

Who, What & How to Protect Vulnerable Road Users

Introduction

Saving More Lives. That's our, Autoliv's, vision since 1953 when we installed our first seatbelts. Our mission is to create solutions that save lives and prevent injuries. Autoliv is the world leader in safety for mobility and society with sales to all major car manufacturers and almost 70 years of expertise within the domain of traffic safety.

In traffic safety the Safe System approach implies that the road, the vehicles and the road users, in conjunction with a safe speed limit, should interact to create a safe road transport system. Our solutions contribute to these pillars of safety.

In this paper we reveal our view for vulnerable road users. Who to protect based on the modes of transportation they use, what to protect in terms of what are the most common injuries and most critical areas to protect as well as what countermeasures we can use to protect our vulnerable road users. As Autoliv we take a first step considering vehicle safety and road user protective systems, though we call for commitment and collaboration to improve the Safe System as a whole.

Who to protect now

In 2017 there were 1,35 million road traffic fatalities that occurred on the roads globally. With the highest share of road user fatalities we have the two groups of pedestrians and motor vehicle occupants. We understand the historical countermeasures for both. We know that lives are being saved by seatbelts and airbags for car occupants. This is vital and something which we at Autoliv are very proud of.

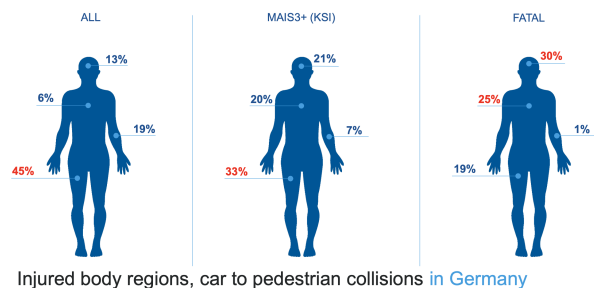
Typically pedestrians are less well protected in collisions with vehicles. Our bodies don't come with seatbelts and airbags fitted as standard, so for vulnerable groups the protection needs to be shared between the road users in conflict.

What needs protection?

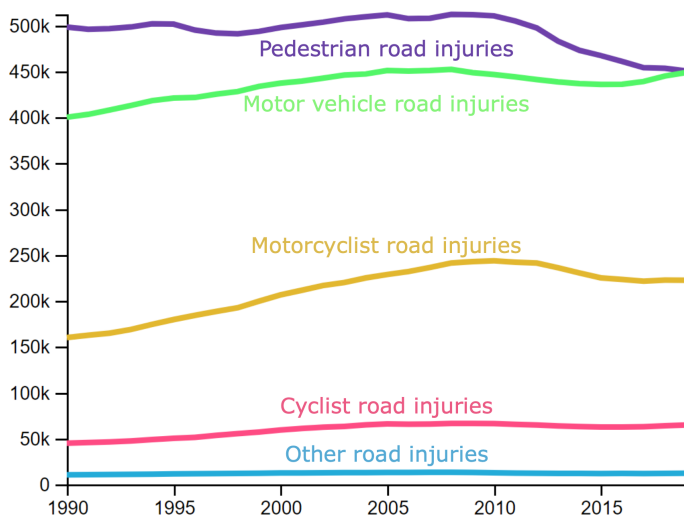
What on these road users do we need to protect, where do we see injuries and what can we do about it? Starting with the pedestrian we look at the in depth collision data from GIDAS (German In Depth Accident Study).

We can show three body type injuries where we see severe injuries on the left side. Here as a pedestrian you can see if you're hit, the first contact will be to the leg. As such, **45%** of all injured pedestrians will have a lower extremity injury. As the severity of outcome increases we see the damage moves towards the chest and head. Looking at fatal outcomes, **25%** of those will have an injury to the chest and **30%** will have an injury to their head. Those remain dominant priorities.

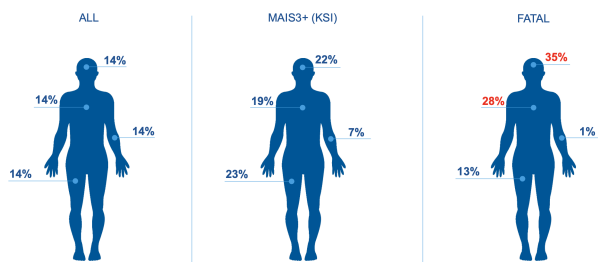
Vulnerable road user groups – pedestrian



Quite a similar scenario is evident for cyclists, here we have a more even distribution of injury if we think about all severities even across legs and arms, chest and head. If we talk only about cyclists who are killed on the road, the trunk, chest and head are the real priorities.



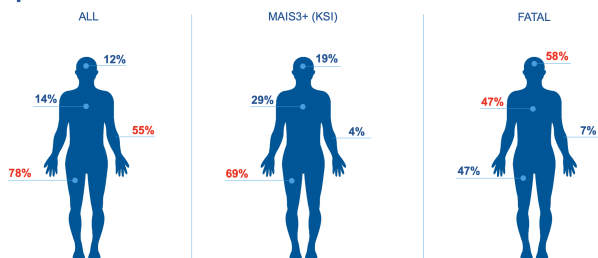
Vulnerable road user groups – pedal cyclist



Injured body regions, car to bicyclist collisions in Germany

The third group is the powered two-wheeler riders. If we look at lower and upper extremities we see 79% and 55% of all injured powered two-wheeler riders will have those body regions involved. Again if we look at riders with a fatal outcome we see equal injuries between the legs and chest. In this German sample where riders have high helmet wearing rates it is still 58% of those killed that will have a head injury.

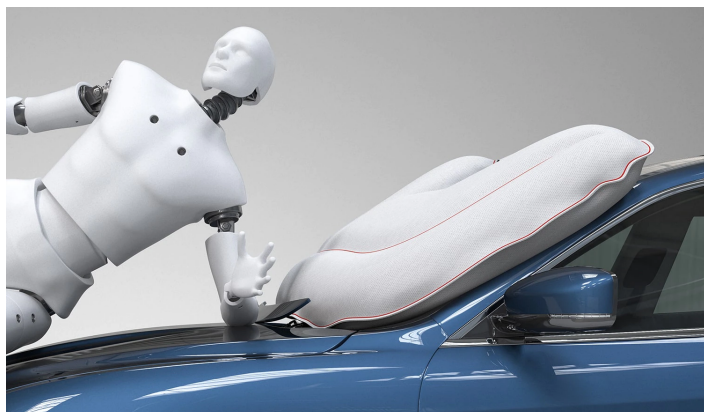
Vulnerable road user groups – powered-two-wheeler riders



Injured body regions, car to PTW collisions in Germany

How to protect?

Pedestrian safety research has been going for a long time and we know a lot about what happens in car to pedestrian collision events. We have legislation in Europe to make the front of vehicles softer and more pedestrian-friendly in a crash. An extension is that you would have deployable systems to protect the head in those contacts with hard regions of the cars like at the base or the sides of the wind screen. We know that this countermeasure is very effective in those critical head impact conditions.



We also know that people fall over. Especially for pedal cyclists, falls are a crucial cause of injuries. We've started looking into what a deployable solution might look like for a single vehicle fall. There is an immediate and very clear benefit having the safety countermeasure on the rider. We've also begun looking into how to reduce risks for the powered-two-wheeler rider where we have 3 examples of putting counter measures on the car, your own vehicle and also on the person. Remember that we're attempting to offer measures related to the safe vehicle and road user pillars, in the knowledge that these do not stand alone in a safe system.

Who is next?

When we talk about the future transport system we talk about a sustainable transport system. We need to adapt to any transitions to more active or more sustainable modes of transportation. That might mean more people commuting with a bicycle instead of car, but it might be that you use an e-scooter for your last-mile transportation. If you happen to ride your bicycle or e-scooter into the side of a car then there would be a substantial benefit in interacting with a deployable external airbag. Alternative to this is that the solution is based on the e-scooter itself. We have more confidence that we can put something in front of the rider if that's where it starts from. What if that is not enough, of course a wearable protective system could benefit the e-scooter rider. There is hope that safety improvements are possible with such initiatives.



Conclusion

In this paper we've concentrated on vehicle-based countermeasures. As a transportation mode emerges it is important that we don't wait for 50 years of historical data to figure out what can be done but that we react and react quickly. That is why our plea is for collaboration defining the safety needs, so that we arrive with something that is desirable, powerful and effective.

Each year Autoliv's products save over 30,000 lives. When we roll out our protection for vulnerable road users that number is going to go up. The most important way to achieve this is together, so we invite you to share in our vision: with more lives saved there will be more life lived.

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