

The Risks Senior Road Users Face in Road Traffic

Abstract

The significant demographic changes are predicted for the European future. The age group over 65 years is permanently increasing and over next 30 years every fourth person will belong to this group. This development will continue so far that by 2050 in many countries will double the percentage of the population aged 65 and more. Many studies analyze the new phenomena of the ageing (graying) society during the last decade. Mobility is integrated part of the life of every citizen, even more it means for the elderly people. The adequate mobility is the precondition for their active life and for their social communication that contribute to their health and functional capacity and their autonomy and independency. The active seniors demand less public support. The mobility of the older citizens is closely linked with health and societal problems and creates an important public challenge.

On the other side the participation of seniors in transport due to their limited physical and mental possibilities means for them an increased risk to be injured or killed. The main mobility spaces are roads that can be used not only as a traveler in a vehicle (driver or passenger) but also as a pedestrian or cyclist or even as a motorcyclist. The road traffic is then an opportunity and danger in the same time.

The accident analyzes show specific risk features of seniors that are different compared with other age groups. First of all the older road users (65 and more) are facing to the higher risk (number of killed divided by the population size) to be killed in a road accident compared with the group of younger road users (0 - 64). More significant difference can be observed when comparing the road user groups. The fatality percentage of the older pedestrians is 2,5 times higher compared with the group 25 – 64. Similar frequency show the cyclist fatalities.

On the other side the vehicle passengers in the younger group have more or less two time higher percentage compared to seniors and in the group of motorcyclists even achieved in 2008 almost five times higher compared with the older group. The share of the old road users fatalities (around 19%) didn't practically change during the last 10 years in the European average. But comparing the gender involvement (2006) there is an interesting difference – female fatalities make 30, 2%, male fatalities 15, 3% of all fatalities in their groups.

The risk of the senior users is more connected with their physical and mental limits than with their risk behavior. According to the Czech statistics (2007) the vehicle drivers over 65 years cause only 3, 6% of all accidents.

The solution of the problem is to minimize the risk and to create a safe environment for the elderly people using the roads. In order to achieve this goal a deep knowledge of risk and of accident circumstances, full understanding of the behavior of the seniors and their limitations and accommodating approach of the whole society is necessary. Road risk of the ageing society has to be considered as a part of the health and social policy. These can build a creditable basis for the implementation of the measures that secure safe moving of seniors on the roads.

Kurzfassung

Die Risiken älterer Verkehrsteilnehmer im Straßenverkehr

Europa steht vor einem erheblichen demographischen Wandel. Die Gruppe der über 65-Jährigen wächst ständig; in 30 Jahren wird jeder Vierte dieser Gruppe angehören. Diese Entwicklung wird anhalten, so dass sich bis zum Jahr 2050 in vielen Ländern der Bevölkerungsanteil der über 65-Jährigen verdoppeln wird. In den letzten 10 Jahren beschäftigen sich zahlreiche Studien mit dieser neuen Entwicklung der alternden Gesellschaft. Mobilität ist ein fester Bestandteil im Leben des Einzelnen, vor allem für Ältere ist sie wichtig.

Ausreichende Mobilität ist Voraussetzung für ein aktives Leben und Teilhabe am gesellschaftlichen Leben. Sie trägt zu Gesundheit, funktioneller Leistungsfähigkeit und Unabhängigkeit bei. Aktive Senioren benötigen weniger staatliche Unterstützung. Es besteht ein unmittelbarer Zusammenhang zwischen der Mobilität der Älteren und gesundheitlichen oder gesellschaftlichen Problemen und sie stellt soweit eine große Herausforderung für die Öffentlichkeit dar.

Andererseits bedeutet die Teilnahme der Senioren am Straßenverkehr aufgrund ihrer eingeschränkten körperlichen oder mentalen Fähigkeiten ein erhöhtes Verletzungs- oder Sterberisiko. Der häufigste Verkehrsträger ist zweifellos die Straße, die nicht nur von Autos (Fahrer oder Beifahrer), sondern auch von Fußgängern, Radfahrern oder Motorradfahrern genutzt werden kann. Der Straßenverkehr ist also Chance und Risiko zugleich.

Im Vergleich mit anderen Altersgruppen zeigen die Unfallanalysen besondere Risiken von Senioren. Zum einen besteht für ältere Verkehrsteilnehmer (65 und älter) ein höheres Risiko, in einem Verkehrsunfall umzukommen, als für jüngere Verkehrsteilnehmer (0 – 64) (Anzahl der Verkehrstoten geteilt durch die Gesamtbevölkerung). Weitere Unterschiede zeigen sich im Vergleich der Gruppen von Verkehrsteilnehmern. Die Todesfälle älterer Fußgänger sind 2,6mal so hoch wie in der Gruppe der 20-64-Jährigen. Bei Radfahrern treten ähnlich häufig Todesfälle auf (2,2x). Andererseits haben Autoreisende in der jüngeren Gruppe ein 1,3-faches, und Motorradfahrer sogar ein 11-faches Risiko im Vergleich zu den Älteren. Der Anteil tödlich verunglückter älterer Verkehrsteilnehmer (etwa 19%) ist in den letzten 10 Jahren im europäischen Durchschnitt nahezu unverändert geblieben.

Allerdings gibt es einen interessanten Unterschied beim Vergleich der Geschlechter: 2006 machten Frauen in dieser Gruppe 30,2% und Männer 15,3% aller Todesfälle aus.

Das Risiko älterer Verkehrsteilnehmer hängt eher mit körperlichen und mentalen Einschränkungen, als mit ihrem Risikoverhalten zusammen. Den tschechischen Statistiken (2007) zufolge verursachen Fahrer über 65 Jahre lediglich 3,6% aller Unfälle. Zur Lösung dieses Problems müssen die Risiken minimiert und ein sicheres Umfeld für ältere Verkehrsteilnehmer geschaffen werden. Hierfür sind umfassende Kenntnisse der Gefahren und Unfallumstände, des Verhaltens der Senioren und ihrer Einschränkungen und ein gesamtgesellschaftlicher Ansatz erforderlich.

Die Verkehrsrisiken in einer alternden Gesellschaft müssen im Gesundheits- und Sozialsystem berücksichtigt werden. Diese können einen glaubwürdigen Ausgangspunkt für die Umsetzung von Maßnahmen bilden, die die sichere Fortbewegung von Senioren auf unseren Straßen gewährleisten.

1. Ageing society

Improving level of the health care, life stile, economic conditions and social aspects are reflected in low mortality and birth rate contributing to the life prolongation. The share of seniors (aged 65 and more) is permanently increasing. The average age and the life expectancy are rising in Europe and this feature of modern society receives already a global dimension. The example of the Czech Republic confirms this trend. The number of seniors aged 65 and more increased in the recent period 1995-2008 from 1356 thousand to 1513 thousand, i.e. by 11, 6%. The population of

the Czech Republic increased in the same period by only 0, 5%. A decomposition of the senior group shown in the Fig. 1 demonstrates the significant increase of the share of “older seniors” (aged 75 and more) from 34% in 1995 to 45% in 2008. Their number increased from 461 thousand in 1995 to 777 thousand in 2008, i.e. by 68, 5%. In the group 80 years and older these comparable numbers changed from 285 in 1995 to 349 in 2008, i.e. by 22, 5%.

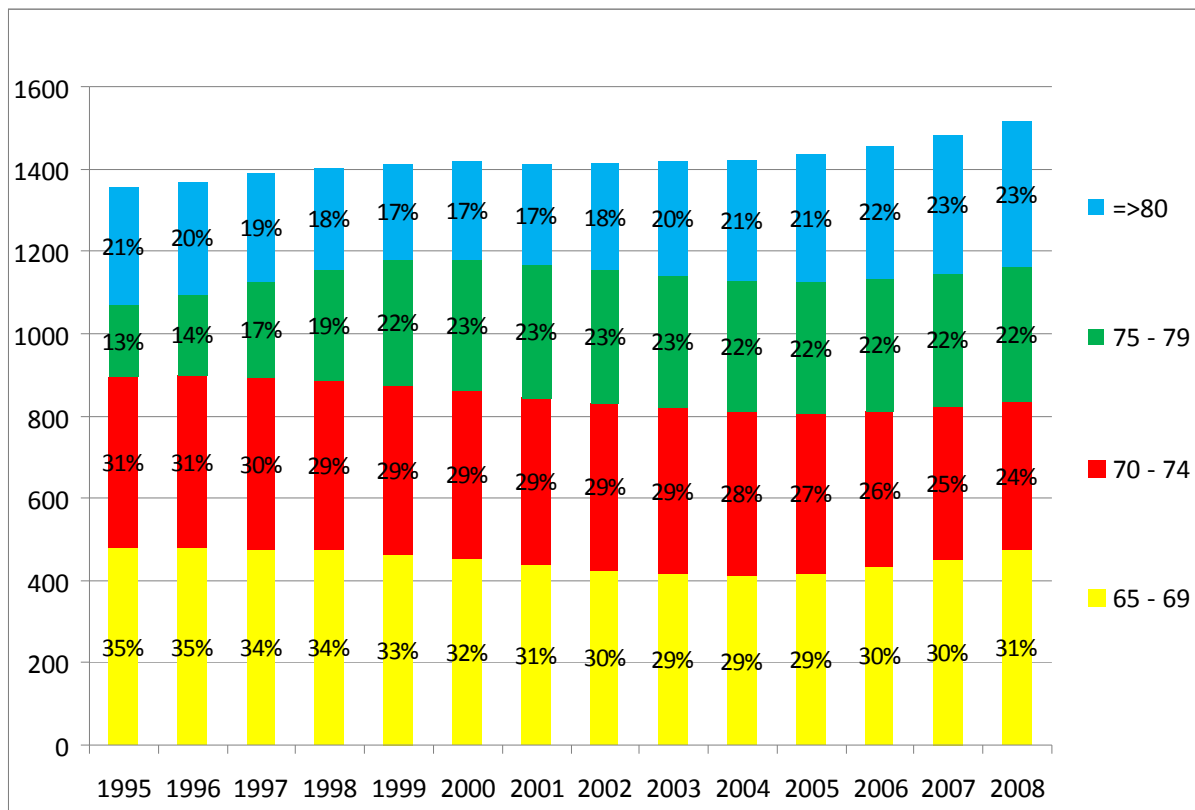


Figure 1: Age composition of seniors in CR

In Germany can be followed even more significant changes. The population aged 65 and more increased from 11, 9 million in 1991 to 15,9 million. in 2006 , i.e. by 33,2%, while the total population changed only by +3,4%. The share of population aged 65 and more increased from 14, 9% in 1991 to 19, 3% in 2006.

Based on the national 2008 projections the significant demographic changes are predicted for the European future. The total population of the EU27 will not vary too much: 2008 – 495 million, 2035 - 521million, 2060 – 506million. But the wide variety of the population number will be expected in individual member states – more than 20 % decrease in Latvia, Lithuania and Bulgaria and reversely the increase even more than 50 % in Luxembourg, Ireland and Cyprus. The expectation of major changes in the age structure can be followed across all countries. The median age will be prolonged from 40, 4 years in 2008 to 47, 9 years in 2060.

The number of seniors aged 65 and over is projected almost to double and to increase from 84,6 million in 2008 to 151,5 million in 2060 and their share will grow from the recent 17,1% to 30,0% of the total population in 2060. It means that

practically one third of population is expected to be over 65 years. The working age population group (15-64 years) is now fourfold bigger than the group aged 65 years and over but in 2060 is this projected to change only 2 : 1.

Even more marked difference is projected in the group of seniors aged 80 and over – they will increase almost threefold – from 21,8 million in 2008 to 61,4 million in 2060 and their share in the total population 4,4% to 12,1%.

There are differences among countries as illustrated in the Fig.2, but the tendency is very close.

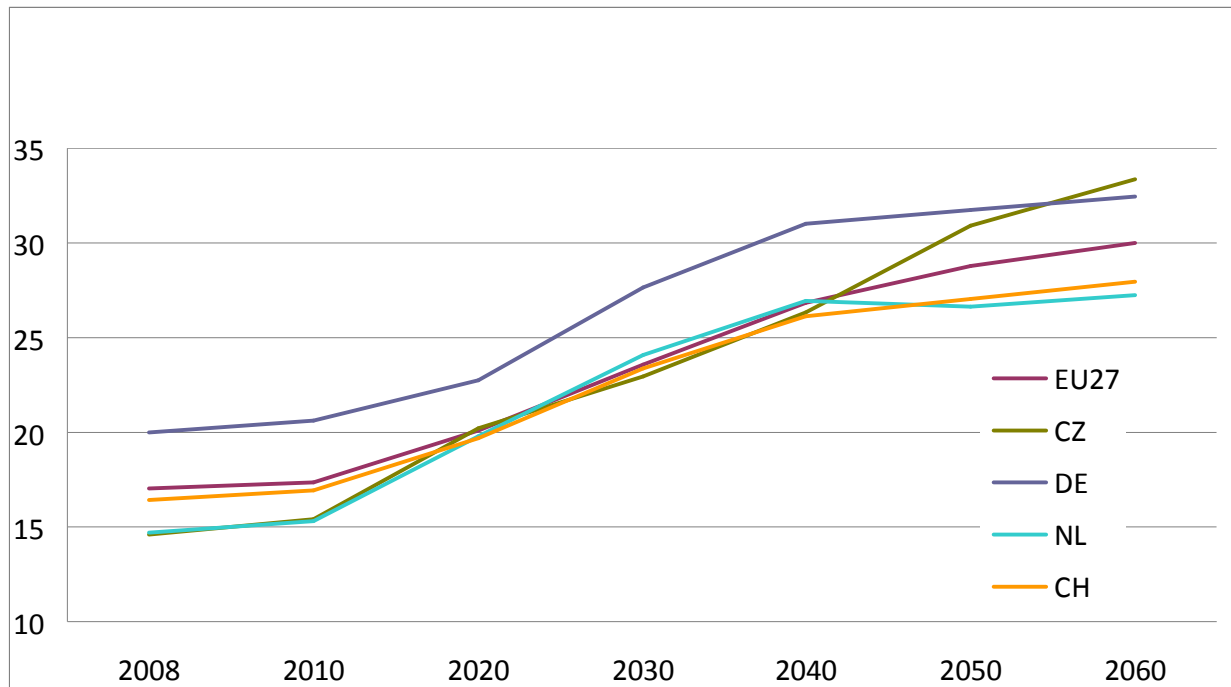


Figure 2: Share of total population aged 65 years or over (2008-2060) Source: Eurostat, Statistics in Focus No 72/2008

This development evokes the urgent need to devote concentrated attention to this phenomenon.

Many studies analyze all different aspects of the ageing society during the last decades. The EU Framework Programme included several projects dealing with these problems, e.g. SIZE – Life quality of senior citizens in relation to mobility conditions, CONSENSUS , AENEAS – Attaining energy-efficient mobility in an ageing society.

2. Mobility needs

The ageing of a human individual is accepted or has to be accepted as a natural course of human life. Everybody has to find his/her own way how to deal with different possibilities, needs and restrictions.

Mobility is the basic condition for economic and social development in every society. It is the integrated part of the life of every citizen, even more it means for the elderly people because it secures their communication with the surrounding world and mostly with their families as well. The adequate mobility is the precondition for their active life and for their social communication that contributes to their health and functional capacity. Mobility has the crucial importance for seniors helping to their autonomy and their independency. The mobility of the older citizens is closely linked with health and societal problems and creates an important public challenge. The active seniors demand less public support.

The older people have different mobility demands compared with the working part of population in the productive age. These needs are based on the different structure of their activities – leisure activities, hobbies, family, social contacts, health care, shopping - that are the main purpose of their trips. But primarily they do not travel (most of them) every day for a job.

Their trip destinations are predominantly located not far from their homes and the travel distances are shorter. Also the trip frequency is lower than the productive population. The number of non-working trips is practically constant until age of 75, afterwards starts to decrease. The comparative investigations show that seniors of today travel more than their parents did and this tendency is going to continue

The change of mobility of seniors is well demonstrated by the results published in *Mobilitaet in Deutschland* comparing years 2002 and 2008.

The average number of daily journeys by age groups in Germany is shown in the Table1. The highest trip frequency dominates, as expected, in the age of 30 – 49 years. Very interesting results offer the comparisons of 2002 and 2008. The average number of daily journeys slightly decreased in the youngsters group while the increase was registered in the older groups. Even the highest change, by 14 % was found in the age group between 65 and 74 years.

age	up to 5	11-13	14-17	18-29	30-39	40-49	50-59	60-64	65-74	75 and more	total
2002	3,1	3,1	3,2	3,5	3,8	3,7	3,4	3,2	2,8	2,0	3,3
2008	3,0	3,0	3,1	3,6	3,9	3,9	3,6	3,5	3,2	2,3	3,4

Table 1: Average number of daily journeys by age groups in Germany
Source: MiD 2008

In the same period increased the percentage of driving license possession in the oldest groups (65-74, 75 and more) by 10% as shown in Table 2. The significant change is also registered in the increased driving license possession in the total group of women.

age	18-29	30-39	40-49	50-59	60-64	65-74	75 and more	men	women	total
2002	88	96	93	89	85	73	54	90	76	83
2008	87	95	96	92	90	83	64	93	82	88

Table 2: Percentage of driving license possession in age groups in Germany
Source: MiD 2008

This shift could also influence the slight change of the modal split. A slight percentage decrease of the public transport use in the oldest groups by 1% (from 9 to 8) and 1% increase of use of motor vehicles (from 48 to 49) was registered.

Important information about the change of the purposes of trips and their frequency was obtained from the investigation of the age cohort born 1940-1944, it means in 2002 they were aged 58 – 62 years, in 2008 they mostly entered behind the senior's age limit with 64 – 68 years. The frequency of journeys didn't change too much, the total number of journeys even increased by 1%. The number of deleted business trips is compensated by increased number of journeys for other purposes, particularly by shopping and by leisure activities. These results are summarized in the following Table 3.

	business trips	shopping	arrangements	leisure activities	escort
2002	13,9	27,9	18,7	35,9	3,6
2008	3,9	32,3	19,8	39,7	4,3

Table 3: Change of journey purposes in the age cohort born 1940-1944 in Germany (%)
Source: MiD 2008

3. Limits of seniors

The participation of seniors in transport due to their limited physical and mental possibilities means for them an increased risk to be injured or killed. Their behavior can also create a potential risk for other road participants. The ageing can be observed in biological, psychological and social level.

Biological ageing (senescing) brings limitation, deterioration and reduction of biological functions and organs. The degradation of sensitivity of senses can significantly influence the driving abilities. For example, the visual information is one of the most important sources (almost 80%) of traffic information. Almost 60% of seniors suffer by some kind of visual disorder. Hearing defects appear more frequently in the senior generation, 30% of seniors suffer by serious hearing defects.

Psychological ageing (geronting) is closely linked with biological and social ageing (eldering). Performance reduction and physiological troubles combined with a social exclusion of seniors can be reflected in the self-evaluation of the individual, can influence his/her social interaction and these all can be projected in the actual and long-lasting psychological state. The impact is very individual and differs very significantly. Many different influences can be identified, including the social environment. Two main aspects are crucial - the genetic disposition and lifestyle of

each person. Many research results therefore dispute the consensus of the senior age limit of 65 years and demand more flexible individual approach.

On the other side the limits of seniors has to be taken in balance with their life, social and driving experience that is reflected in their less risky traffic behavior, more calm driving style, with their significantly higher respect of traffic rules. They do not suffer by economic and social pressure; they don't need to travel during the peak hours or during the worse weather or light conditions.

The main mobility space is road that can be used by seniors not only as a traveler in a vehicle (driver or passenger) but also as a pedestrian or cyclist or even as a motorcyclists. The road traffic is then an opportunity and danger in the same time.

4. Higher vulnerability

The accident analyzes show specific risk features of seniors that are different compared with other age groups. The share of different age groups in the number of road fatalities during the period 1995 – 2008 in the Czech Republic is shown in the Figure 3 and Table 4.

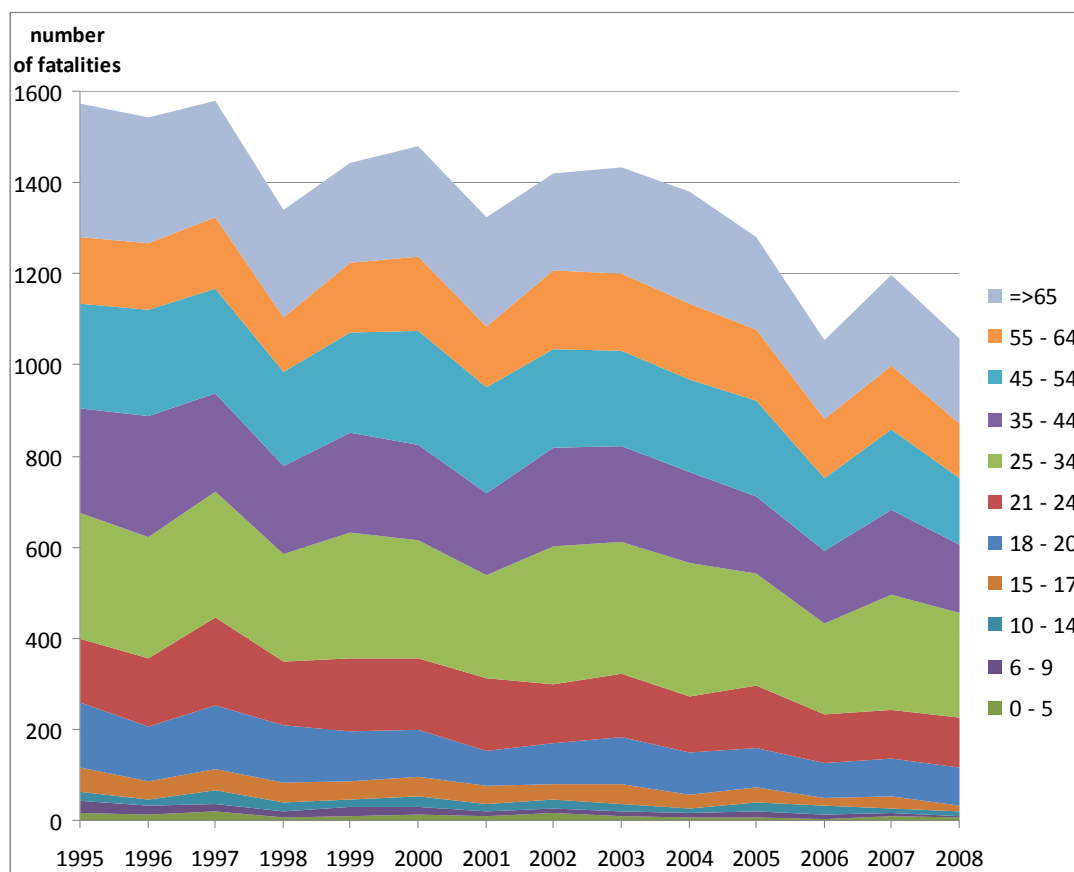


Figure 3: Development of fatalities by age groups (1995-2008)

Significant decrease of fatalities in the outside age groups (till 20, 65 and more) can be clearly recognized. Although the population of the age group 65 and more

increased by 11, 6%, the number of seniors fatalities decreased in a comparable percentage to the total number.

age group	-5	6-9	10-14	15-17	18-20	21-24	25-34	35-44	45-54	55-64	64-	total
%	67	85	65	76	41	21	16	36	35	19	36	33

Table 4: Decrease of fatalities in 2008 compared to 1995 in CR (%)

The older road users (65 and more) are facing to the higher risk (number of killed divided by the population size) to be killed in a road accident compared with the group of younger road users. This indicator calculated for 2008 numbers confirms the highest risk of the youngsters aged between 18 and 24 with around 200 fatalities per 1 million population, but this special risky group is followed by seniors with the indicator of 123. The value of this indicator for the whole group of population in the productive age (travelling more kilometers) is about 107. Looking the numbers of year 1995 even the seniors aged 75 and more was the worst group with the indicator around 300 compared to the age group of 18 and 24 with around 240 fatalities per 1 million population.

Clear picture about the high vulnerability of seniors gives the proportion of injuries to fatalities indicating the gravity of accidents. The following Figure 4 shows this ratio for all accidents, much worse results can be obtained in the case of pedestrians.

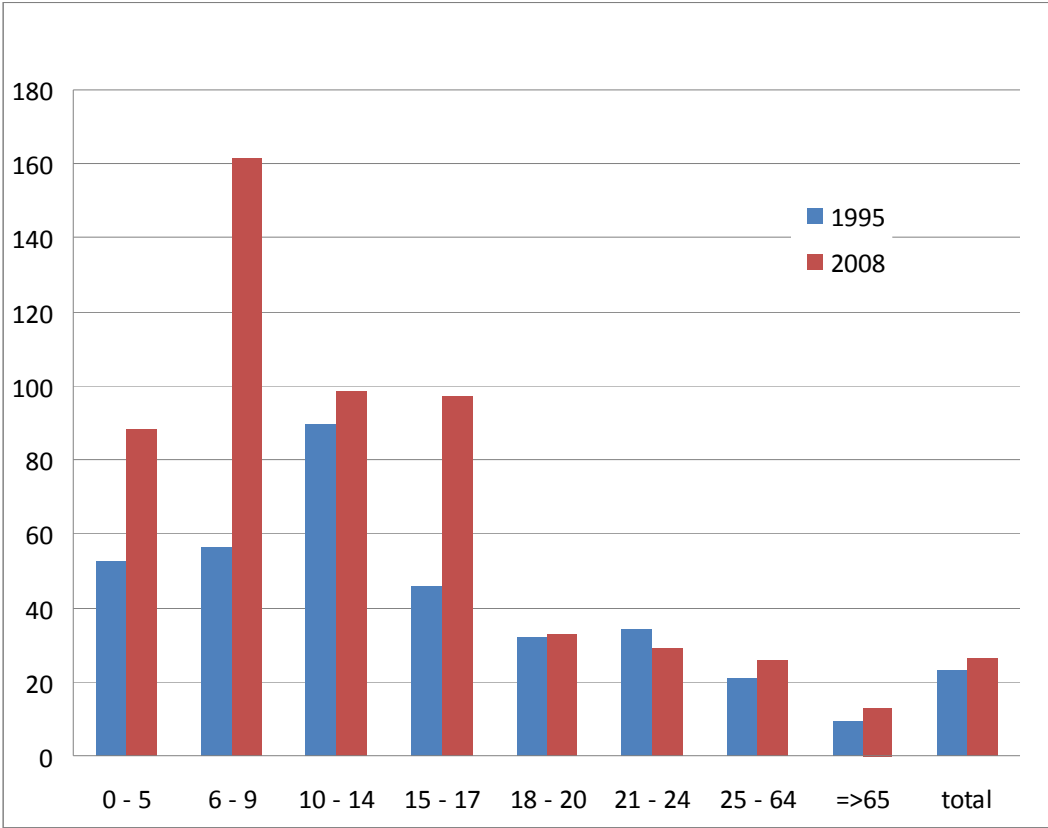


Figure 4: Gravity of accidents consequences by age groups

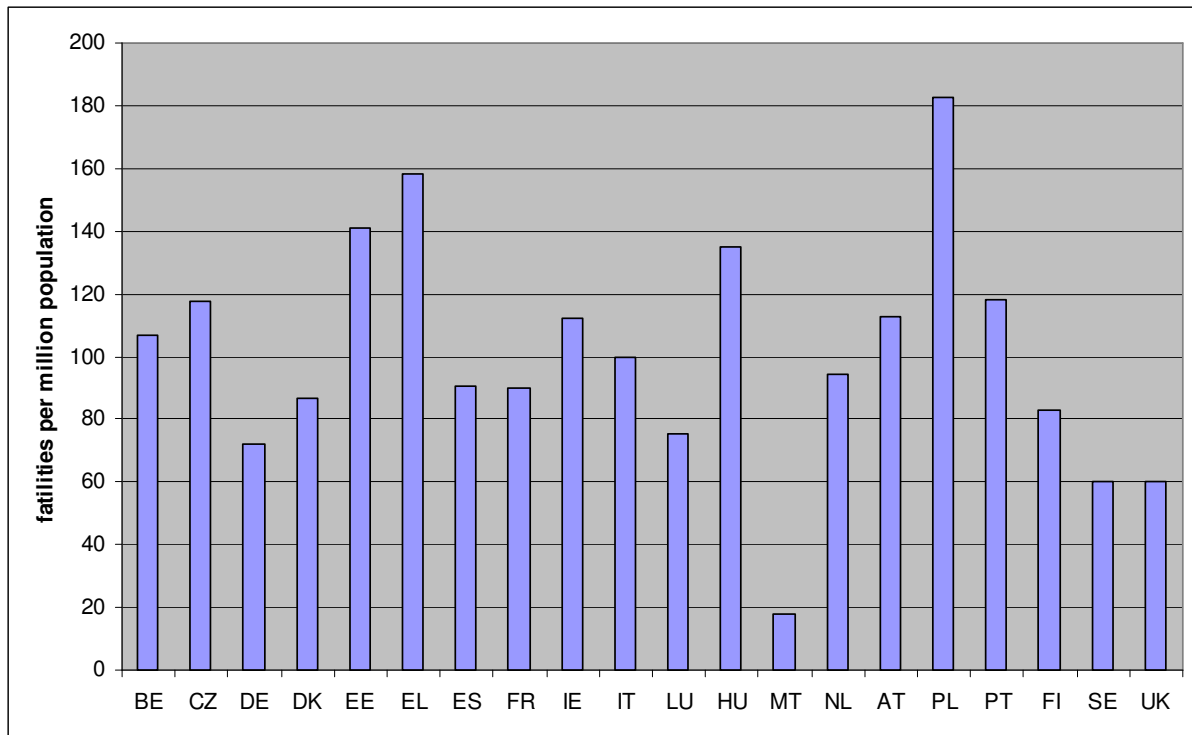


Figure 5: Fatalities of seniors per million population in selected EU countries (2006)

A basic comparison of the severity of seniors accident in some European countries provides the Figure 5. The EU average is around 105 fatalities per million population. The share of the old road users fatalities (around 19%) didn't practically change during the last 10 years in the European average. But comparing the gender involvement (2006) there is an interesting difference – female fatalities make 30, 2%, male fatalities 15, 3% of all fatalities in their groups.

5. Different involvements

The risk of the senior users is more connected with their physical and mental limits than with their risk behavior. According to the Czech statistics (2007) the vehicle drivers over 65 years cause only 3, 6% of all accidents.

There are significant differences among behavior of seniors, chronological age is not the only limit, individual approach is needed. The accidents of seniors are linked with their slower visual processing speed, poorer selective attention and longer detection and reflection time. They have bigger problems in situations with high demand on complicated information understanding and processing.

The typical senior driver's accidents includes

- left turning at intersections
- giving right-of-way at intersections with yield sign
- influence of tiredness and illness
- higher frequency in good weather and visibility conditions.

On the other side less typical are accidents caused by speeding, by impairment by alcohol and drugs and by intentional not obeying rules. The important difference can be observed when comparing the road user groups in the Czech Republic (Table 5).. The fatality percentage of the older pedestrians is 2,5 times higher compared with the

group 25 – 64. Similar frequency show the cyclist fatalities. On the other side the vehicle passengers in the younger group have more or less two time higher percentage compared to seniors and in the group of motorcyclists even achieved in 2008 almost five times higher compared with the older group.

Group	Total		65+		25-64	
	1995	2008	1995	2008	1995	2008
Motorcycle, moped	6%	11%	4%	3%	4%	14%
Car	53%	53%	25%	32%	58%	54%
Pedestrian	27%	22%	55%	45%	22%	18%
Bicycle	11%	9%	15%	19%	10%	8%
Others	3%	5%	1%	1%	5%	6%

Table5: Share of fatalities by transport mode and age groups in the Czech Republic (%)

The international comparison in the Figure 6 showing the share of seniors fatalities structured by transport mode indicates practically the same proportion of killed seniors in cars, the differences can be found in all other transport modes.

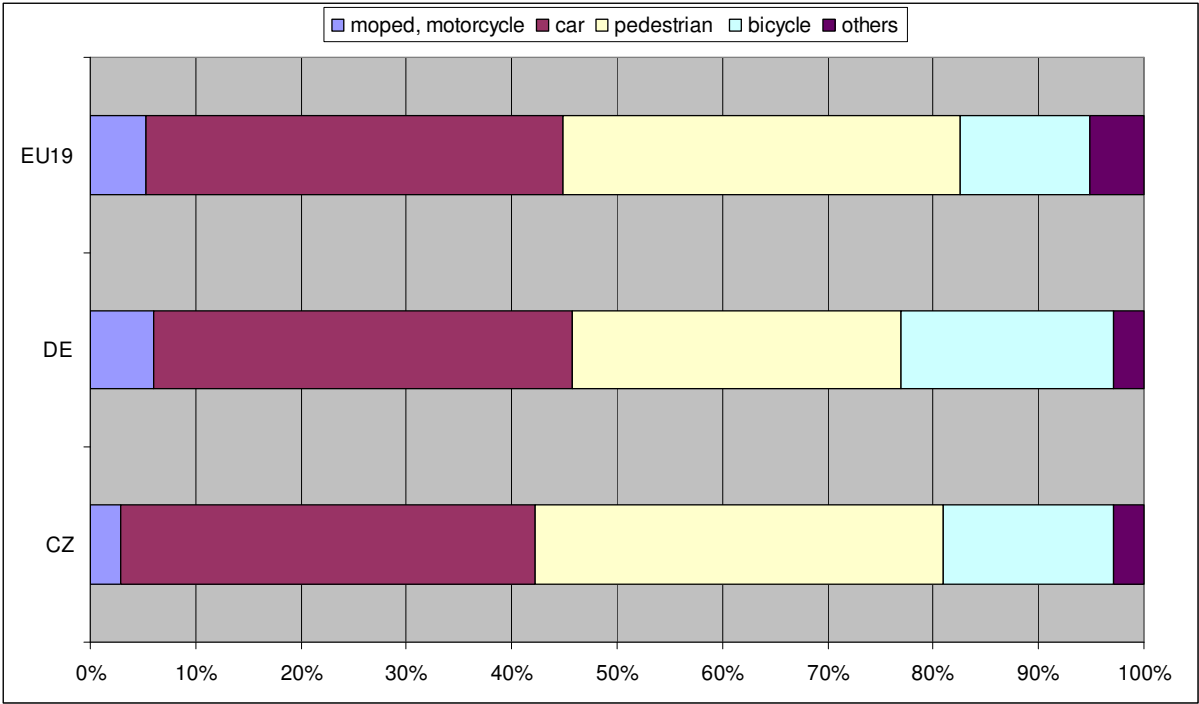


Figure 6: International comparison of seniors fatalities share by transport mode

6. What to do?

The solution of the problem is to minimize the risk and to create a safe environment for the elderly people using the roads. In order to achieve this goal a deep knowledge of risk and of accident circumstances, full understanding of the behavior of the seniors and their limitations and accommodating approach of the whole society is necessary. Mobility risk solution of the ageing society has to be integrated in relevant documents and to be considered as the unembarrassed part of the health and social policy. These can build a creditable basis for the implementation of the measures that secure safe moving of seniors on the roads.

A creation of a safe road system is usually based on the 3E pillars – Engineering, Education and Enforcement. This approach can create a valuable frame for seniors' safety as well. But the circumstances influencing safe road mobility of seniors are much more diversified and they demand much wider structured approach.

The extended **6E pillars – Explication, Empathy, Education, Engineering, Emergency and Encouragement** approach is proposed as follows:

- **Explication**

Thoroughgoing investigation of accidents with involvement of seniors, exploration of road characteristics, traffic and operating conditions should create the source of basic knowledge for further steps. This information has to be enriched by the results of extensive research of biological, psychological and social features of accident participants. Specific attention has to be devoted to circumstances leading to the accident and to the research of behavior during the accident. Investigation of accident impacts and consequences on the subsequent life will accomplish the whole puzzle of the diversified aspects of seniors safety and their behavior in transport.

- **Empathy**

Understanding and acceptance are the key words of this new pillar. Understanding of fears, concerns, qualms, scruples, worries and troubles that seniors feel before entering and during transport will give the new dimension for considerations on improvement measures and the acceptance of the seniors' perception of transport performance will open new possibilities for tailor made interventions.

- **Education**

Special education system for seniors as a driver or pedestrian or cyclist helping them to understand their limits and to deal with their physiological and psychological changes has to be developed. Enforcement that is important (in many cases the most influential) aspect in the creation of a safe traffic behavior of younger road traffic participants seems not to play a big role for seniors.

On the other side driving schools should educate new drivers to understand and to respect limited abilities and possibilities of older road traffic participants.

- **Engineering**

Technical measures adapting the transport space to the needs of seniors have to follow the principles of a self-explaining road and forgiving road environment. Due to

the more frequent physical and psychical limitations of seniors is the consistent implementation of this key principles even more important than for the other groups of the road users.

Particularly the creation of safe road infrastructure for senior pedestrians and cyclists has to be developed. These include for example barrier-free walkways and cycle paths, adaptation of technical parameters of road crossings including a modification of traffic lights as to the crossing times needs for seniors, equipment of traffic lights with the acoustic signals. Lowering of speed limits in the zones with higher frequency of seniors (health facilities, shopping centers, cemeteries ..) and in the specific risk spots with the higher frequency of senior accidents has to be sensitively considered. This will to provide them with more comfortable time for decision and maneuvers on spots with complicated traffic conditions. The improvements and simplification of traffic signs and road marking can also contribute to better reflection and safer behavior of seniors.

Quality and accessibility of public transport will facilitate their use. These measures should provide not only better access to the stops of public transport and their comfortable use, but also change of the vehicle fleet for low floor vehicles.

More and more important role in transport management and operation are playing ICT systems. Their implementation can bring new solutions that will enable to reduce the risk that seniors are facing in road traffic. The thematic priority FP7 ICT for Independent Living and Inclusion opened the topic ICT and ageing in several projects.

- **Emergency**

Due to the higher vulnerability of seniors the high level of emergency system and post-accident care is vital important and should be further improved.

The regular medical investigations identify clearly the physical limitations of seniors. Further more the physicians can directly explain the potential risks linked with participation in transport with these troubles. The trust of the senior in the doctor's advise has highly valuable preventive impact.

- **Encouragement**

The change of private car use to other transport modes like public transport, cycling and walking should be strongly encouraged. This change should start already in the relevant strategic and policy documents and to be implemented in the creation of economic, social, infrastructure and performance incentives that will initiate and attract the shift from private car to other transport modes.

7. Conclusions

The significant changes in the age structure of the European society are predicted and the ageing of society will continue and increase. The seniors will create important share of the population. The mobility plays crucial role in the seniors' life and a support of their relevant transport activities is the precondition of the harmonized existence.

Transport risk of seniors has to be further analyzed, understood and improvement measures have to be tested and widely introduced. Implementation of improvement measures for seniors facilitating their mobility will also make transport easier for other road users groups, like e.g. handicapped people, temporary disabled people, pregnant women, children, mother with children cars. The consistent introduction of the principals of an self-explaining and forgiving road even facilitates the general improvement of the road environment towards sustainable safety and to a fulfilling of the "Vision 0".

The oncoming period of the ageing society has to be soon enough reflected. This reality demands to look for a new balance between younger and older part of society. It also offers a challenge for searching new possibilities of mutual relations and behavior, for new ways of communication among generations, for mutual support and for social integration.

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