Specific features of accidents caused by Elderly traffic participants

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Abstract

With an ever rising human life expectancy the share of elderly people in society is constantly rising. This leads to the fact that at the same rate the share of people with age related diseases such as dementia and poor eyesight taking part in traffic will rise and therefore traffic accidents caused by this group of people due to the disease will play an ever greater role. This Situation will be among the future challenges of road safety work.

At present this study displays specific characteristics of accidents caused by elderly car drivers (aged 65 or higher) based on the analysis of the German In-Depth Accident Study GIDAS. Herein almost 1000 elderly car drivers were identified as accident participants in the years 2008 to 2011. The focus of this study lies on identifying special types of accidents which are caused by elderly drivers and on characterizing these types with the information gathered on scene and by interviewing the participants. The main evidence analyzed is the knowledge about the accident locality, the trajectories of the participants as well as the reasons for the occurrence of the accidents. Furthermore personal information such as the personal condition before the accident and driving purposes is used to identify patterns of contributing circumstances for accidents caused by elderly traffic participants.

The demographic change in Germany is a well-known phenomenon which is leading to a distribution of population, where the share of older People in society is continuously increasing [1]. On the other hand human life expectancy is continuously increasing in Germany but the appearance of age related diseases such as dementia or poor eye sight is not delayed in the same manner. As a result of this situation a steady increase of the share of elderly traffic participants with diseases that have an influence on the driving performance is expected in the future. This situation will expectably have a significant impact on the accident situation in Germany and will be among the future challenges of road safety work. The present study seeks to identify specific features or circumstances of accidents caused by elderly traffic participants to antagonize these types of accidents in the future by appropriate road safety work.

The study focuses on elderly car drivers that were involved in an accident with at least one person injured. To evaluate the relevance of a study on the accident situation of elderly car drivers in Germany, in a first step the German National Data was analysed to display the occurrence of accidents with elderly car drivers in Germany. In a second step the features and the characteristics of accidents caused by elderly car drivers were analysed using in-depth accident data from the GIDAS Database. GIDAS' special feature is a statistically representative sample appropriate for all types of accidents with personal injury collected by an on scene investigation team consisting of physicians and engineers and a very comprehensive, detailed compilation of the accident data by means of more than 2000 items of information for every accident, concerning injury and causation information as well as deformation patterns, vehicle details, driving and collision speeds and other accident characteristics [2].

The emphasis lies on analyzing different age groups of car drivers as car drivers are the most frequent group of road users in Germany and account for the most accidents on German roads. Concerning the accident severity all accidents were taken into account if at least one person was injured (injury accidents including fatal accidents) as they have the greatest socio economic impact.

German National Data

To display the accident situation in Germany the dataset of the German Federal Statistical Office, DESTATIS from the year 2010 was analysed as data of this year was the youngest data available at the time of the analysis. The dataset included 342.612 car drivers of all age groups that were involved in an injury accident. The distribution of the frequency of being in an accident for different age groups is displayed in Figure 1. Drivers aged 65 or older account for only 11.1% of all involved car drivers and thus are not much more frequently found in crashes than the youngest drivers of only three age-years 18-20 with a frequency of 10.3%. However it can be assumed that the elderly drive less often than younger drivers and if they drive, the elderly presumably drive shorter distances.

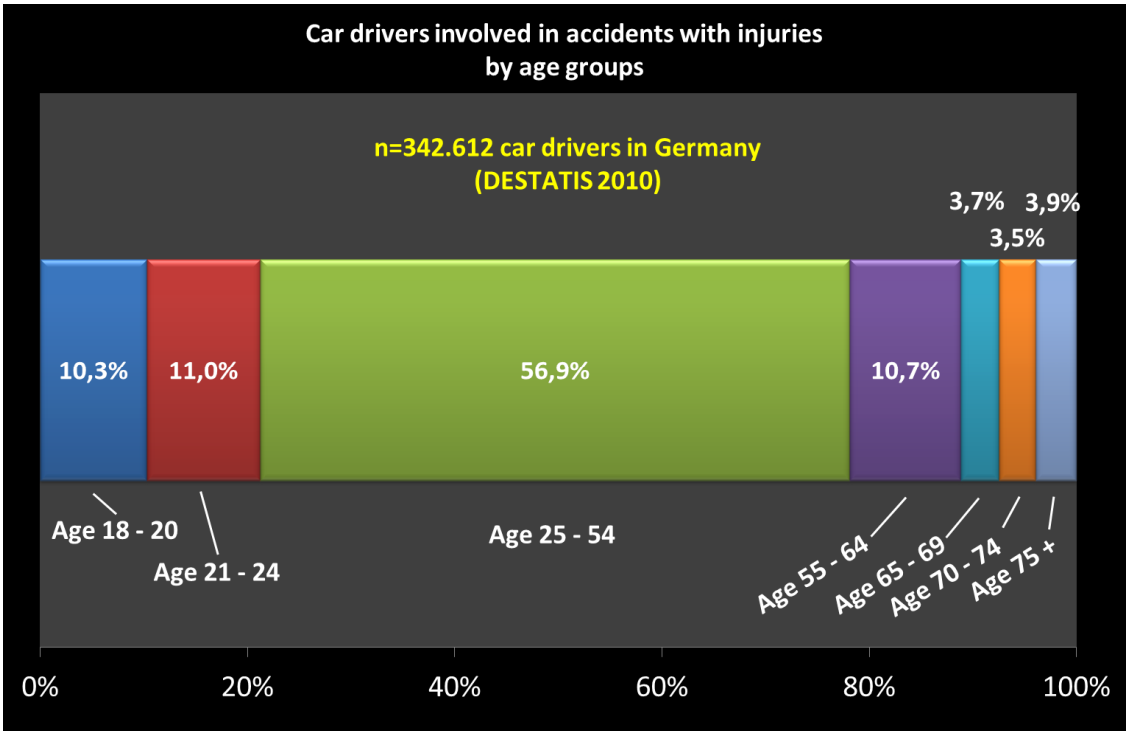

Figure 1. Car drivers involved in accidents with injuries in Germany

To receive an indication if the elderly car drivers cause accidents more often when driving, the sole display of the frequencies by age groups is not sufficient. Therefore the car drivers involved in an accident were divided into 2 groups: The group that caused an accident (main causers according to the police) and the group that did not cause an accident (and was involved by coincidence). It was then presumed, that if the share of causers in a certain age group is higher than in another age group that this would indicate that this age group more often causes an accident. When looking at all age groups, 55.6% of the car drivers involved in an accident were the main causers of the accident (Figure 2). When looking at different age groups however, the frequency of being an accident causer varies significantly. In the group of novice drivers (aged 18-20) involved in an accident some 71.2% had caused an accident. This portion drops to 61.3% in the age group 21-24 but is still over the portion of all age groups. Experienced drivers aged 25 to 54 (share of causers: 50.2%) and drivers of the age group 55-64 (share of causers: 52.5%) less often cause an accident compared to the average of 55.6%. However the age group 65 to 69 the share of causers starts to rise above the average of all age groups. With older ages the amount of drivers that had caused an accident compared to the amount of involved drivers that did not cause an accident constantly rises. For the group of drivers aged above 75 years 76% of the drivers involved in an accident had also caused the accident. This share is even higher than

the share of causers in the group of novice drivers, which are known to have little experience and a high acceptance for taking risks in traffic. Therefore the analysis of the German national statistics data clearly shows that there is a certain correlation between the age and the occurrence of an accident. Older car drivers apparently drive less, but if they drive they cause more accidents.

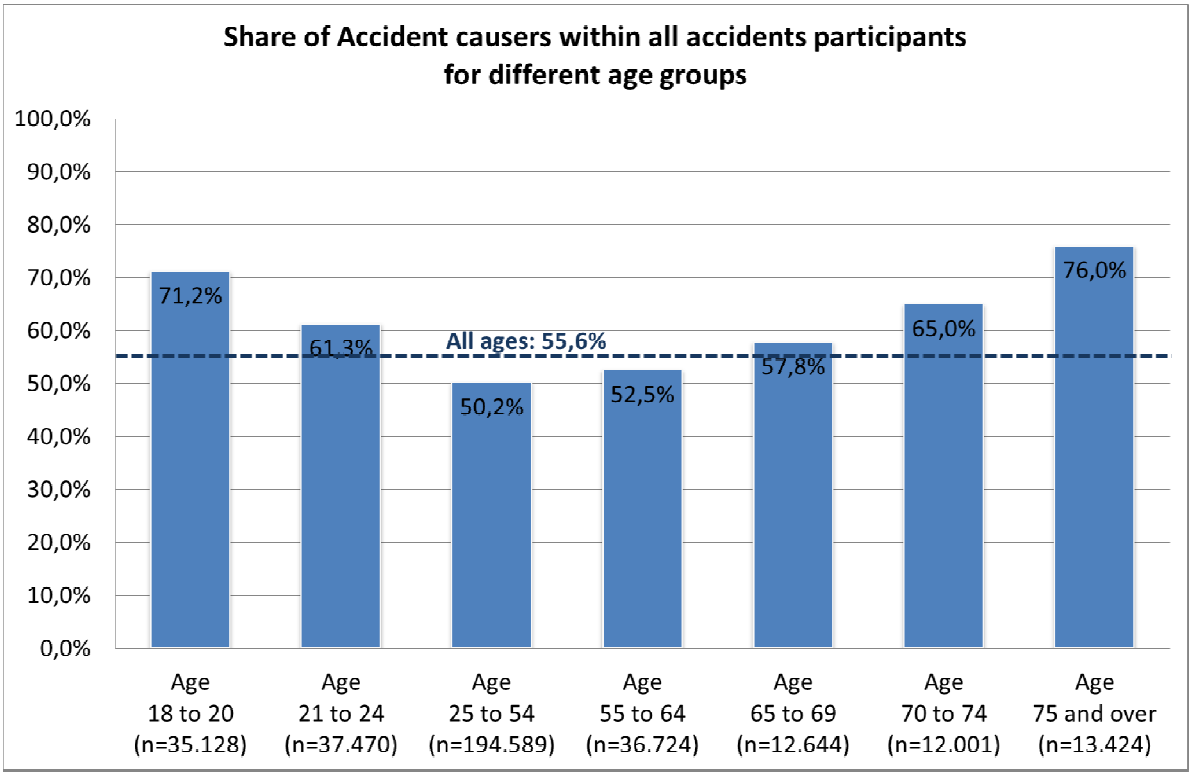

Figure 2: Share of Accident causers within all accidents participants for different age groups

Analysis of GIDAS in-depth data

To describe the accidents caused by elderly car drivers and to compare these accidents to the accidents caused by non-elderly car drivers the data of the GIDAS-database was analysed. The sample frame included cases of car drivers that were the main causers of an accident with at least one injured person. For the 4 year period 2008 – 2011 some 4 037 cases were identified of which 3 947 cases could be taken into the analyses where the age of the driver was known.

In a first step the time of the occurrence of the accident was analysed (Figure 3). The group of the non-elderly car drivers (under 65 years) shows a different time distribution than the group of the elderly car drivers. The non-elderly participate at traffic during the rush hours and cause most accidents between 6 am and 8 am and between 3 pm and 7 pm. The elderly car drivers however seem to stay away from the morning rush hour but cause the most accidents between 9 am and 11 am. Furthermore it is visible, that only few accidents of elderly car drivers were caused during night time, when it is dark, presumably because the Elderly don't participate in traffic very often at these hours.

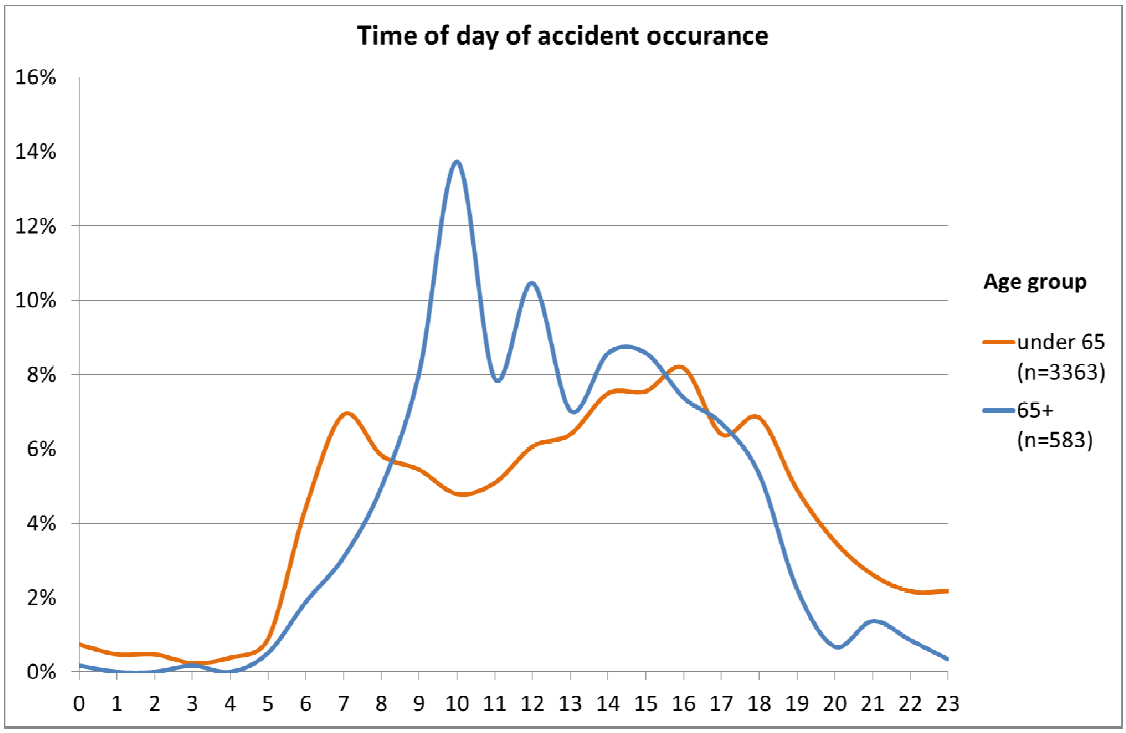

Figure 3: Hour of the accident occurrence, comparing elderly car drivers with non-elderly car drivers.

In a next step the type of road where the accidents happened was analysed, comparing the non-elderly car drivers to different age groups of elderly car drivers (Figure 4).

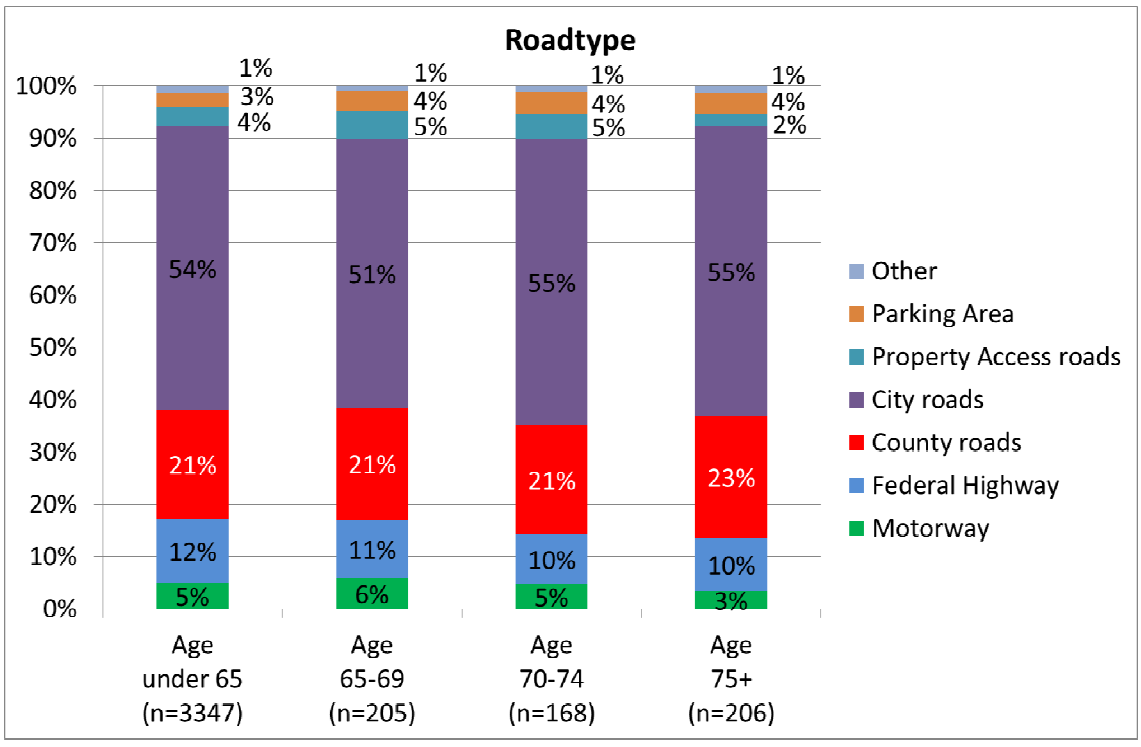

Figure 4: Road type of accidents caused by elderly and non-elderly car drivers.

It is visible, that no significant differences were found regarding the distribution of accidents on different types of road. As expected few accidents happened on motorways and most of the accidents happened on city streets. When comparing the elderly car drivers (age 65+) with the non-elderly car drivers (age under 65) and when comparing different age groups of elderly car drivers no tendency towards a type of road with increasing age can be identified.

The driver's age also has little influence on the condition of the road-surface when looking at accidents caused by car drivers. It can be seen in Figure 5 that with higher ages of the driver who caused an accident the share of accidents on dry roads increases from 71% at ages between 65 and 69 to 75% at ages above 75 years. This increase however is only marginal and seems to be a result of the fact that elderly car drivers try to avoid driving when the road is wet or even slippery due to ice or snow.

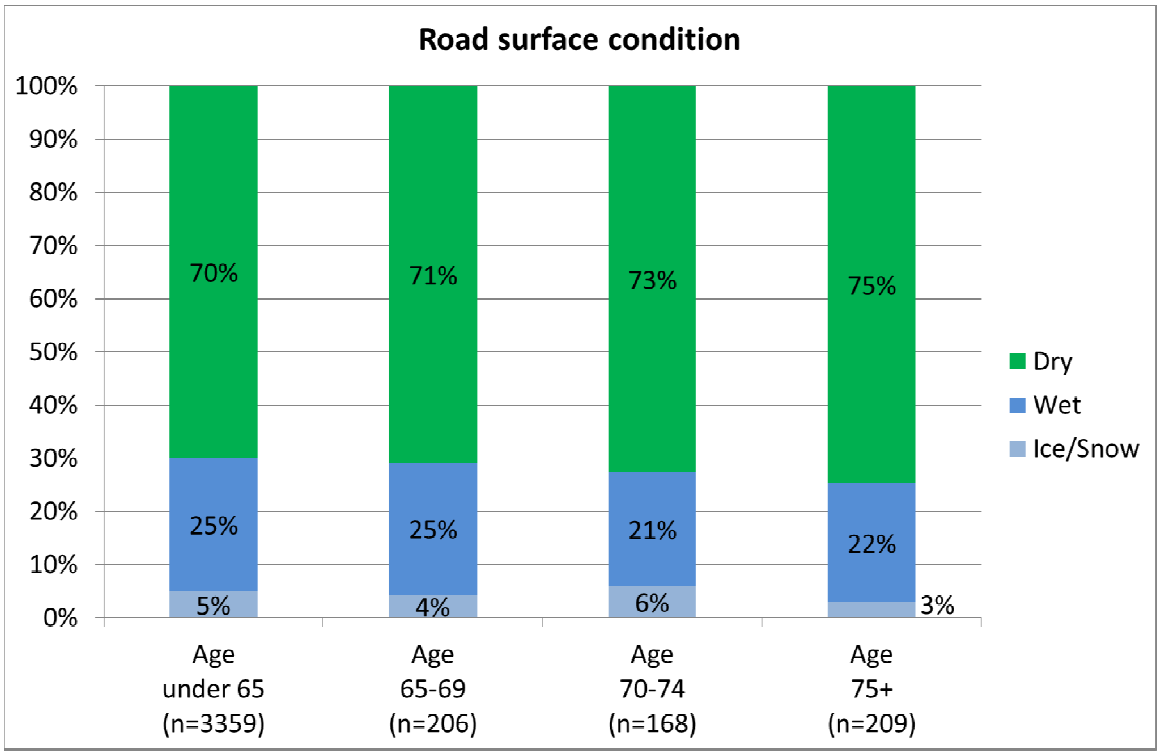

Figure 5: Road surface condition at accidents caused by car drivers of different age groups

So while the age of the driver causing an accident seems to have an influence on the time of day of the accident, there is no major influence visible on the place (road type) of the accident or on the road surface condition.

The amount of passengers in the car when causing an accident was examined as passengers may have an influence on the driving performance of the driver –positive: helping to navigate or negative: Distraction. Figure 6 shows the amount of passengers in the car together with the drivers of different age groups.

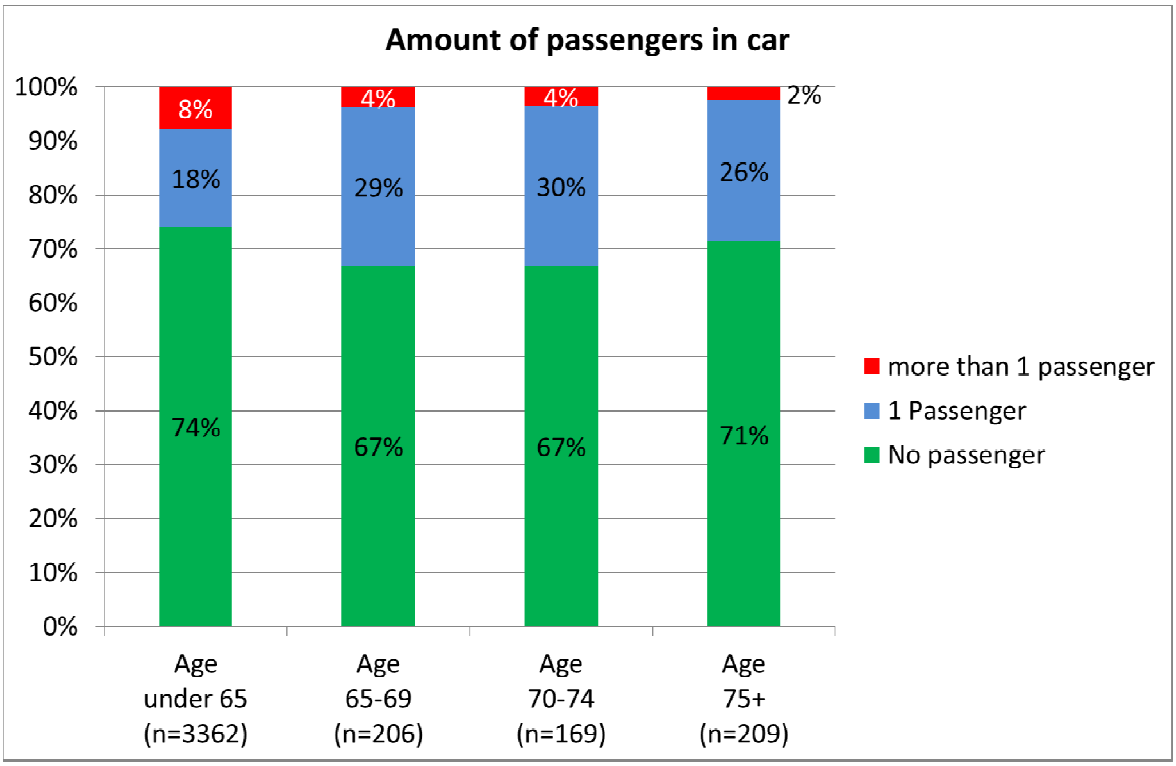

Figure 6: Amount of passengers in car when causing an accident

While car drivers under the age of 65 had no passenger on board in 74% of the cases when causing an accident, elderly car drivers in general caused more accidents with passengers on board than the non-elderly. The rate of cases where there was only one passenger on board drops to 67% for the age groups 65-69 and 70-74. It is probable, that the elderly more often participate in traffic with one passenger (e.g. husband/wife) than the non-elderly, where e.g. trips to work are often done alone. An influence of the passenger on the driving performance or on the causes of the accident could not be analysed, as not sufficient accident causation data (ACAS) was available when conducting the study.

To address the issue of a bad eye sight of the driver e.g. due to myopia the need of corrective lenses was analysed as an indicator that vision problems could have influenced the accident occurrence. The information on the eye-sight was collected after the accident by asking the participants whether they need corrective lenses or not. The fact if they were using correct lenses/glasses at the time of the accident was not examined. Nevertheless Figure 7 displays that only the age group under 50 years mostly do not have vision problems (70%). Already in the transition group to the older age (50-54 years and 55-59 years) problems with the vision start to increase to over 50% for the age group 55-59. The elderly car drivers over 65 years needed corrective lenses in over 60% of the cases. So problem with the eye sight are predominant at older ages. It is therefore probable that a bad eye-sight could be a factor when trying to answer the question why elderly car drivers cause accidents more often.

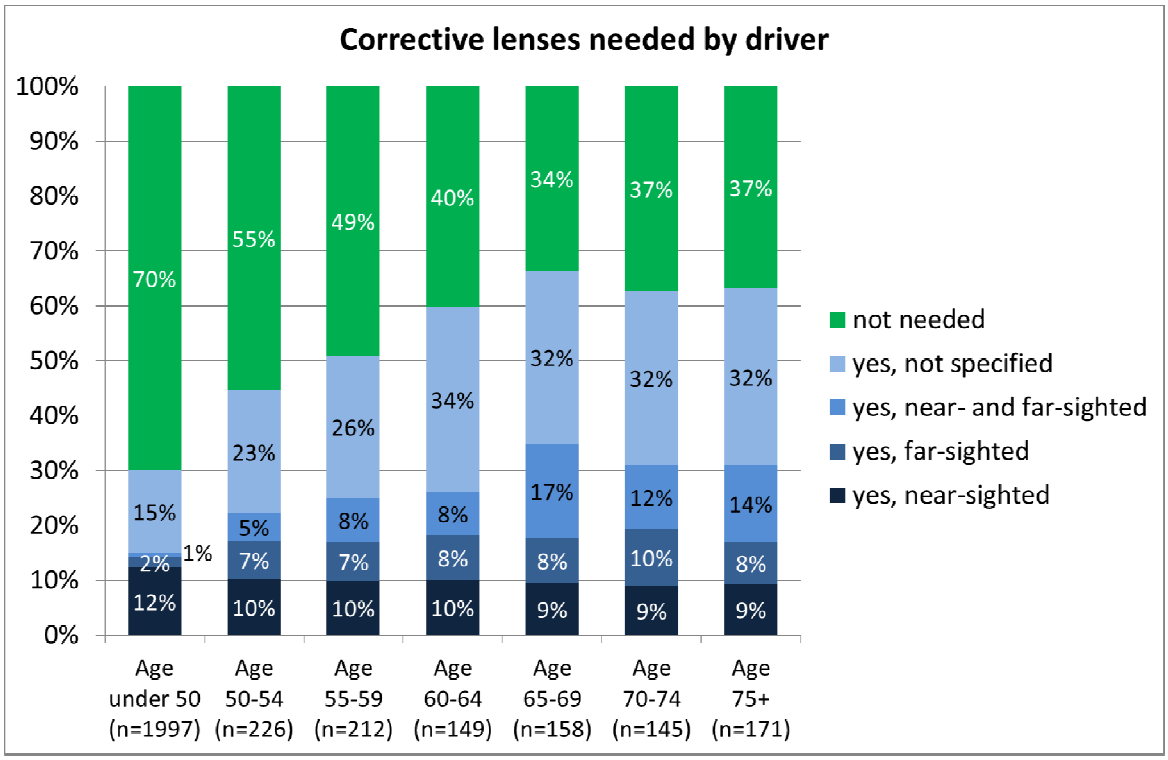

Figure 7. Corrective lenses needed by car drivers that caused an accident for different age groups.

Analysing the GDV-accident-type is an appropriate method to describe differences in the accidents events of certain age groups. The accidents type is classified by the initial conflict situation which led to the crash. There are 7 main categories of accident types (*driving accidents, Turning-off accidents, Crossing accidents, Pedestrian accidents, accidents with parked vehicles, accidents in lateral traffic and "other" accidents*) which are further specified by nearly 300 subtypes in those categories.

Figure 8 shows the distribution of accident types for the elderly (65+) car drivers and the non-elderly car drivers (under 65). The most frequent accidents caused by elderly car drivers are "turning-off accidents" (21%) and "crossing accidents" (34%), here the frequency is even higher than with the non-elderly car drivers (16%/31%). Driving accidents however are underrepresented in the group of elderly car drivers (11%) compared to the non-elderly (15%). So elderly car drivers more often cause accidents due a conflict of the right of way, while accidents due to a false estimation or high acceptance of risks (as often found in driving accidents) are underrepresented. When looking at the most frequent accidents subtypes of "turning off accidents", the accident sub-type 211 (turning off to the left, conflict with on-coming traffic) is about evenly frequently found in both age groups with 36% for the non-elderly and 37% for the elderly. The second most frequent subtype is turning off to the right with a conflict with cyclists on the bicycle-path (Type 243 and 244) for both age groups. A significant difference in the frequency of these accident sub-types between the two age groups can also not be found. In the group of crossing accidents (Type 3) there is also no significant difference evident in the distribution of the most frequent sub-types. For both age groups the conflict when entering a crossing and not giving way to the traffic the left from (types 301 & 302) is most frequently found (age under 65: 30%; age 65 and older: 36%) and the conflict when entering a crossing and not giving way to the traffic from the right (types 321 & 322) is the second most frequently found accident sub-type (age under 65: 30%; age 65 and older: 36%).

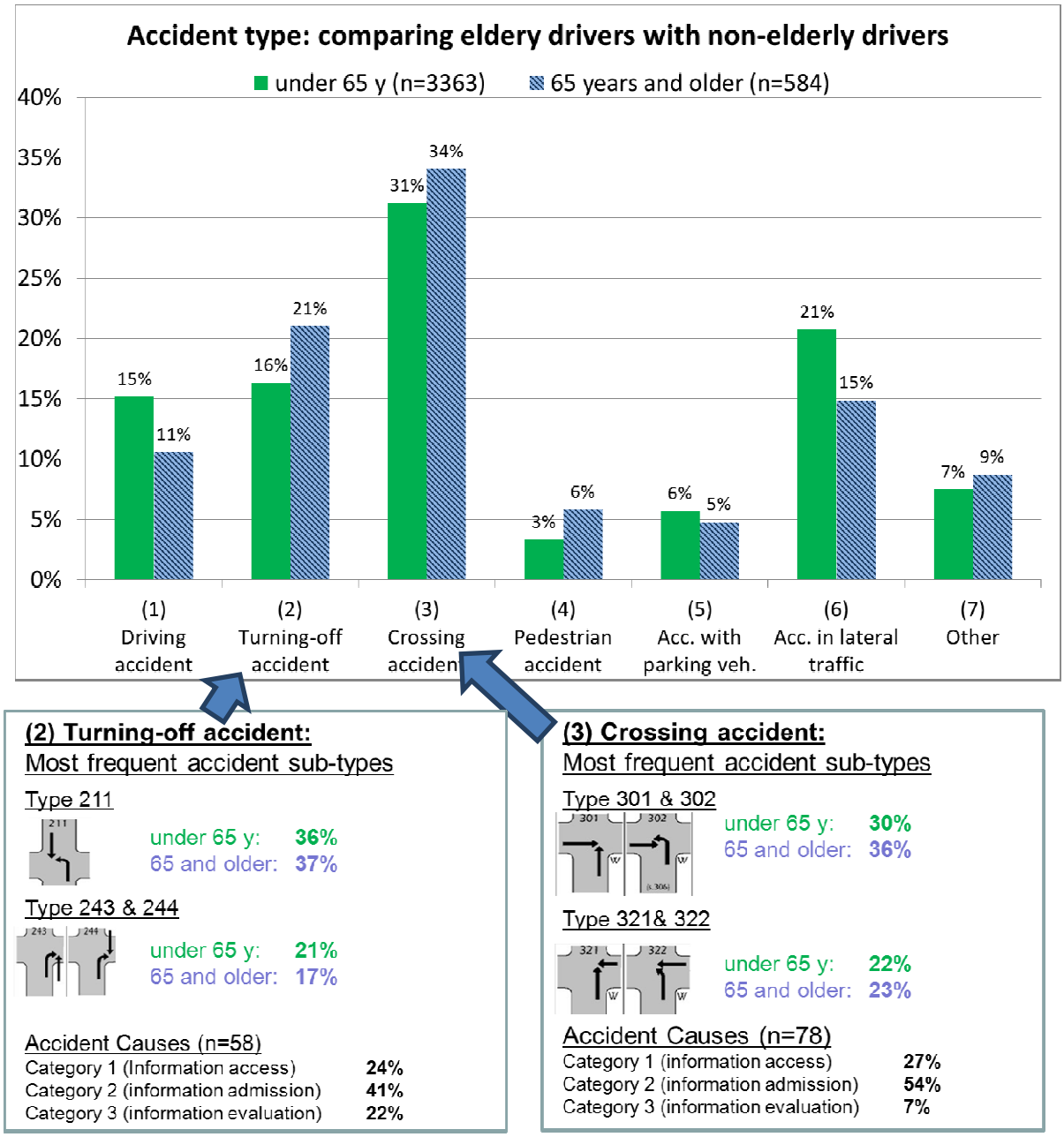

Figure 8: Accident types of elderly car drivers compared to non-elderly car drivers

In a second step accident causation data collected with the accident causations system ACAS was analysed in the two predominant accident types. ACAS collects accidents causation factors with a focus on the human causes, which are identified and classified in categories in a chronological sequence (from the perception to concrete action errors), considering the logical sequence of basic human functions when accomplishing the driving task [3].

Due to little case numbers however (58 causation factors in accident type 2, 78 causation factors in accident type 3) a quantitative evaluation of the accident causes or an evaluation for different age groups not possible. The distribution of causation factors on the three most frequent main categories of human causes is displayed at the bottom of Figure 8 for the accidents types turning-off accidents (type 2) and crossing accidents (type 3). Problems related to the information access (e.g. line-of-sight obstruction) are equally common at both accident types (Type 2: 24%, Type 3: 27%). Causes related

to the information admission (e.g. distraction, missed observation) are the most frequent causes at both accident types and account for about half of the causes in these categories (accident type 2: 41%, accident type 3: 54%). However when looking at the frequency of causes from the category of information evaluation (e.g. wrong expectation, misjudgement) at the different accident types, this category seems to be less relevant for crossing accidents (7% of causes) than for turning-off accidents (22% of causes). While it is possible to identify slightly different frequencies of accident causes when comparing the most common accident types of accidents caused by elderly car drivers it is at this time not possible to differentiate between causes of accidents caused by the elderly and causes of accidents caused by the non-elderly.

Summary and Conclusion

To identify the relevance of elderly car drivers in the accident situation in a first step the analysis of the German statistical data was conducted for the year 2010. The data revealed that elderly car drivers (aged 65 and above) only account for about 10% of all car drivers involved in an injury accident – about the same amount as novice drivers aged 18, 19 or 20. However when comparing the group that caused an accident to the group of car drivers involved in an accident which did not cause the accident a relationship to the age becomes visible. Novice drivers and also elderly drivers more often cause accidents than other age groups. This effect is highest in the group of the aged traffic participants (75+) where 76% of the accident participants had caused an accident (average of all ages: 55.6%).

In a second step the circumstances and features of accidents caused by elderly car drivers were examined using the GIDAS in-depth accident data. The analysis showed that elderly car drivers cause fewer accidents during the morning rush hour but have a peak of accidents between 9 and 11 o'clock which presumably correlates with the times when the elderly take part in traffic. No significant influence of the age of the car driver was found when evaluating the road type where the accident happened and the road surface conditions, however the amount of passengers in car when causing an accident is linked with the age: Elderly car drivers less often drive alone and more often have one passenger on board (presumably husband or wife) than younger car drivers. A relation of the passengers on board to distraction as a cause of the accidents could not be done due to the low number of cases with causation information. The impact of a poor eye sight on the accident situation can be assumed. The study revealed that vision problems of car drivers however already start to increase in the transition group (age group 50-54) and continuously rises to the group of elderly traffic participants aged 65 or older. Interestingly no specific distinct accident types could be identified in the group of accidents caused by elderly car drivers, however the elderly show a slightly higher frequency of accidents from the accident type 2 "turning-off accidents" and accident type 3 "crossing accidents". Concerning the causes of accidents, in general problems with the information evaluation (e.g. wrong expectation, misjudgement) appear to be more frequent in the "turning-off accidents" than in the "crossing accidents". A comparative analysis between different age groups could not be conducted again due to the low amount of cases available with causation information.

In summary the present study reveals that the elderly do not cause many accidents but cause accidents often when driving. However typical circumstances or types of accidents caused by elderly car drivers could not be identified. However there is potential for future studies to focus on the question why the accidents of elderly traffic participants happened by studying the accident causes when a larger number of cases with causation information is available.

Literature

[1] Statistisches Bundesamt: 11. Koordinierte Bevölkerungsvorausberechnung. Annahmen und Ergebnisse, Wiesbaden 2006, S. 28

[2] BRÜHNING, E., OTTE, D., PASTOR, C.; (2005): 30 Jahre wissenschaftliche Erhebungen am Unfallort für mehr Verkehrssicherheit, Zeitschrift für Verkehrssicherheit 51, 175-181, 2005

[3] JÄNSCH, M., OTTE, D., PUND, B.,CHIELLINO, U., HOPPE, M.; (2006): Implementation of ACASS - Accident Causation Analysis with Seven Steps – in In-Depth Accident Study GIDAS, Reports on the ESAR-Conference on 5th/6th September 2008 at Hannover Medical School, Berichte der Bundesanstalt für Straßenwesen, Heft F 72.