



Visual impairments, Medical Conditions and Diseases: Potential for ITS Solutions ?

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**TRULS VAA
INSTITUTE OF TRANSPORT ECONOMICS
BOX 6110 – ETTERSTAD
N-0602 OSLO, NORWAY**

e-mail address: truls.vaa@toi.no

Or:

- **Impairments, medical conditions, diseases and age: → Driver needs**

- **or:**

Relative risks → Driver needs

The REAL problems

- **and**

ITS – solutions (traffic safety potentials)

**LITERATURE REVIEW OF IMPAIRMENT AND
ACCIDENT RISK ASSOCIATED WITH AGEING
AND DISEASE**

Status:

IMMORTAL

CONTRACT NO GMA1/2000/27043 SI2.319837



Author: Truls Vaa, Institute of Transport Economics, Norway

Workpackage Leader: Javier Alvarez, University of Valladolid, Spain

Project Co-ordinator: Bob Hockey, University of Leeds, UK

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*Defined as impairments/diseases
listed in Council Directive on Driving
Licence CD91/439/EEC:*

- *Hearing*
- *Locomotive disability*
- *Cardiovascular diseases*
- *Diabetes mellitus*
- *Neurological diseases*
- *Mental disorders*
- *Alcohol, drugs, and medical products*
- *Renal disorders*
- ***Sight***

Estimating Relative Risks:

Calculation of Accident Rate Ratio (Relative Risk):

$$\text{ARR/RR} = \frac{\begin{array}{l} \# \text{ accidents w/drivers w/condition X} \\ \# \text{ driving km - drivers w/condition X} \end{array}}{\begin{array}{l} \# \text{ accidents w/drivers w/o condition X} \\ \# \text{ driving km - drivers w/o condition X} \end{array}}$$

- (Case control studies)

Table 6: Relative risks of accident involvement of drivers with medical conditions according to main categories in CD 91/439/EE (Relative risk of drivers without a give medical condition = 1,00. From IMMORTAL Deliverable R1.1)

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 diseases	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
Weigthed average	1,33*	(1,28; 1,37)*	0.000	298

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

Table 6: Relative risks of accident involvement of medical conditions according to main categories in C 91/439/EEC - Annex III (Relative risk of drivers not having a given medical condition = 1,00)

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

Table 8: Relative risks of vision impairments (V1-V4: Categories of Annex III (in CD 91/439/EEC – The Council of the European Communities, 1991)

	Relative risk	95% Confidence interval	p – value **	Number of results
Vision – all kinds of impairment	1,09 *	(1,04; 1,15)	0.000	79
V-1: Vision field impairment	0,90	(0,69; 1,17)	0.299	4
V-2: Twilight vision	No data	-		-
V-3: Progressive eye diseases	0,86	(0,50; 1,49)	0,922	4
V-4: Reduced visual acuity (< 80%)	1,19 *	(1,07; 1,33)	0.000	23
V-4: Reduced visual acuity (< 50%)	1,14 *	(1,003; 1,29)	0,035	20
V-4: Reduced visual acuity (< 25%)	1,24 *	(1,04; 1,47)	0,006	8
Corrective lenses (any use)/aided visual acuity	0,96 *	(0,93; 0,99)	0,580	7
Unaided reduced visual acuity	1,03	(0,89; 1,19)	0,530	4
Glaucoma	0,64	(0,90; 1,26)	0,176	4
Cataract	0,98	(0,86; 1,12)	0,092	4

*) 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

Table: Relative risks of some specific vision impairments – Single results

	Relative risk	95% Confidence interval	Number of results
Vision – all kinds of impairment	1,09 *	(1,04; 1,15)	79
Myopia (near vision)	0,75	(0,54; 1,05)	1
Hypermetropia (far vision)	0,97	(0,86; 1,10)	1
Presbyopia (far vision – elderly)	1,00	(0,94; 1,05)	1
Corrective lenses for far vision	0,98	(0,97; 1,03)	1
Corrective lenses for near vision	0,92 *	(0,85; 0,9997)	1
Astigmatism	0,96	(0,85; 1,08)	1
Refractive disorders	0,97 *	(0,93; 0,998)	1
(Heavily) reduced night-time vision	1,66 *	(1,06; 2,57)	1
Enhanced glare sensitivity	1,50 *	(1,05; 2,14)	1

*) 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

Relative risk of involvement in injury accidents by driver age and gender

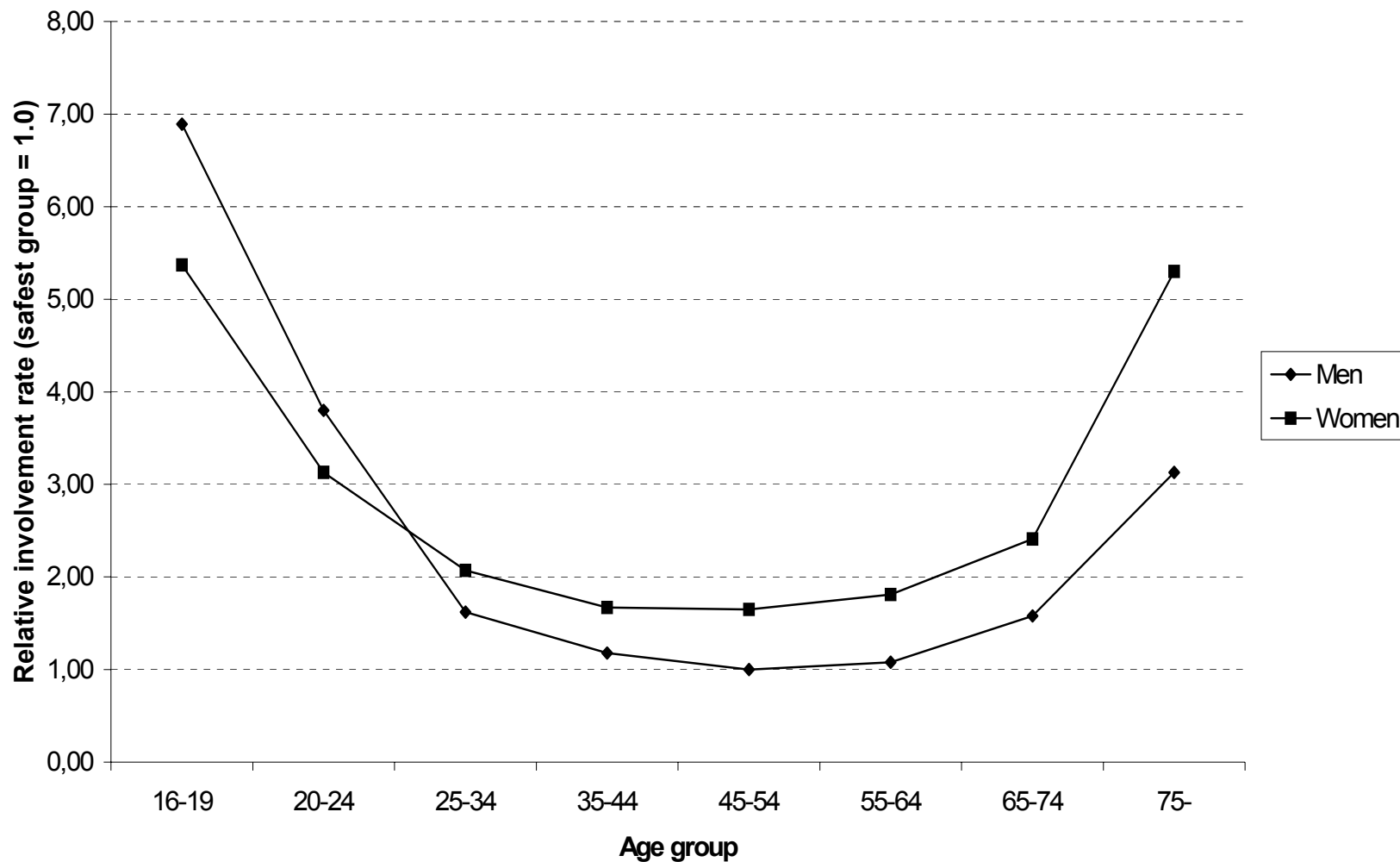


Table 9: Relative risks of selected medical/psychological conditions and substances

Selected medical/psychological conditions	Relative risk	95% Confidence interval	p-value **	Number of results
Depression/depressive symptoms	1,67 *	(1,10; 2,55)	0.834	4
Sleep apnoea/narcolepsy	3,71 *	(2,14; 6,4)	0.000	8
Flu	No data	-		-
Learning difficulty associated with light mental retardation	No data	-		-
Benzodiazepines (diazepam included)	1,54 *	(1,24; 1,90) *	0.000	14
Cannabis	1,70 *	(1,06; 2,74)	0.000	5
Cocaine	No data	-		-
Opiates	1,83 *	(1,38; 2,53)	0.073	5

*) 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

Table 7: Relative risk of accident involvement and being killed in personal injury accidents for drivers with different levels of alcohol concentration in blood. (relative risk = 1,00 for drivers with BAC = 0. Source: Glad, 1985).

Blood Alcohol Level %	Involved in personal injury accident	Killed
0	1	1
0,050 – 0,099	10	13
0,100 – 0,149	25	100
+ 0,15	65	500

Table 5: Relative risks of accident involvement of selected states/conditions

State/condition	Relative risk
Drunken driving – BAC + 0,15 % (sober = 1,00) (Glad 1985)	65
Drunken driving – BAC 0,100 – 0,149 % (sober = 1,00) (Glad 1985)	25
Driver of MC (driver of personal vehicle = 1,00) (Elvik et al 1997)	13,2
Drunken driving – BAC 0,050 – 0,099 % (sober = 1,00) (Glad 1985)	10
Male drivers aged 16-19 compared to male drivers aged 45-54 (Elvik 2002)	5,3
Drivers with sleep disorders/sleep apnoea/narcolepsy (Vaa 2003)	3,71
Male drivers aged 75+ compared to male drivers aged 45-54 (Elvik 2002)	3,1
Female drivers aged 75+ compared to female drivers aged 35-54 (Elvik 2002)	3
Female drivers aged 16-19 compared to female drivers aged 35-54 (Elvik 2002)	3
Road surface covered with ice/snow compared to dry road (Elvik 1997)	2,5
Mobile telephone use (Sagberg 1998)	1,72
Road surface covered with wet snow compared to dry road (Elvik et al 1997)	1,5
Driving in darkness compared to daylight (Elvik et al 1997)	1,5
Average of main conditions of Annex III - CD 91/439/EEC (Vaa 2003)	1,33
Driving on wet road compared to dry road (Elvik et al 1997)	1,3