AGEING EUROPE: THE CHALLENGES AND OPPORTUNITIES FOR TRANSPORT SAFETY

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INTRODUCTION

Professor Herman De Croo MP

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Our aim in the European Transport Safety Lecture is to increase awareness of innovation and research-based solutions to important problems amongst senior levels of government, Parliament and the private sector. By mounting this annual Brussels event our objective is to stimulate a high level debate across the European Union, to exchange knowledge and experience and to help forge new commitment to efforts to reduce the risks and costs of transport crashes.

Liisa Hakamies-Blomqvist in the Fifth European Transport Safety Lecture "Ageing Europe: challenges and opportunities for transport safety" addresses the fundamental future issue of ageing and driving and the importance of new policies targeting the safety of elderly road users. Liisa Hakamies-Blomqvist is a Scientific Director at the Swedish National Road and Transport Research Institute and chaired the OECD expert group on Ageing and Transport.

Over the next 30 years, the significant increase in the adult population aged 65 or more will place new and growing demands on transport systems. In Europe, walking is an important transport mode for older people, with 30-50% of older people's trip made on foot. Older people account for nearly half of all pedestrian fatalities in many countries. We need to cater much better for citizens in the design of our towns and cities, and in the design of vehicles used there if we are going to meet the highly ambitious new EU-wide target to reduce road deaths by 50% by 2010.

As we await the forthcoming discussion by the EU Institutions of the long-awaited Directive on safer car fronts for vulnerable pedestrians and the EU Third Road Safety Action Programme, there could be no better time to focus on this important area of activity and to highlight appropriate EU actions.

I am delighted that Liisa Hakamies-Blomqvist has agreed tonight to give us further insight into this huge challenge in the 5th European Transport Safety Lecture: Ageing Europe: challenges and opportunities for transport safety.

De Croo

AGEING EUROPE:
THE CHALLENGES AND OPPORTUNITIES FOR TRANSPORT SAFETY

Summary

In the first part of the presentation, ageing and transportation as a public health problem is discussed in general, paying attention to both safety and mobility aspects.

The second part of the presentation focuses on older drivers and their risk of accident. A number of common methodological errors in risk estimation are discussed. The frailty effect affects the comparability of crash data between different driver groups. As to the exposure, all the different measurements currently in use have their limitations. Conclusions based on crash type distributions also are critically discussed, as well as the safety-inducing potential of general screening.

In the third part of the presentation, a number of factors are discussed that may limit our ability to foresee the safety situation for a future where a much larger share of drivers on the roads are seniors. These include changes between cohorts, changes in gender distribution and possible time-related changes. Finally, some conclusions from a recent OECD report are presented.

1. Ageing and transportation: what is the problem?

In the first European Traffic Safety Lecture, Professor Kåre Rumar (Rumar, 1999) stressed the importance of treating road casualties as a public health problem, rather than as the inevitable cost of mobility. A change of perspective will, in his view, be useful in highlighting the importance of the problem both on a societal level and on an individual level.

Within the context of ageing and transportation, the importance of a public health perspective is obvious. Only within the realm of such a perspective can we adequately analyse the problems and their interdependencies as well as specific goal conflicts that need to be addressed.

Ageing and transportation, viewed as a public health issue, have two main dimensions: safety and mobility. Problems with both lead to adverse consequences for health and societal costs. In the past however, the focus has been largely on the safety aspect of this issue. This is natural: accidents are relatively straightforward events both as to their public health consequences and as to their societal costs. Most industrialised countries indeed have their established systems for recording accidents calculating their cost.

In contrast, the relationship between mobility limitations and health loss is more complicated, and it is much more difficult to estimate the costs thereof. Figure 1 shows a conceptual graph of how mobility is related to health and health care cost outcomes (Hakamies-Blomqvist 2000).

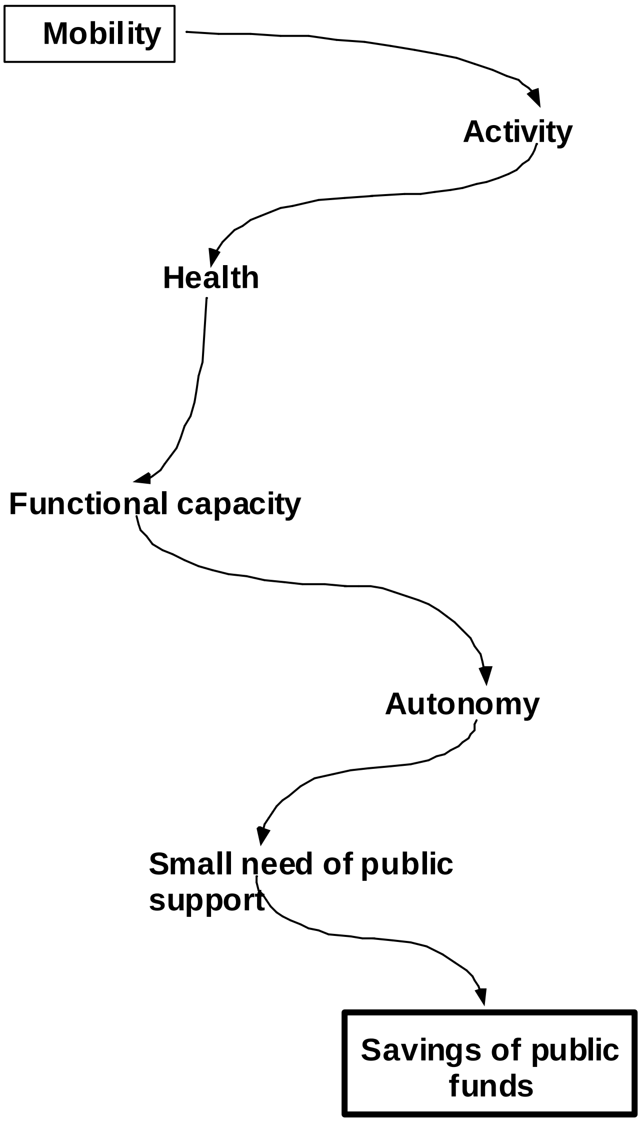

Figure 1. Mobility, health, and societal costs in the elderly

Briefly: it is necessary for an older person to lead an active life and keep his or her former activity patterns; active elders are, statistically speaking, healthier elders than passive ones; health is directly related to functional capacity, and elders with good functional capacity are more able to lead autonomous lives and have smaller need for public support, which ultimately leads to savings of public funds. However, while all the links in this chain of reasoning have been substantiated empirically, an overall analysis of their economic impact still needs to be done. A thorough understanding of the economic significance of good outdoor mobility for ageing citizens would be very useful in guiding future policymakers' efforts towards sustainable policies within the area of ageing and transportation.

To summarise the public health view on ageing and transportation: an inadequate transport system threatens older citizens with two kinds of risk, or, in other words, of adverse health effects: those due to crashes and those due to lack of sufficient outdoor mobility.

2. Safety of older road users

2.1. What are the main safety issues?

Let me now move on to discussing the safety of older road users. I will focus on private car driving since its importance is increasing in Europe and it is evident that in future older Europeans will rely heavily on private car driving for their personal mobility (OECD 2001). However, it is important to note that for older road users, driving their own car is one of the safest ways to travel and it is far more risky for them to participate in traffic as unprotected road users.

Table 1 illustrates this by showing the representation of older people as road accident casualties in Great Britain, 1998.

Table 1: Representation of older people as road accident casualties in Great Britain, 1998

Severity	**Percentage of older road user casualties**					
	All road users	**Pedestrians**	**Bus passengers**	**Pedal cyclists**	**Car drivers**	**Car passengers**
People aged 60+ 20.5 percent of the population						
Killed	**25.4**	**46.6**	**52.9**	19.6	**20.6**	**24.4**
Seriously injured	14.1	**21.8**	**50.3**	7.8	13.8	15.3
All severities	9.8	14.6	**33.8**	5.0	8.8	10.4
People aged 80+ 4.6 percent of the population						
Killed	**8.2**	**19.0**	**23.5**	1.3	**5.6**	**6.2**
Seriously injured	3.3	**7.1**	**16.0**	0.6	2.5	3.1
All severities	1.6	4.1	**6.7**	0.5	1.1	1.6

Compared to their share of the population, older people are overrepresented in casualties mainly when using public transport and as pedestrians. This reflects, of course, both their travel characteristics and their physical frailty.

Figure 2 shows the effect of physical frailty even more clearly.

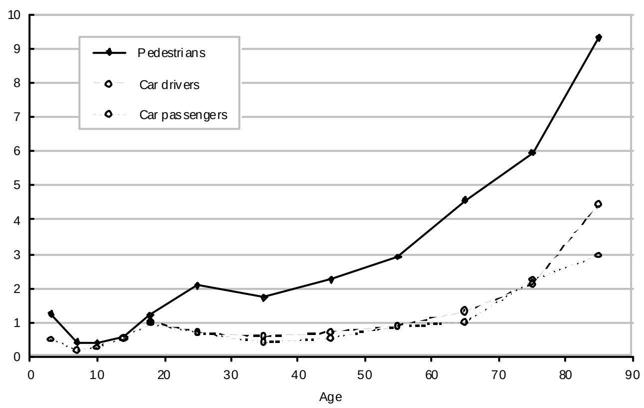

Figure 2: Fatality ratio as percent of all injuries by age and mode of travel (British crash data 1998)

After middle age, the risk that any mishap in traffic leads to death increases sharply with age and most so for the less protected modes of transport.

To summarise: as a public health problem, lack of transport safety affects older road users most when using less protected modes. Older people are not so much risky as at risk in traffic, mainly because of their increasing physical vulnerability.

2.2. Ageing and driving: the myth of increased crash risk

In the following discussion, the focus will be on older drivers. The area of ageing and driving is one where many misconceptions reign; it is also an area of intensive research and policy work where different economic and other interests may be at stake. It is, therefore, important to establish the problem based on critical and impartial scrutiny of the existing research evidence.

The common perception of older drivers seems to be very biased towards seeing them as risky and as a threat to general traffic safety. The focus of the present analysis will, therefore, be methodological: how do we read crash statistics correctly? How can we make conclusions about risk?

The starting point of any analysis of accident risk is the equation: risk is accidents per exposure. When calculating risks, we therefore need a count of the number of crashes and a measurement of exposure. Both of these have their own problems that may lead to problems in estimating risk, especially in group comparisons.

Figure 3 illustrates all the problems we have with these kinds of estimates.

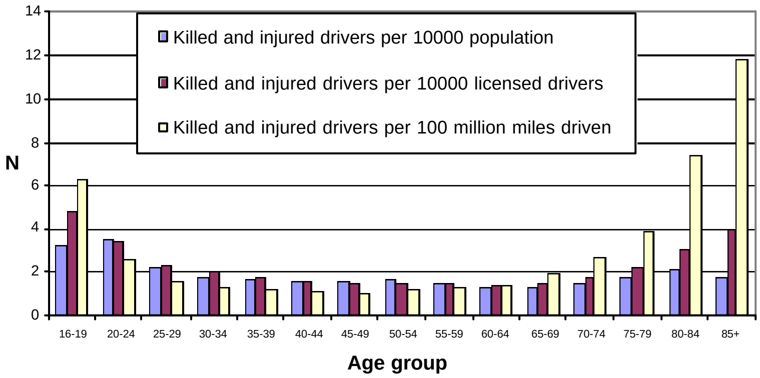

Figure 3: Driver fatalities and injuries by age related to population, number of driver licences, and mileage driven (FARS 1997)

Figure 3 shows US driver fatalities in 1997, i.e., the killed and injured drivers from fatal accidents from the FARS database, related to three alternative exposure measures. All these exposure measures reflect different kinds of risk.

Accidents by population give a good estimate of the overall impact of the age group on safety. The present graph clearly shows that there is no real problem. Accidents by driver licences are a better indicator of driver risk, since different age groups of course may have different licensing rates. Again, the apparent risk increase is not dramatic.

If a hard estimate of individual risk is needed, accident per distance travelled is usually considered the best. And, indeed, it shows the customary U-shaped curve of risk by age. However, all these ways of measuring exposure are subject to systematic error in group comparisons. As will be demonstrated in the following, an interpretation of the U-shaped curve as indicating an increase of accident risk by age is grossly erroneous.

All parts of the risk equation “risk equals accidents per exposure” pose problems of estimation. Let me start by the numerator, i.e., accidents. When comparing different driver groups’ risks we have to assume that their accidents are represented in a similar manner in the database we use, so that we have the “same” accidents from both groups. However, it is possible that the inclusion criteria as such are met more frequently by one group’s crashes than by those of others. For older drivers, of course, the best example of this type of sampling bias is the frailty bias. that is, their greater physical frailty. It is much easier to kill an 80-year-old than a 30-year-old, and consequently a larger share of older driver crashes tend to lead to injury or death. Therefore, they are also more often recorded in databases.

Leonard Evans demonstrated in 1991 that if we correct for the frailty bias by comparing crash rates of sufficient severity to kill an 80-years old male (independently of the factual outcome), the age-related increase in rates practically disappears.

Getting back to the risk equation: while the estimation of crash rates presents some difficulties, the real problem is the denominator, i.e., how to measure exposure. For group comparisons to be fair, the entity measured should be the same for all the groups under comparison. For instance, if we compare accident rates per driver license, the licensing legislation should be similar for all groups. If not, those groups with any screening imposed on them will get higher rates; not because of having higher risks but because their licensing rates will reflect the number of active drivers more accurately, since non-drivers will less often be licensed.

When discussing older driver risk in the sense of individual accident proneness or tendency, it is generally felt that the hard estimate of the actual amount of the driving, such as yearly mileage, is needed. In Figure 4, using mileage as the exposure measure, we do indeed get the U-shaped curve. However, it is important to notice that the relationship between yearly mileage and the number of accidents per mile is not linear. Those who have large yearly mileages always have fewer crashes per mile than those who have shorter yearly mileages (Janke 1991). This has been found independently of age, gender and any demographic characteristics. Therefore, a fair comparison of any driver group risk of accident per distance travelled should be made in groups matched for yearly mileage. Theoretically, this has been known for quite a while but only recently we have been able to demonstrate it empirically (Hakamies-Blomqvist, Ukkonen, O'Neill, in press).

Table 2 shows the results of this first empirical demonstration of the so-called Low Mileage Bias.

		Yearly driving exposure		
		£3000 km	**>3000 km £14000 km**	**>14000 km**
Age				
26-40	**n drivers**	38	64	98
	S **km/year**	48350	543800	2502500
	mean km/driver/year	1272,48	8496,9	25535,7
	S **acc***	3,5	8,0	14,5
	acc/1 million km	**72.4**	**14,7**	**5.8**
65+	**n drivers**	202	515	163
	S **km/year**	319253	4150568	3331418
	mean km/driver/year	1580,5	8059,3	20438,1
	S **acc***	15,5	48,0	20,5
	acc/1 million km	**48.6**	**11.6**	**6.2**

Table 2: Low mileage bias: an example of the biasing effect of yearly mileage on accident rates in group comparisons. (Overall rates for the older and the young middle-aged group: 10.8 vs 8.3 per 1 million km, respectively)

In the present study, we compared drivers aged 65 and more against a young middle age group of 26 to 40. Overall we got the usual finding - older drivers had somewhat more accidents per mile than younger ones, 10.8, against the younger groups, 8.3. However, when we divided both age groups in subgro ups based on yearly exposure, corresponding to the 20-60-20 percentiles of the older group, and made the age comparison in groups matched for yearly exposure, all the age disadvantage disappeared. If anything, the older drivers were safer. As a rule, in age group comparisons, older drivers have lower yearly mileages than other age groups – the older, the lower. Therefore, what you see in the U-shaped curve is not proof of any age disadvantage in driver safety but simply a demonstration of the so called “lowmileage bias”.

A third important aspect of risk estimation is what I would like to call the “proportional comparison fallacy”; i.e., when comparing accident type distributions between different driver groups, since the different categories total

100%, an overrepresentation in one category necessarily entails an under representation in another. Fig 4 illustrates it with some Finnish data.

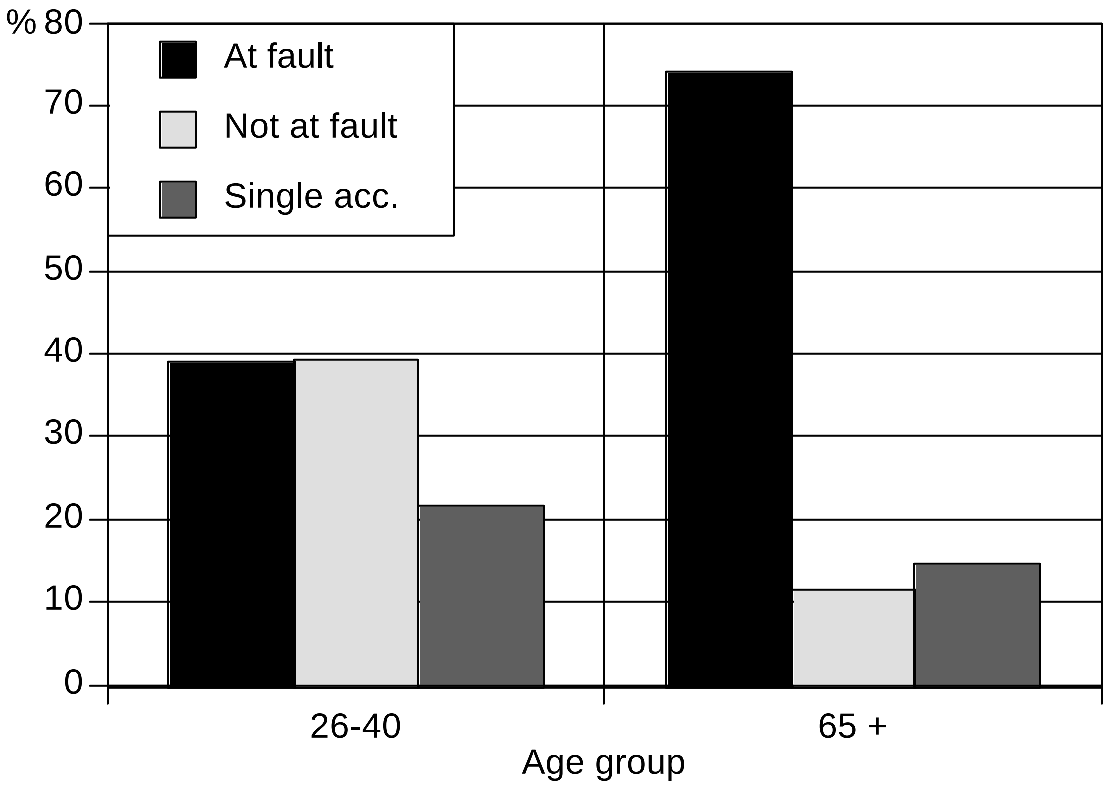

Figure 4. Proportions of drivers in single-vehicle accidents, at fault in collisions and not at fault in collisions (Finnish RAIT data 1984-1989)

These are the proportions of different types of participation in crashes among Finnish drivers, again aged 26 to 40, compared to those aged 65 or more. Both sides sum up to 100 per cent. As it is often claimed, older drivers have a larger share of crashes as the legally responsible party. However, it is equally fair to describe the figure by saying that old drivers are more seldom involved in crashes as the non-guilty party. Their driving style as a group indeed is so slow, cautious and defensive that the time margins in any pressing situation when the other driver is the one committing the error are much larger than with a younger, more aggressive counterparts. Thus, older drivers are “hard to hit” as the not-responsible party. The only accidents they have left are the ones in which they commit their own errors.

The same reasoning applies to accident types. Much ink has been used to describe how different age-related deficiencies increase accident risk at intersections and in other complex environments. However, it should be equally interesting to explain why the risk of other types of accidents, such as those due to careless overtaking or speed decreases. This is not really quibbling: the causal attributions we make regarding accidents have a heavy impact on both safety measures and on public opinion.

To sum up: based on a serious, critical and unbiased reading of research evidence, what do we know about age-related risk in drivers? First: Is there an increased risk of injury and death? There certainly is, mainly because of increasing physical frailty of the ageing organism. Second: Is there an increase in the risk of having accidents? There is no convincing scientific evidence for any considerable group-level risk increase. And finally: are older drivers' accidents different from others'? They are, but it is important to point out that the differences reflect both weaknesses and strengths. While the share of accidents involving complex environments and situations under time pressure increases, the share of those avoidable with cautious, safety-oriented driving decreases.

2.3. Age-related driver screening: A Jack-in-the-box safety measure

Based on the generally accepted albeit erroneous idea of older drivers as a high-risk group, age-related screening often is suggested as an effective safety measure. The general idea would be to regularly "check" licence holders after a certain age in order to exclude from the driver population those with increased accident risk. This idea, jumping up again and again like a Jack-in-the-box, has support from many directions. Not only has it some (simplistic) face validity but it also creates visions of wonderful business opportunities. In the ageing Europe, the professions vested with the screening tasks would get numerous new work opportunities and anybody inventing a testing gimmick for driver risk and getting it included into a pan-European standard equipment would greatly increase his/her personal wealth.

However, all serious studies that have aimed to evaluate the safety effects of general age-based driver screening have failed to show any benefits (for an overview, see OECD 2001). There are many reasons for this. While certain older drivers doubtlessly have higher crash risk than others, and in some cases for age-related reasons (such as dementia illnesses the incidence of which grows with age), it is difficult to find correlations between single functional measures and risk, and even the most carefully performed studies relating functional measures to accident risk end up with correlations so low that they cannot be used as decision criteria. In addition, on the individual level, accidents are rare events. In Sweden, one in 20000 drivers yearly is involved in a personal injury accident. Hence, if we have a "high-risk" group with twice the average risk, still only one in 10000 drivers yearly is involved in such accidents. To prevent one personal injury accident per year by excluding this "high-risk" group from driving, provided that we could perfectly identify its members (which we normally cannot), therefore would cost the mobility of 9999 drivers who would not have had accidents. In addition, these 9999 drivers probably would switch to other, less safe modes of travel and we might well end up by having decreased their overall safety. What this example illustrates is that driver diagnostics and screening only can produce safety effects and be cost-effective if targeted on sub-groups of drivers who have identifiable and very high risk increase, not on the level of the general population.

2.4. Future trends in ageing and driving

There are several reasons why future trends in licensing rates, driving habits and crash rates may present a discontinuous development; therefore, extrapolations based on the current situation are subject to considerable uncertainty. True age effects may be confounded by both cohort effects and time-specific factors that are not generalisable over time.

First, there may be cohort effects: people born in different times may age differently, and there are several studies now indicating that older drivers may be growing younger — that is, that cohorts of older drivers born later may have smaller accident rates than those born earlier. There are also some indications that the dominance of intersection accidents starts at a later age in cohorts born later (Hakamies-Blomqvist & Henriksson). There are many possible explanations for this which relate to both health and social factors and also to changes in typical older drivers' personal driving histories.

A major cohort-related change in future older driver populations will be the increase in the share of older female drivers. The current older female drivers in many European countries are still a very select group, but gender differences in licensing rates among the so-called baby boomers are diminishing and in some places they have almost disappeared. Generally speaking, the driving habits and accumulation of experience of female drivers are approaching those of male drivers. However, we do not know at what rate, and it is difficult to predict what effect this will have on their accident risk in old age and when, if ever, the remaining differences in driving patterns will disappear.

There is a gap in our knowledge that affects our ability to predict future developments: the target time of most predictions is when the so-called baby-boomers, i.e., the large post-war generations, are "old" (defined somewhat differently in different contexts). However, our knowledge on ageing and driving is based on past and current cohorts of older drivers. A recent study at VTI (Hakamies-Blomqvist et al in preparation) tried to overcome this gap by asking license holders born 1944 in a large postal survey to answer questions about their current travel habits, about their experiences with the transportation problems of ageing friends and relatives, and about their expectations regarding their own ageing as drivers. A few findings are worth mentioning here. First, we achieved a response rate of over 80% which is quite exceptional; several respondents gave additional comments on how important they found the subject. Second, most respondents, especially men, relied heavily on the private car for their daily transport. Third, most respondents, again especially men, expected to be still driving at the age of 80 years. Fourth, 50% of the respondents regularly chauffeured an old relative or friend (mostly mother or mother-in-law). We found this last percentage remarkable. It seems likely that when retired, still relatively young and healthy elders will continue being a transportation resource for their older relatives and friends who need help with their travel – an aspect of their ageing as road users often neglected in public discussion.

In addition to cohort and gender effects, a third source of uncertainty in predictions are time effects. Time, as a confounding variable, may indeed play an important role. If, for example, some changes to the driving infrastructure (such as support and control systems based on IT) are introduced during a certain historical period of time, they may affect the first older users cohort differently from the following who get acquainted with the systems at an earlier age.

One special aspect of the time-related changes is, of course, the increase in the share of older drivers in the population. An early study by Smeed (1968), which eventually came to be called Smeed's Law, about the introduction of private cars in new countries showed that with the introduction of private cars in a new country, the first cars had very high accident rates per car, but that when the car density increased the rates per car went down. If a similar "unit density law" essentially saying that rare events are dangerous applies to older drivers also, then we would expect that when the share of older drivers increases their rates per driver would go down. There is indeed some indication that this may be the case: in those states of the U.S. where the share of drivers aged 65+ is larger, their corresponding share of accidents is somewhat smaller than in states where older drivers are rare.

3. Conclusions

I am now moving on to my conclusions and recommendations. If you feel a need for a more thorough empirical substantiation of the conclusions than what has been possible within the realms of my presentation I warmly recommend the recent OECD report on Ageing and transportation that I had the pleasure to co-chair with John Eberhard from the U.S (OECD 2001).

In the following are listed the major policy priorities identified in the OECD report:

1. Support and funding to enable lifelong mobility
2. Support for older people to continue driving safely;
3. Provision of suitable transport alternatives to the private car;
4. Involvement of older people in policy development;
5. Safer vehicles for older people;
6. Development of safer roads;

7. Appropriate land-use practices; and
8. Educational campaigns to ensure maximum mobility and safety for older people

These recommendations are based on a consensual view of the relevant facts and certain central values that the OECD expert group achieved during its work. The Leitmotiv is the recognition of the importance of satisfactory outdoor mobility for the quality of life and well-being of older citizens, as well as for the sustainable development of society. In addition to all moral and ethical aspects, it is also an economic necessity for ageing societies to help ageing citizens to live as independently as possible as long as possible. It follows that the elders should be encouraged and supported in choosing modes of transport that best fulfil their travel needs while providing acceptable safety. In light of current knowledge, private car driving is and will remain central. However, there will also be older citizens who cannot or do not want to drive their own car; for these, nationally and locally adapted transport alternatives will be needed. The recommendation to include older people in policy development is rather self-evident but not trivial, especially not in the European context where national and local characteristics may define the opportunities and barriers for good policies. The development of safer roads should also be a non-controversial recommendation since road design characteristics helpful for older road users in general are good for everybody. Emphasising land use relates to the possibility of increasing safety by reducing exposure; with good land use policies it is possible to reduce unnecessary travel and make a larger share of the daily or weekly trips safely feasible without driving. Finally, educational campaigns will be needed to disperse the common misconceptions regarding older drivers and to help the creation of policy measures firmly based on the problems to be solved. These educational campaigns should not only target road users but even more importantly those in charge of policy decisions – indeed, you may consider the present Lecture as part of such an educational campaign.

4. Final words

I started my introduction by referring to the first European Transport Safety Lecture given by Kåre Rumar. I realise I cannot finish my conclusions without referring to him once more. I found his distinction between different levels of safety problems especially useful in the context of ageing and transportation. According to Rumar, first level problems are those emerging directly from accident statistics and where countermeasures tend to be relatively straightforward. For older road users generally, their physical frailty is such a first order problem and the obvious countermeasures are, for example, to increase physical protection in cars and to plan the traffic environment in such a manner that the likelihood of falls on pavements and of conflicts between pedestrians and bicyclists is minimised. For drivers, there are certain design characteristics that are likely to decrease mental load and to help older drivers to cope.

Second order problems are, according to Rumar, factors that reduce the effectiveness of countermeasures targeting first order problems. For older drivers, one example might be enforcement of speed limits. Older drivers themselves seldom speed, but careful observation studies have shown that the likelihood of merging accidents (in which the older driver will be at fault) increases if the potential counterpart is a younger driver who drivers at a higher speed than anticipated by the older driver trying to merge (Keskinen et al).

Third order road safety problems are hidden and do not deal directly with the traffic situation but rather with underlying factors such as organisation and management of road safety work and the knowledge base and values on which safety work is grounded. Again, with respect to older road users, an example of a third order problem is the common misconception that older drivers are a risk for society.

In my personal view, at present our greatest problems when trying to develop sound policies for the transportation of the ageing European societies, are on the third level. In order to make possible and facilitate second and first level safety efforts we need to target certain third order problems first. I shall, therefore, end by giving some highly subjective recommendations of third level safety measures.

1. A sound research evidence based view of the complex problems of ageing and safe transportation should be implemented among decision makers. Viewing traffic safety in a public health perspective will be useful in balancing the legitimate demands of ageing citizens concerning both mobility and safety.

2. A broad collaboration should be established between different areas of policymaking, notably land use, health care, and transport planning. Again, from a public health perspective, constructing the “big picture” of older road user safety on the basis of both police and hospital statistics, including falls (=pedestrian single accidents), will help to get a more balanced view of the safety of different travel modes. It will also help to avoid apparent “black holes” in budgeting, e.g., when investments in the road environment produce costs within the transportation sector but the gains “disappear” somewhere in the health care sector.

3. In line with the idea of Active Ageing brought forward by the WHO, safety work focusing on older road users should aim at encouraging people to actively participate in the planning, implementation and evaluation of their transportation options. Active participation of both current and future older road users will ensure the use of locally adequate and user-specific expertise, which in turn will lead to good acceptance of different safety actions.

4. Finally, it is necessary to extend the broad collaboration effort to other relevant actors who may not yet fully realise their potential role in this context, such as the insurance branch, the car industry, etc. In car design, for example, the problem is not so much to know what to do: there exist a number of technical solutions that we know might be good for the comfort and safety of older users. Rather, the problem is one of implementation: how to make the manufacturers include such features in their design specifications.

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LIISA EMILIA HAKAMIES- BLOMQVIST

Liisa Emilia Hakamies-Blomqvist was born in 1957 in Finland. After studying Roman philology and psychology, she became Doctor in Psychology in 1994.

In 1996, she joined the Swedish National Road and Transport Research Institute (VTI) as a researcher. She later became Research Director and, since July 2000 she has been VTI's Scientific Director.

She is member of a number of international and national scientific committees. Between 1993 and 1999, she was member of the Finnish committee on road safety. She is also chairman of the OECD expert group on Ageing and Transport and her pioneering work in that field is known and appreciated worldwide.

She has written over a hundred scientific and technical papers on road safety, developmental psychology and heath psychology and has been Associate Editor of the scientific journal Accident Analysis and Prevention since 2001.

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