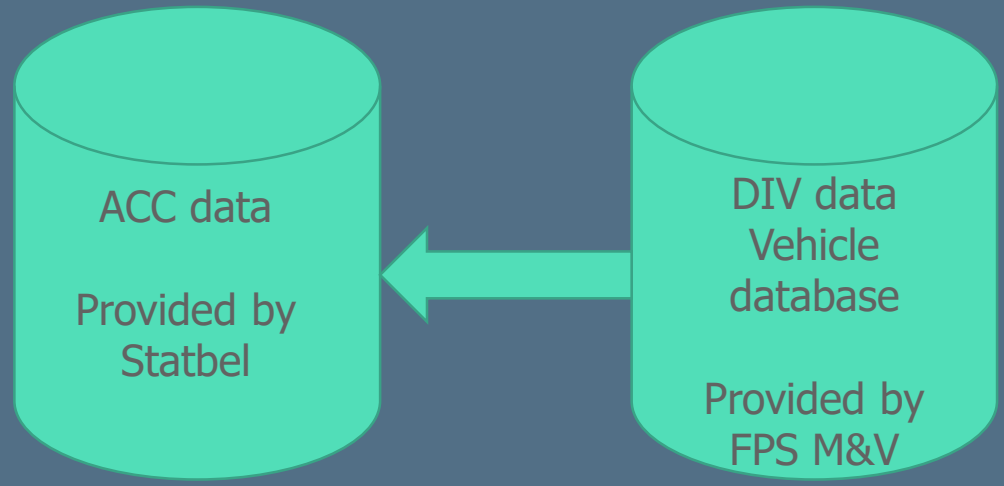
Data



- **2021: Linking based on numberplate and Chassis number**
- **By StatBel**
- **Vehicles involved in crashes**
- **2017-2020**
- **Vehicle info for +/- 336.000 casualties**

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First analysis

- Vehicle factors affecting severity in crashes with VRU
- Relative importance of vehicle factors
- Difference between different types of VRU

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Vehicle factors

Most important factor: mass

Chance for a fatal outcome in a VRU – car crash increases with mass of the car:

Mass	+135kg	405kg	+575kg	+984kg
Risk fatal outcome	**+10%**	+33%	+50%	+100%

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Car age and power

- **Risk for serious injury of a VRU hit by a car increases:**

Car-age	+ 5 jaar
Risico	**+4%**

Power	+80 PK
Risico	**+10%**

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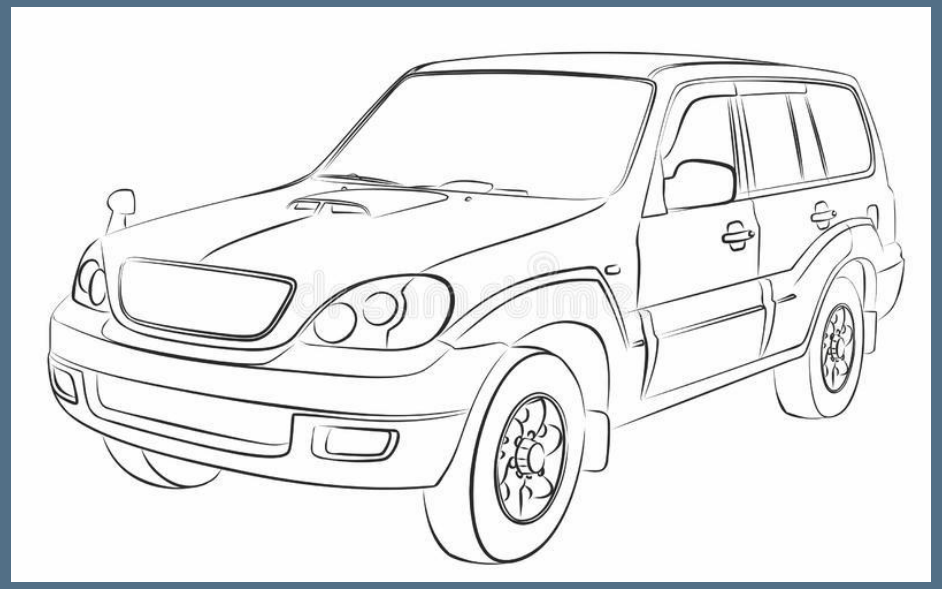
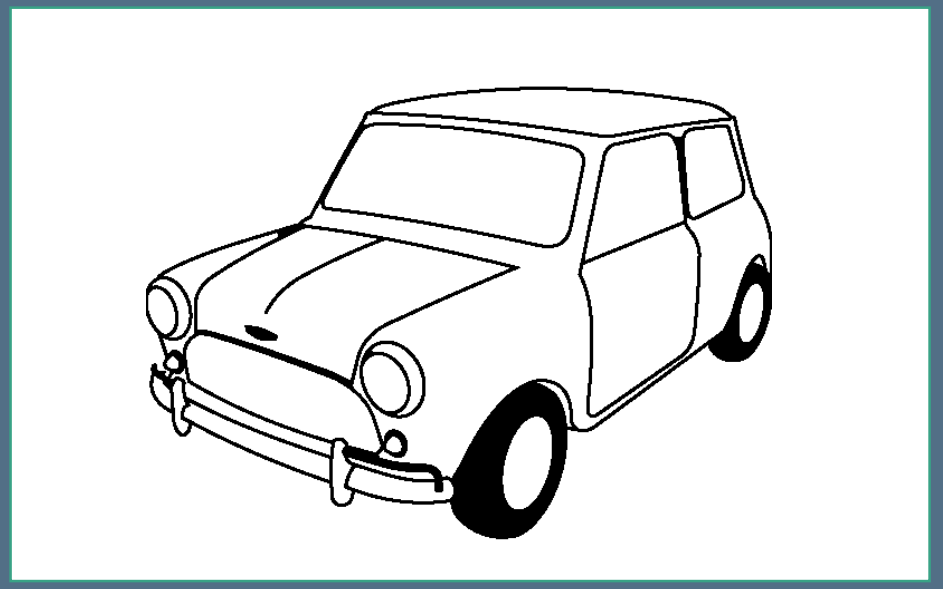
(Cor)relation mass, power, bonnet height





- **Large car**
  - Large mass
  - Powerful engine
  - High bonnet
- **Small car**
  - Small mass
  - Light engine
  - Low bonnet

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(Cor)relation mass and power

- **Predicting fatal crashes**
  - As opposed to injury crashes
  - Mass more important
  - Power & age not significant

- **Predicting serious crashes**
  - As opposed to crashes with slight injuries
  - Power more important
  - Mass not significant

- **Heavy, powerful cars increase the risk for serious and fatal injuries when hitting a vulnerable road user.**

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Non-vehicle factors

Age – Automobilist and VRU

Average age car driver
45 years

Average age VRU
37 years

- **Older automobilists have a lower risk to cause fatal injuries among VRU's**

(+10 jaar -> -12%)

- **Older VRU's have a higher risk to suffer fatal injuries**

(+20 ans -> +107%)

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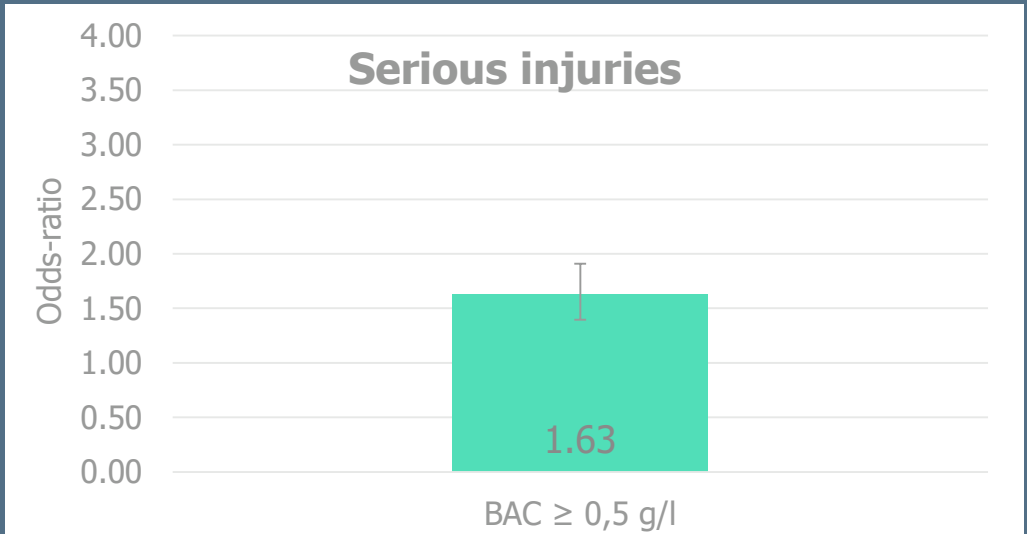
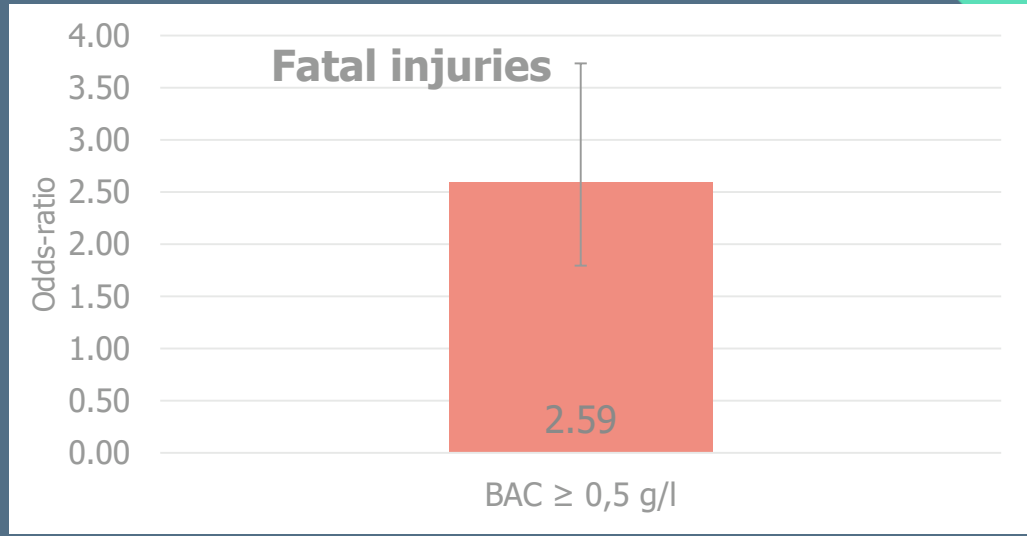
Drunk car driver (BAC ≥ 0,5 g/l) VERSUS sober driver (BAC < 0,5 g/l)





- **Risk for serious injuries for VRU is 63% if opponent has > 0,5 g/l blood alcohol as compared to sober driver**
- **Risk for fatal injury is 159% higher**

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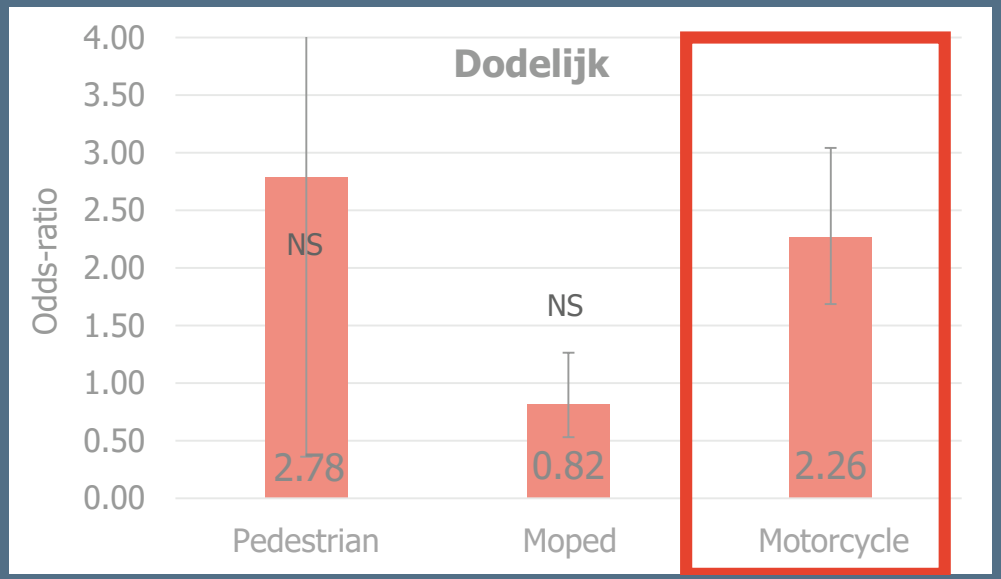
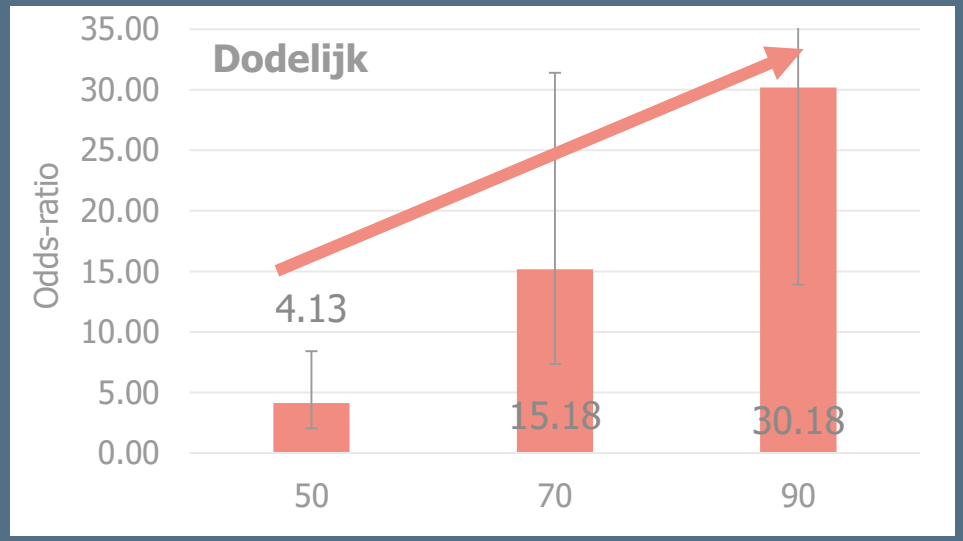
Motorcyclists VERSUS cyclist



- **When hitting a car, mopeds have a 26% higher risk for fatal injuries as compared to a cyclist.**

Various speed limits VERSUS 30 km/h speed limit



- Risk for fatal injuries for VRU who is hit by a car (as compared to speed limit 30)
- 50 km/h 4 times higher
- 70 km/h 15 times higher
- 90 km/h 30 keer higher

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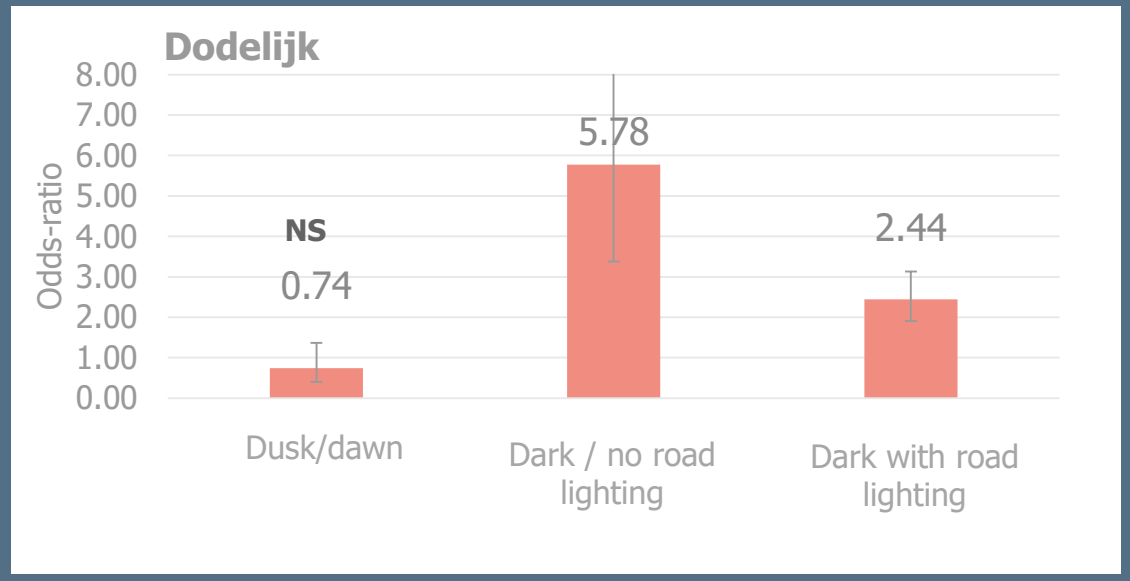
Various light conditions VERSUS daytime



- **Risk of fatal injuries in VRUs hit by a car is more than 5 times higher at night without road lightning.**

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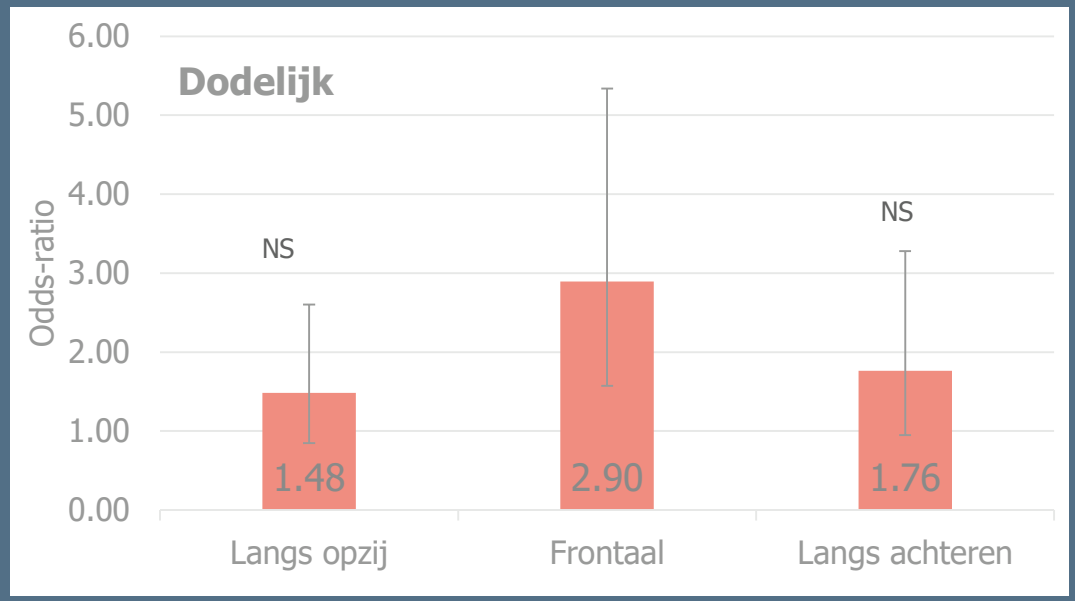
Different types of collisions VERSUS side-swipes



- **Risk of fatal injuries in VRUs hit by a car is more than 3 times higher in frontal crashes as compared to sideswipes.**

Overview of characteristics that influence the risk for fatal injuries in VRUs hit by a car

	Kans op dodelijke verwondingen
Age driver (+ 10 jaar)	- 12%
Age VRU (37 -> 57 jaar)	+ 107%
Alcohol positive driver <-> sober	+ 159%
Motorcyclist <-> cyclist	+ 126%
90 <-> 30	* 30
Night no public lighting <-> daytime	+ 478%
Frontal <-> side to side	+ 190%

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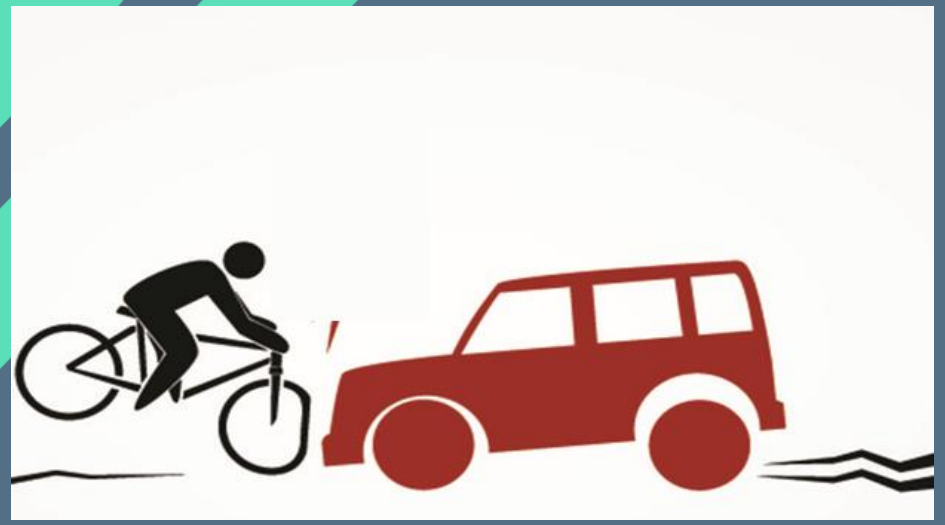
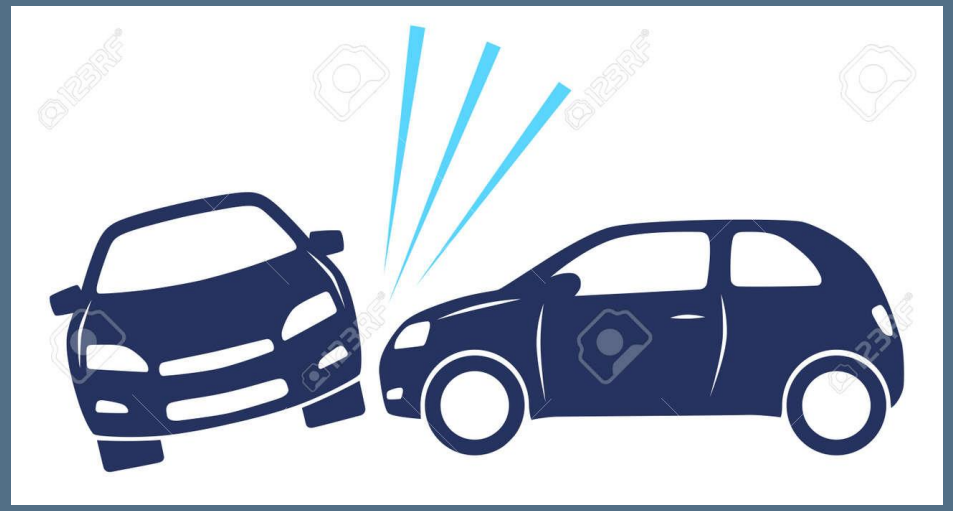
What we did not find …

- **SUV**
  - No effect – neither in single variable analysis, nor when analysed jointly with other variables
  - Difference with other results?
    - Belgian SUV's (in crashes) are relatively small.
    - Did not include Pick-ups
    - Newer cars (-> more ADAS)
- **E-cars**
  - Although they are heavier, we did not find a higher injury severity for electric cars
  - Newer cars (-> more ADAS)
  - Driver characteristics?

Conclusions

- Among vehicle characteristics, mass is the factor that has the greatest impact on the risk of killing a vulnerable road user. Vehicle age and vehicle power also increase the risk of serious injury to vulnerable road users.
- The effects of vehicle characteristics on injury severity among vulnerable road users are relatively small compared to other characteristics, such as speed, lighting conditions, type of collision, driver's age, driving under the influence of alcohol.





Next steps

Injury severity of VRU in car crashes

- Include information about EuroNCAP ratings and active/passive safety systems (e.g. AEB)
- Include bonnet height

Injury severity of car occupants

- Analyse effect of vehicle characteristics of casualty and opponent.
- Include information about EuroNCAP ratings and active/passive safety systems (e.g. AEB)

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Thank you for your attention!

Questions to nina.nuyttens@vias.be