TØI report 690/2003
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Summary:

Impairments, diseases, age and their relative risks of accident involvement: Results from meta-analysis

Deliverable R1.1 in EU-project IMMORTAL is a literature review of impairment and accident risk associated with ageing and disease. The deliverable gives an updated literature review and meta-analyses of health-related risk factors referring especially to the medical conditions addressed in Annex III of Council Directive on driving licences (CD 91/439/EEC). The deliverable also gives an overview of national practices regarding mandatory medical examination and self-report for drivers applying for a driver's licence and licence renewals in the countries participating in the IMMORTAL project. These countries are: Austria, the Czech Republic, Denmark, the Netherlands, Norway, Spain, and the UK.

62 reports, mainly case-control studies, have been reviewed giving a total of 298 results that serve as basis for calculations of relative risks of being involved in road accidents. All main categories of impairment except renal disorders were associated with a statistical significant increase in the risk of being involved in a road accident. Estimates of relative risks of impairments according to the main categories described in Annex III, were as follows:

Table A: Relative risks of accident involvement of medical conditions according to main categories in CD 91/439/EEC - Annex III. Results from meta-analysis (Relative risk of drivers not having a given medical condition = 1,00)

Main category	*Relative risk*	*95% CI*	*p-value***	*Number of results*
Vision impairment	1,09*	(1,04; 1,15)	0.000	79
Hearing impairment	1,19*	(1,02; 1,40)	0.649	5
Arthritis/Locomotor disability	1,17*	(1,004; 1,36)	0.002	12
Cardiovascular diseases	1,23*	(1,09; 1,38)	0.000	48
Diabetes mellitus	1,56*	(1,31; 1,86)	0.000	25
Neurological disease	1,75*	(1,61; 1,89)	0.000	22
Mental disorders	1,72*	(1,48; 1,99)	0.000	33
Alcoholism	2,00*	(1,89; 2,12)	0.210	3
Drugs and medicines	1,58*	(1,45; 1;73)	0.000	68
Renal disorders	0,87	(0,54; 1,34)	0.076	3
Weighted average across all categories	1,33*	(1,28; 1,37)	0.000	298

Source: TØI report 690/2003

*) The relative risk is statistically significant at a level of $\alpha < 0.05$

**) Test for homogeneity: If $p < 0.05$, data is considered heterogeneous and a random-effect model is used

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The weighted average across all main categories is 1,33, which means that a driver with a given medical condition comprised by Annex III would have a 33% higher risk of accident involvement than a driver without that given condition. The relative risks for all main categories are significantly higher than 1,00, except for renal disorders.

None of the main categories show a relative risk of more than 2,00, the highest being 'Alcoholism'. However, the reliability of this estimate could be questioned as the number of results which the estimate is based on, is only 3.

The categories can be grouped in two parts that may be labelled *high-risk impairments* and *low-risk impairments*. High-risk impairments exhibit relative risks that are significantly higher than low-risk impairments. *Alcoholism, neurological diseases, mental disorders* and *drugs and medicines* all belong to the high-risk group, while *vision impairment, arthritis/locomotor disability, hearing impairment,* and *cardiovascular diseases* all belong to the low-risk group. *Diabetes mellitus* lay in-between the high-risk and the low-risk group with a relative risk of 1,56.

Estimating relative risks of sub-groups of the main categories, some sub-groups came out with the relative risks that were of the same magnitude as high-risk impairment group of the main categories: These were *(Severe) mental disturbances, psychotropic substances (alcohol included), drugs assumed to be abused* and *epilepsy/sudden disturbance of consciousness* with relative risks of 2,01 – 1,96 - 1,96 and 1,84 respectively.

Several other conditions were also considered. These were: *Depression, sleep apnoea /narcolepsy, AD(/HD), benzodiazepines, cannabis* and *opiates.* Sleep apnoea/narcolepsy came out with a relative risk of 3,71. This is the highest relative risk of all conditions considered. It is also significantly higher than all other categories but *depression, cannabis* and *opiates*. The rest were of middle magnitude, i.e. about the same as *diabetes mellitus*.

The highest relative risks of all conditions considered, are associated with age and gender. Young male drivers (aged 16-19) have a relative risk of being involved in an injury accident of about 7, compared to the group with the lowest risk (male drivers aged 45-54). Young female drivers (aged 16-19) have a relative risk of accident involvement of about 3,2 compared to the lowest female group (women aged 35-54). Male drivers aged 75+ have a relative risk of about 3,2, and women aged 75+ about 3,1 compared to the groups of males and females with the lowest accident risks, respectively.

Estimates of relative risks which are based on few results must be interpreted with caution. This concern especially hearing impairment, alcoholism, angina, depression, sleep apnoea/narcolepsy, and use of cannabis, analgesics/opiates, antidepressants. Including more results in these groups may change the estimates and confidence intervals.

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