Connected Motorcycle Consortium

Connectivity will make motorcycling safer

Hennes Fischer, Yamaha Motor Europe, Netherlands

Yoichiro Takeda , Honda Motor Co. Ltd. , Japan

Marcus Petzold, VUFO GmbH, Germany

14th International Motorcycle Conference Cologne

3. October 2022

Accident analysis to prove ITS applications

Contents

1. About CMC

Mission

- Make motorcycle riding safer
- Make motorcycles part of future mobility
  (C-ITS: Cooperative Intelligent Transport System)

How

- Joining forces, creating a *common* approach for motorcycle ITS
- Creating a common basic specification for components
- Having motorcycles integrated into global future ITS strategies

1. About CMC: ‘NEXT’ scope

ADAS & V2X = Motorcycle Safety

Vision of Connected Motorcycle Consortium
(www.cmc-info.net)

2a. Goal of accident study

- First motorcycle in-depth analysis using GIDAS

- Understand dynamics and accident **key factors** of motorcycle ⟺ car
- Rate potential of C-ITS and ADAS technology for typical motorcycle accidents

2a. Motorcycle accidents

Majority of accidents:

Caused by other vehicle driver

50 - 70 %

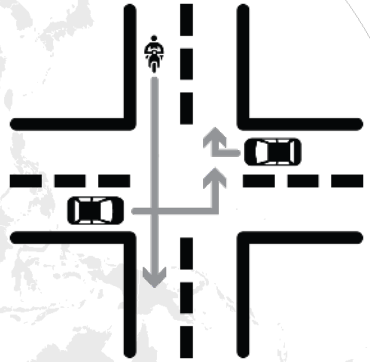
Main collision partner:

Car

60 – 90 %

Majority of collisions:

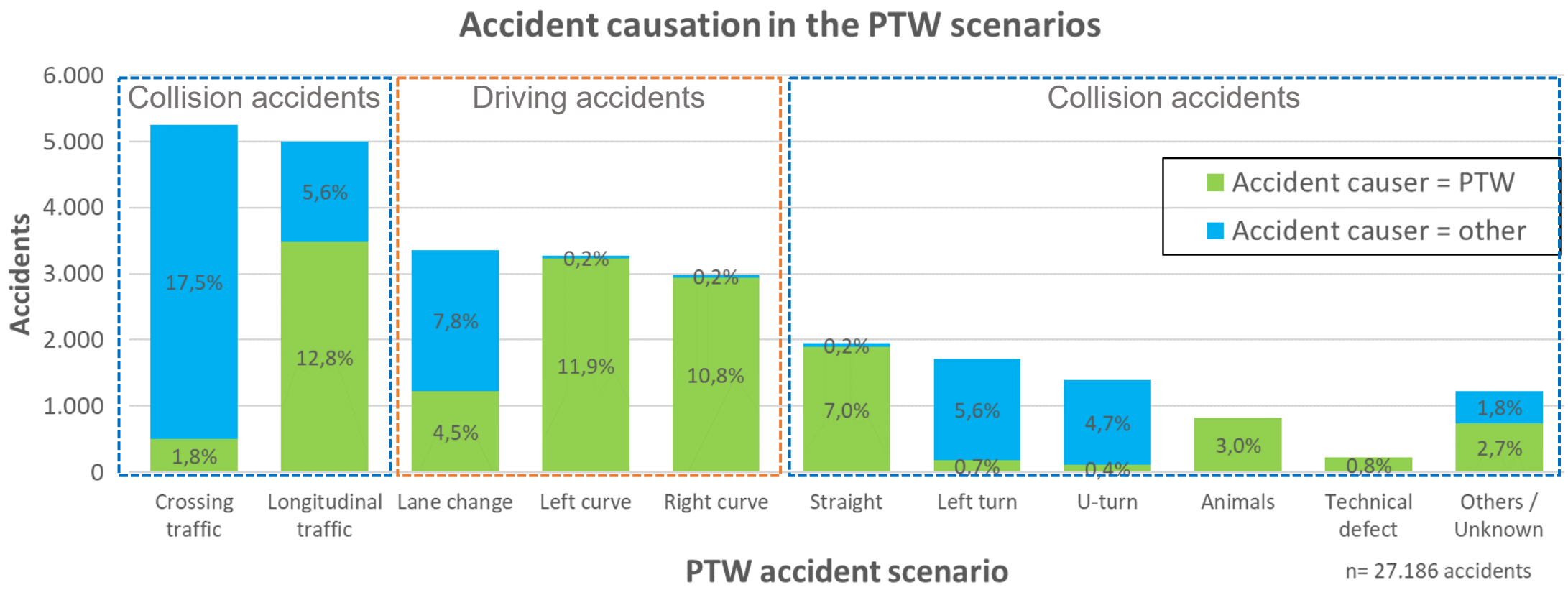
Crossing/turning



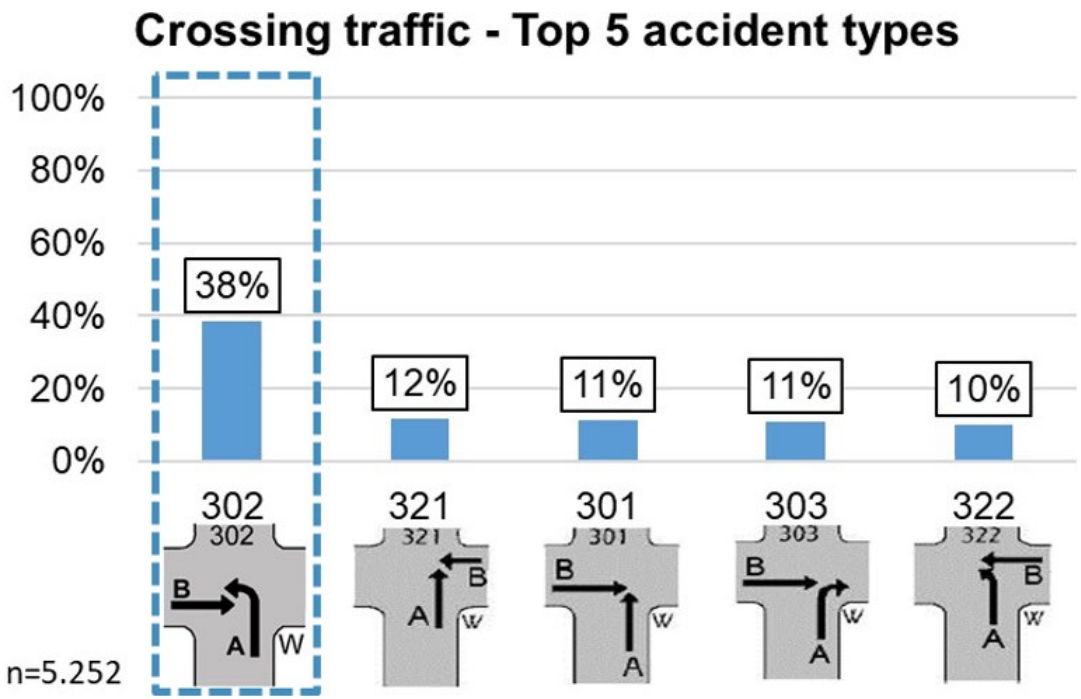
15 – 30 %
at intersections

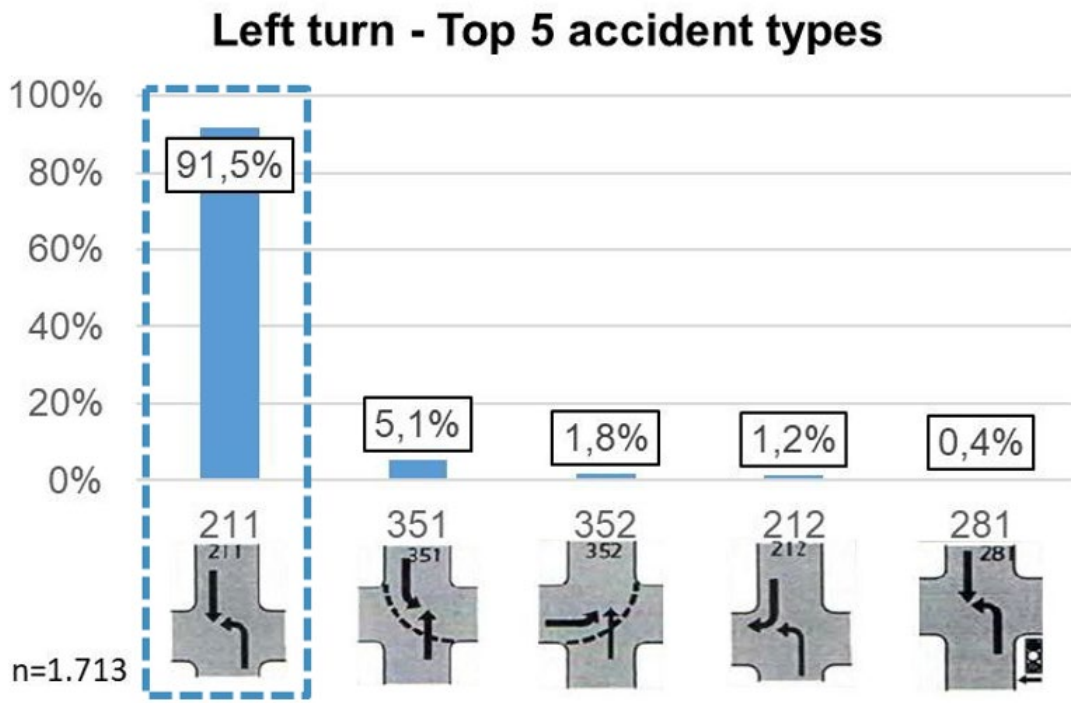
Source data based on country specific studies (USA, Europe, Japan)

2a. Analysis General: Motorcycles not seen



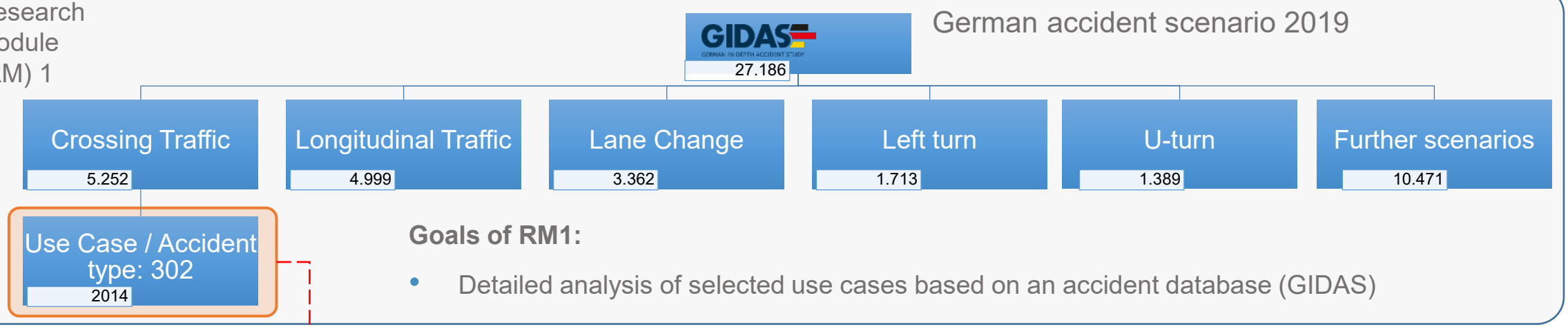
2a. Accident types studied





2b. Study method

Research Module (RM) 1



Goals of RM1:

- Detailed analysis of selected use cases based on an accident database (GIDAS)

Research Module (RM) 2

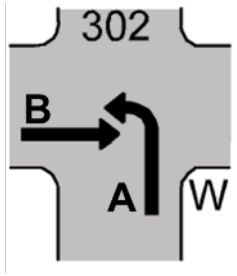
* Unweighted accidents in database

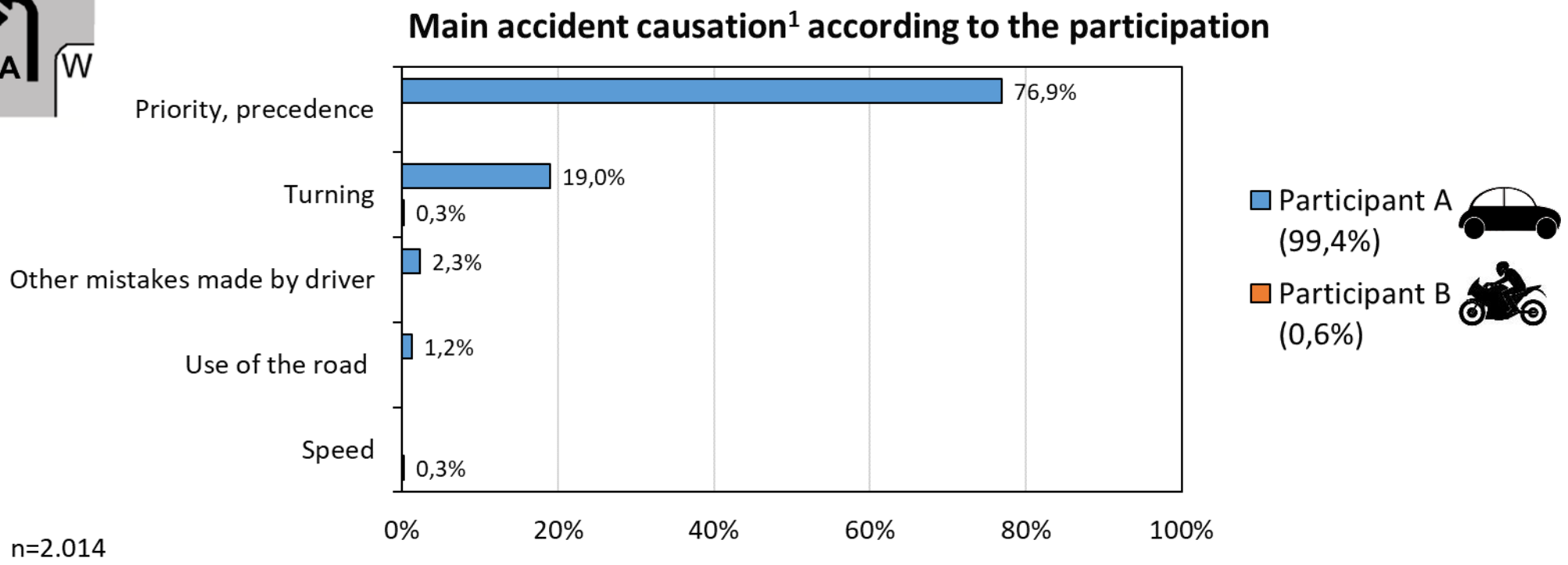
Goals of RM2:

- In-depth analysis based on a accident **simulation database** (GIDAS-PCM)
- Motion and dynamics information of the involved participants for a possible use-/test-case of safety systems, based on real accident data.

- ➢ Trajectories
- ➢ Manoeuvres
- ➢ Speeds
- ➢ Decelerations / Accelerations
- ❑ TTC (Time to Collision) *>in separate model*

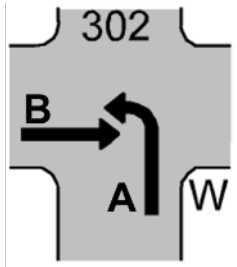
2c. Crossing Type 302

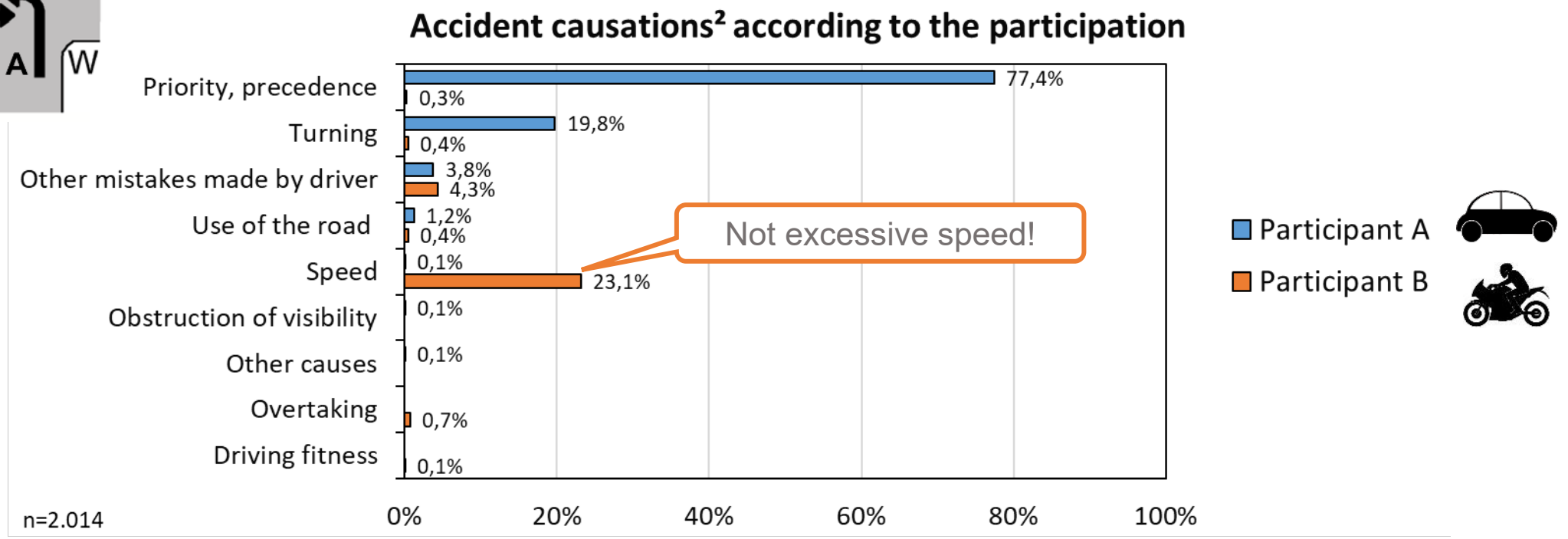




[1]The police and also the technical investigation units in GIDAS have to assign a main accident causer with one main accident causation in each accident.

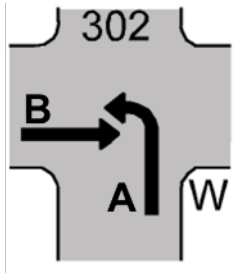
2c. Crossing Type 302

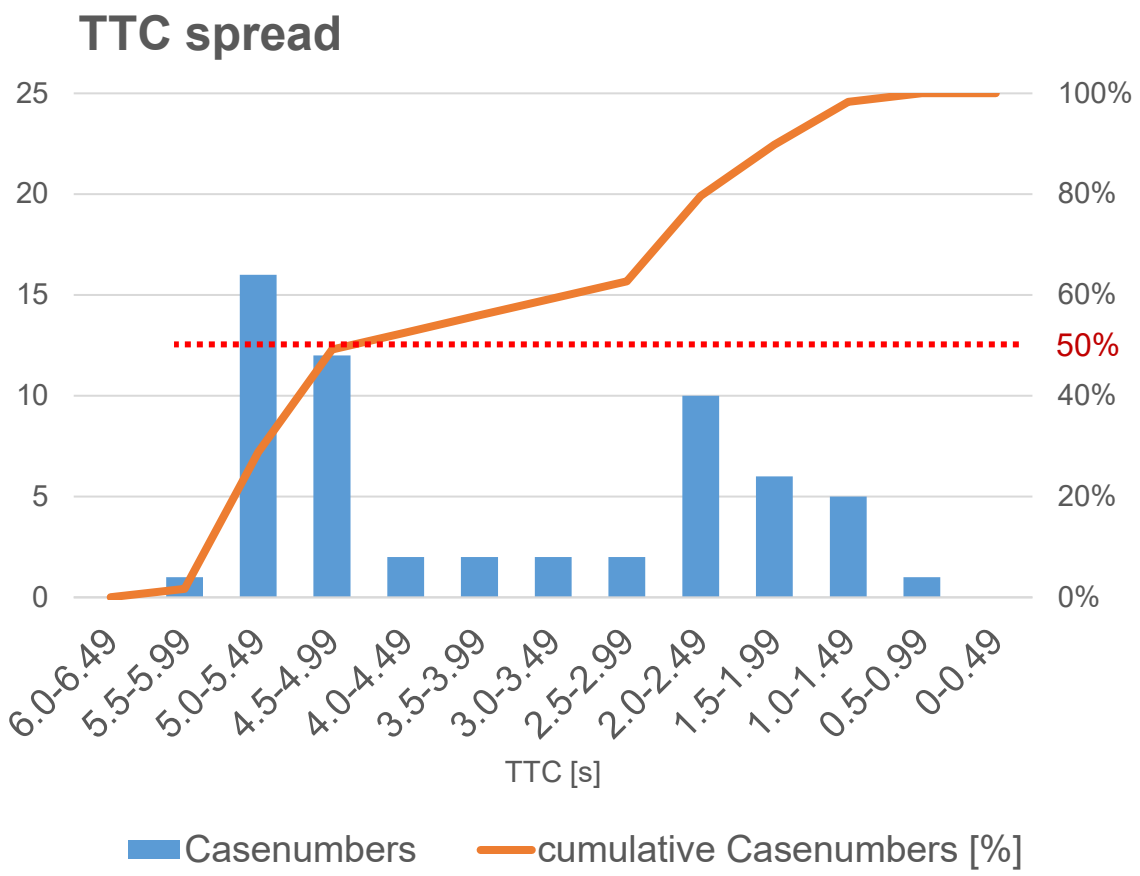




²The police and the technical investigation units in GIDAS can assign up to 3 accident causations for each accident participant. Consequently, one accident can have several accident causes depending on the participant and so the sum of the accident causations is ≥100%.

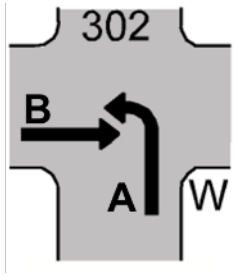
2c. Time-To-Collision Type 302





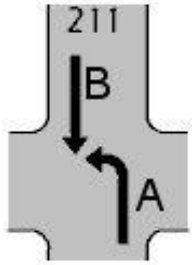
- In 50% of the accidents, a system can warn the rider already at least 4.5 sec. before collision.

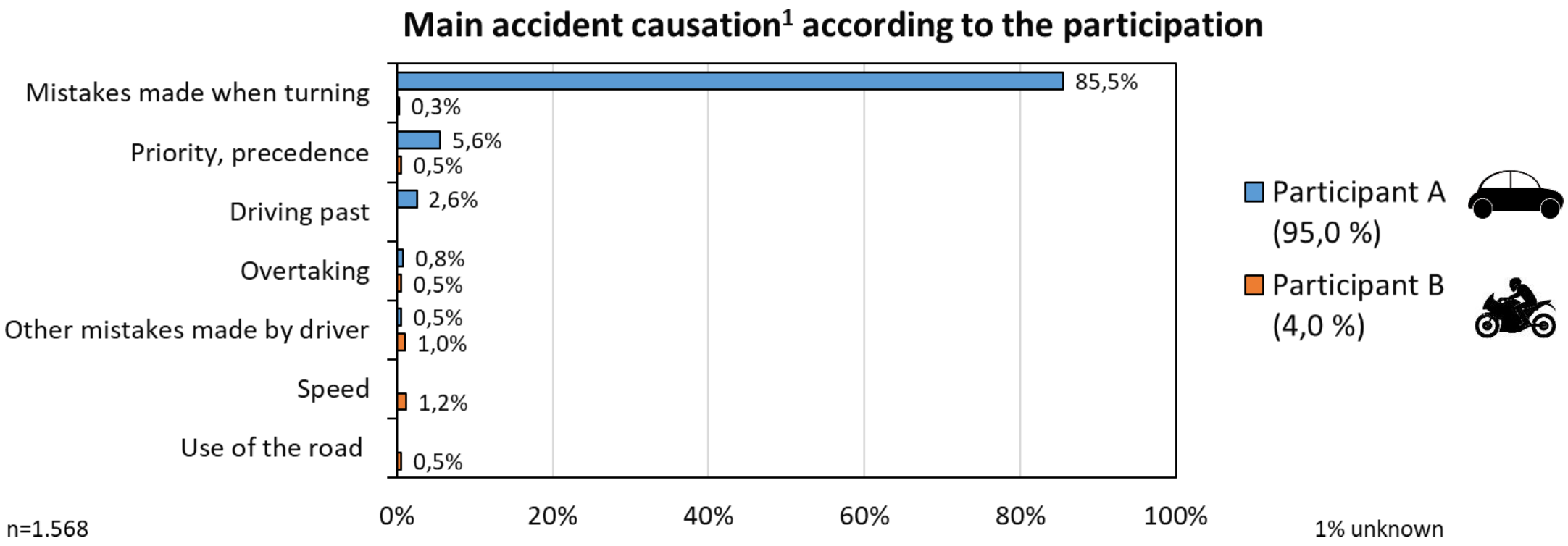
2c. Key Findings Type 302



- More than 90% of these accidents occur at junctions, crossings or property exits.
- In more than 95% of the cases, M1/N1 vehicles (cars and trucks) cause the accidents.
- Participant B is a motorcycle in more than 90% of accidents.
- The speed at collision of participant A is 5-18 km/h, while that of participant B is 26-47 km/h (75%tile).
- In more than 30% of the accidents, there was a view obstruction for participant A.
- Weather condition is not a major factor for the accidents.
- The last two manoeuvres before collision indicate that participant A did not decelerate before collision, but instead, was accelerating in more than 50% of the accidents.
- In half of the cases, a potential collision could already be predicted 4.5 seconds before collision (50%tile of the TTC values).

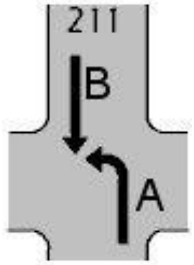
2d. Left Turn Type 211

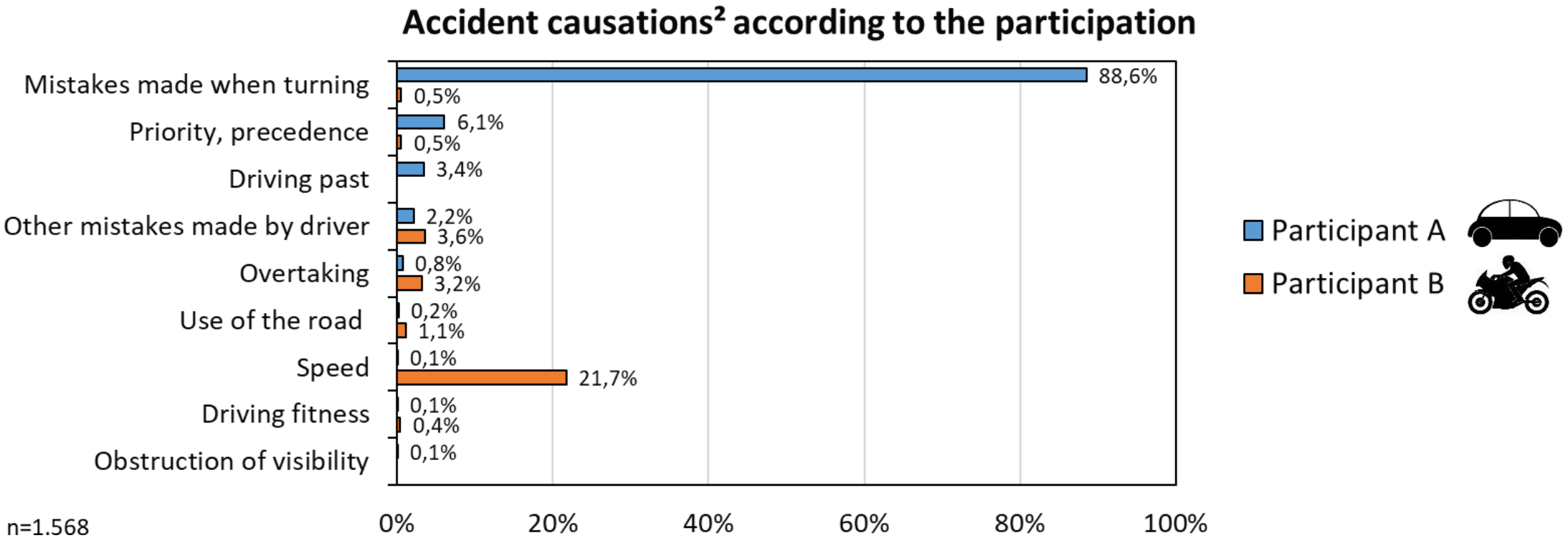




[1]The police and also the technical investigation units in GIDAS have to assign a main accident causer with one main accident causation in each accident.

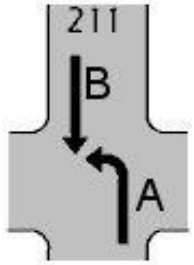
2d. Left Turn Type 211

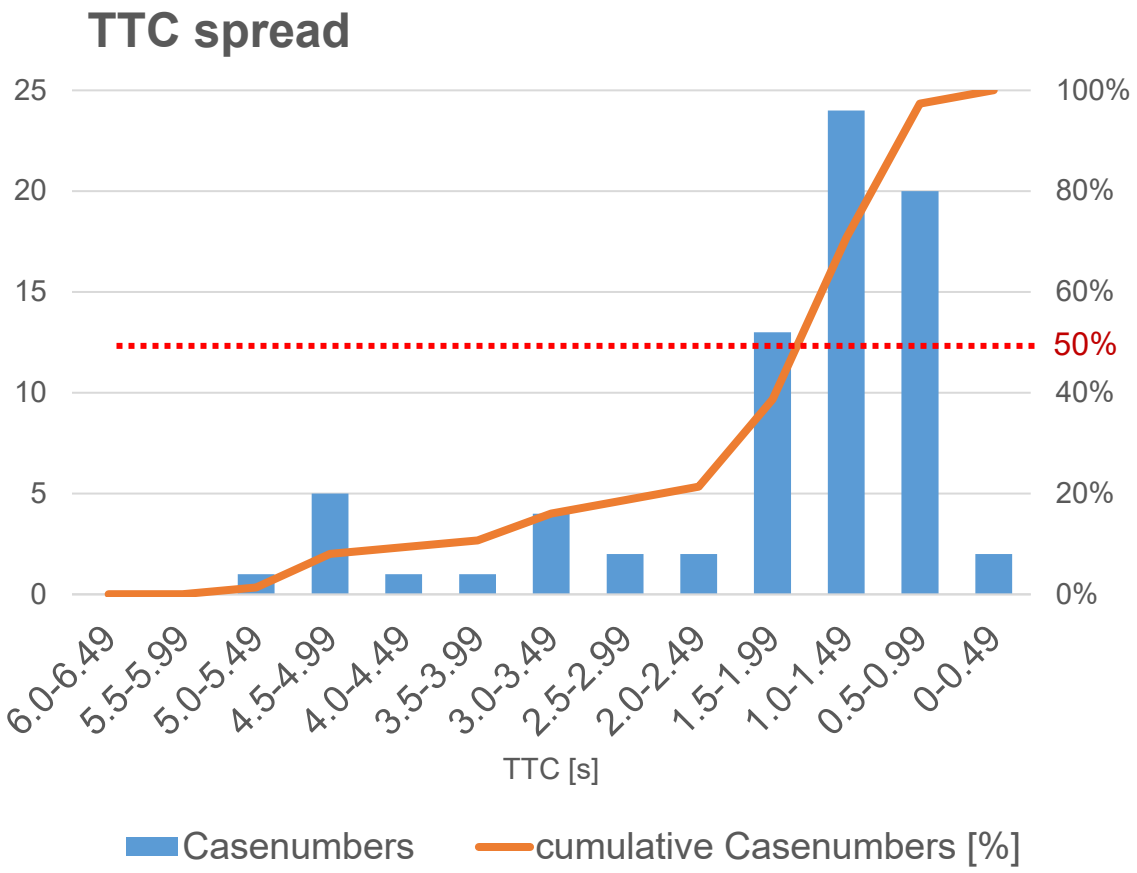




²The police and the technical investigation units in GIDAS can assign up to 3 accident causations for each accident participant. Consequently, one accident can have several accident causes depending on the participant and so the sum of the accident causations is ≥100%.

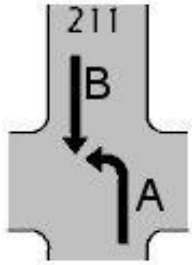
2d. Time-To-Collision Type 211





- In 50% of the accidents, a system can warn the rider at least 1.5 sec. before collision.

2d. Key Findings Type 211



- More than 90% of these accidents occur at junctions, crossings or property exits.
- Accidents are caused by M1/N1 vehicles in more than 90% of the cases.
- In approx. 17% of the accidents, there was a view obstruction.
- Weather condition is not a major factor for the accidents.
- The last two maneuvers before collision indicate that the accident causer did not decelerate before collision in more than 40% of accidents.
- In half of the cases, a potential collision could be predicted not earlier than 1.5 s before collision. (50%tile of the TTC values).

2e. Summary

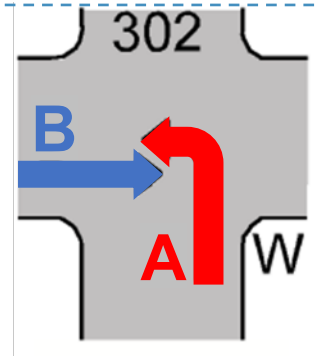
- Motorcycles are overseen
  - The investigation confirms once more, motorcycles are often overseen:
    here in over 90% of these accidents.
- Mostly ‘line of sight’
  - View obstructions only occurred in less than 30% of cases and weather was not an important influence;
    so most of the time the accident happened 'in line of sight'.
- Connectivity has potential
  - This implies that there is a need for technology support to inform car/truck drivers of the existence of oncoming motorcycles.
- Driver in the loop
  - Such information or warning should come in time for drivers to react;
    Different scenarios however, show different opportunities to inform timely.

3. Conclusion: Study shows good potential

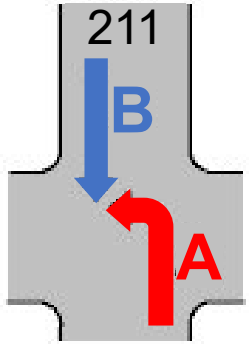
Categorization of Time-To-Collision

- 0s - <0.6s → severely critical
- 0.6s - <1.6s → critical
- 1.6s - <2.6s → light critical
- 2.6s - > → uncritical

- Source: Breuer, J.; Gleissner, S. : VDI-Berichte 1960, S. 397 Neue Systeme zur Vermeidung bzw. Folgenminderung von Auffahrunfällen. Düsseldorf : VDI Verlag, 2006
- Study was about longitudinal scenarios – therefore only an indication



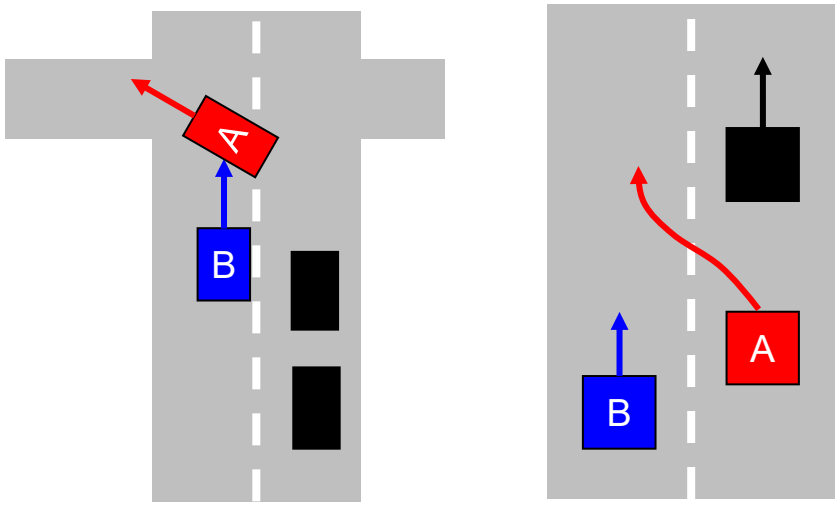
- TTC promising
- Crash mitigation feasible already

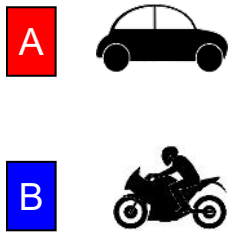


- Low TTC decreases efficiency
- Some use cases feasible
- Next generation sensing & AEB

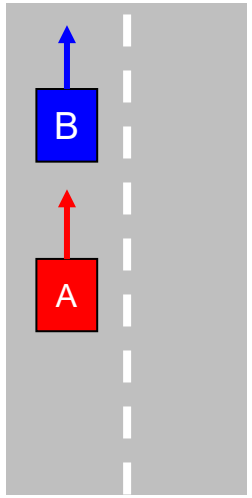
Next: other accident scenarios

1: Lane Change Scenarios



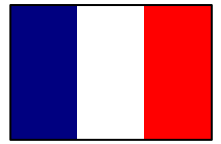


2: Rear End Collision



Next: other countries

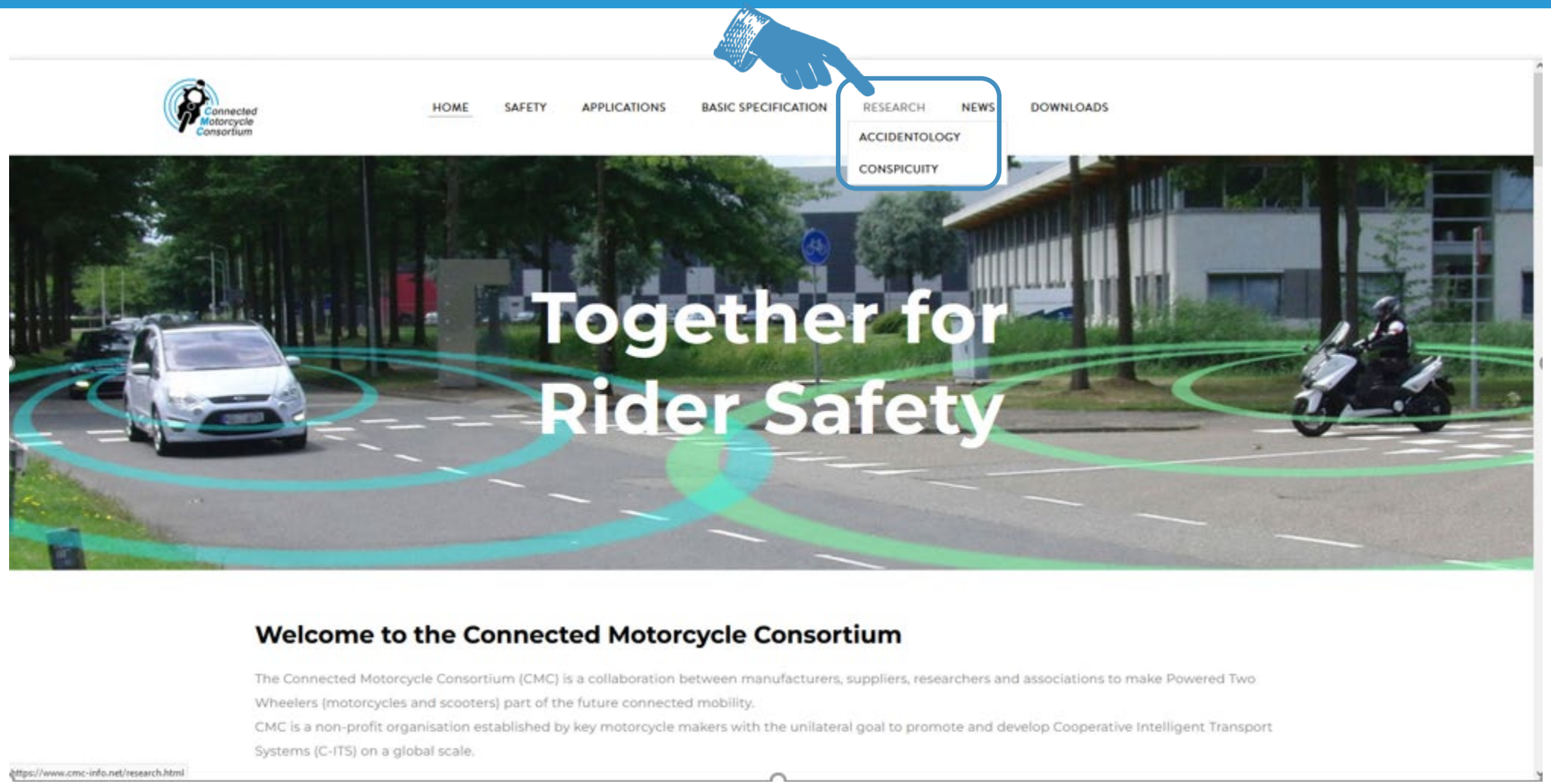
German/GIDAS data was used because most complete;
Now study can be extended to other countries;
Weighting of German data improves comparison



Challenges

- Different data format and classification
- Different usage of PTW
  e.g. Italy has highest proportion of urban accidents (85%) > France (72%) > Germany (60%)
- Different Rider & Driver behavior

Documents published



Connected Motorcycle Consortium

Thank you for your attention

BMW MOTORRAD

HONDA

DUCATI

HARLEY-DAVIDSON

TRIUMPH

SUZUKI

nfiniity

VUFO GmbH

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

wivw

Technische Hochschule Ingolstadt

ika | RWTH AACHEN UNIVERSITY

ifz
Institut für Zweiradsicherheit e.V.

FIM
FÉDÉRATION INTERNATIONALE DE MOTOCYCLISME

acem
The Motorcycle Industry In Europe

www.cmc-info.net

contact@cmc-info.net

KTM

YAMAHA

bertrandt