Statement of Work on the Issue of Equitable Occupant Protection

Statement from 18.10.2023 based on the findings of the DVR working group „Adaptivity and Accident Data“

Participants of the Working Group

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Introduction and Motivation

The research question of gender equality with regards to the protection of occupants in passenger cars has come into focus through a number of studies from North America and in Europe. The main research question was whether females are at higher risk of sustaining moderate or more severe injuries (MAIS2+ or MAIS3+) than males when involved in motor vehicle crashes.

The German Road Safety Council (Deutscher Verkehrssicherheitsrat e.V., DVR) formed a working group on crash data and adaptivity (Working Group „Adaptivity and Accident Data“) to look into German crash databases and to discuss them in the context of published studies. Experts from the group met numerous times to evaluate the results from pre-existing studies and own analyses (data from GIDAS, ADAC and Unfallforschung der Versicherer).

During the discussion in the working group some aspects were identified. Some of these are so prominent that the group thinks they should not go unnoticed in the discussion about gender equality in passive crash safety as the analysis and view on the impact of biological sex might otherwise become skewed. The group would therefore like to share them with eqOP.

Given the current state of research, no final conclusion can be drawn as to which extent the variable of sex (female vs. male) contributes to the risk of MAIS2+ or MAIS3+ injuries for car occupants in road traffic crashes. An increased risk would be accepted, if in fully comparable exposure situations the outcome in terms of injury risk/severity/distribution clearly differs related to sex. “Fully comparable” would also be accepted for variables that were not or cannot be measured, if a non-biased, equal distribution for both sexes can reasonably be assumed.

All regarded published studies have their shortcomings. Selection and documentation related biases as well as the choice of statistical models could have influenced some of the results.

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Further, potentially confounding variables had partly been neglected, depending on study, but should have been considered appropriately.

These variables are related to

- the person (among them age, body height, BMI …),
- the vehicle (among them seating position in vehicle, curb weight of vehicle, vehicle type and MY …),
- the crash event (among them crash type like frontal, side or rear impact, pulse and delta v, direction of impact, impact location on vehicle…).

No study could take pre-crash behavior or sitting posture into account, nearly no study regarded the impact pulse. Most of the studies refer to NASS-CDS and FARS (both US) data.

Furthermore, it needs to be stated, that the group identified injury risks derived from rear impact crashes as potentially biasing the bigger picture of all crash types due to most injuries being AIS1 severity. It was decided to analyze rear-end impacts in a separate study.

Conclusion

Gender specific differences should be understood as only one criterion, whereas other aspects of occupant diversity, like age, mass or height (e.g., BMI), as well as variables tied to the vehicle and the crash event may influence gender specific findings in a way that it is strongly recommended to include them in such studies.

Excerpt of German Studies

Malczyk A., Kröling S. Occupant injury severity and gender: Evidence for a gender gap? Gesamtverband der Deutschen Versicherungswirtschaft e.V., Unfallforschung der Versicherer, Berlin, 2022:

- In German national accident statistics, 2019, the proportion of seriously injured drivers among driver casualties is smaller throughout all age groups > 17 yo. for female drivers than it is for male drivers.
- The proportion of seriously injured passengers among passenger casualties is smaller for most age groups > 17 yo. for female passengers than it is for male passengers, except for age groups 55-60 yo. and 65-70 yo.
- In UDB accident database, female occupants remained uninjured (MAIS0) significantly less frequently than male occupants.

- Multivariate regression analysis of data from UDB database demonstrated an OR of 1.13 for females (vs. males) to sustain MAIS2+ injuries in front impacts, however non-significant ($p = 0.63$). Seating position was a significant variable (OR of 2.44 for front seat passenger vs. driver to sustain MAIS2+ injuries). Also, age of occupant, registration year of the vehicle and curb weight of the vehicle were significant variables ($p < 0.01$).
- In all crash modes, cars with female occupants were on average 100 kg lighter than cars with male occupants (1299 kg vs. 1400 kg), but average years of registration differed only slightly (registration year 2005.8 vs. 2005.0).
- In rear impacts, sex was the only significant variable with an OR of 3.35 for females (vs. males) to sustain MAIS1+ injuries (i.e., any injury).

Note: In German national statistics, „seriously injured“ are defined as injured persons who are hospitalized for > 24 hrs., unless death occurs within 30 days after the accident.

Note: UDB is the Insurers Accident Database, a sample of third-party loss insurers claim files involving personal damage and at least 15,000 Euro total claim costs. For the above analysis, only passenger cars colliding with other passenger cars or commercial vans were considered.

Ostermaier I., Ostermaier M., Sandner V., Kolke R. Rückhaltesysteme für alle Pkw-Insassen? (Restraint systems for all occupants?) ADAC e.V., Landsberg am Lech, 2021:

- Descriptive analysis of serious traffic accidents in Germany obtained from the ADAC accident database. In the accidents, a rescue helicopter was called into action, which means that this is a special sample of accidents with mainly seriously injured people outside built-up areas. Only occupants treated by the rescue helicopter crew were included in the analysis. This can also be more than one person per accident/car.
- In a first step, only frontal crashes were considered, with the year of manufacture of the passenger cars greater than or equal to 2005. In addition, only occupants of the first row of seats were considered. Drivers and front-seat passengers were not considered separately, as the number of cases would then be too small. Ratio: 81% driver and 19% passenger. Altogether, there was a nearly equal number of female and male patients. Injury severity per body region is assessed by the emergency doctor during prehospital treatment. The car occupants involved in accidents were clustered regarding their gender and age.
- The comparison of gender shows that the injury severity is lower for female occupants compared to male occupants. The injury pattern differs between the two sexes:

Females are more likely to be diagnosed with trauma to the pelvis and lower extremities, while males are more likely to experience traumatic head injury.

- In terms of the age of the occupants, the study showed that the group over 60 years old had a higher injury severity than the younger age groups. 46% of occupants 60 years or older were severely and fatally injured, 37% of those 30 to 59 years old and 34% of those 17 to 29 years old. The older car occupants suffer thoracic trauma significantly more often. These were also more severe.
- The analysis of side collisions showed a similar picture.

Note: Due to the nature of the data collection, it was not possible to completely separate the age and gender of the occupants from other factors (e.g., accident severity, speed, collision type, vehicle class). An evaluation of accident severity (e.g., delta V) was also possible only to a limited extent.

Gez.

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