

Research on seniors in traffic and e-bikes



Project Czech In-Depth Accident Study (CzIDAS)

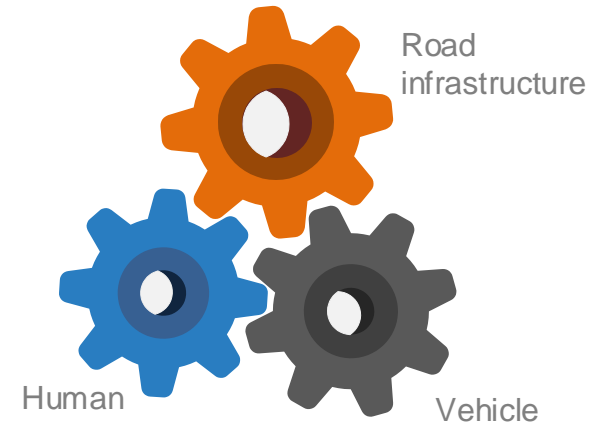


Data from In-depth Accident Analysis

- provide a comprehensive view of all the factors related to a particular accident,

The in – depth accident investigation teams document all relevant information on

- traffic environment
- vehicles
- human factor



Seniors in road traffic

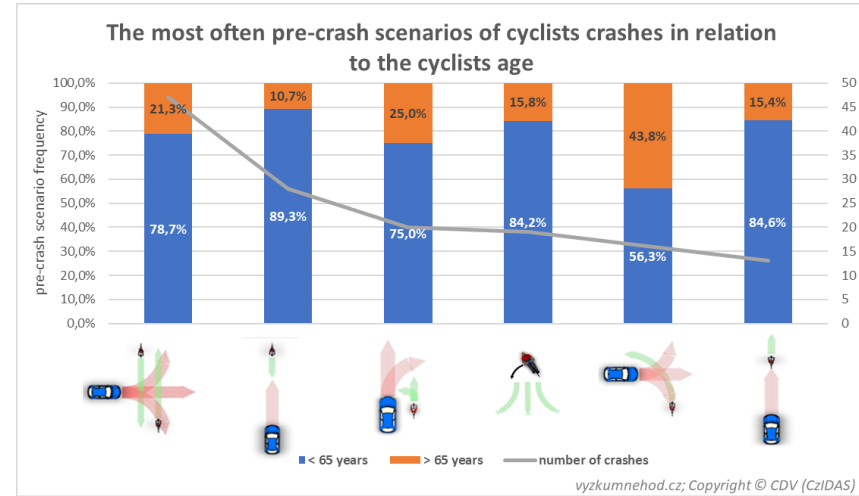
- **Seniors as vulnerable road users**
- **Human aging**
 - awareness and adaptability decrease,
 - **difficulties with adjustment to the new situation** increase,
 - **decline in their cognitive abilities**
 - changes in the intellectual sphere appear,
 - **perceived sensations is lowered**
 - and memory skills decrease
- Understanding the crash patterns of senior drivers has become increasingly important as life expectancy increases



Cyclist crash mechanism

Higher proportion of elderly cyclists

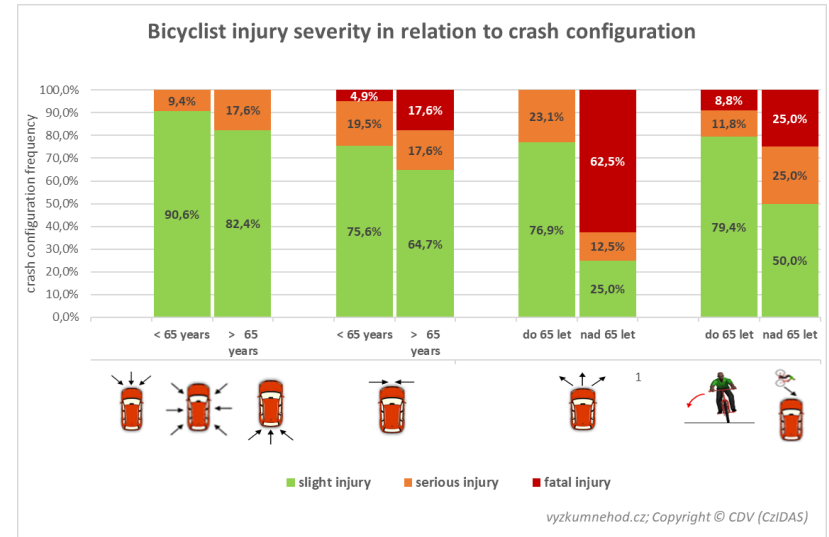
- in crash scenarios at intersections, especially **seniors are significantly more often involved in pre-crash scenarios at intersection when bicyclists turn left.**
- when cyclist change direction during riding or vehicle change direction during driving and crash with cyclist riding in the same direction.



Cyclist crash mechanism and injury severity

Elderly cyclists are more vulnerable to injury regardless of the crash mechanism.

- The riskiest scenario is
 - the rear-end bicycle-vehicle scenario
 - the fall off the bike, especially when followed by a collision with a vehicle or road infrastructure.



Cyclist crash mechanism and impact speed

Increased probability of severe bicyclist injury is associated with older bicyclists and higher motor-vehicle speeds.

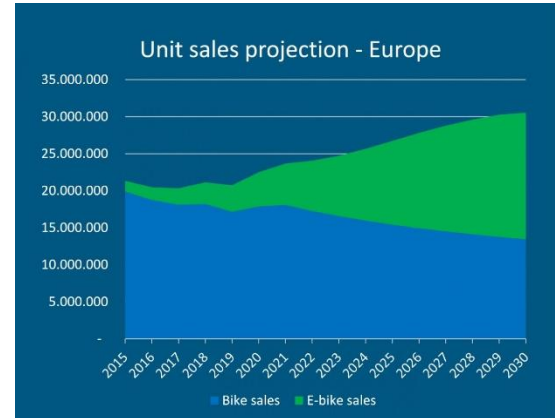
- **the probability of cyclist severe and fatal injuries increase with higher age**
- **even lower-speed crashes could, with higher probability, result in severe injuries.**



(e)bike sales projections

The rapid rise in e-bike use and sales in many countries

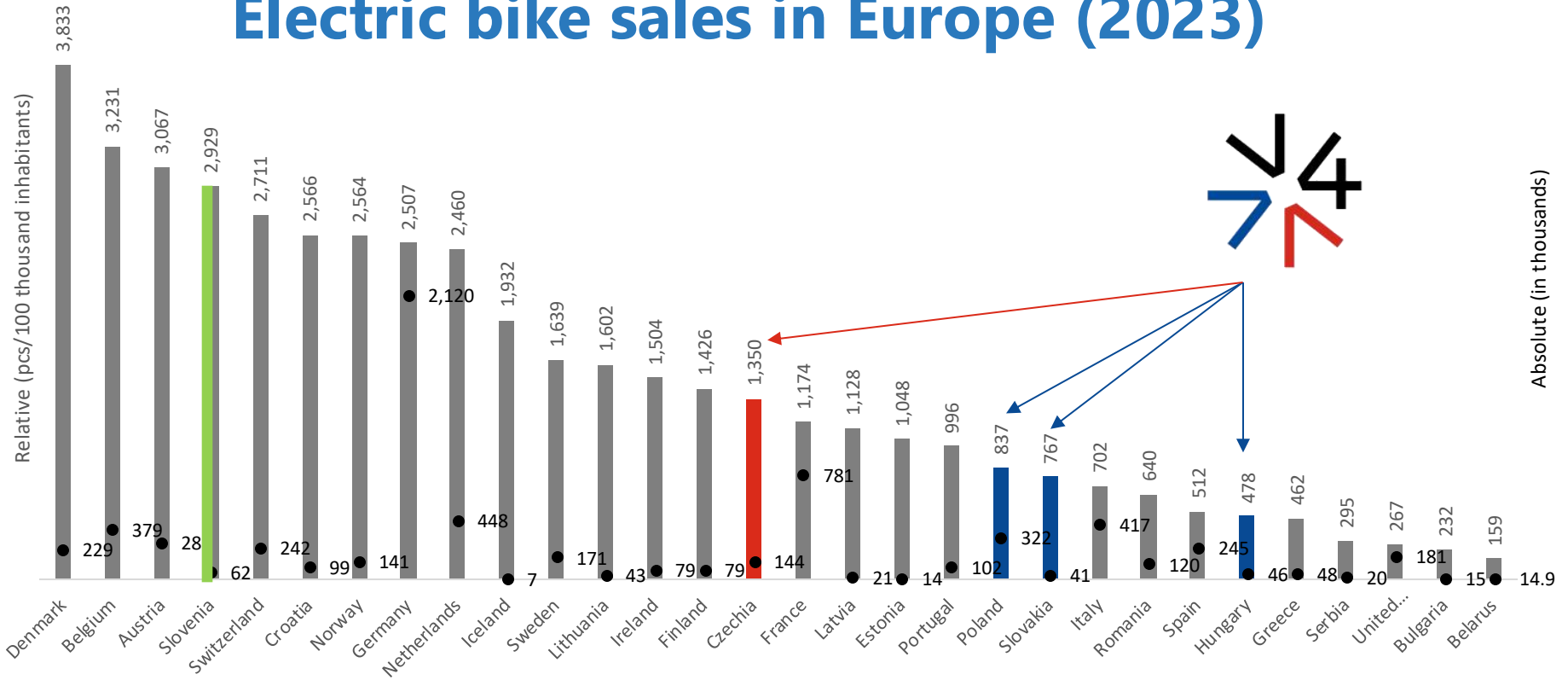
- In 2020, every fifth bicycle sold in EU countries was an e-bike
- it is predicted that by 2030 it will be every second bicycle
- the data about sales in EU countries are periodically updated, data about crashes are often not available and harmonized



Unit sales projections - CONEBI report [https://pro.eurovelo.com/news/2023-03-08_how-do-e-bikes-impact-cycling-tourism]



Electric bike sales in Europe (2023)

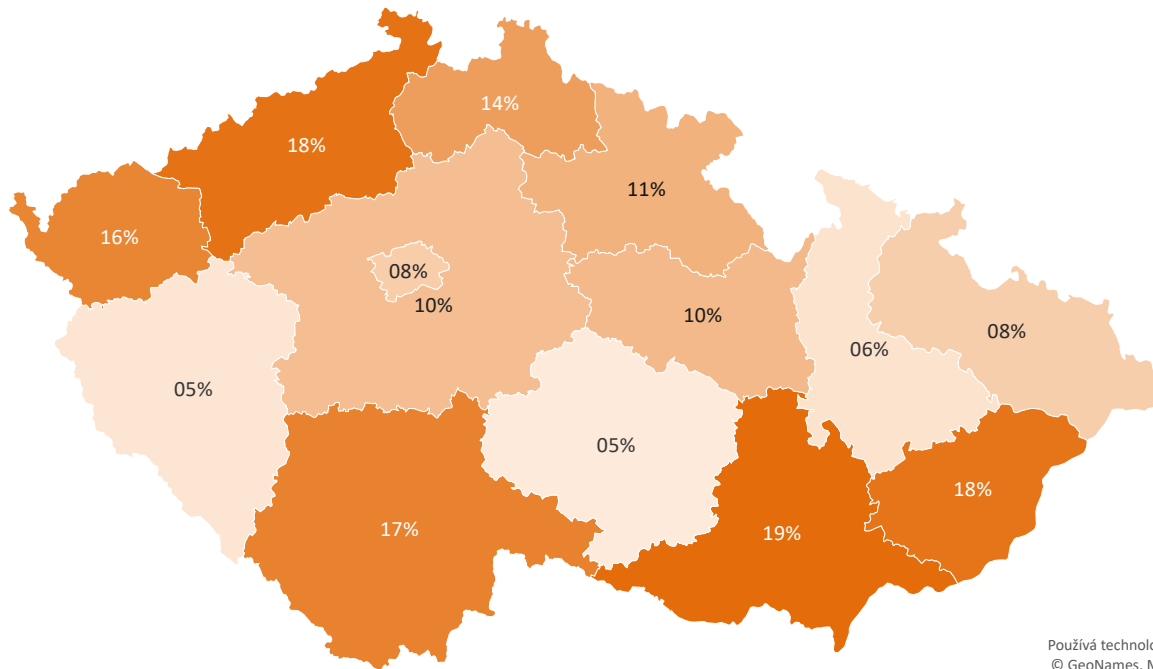


Source of input data: Statista, Eurostat; Graphics by the Transport Research Centre



Accidents of cyclists on e-bikes in the Czechia

- In the Czech Republic, the e-bikes accident rate are recorded in detail from January 2023 (Police of the Czech Republic)
- Between January 2023 and July 2024, 786 accidents involving e-bikes were recorded
- 689 cyclists on e-bikes were injured, i.e. 11.9% of all injured cyclists (on bicycles)
- the shares in 14 regions are different - see attached cartogram (max. 19.1% in the South Moravian Region)



Používá technologii Bing.
© GeoNames, Microsoft

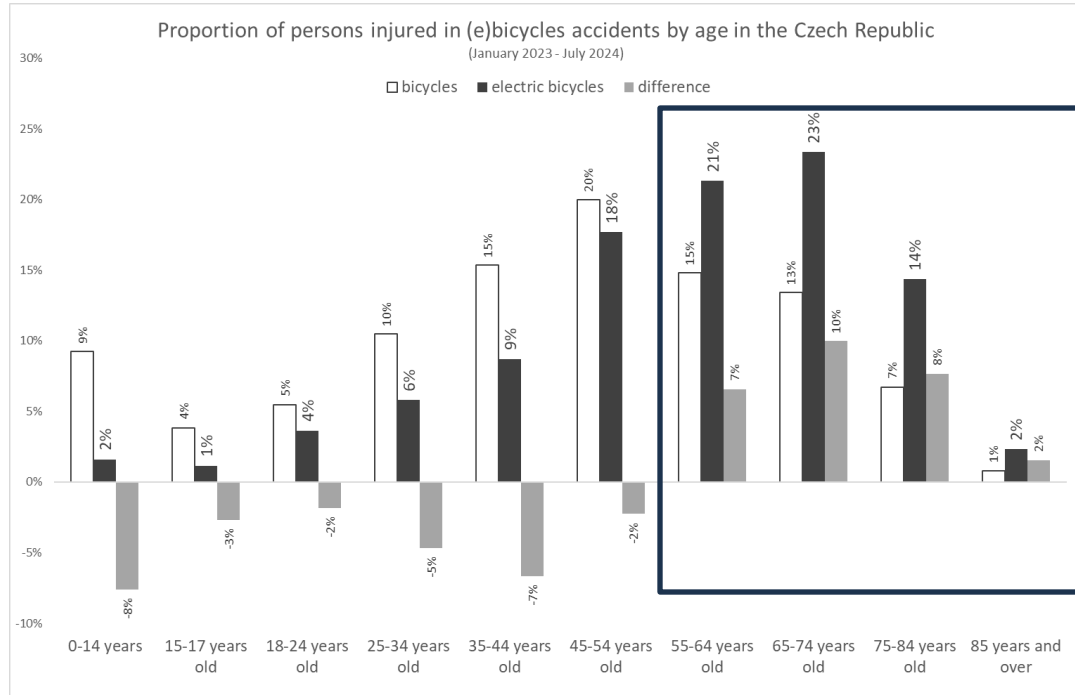
Data source: Police of the Czech Republic



Injured cyclists by age

higher proportion of elderly in e-bike crashes

- while on bicycles the proportion of injured seniors (65+) was 21%, on e-bikes it was 39%
- 6 out of 10 cyclists injured on e-bikes were over 55 years old



Data source: Police of the Czech Republic, graphics by CDV



Consequences of accidents of seniors (65+) on e-bikes

In the period January 2023-July 2024, 298 accidents involving senior cyclists on e-bikes were registered in the Czech Republic (20% share of all senior cyclist accidents).

These accidents involved:

- 13 persons were killed (**41% of all senior cyclists killed**)
- 22 persons seriously injured (22% of all seriously injured senior cyclists)
- 241 persons slightly injured (20% of all slightly injured senior cyclists)

Note: For the age category up to 64 years, proportions of 9% for accidents, 8% for fatalities, 14% for seriously injured, 9% for slightly injured persons were recorded.



Eight of the ten cyclists killed on e-bikes were seniors (65+)

If these are exclusively e-bike accidents, then seniors (65+) were involved:

- 38% of accidents
- **81% of fatalities**
- 39% of the seriously injured
- 39% of slightly injured

Note: For bicycles (excluding assisted motorcycles), the proportions of seniors (65+) were recorded as 20% for crashes, 37% for fatalities, 27% for serious injuries, and 20% for slight injuries.



Cyclist and e-cyclist injury severity

The overall severity of cyclist crashes is determined by the sum of fatalities and serious injuries in thousands of crashes.

Crashes on e-bikes are about 42% more severe for the elderly than crashes on bicycles (without a motorcycle assist)

The single-vehicle crashes including e-bikes have higher severity in comparison to the single bicycle crashes

Crash rates for senior cyclists (65+): 41% of crashes

- 69 % of fatalities
- 77 % of seriously injured
- 41% of slightly injured



Causes of accidents involving cyclists on e-bikes

The most common causes of traffic accidents:

- **Incorrect driving style - - - - e-bicyclist's fault**
- **Failure to give way ---- e-bicyclist collision opponent's fault**

| Causes of traffic accidents (guilty cyclist on electric bike) | 65+ years | | up to 64 years | |
|---|-----------|------------|----------------|------------|
| excessive speed | 36 | 19% | 65 | 22% |
| incorrect overtaking | 1 | 1% | 4 | 1% |
| not giving way | 24 | 13% | 34 | 11% |
| driving on the wrong side of the road (driving in the opposite direction) | 5 | 3% | 5 | 2% |
| the driver was not fully engaged in driving the vehicle | 44 | 23% | 50 | 17% |
| incorrect driving style | 82 | 43% | 140 | 47% |

| Causes of traffic accidents (culprit-collision opponent) | 65+ years | | up to 64 years | |
|---|-----------|------------|----------------|------------|
| excessive speed | 2 | 2% | 7 | 6% |
| incorrect overtaking | 6 | 7% | 12 | 10% |
| not giving way | 35 | 42% | 55 | 48% |
| driving on the wrong side of the road (driving in the opposite direction) | 1 | 1% | 6 | 5% |
| the driver was not fully engaged in driving the vehicle | 15 | 18% | 10 | 9% |
| incorrect driving style | 21 | 25% | 17 | 15% |
| not the fault of the driver | 4 | 5% | 8 | 7% |



E-cyclist fatalities in Czechia

- **58%** of e-cyclists fatal crashes were result of a **single-vehicle crash**
 - x 55 % of all e-bike crashes, 26 % of all conventional bike crashes
- **Higher proportion** of fatally injured e-cyclists **65+**
- 31% of e-bike fatal crashes were caused by **inappropriate speed**
19% were caused by **inattention**
 - X 24 % caused by inappropriate speed of all e-bike crashes, 11 % of all conventional bike crashes
 - X 21 % caused by inattention of all e-bike crashes, 4 % of all conventional bike crashes

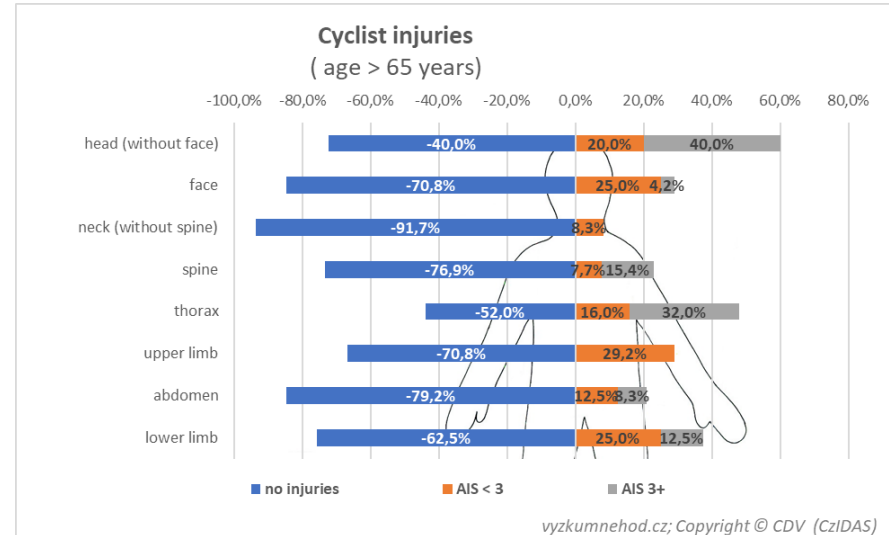


Cyclist injury mechanism

The most frequently injured cyclist body regions are:

- the lower extremities,
- the head
- the upper extremities.

Older cyclists most often suffered fatal thorax and head injuries.



Helmet usage

- 37% of fatally injured cyclists could have survived if they had been wearing helmets.¹
- The most promising contribution of helmets would be with single-vehicle crashes.¹

ESRA3 (E-survey of Road Users' Attitudes)

- 71 % of Czech cyclist do not use helmet (60 % of EU cyclist)

Older cyclists

- Only a minority of senior cyclists (including e-bike cyclists) used helmets during crashes.
- More frequent severe head injuries of elderly cyclists are also related to the less share of helmet use among seniors.

¹ Bíl, M., Dobiáš, M., Andrášik, R., Bílová, M., & Hejna, P. (2018). Cycling fatalities: When a helmet is useless and when it might save your life. *Safety science*, 105, 71-76.



Absence of bicycle helmets on electric bicycles

Did not use a bicycle helmet when riding e-bike (January 2023 - June 2024):

- 56.3% of those killed
- 57.9% seriously injured
- 57.3% slightly injured

Seniors (65+):

- **61.5% of those killed**
- 50.0% seriously injured
- 56.8% slightly injured



What can I meet on road?

- E-bikes/Pedelecs support the rider to a speed limit of 25 km/h, considering Czech legislation, pedelecs are approved for use on public roads
- Tuned e-bikes
 - the use of illegal tuning allows support even in higher speeds
 - presence of road users, whose physical condition would not allow them to cycle without support?



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