Effects of the severity of medical conditions upon crash risk

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Linthicum Heights, MD
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Population : 8.1 million
Drivers : 5.3 million

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Maryland

Population : 8 million
Drivers : 5.2 million

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Maryland
(same scale)

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QC versus MD (2011)

	QC	MD
Area :	595 391 sq mi	12 407 sq mi
Population :	8.1 million	5.9 million
Density :	15.3/sq mi	596/sq mi
Drivers :	5.3 million	4.1 million
Drivers >65 :	816 235 (16%)	643 176(16%)
Fatalities :	479 ($59/10^6$)	485 ($82/10^6$)

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QC versus MD – Older drivers

Drivers >65:	QC	MD
% of driving population	16%	16%
% of crashes	8%	7%
Persons aged >65		
% of fatalities	26%	?
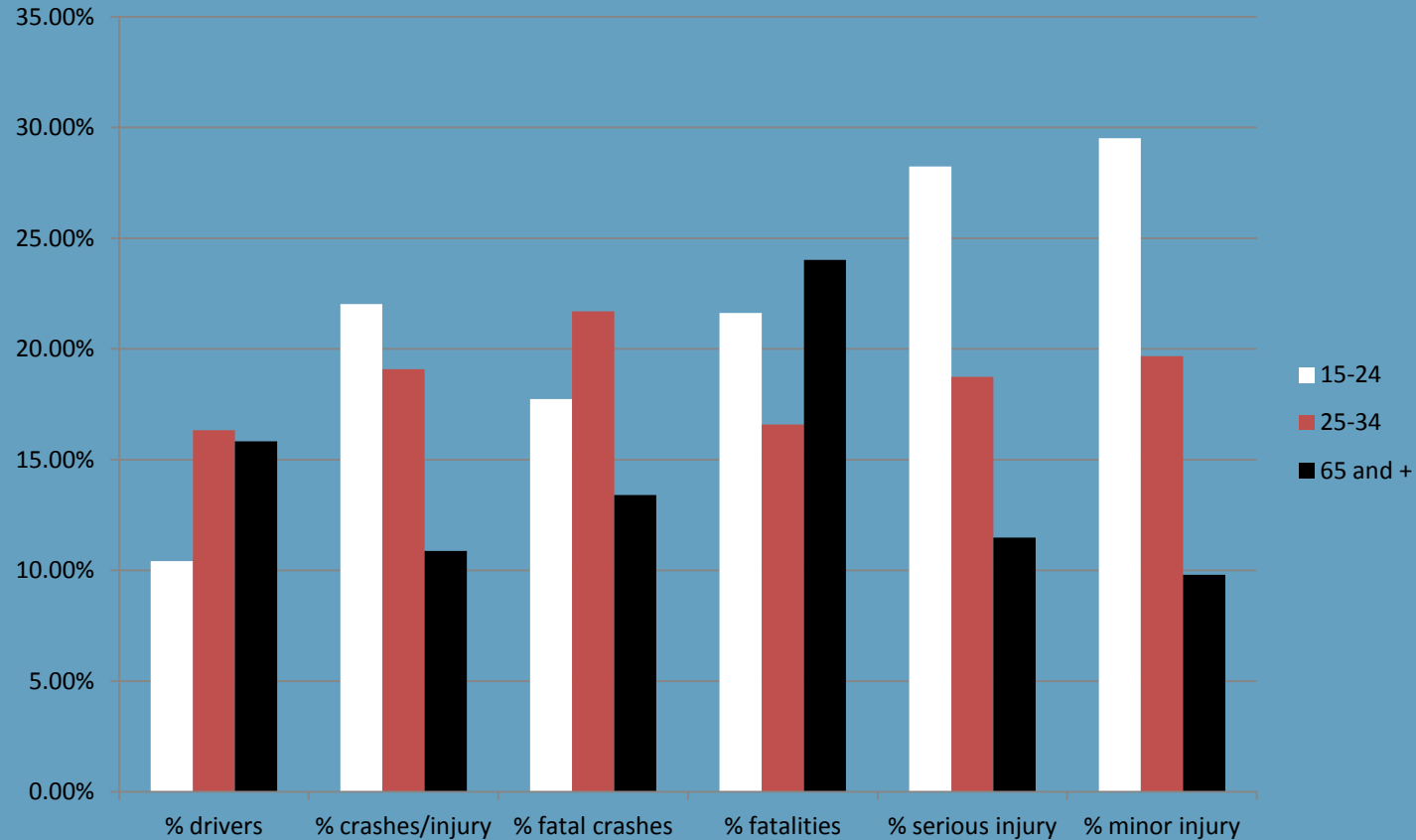
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Crashes in Quebec

Evolution of older drivers in Quebec
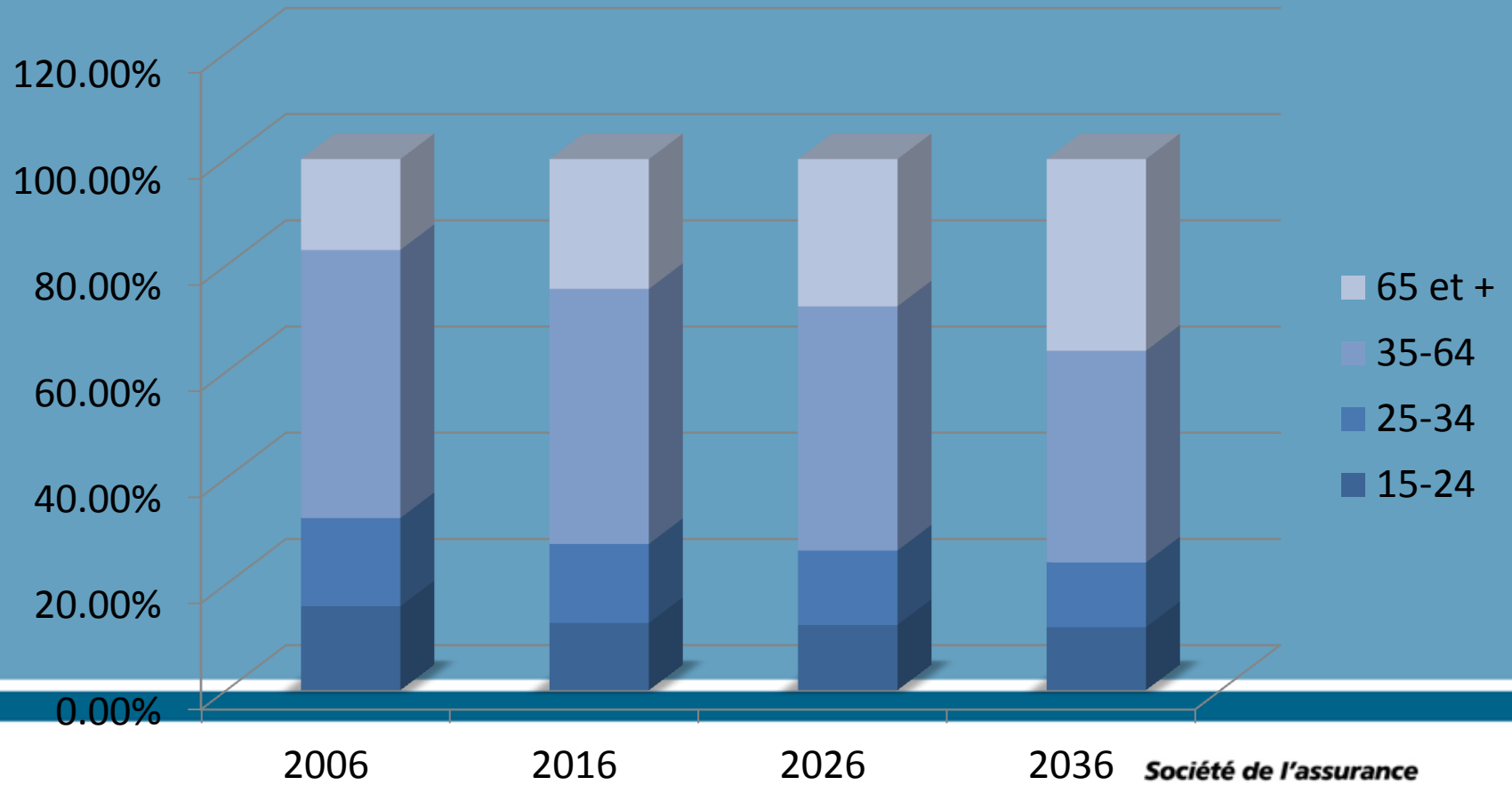
(Institut de la statistique du Québec : *Perspectives démographiques du Québec et les régions 2006-2056*

Evolution of older drivers in Quebec

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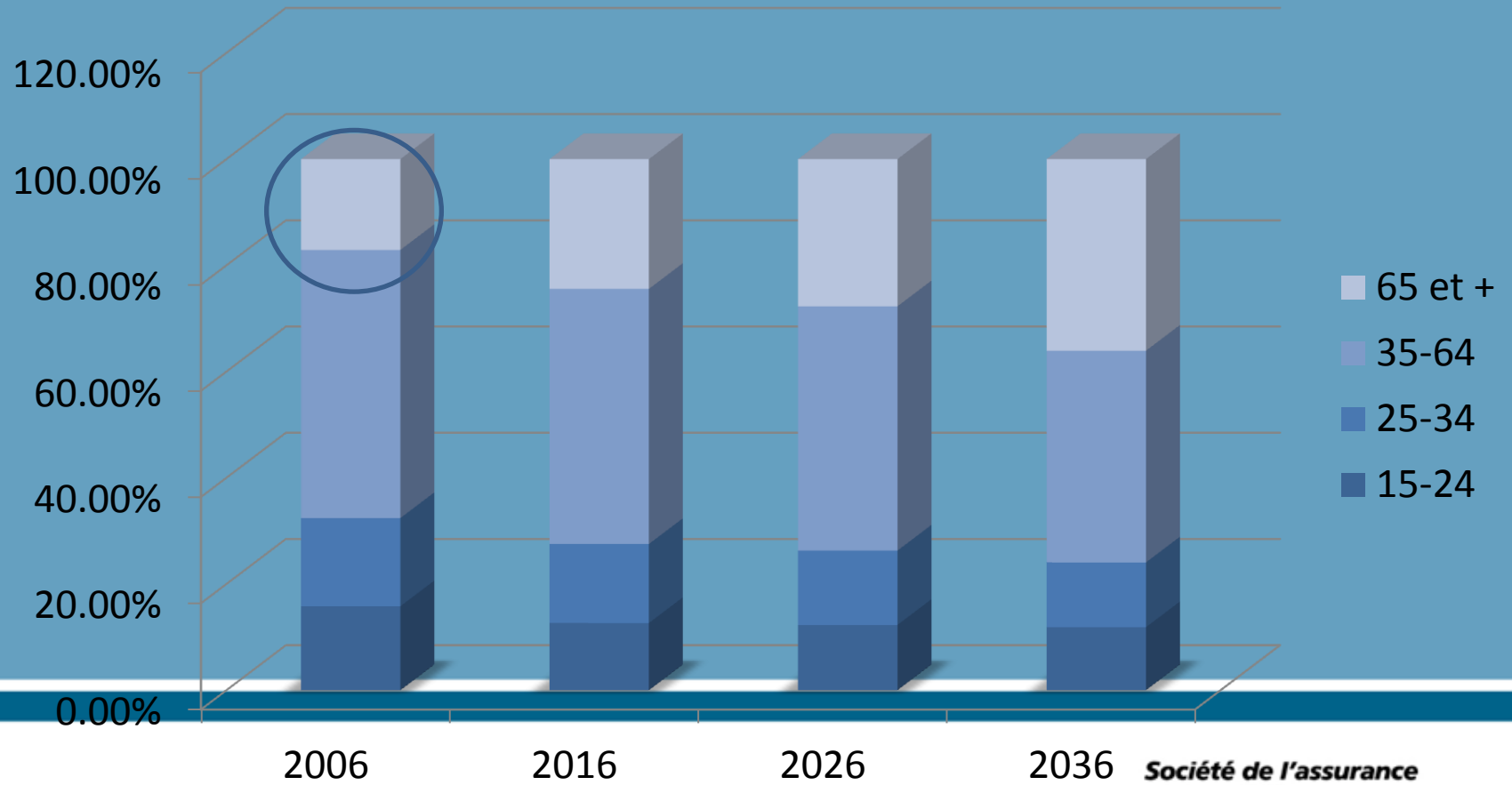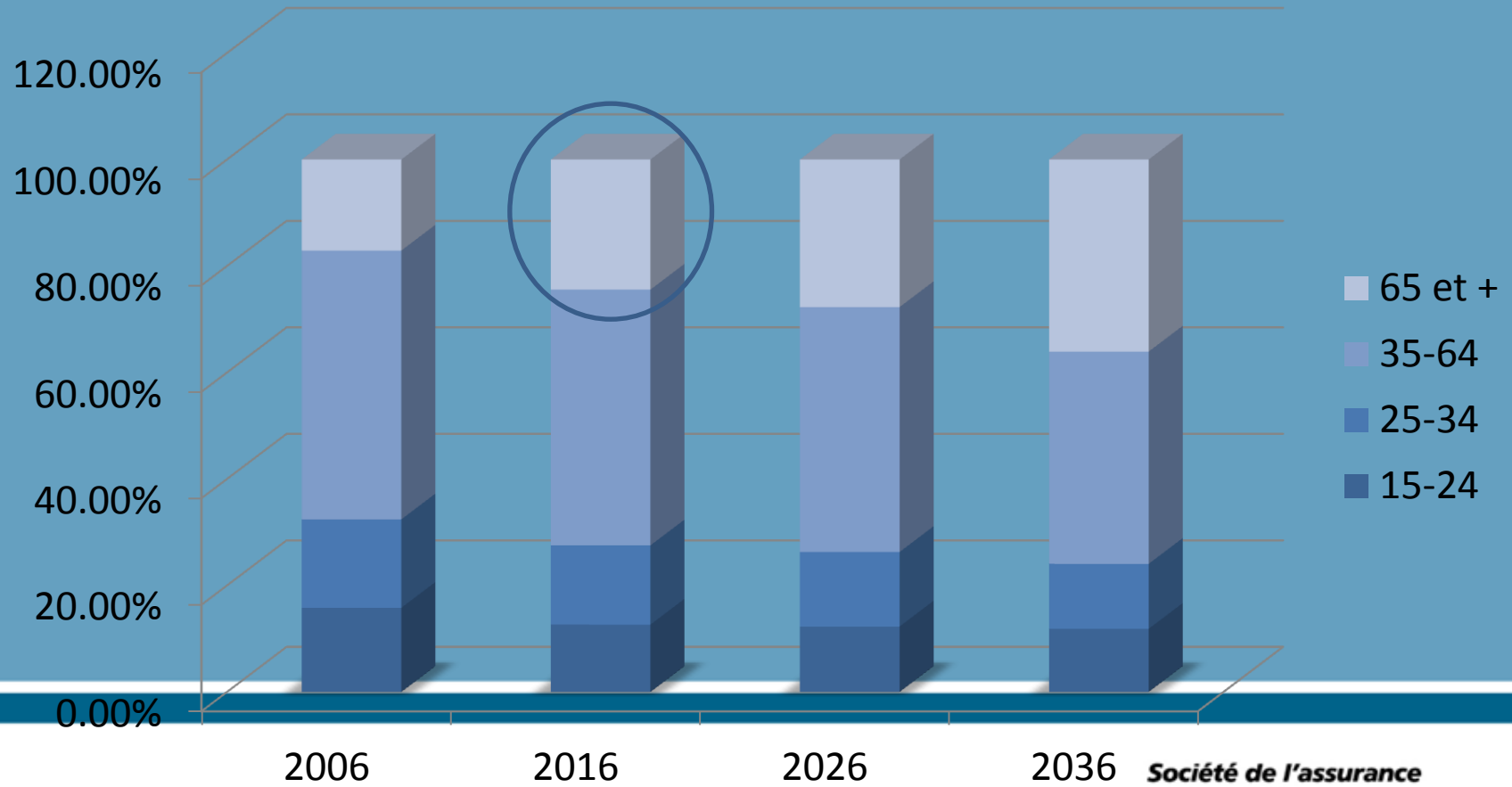
Evolution of older drivers in Quebec

(Institut de la statistique du Québec : *Perspectives démographiques du Québec et les régions 2006-2056*

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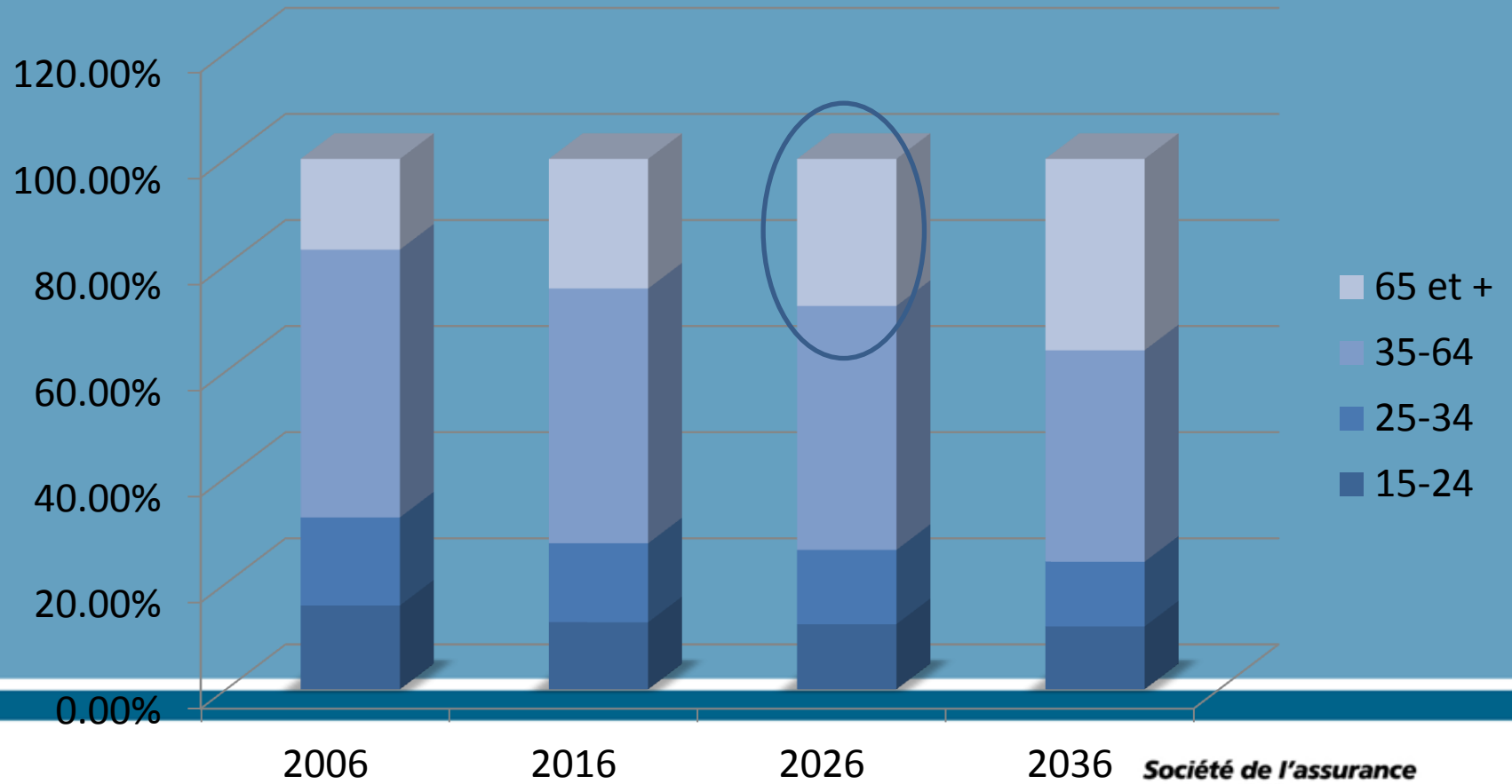# Evolution of older drivers in Quebec

Evolution of older drivers in Quebec

65 et +
35-64
25-34
15-24

120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%

2006   2016   2026   2036

(Institut de la statistique du Québec : *Perspectives démographiques du Québec et les régions 2006-2056*

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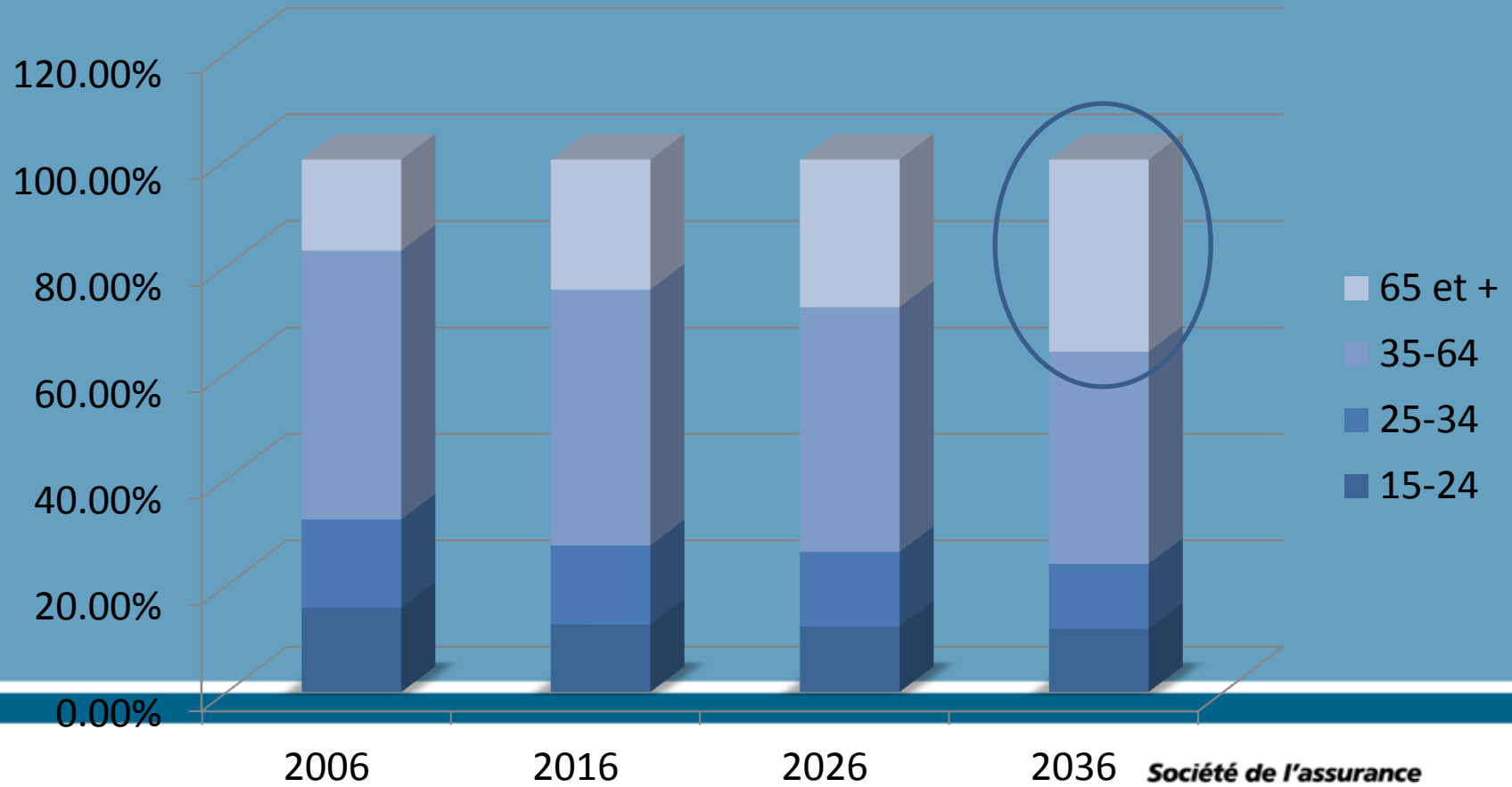# Crossing the street

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Geriatric trauma

The older a person is when they undergo trauma, the more likely they are to:

Die

Suffer a complication

Suffer sequellae that affect their autonomy

Spend a long time in hospital

Require a long rehabilitation period

Fragility and anticoagulation

Geriatric patients are more fragile than their younger counterparts

More likely to suffer serious injury/death whereas a younger person would suffer minor injuries

Bones are more brittle

Many geriatric patients take an aspirin a day

Hemorrhagic complications due to anti-coagulation

At 75, 10 days in bed = loss of 10% - force and motricity – that is a permanent loss.

To quote Abraham Lincoln

"There are three kinds of lies:

Lies

Damned lies

And:

STATISTICS!"

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Basis: mileage driven
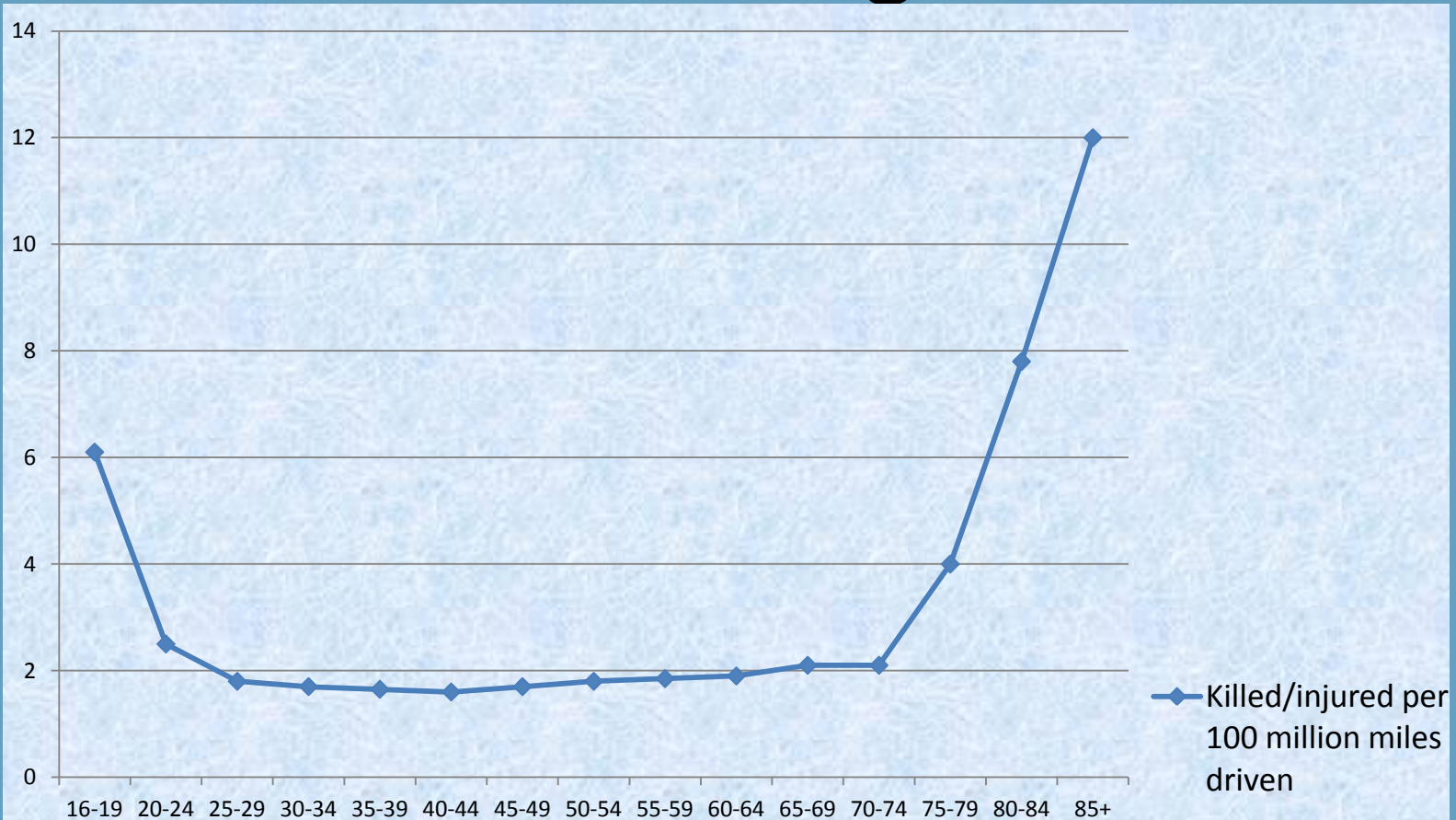
Basis: per 10 000 licensed drivers
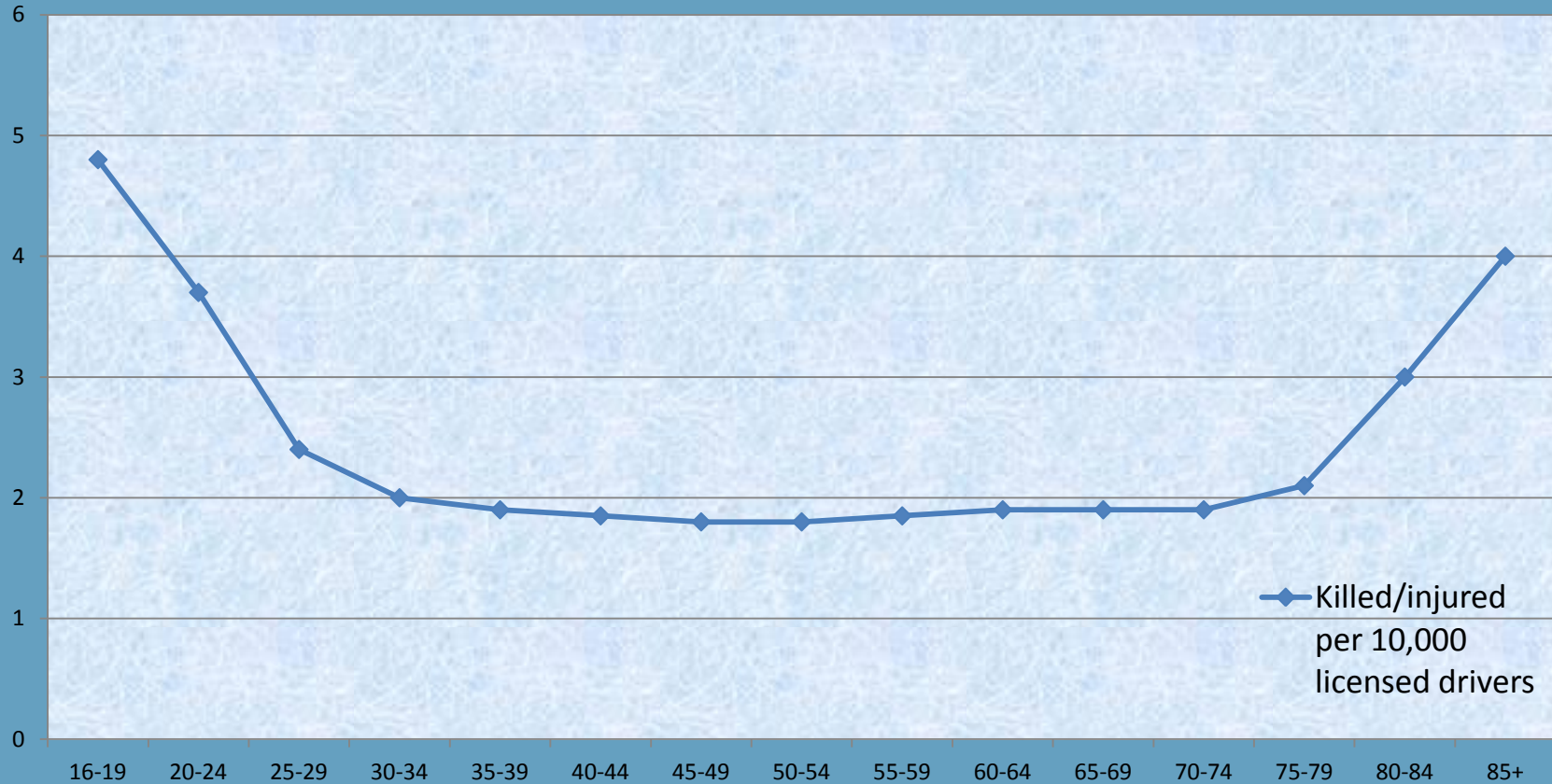
Basis: per 10 000 people
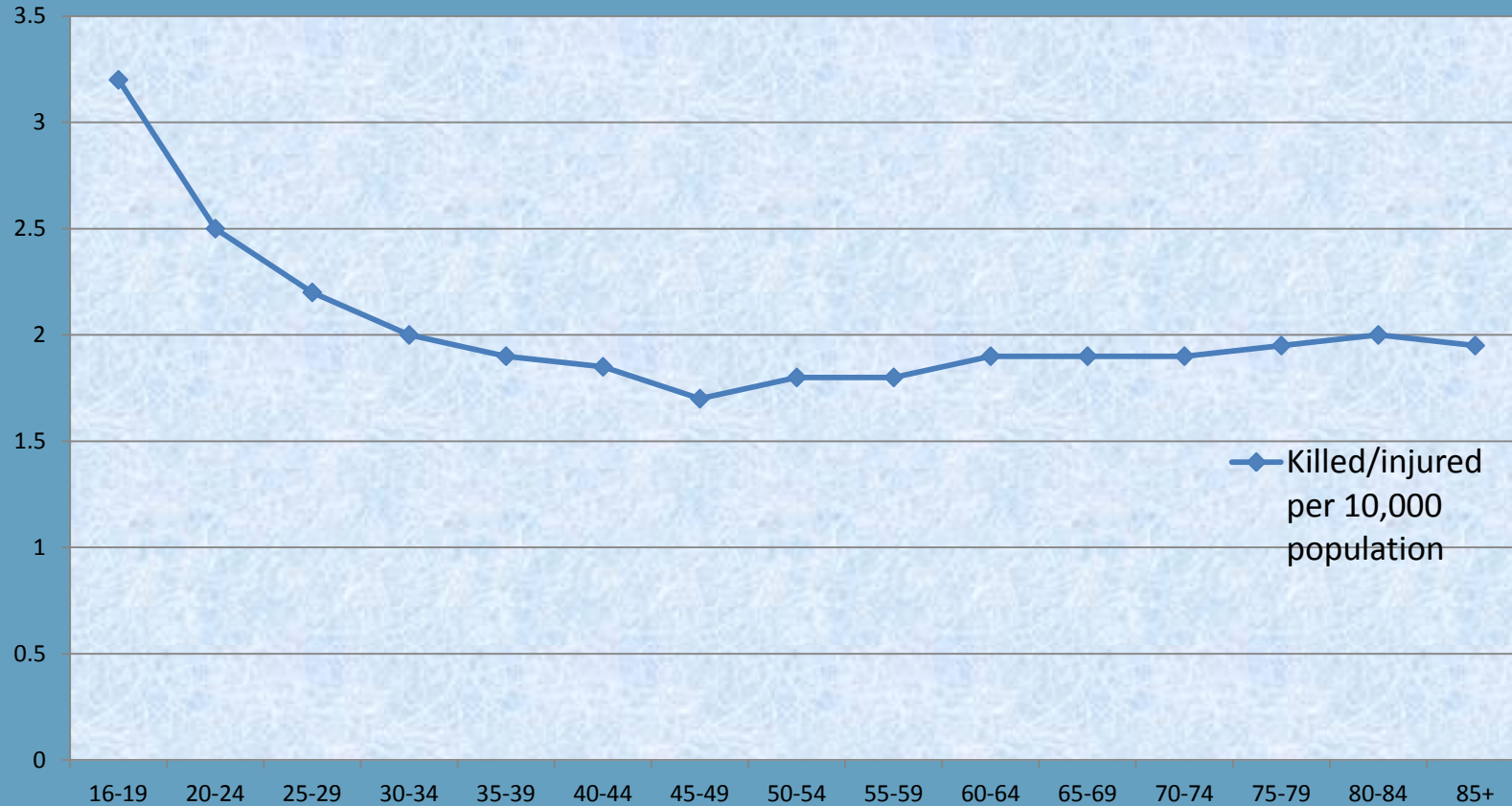
Combined
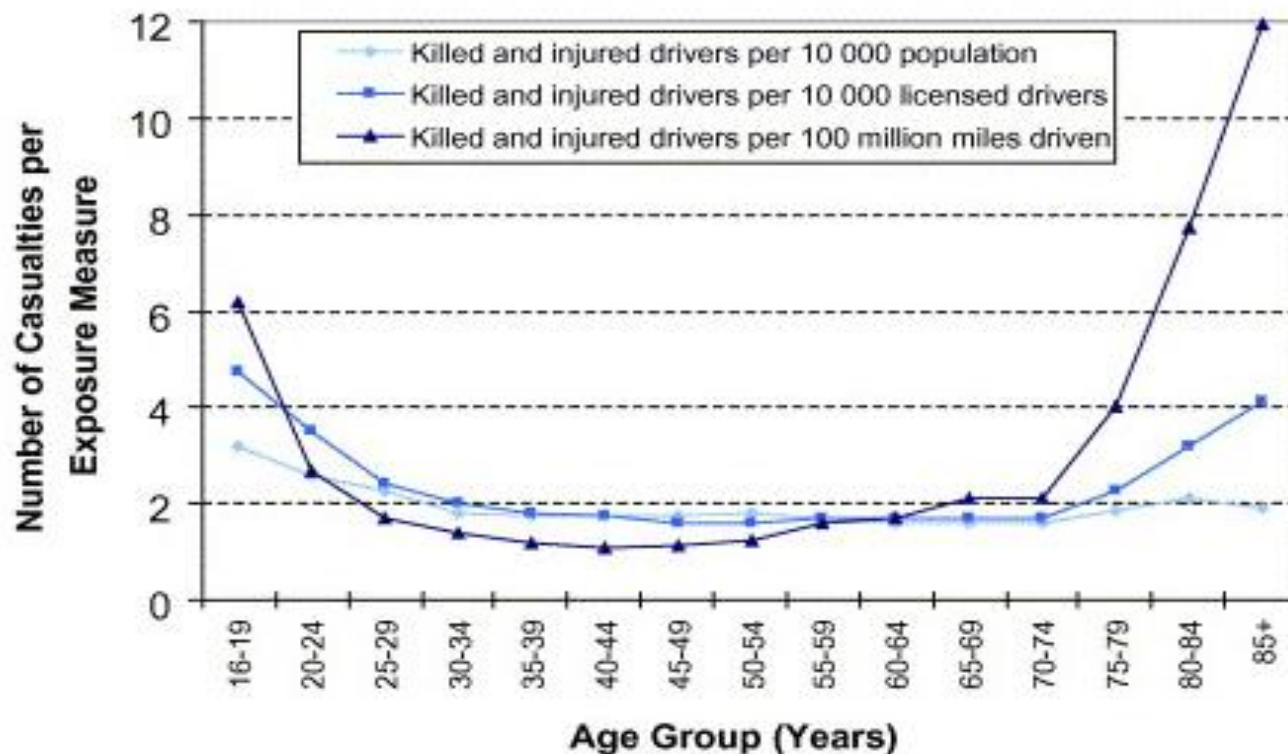
Fig. 1. US driver fatalities and injuries for different age groups relative to the population, the number of drivers' licenced and distance travelled, 1997 (adapted from OECD, 2001).

Langford, 2004

SAAQ medical review programme

- SAAQ does between 350 000 and 450 000 medical reviews annually

- Mandatory age-based medical reviews at 75, 80 and every 2 years thereafter

- 75 000 to 85 000 medical reviews annually for drivers over 75

- 880 medical suspensions and 3 780 voluntary forfeitures annually for drivers over 75

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Physician reporting in Canada

- 10 of 13 jurisdictions –mandatory
- 3 – discretionary – AB, NS, QC
- QC – full legal protection if done in good faith
- BUT: Physicians cannot report what they don't know
- Physician training in driver evaluation essential
- QC – 1 800 (2001) to 16 000 (2011) with CME

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Questions for medical/paramedical personnel

- Do you query patients on driving habits on a routine basis?

- Do you counsel patients on the effects that their medical conditions will have on driving?

- Do you counsel patients on how to avoid risks caused by their medical condition?

- NO MATTER HOW OLD THEY ARE?

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Driving in Quebec

- Driving is a privilege
- An activity of daily living (ADL)?
  - Most adults possess a driver's licence
  - Most drive at least once a week and many drive each day
  - The car is the principal means of transportation for most Quebecois
  - Outside the few urban areas, little public transport
- Driving cessation = social isolation

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Medical standards

Medical standards for drivers are based upon statistics derived from clinical experience in the general population

We do not know if the driving population reflects the distribution of medical conditions in the general population

Is it valid to apply clinical statistics derived from the general population to drivers?

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Crash risk: medical factors

"While there is a substantial body of research evidence linking specific medical conditions to heightened crash risk, the proportions of road crashes which can be attributed to medical conditions are less certain. **Lindsay and Ryan (2011)** *used linked medical, licensing and crash data from a sample of seriously injured South Australian road users to judge the contribution of a pre-existing medical condition or an acute medical event to the sample's crashes.* **It was judged that medical factors contributed to 12.7 percent of all crashes**. *Almost 25 percent of medically-related crashes involved a loss of consciousness prior to the crash, with seizure accounting for a further 17 percent of these cases."*

(Langford 2012)

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The "Quebec" study

The Societe de l'Assurance Automobile du Québec (SAAQ) data bank with linked records for :

- health insurance records,1 July 2003- 30 June 2006;

- crash statistics, 1 July 2004- 30 June 2006;

- driving record (includes declared medical information)

- licence data as of June 1 of each year (2003, 2004, 2005).

Linked licensing and health data was established for 96.0% of the original driver population .

(4.94 million drivers)

Medical conditions at risk

Eight medical conditions with elevated crash risk

- Diabetes

- Neurological

- Epilepsy

- Psychiatric

- Alcohol (abuse/dependency)

- Eye diseases

- Cardiovascular disorders

- Dementia

Conditions with a significantly elevated crash risk in at least two lists: Vernon et al. (2002), Vaa (2003) and Charlton et al. (2010).

Health versus age
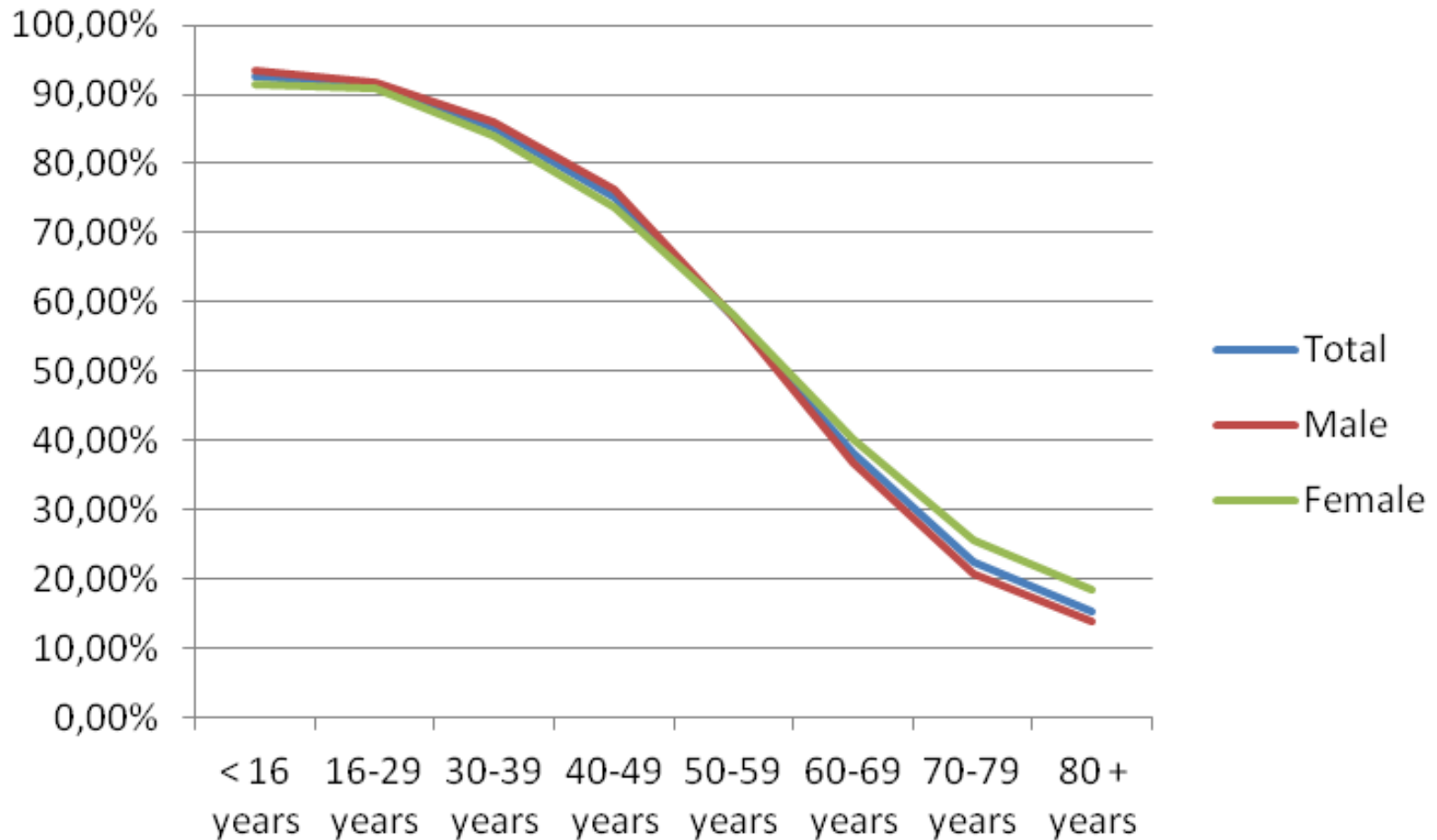
Langford, Dow, Turmel, 2011

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Diabetes

Langford, Dow, Turmel, 2011

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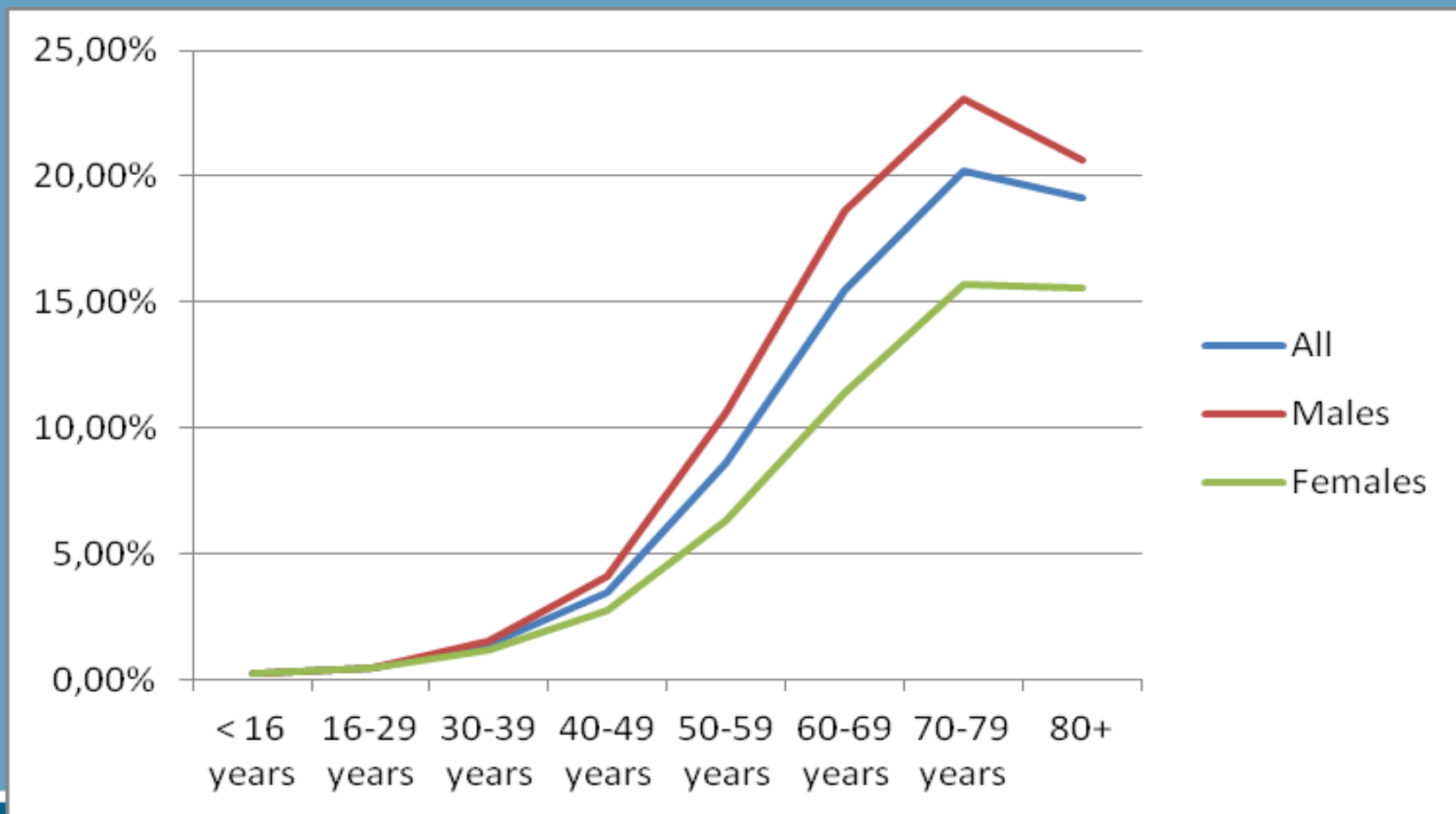
Substance abuse

Langford, Dow, Turmel, 2011

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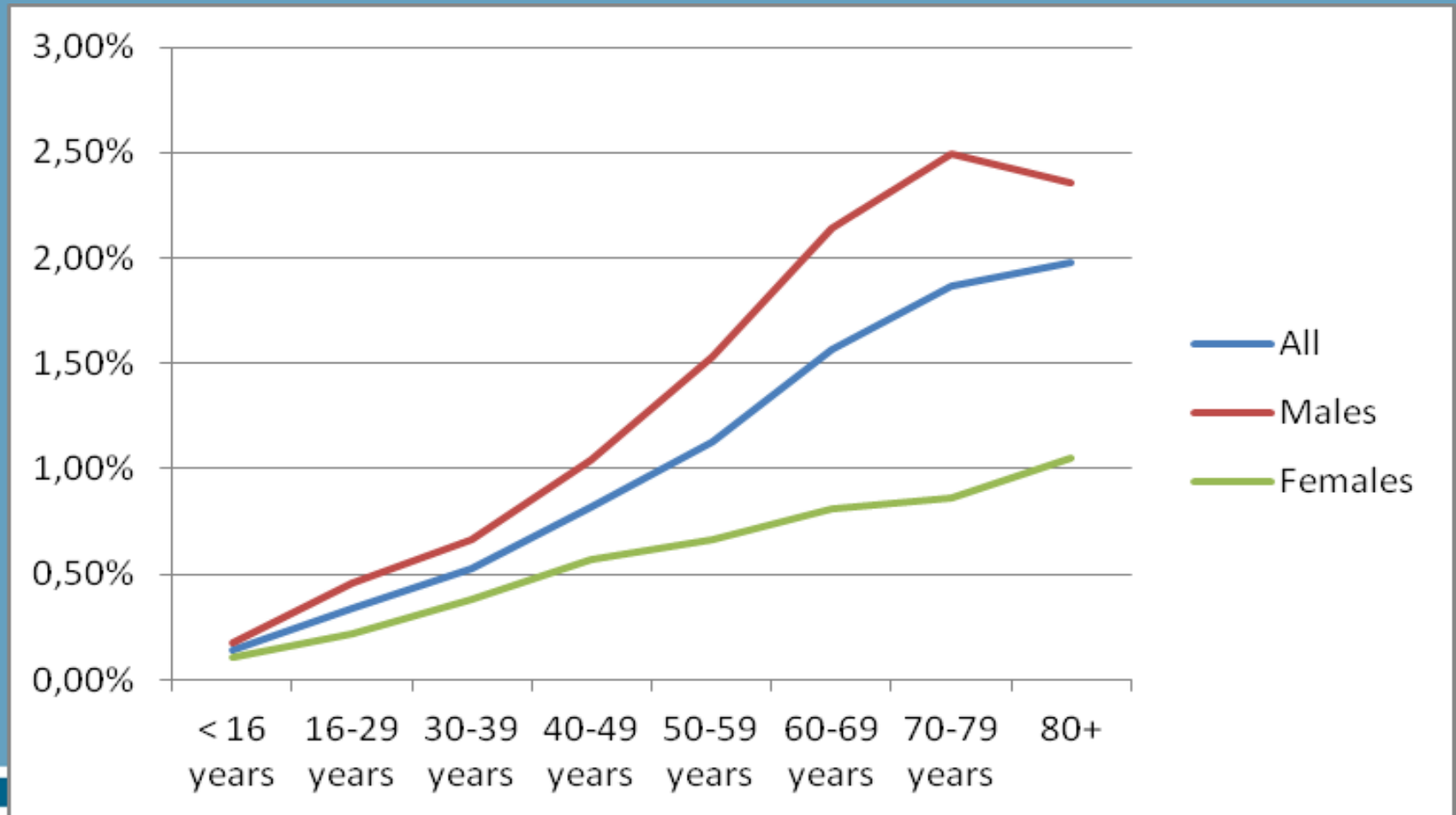
Predicted versus observed values
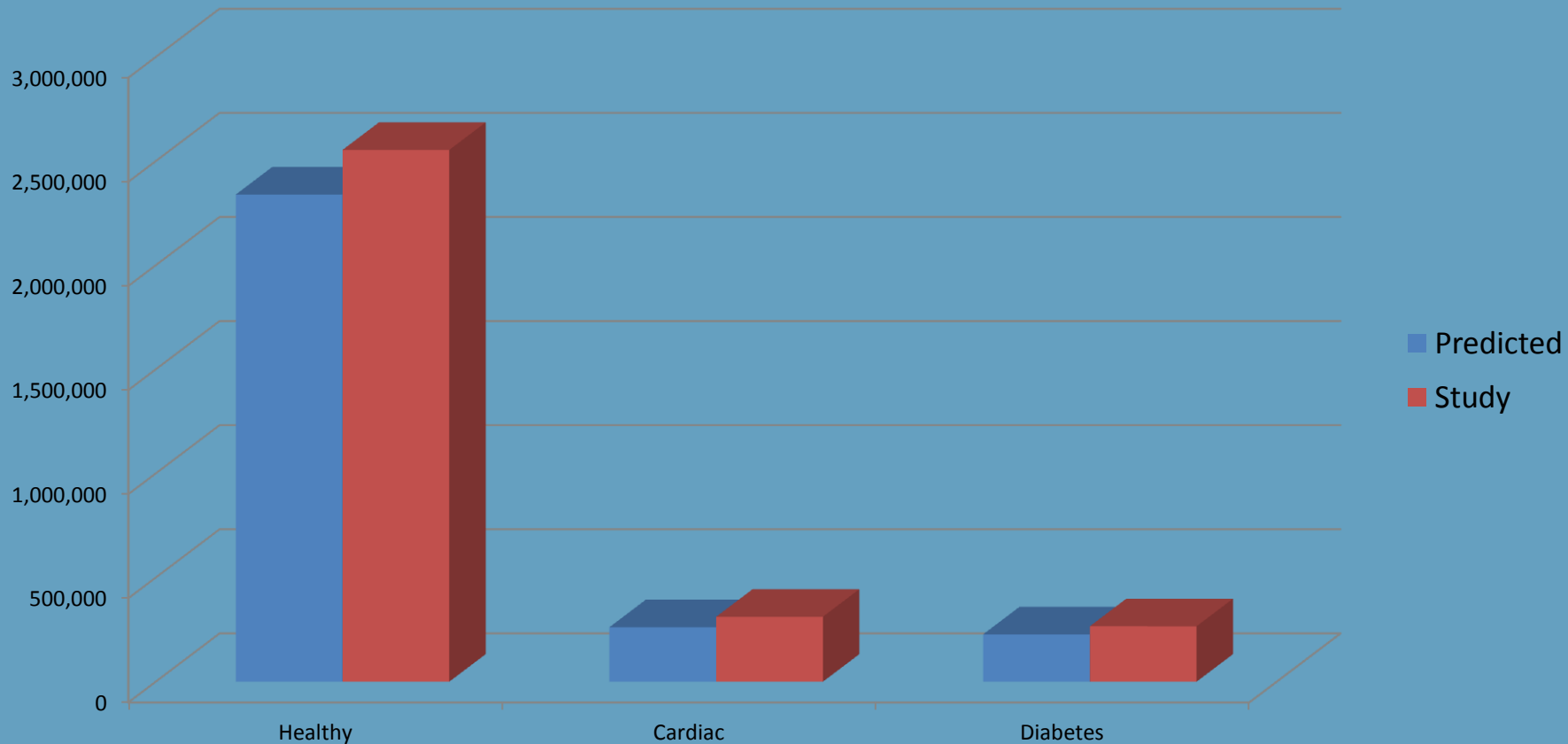
BUT…..

Epilepsy

- Predicted: 35 000 – 50 000 (0.7 – 1%)
- Actual : 31 000

Most of the epileptics in our sample are stable, receiving on-going treatment.

It is common knowledge that epilepsy has an incidence upon driving and many epileptics do not apply for licences unless their epilepsy is controlled.

Does this mean that, at least for epilepsy, it is incorrect to apply clinical statistics from the general population to drivers?

Why do we have mandatory medical controls?

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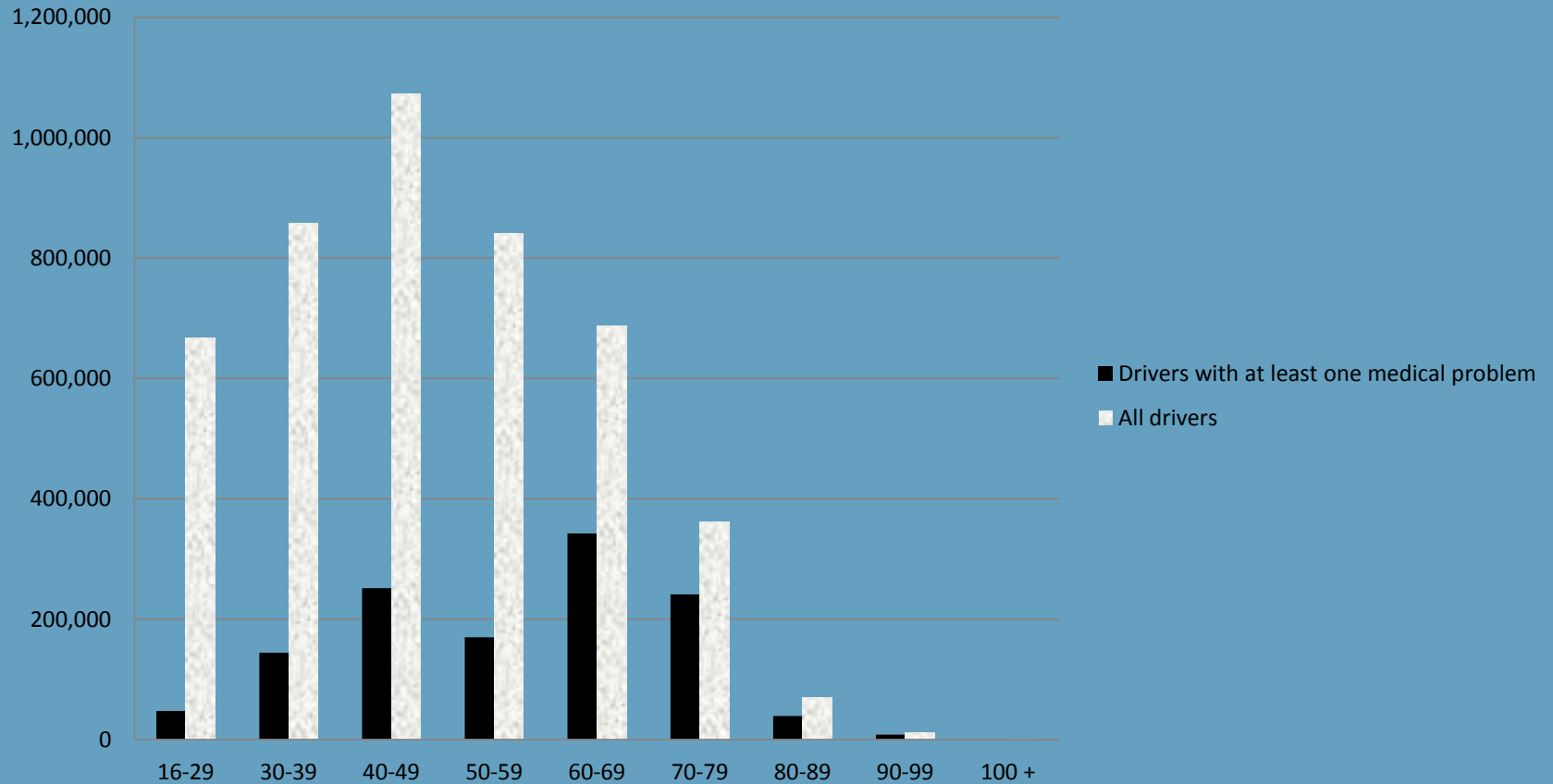
Voluntary self-reporting

33.45%

66.55%

■ Declaration
■ No declaration

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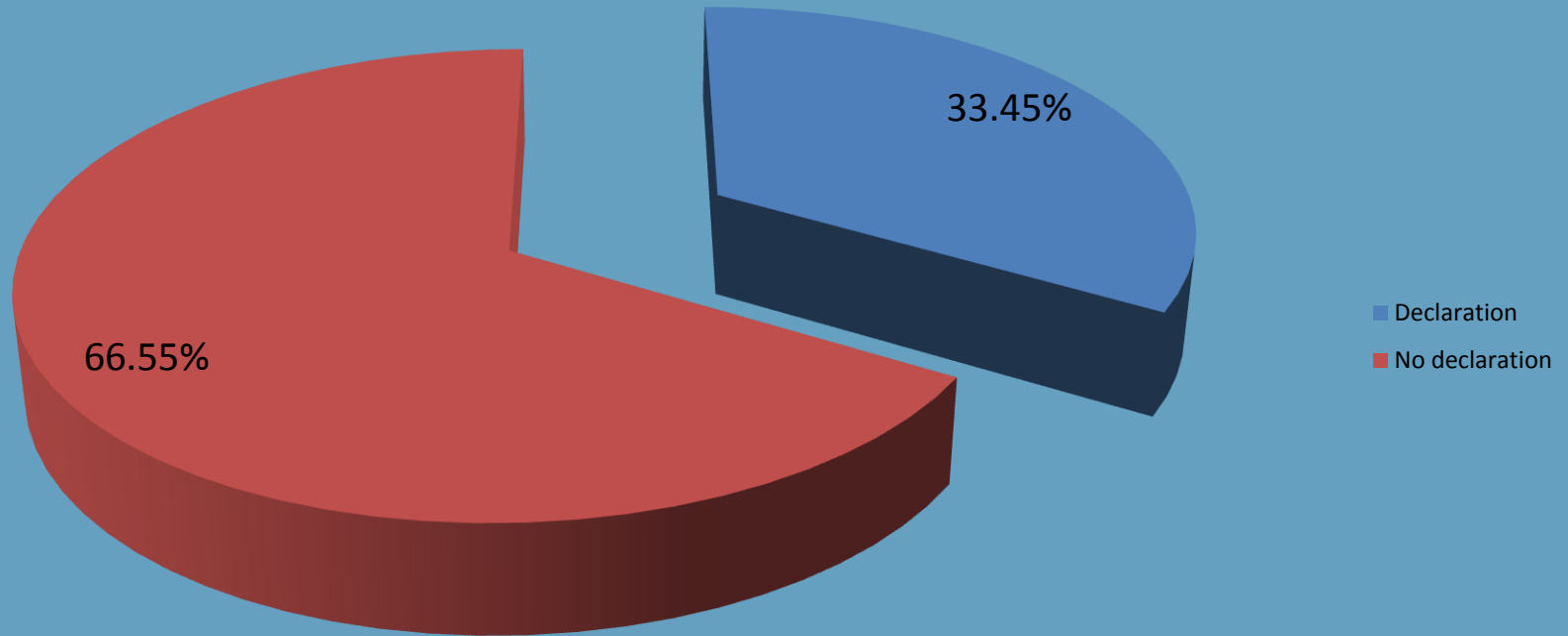
Drivers with a medical condition

29.40%

70.60%

■ Healthy/Minor

■ Identified Condition

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Self-reporting

80.00%	
70.00%	
60.00%	
50.00%	
40.00%	
30.00%	
20.00%	
10.00%	
0.00%	

1 Spectacles, 2 Visual, 3 Audition, 4 Vertigo, 5 Cardiac, 6 HBP, 7 Locomotor, 8 Psychiatric, 9 Alcohol, 10 Drug, 11 Epilepsy, 12 Neurology, 13 Syncope, 14 Diabetes, 15 Respiratory, 16 LOA, 17 Medication
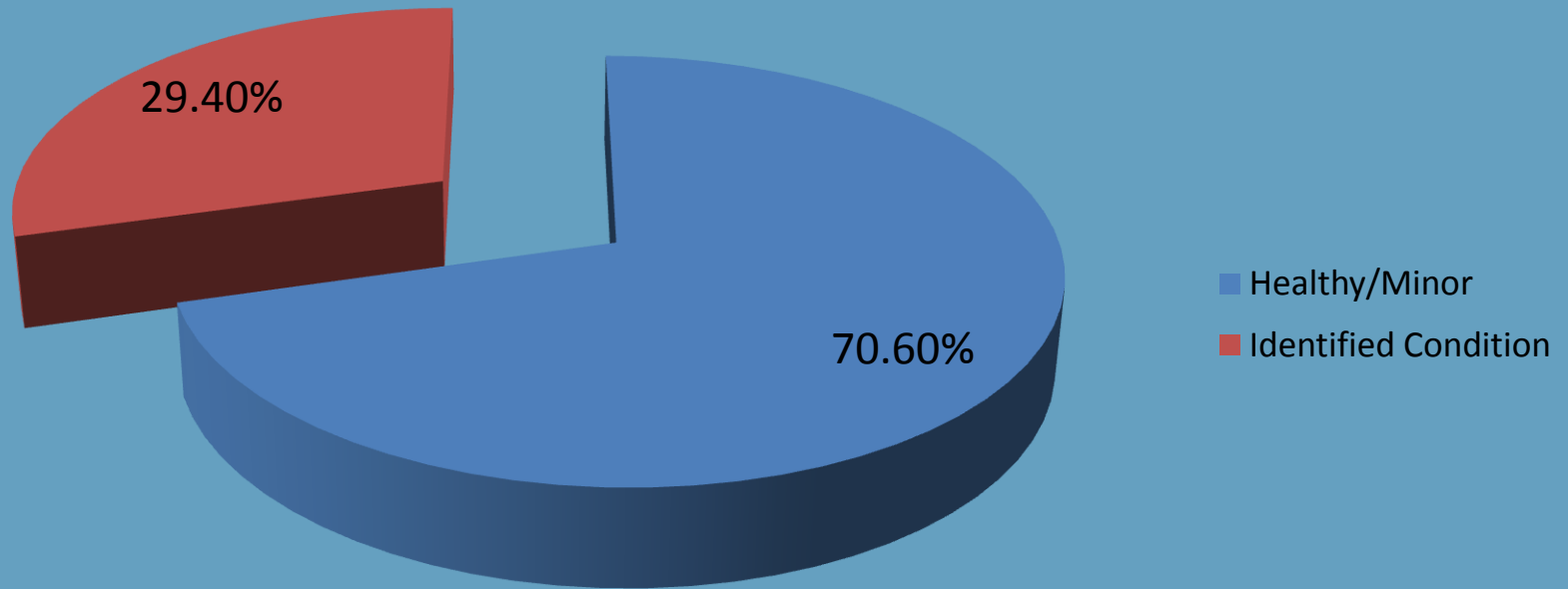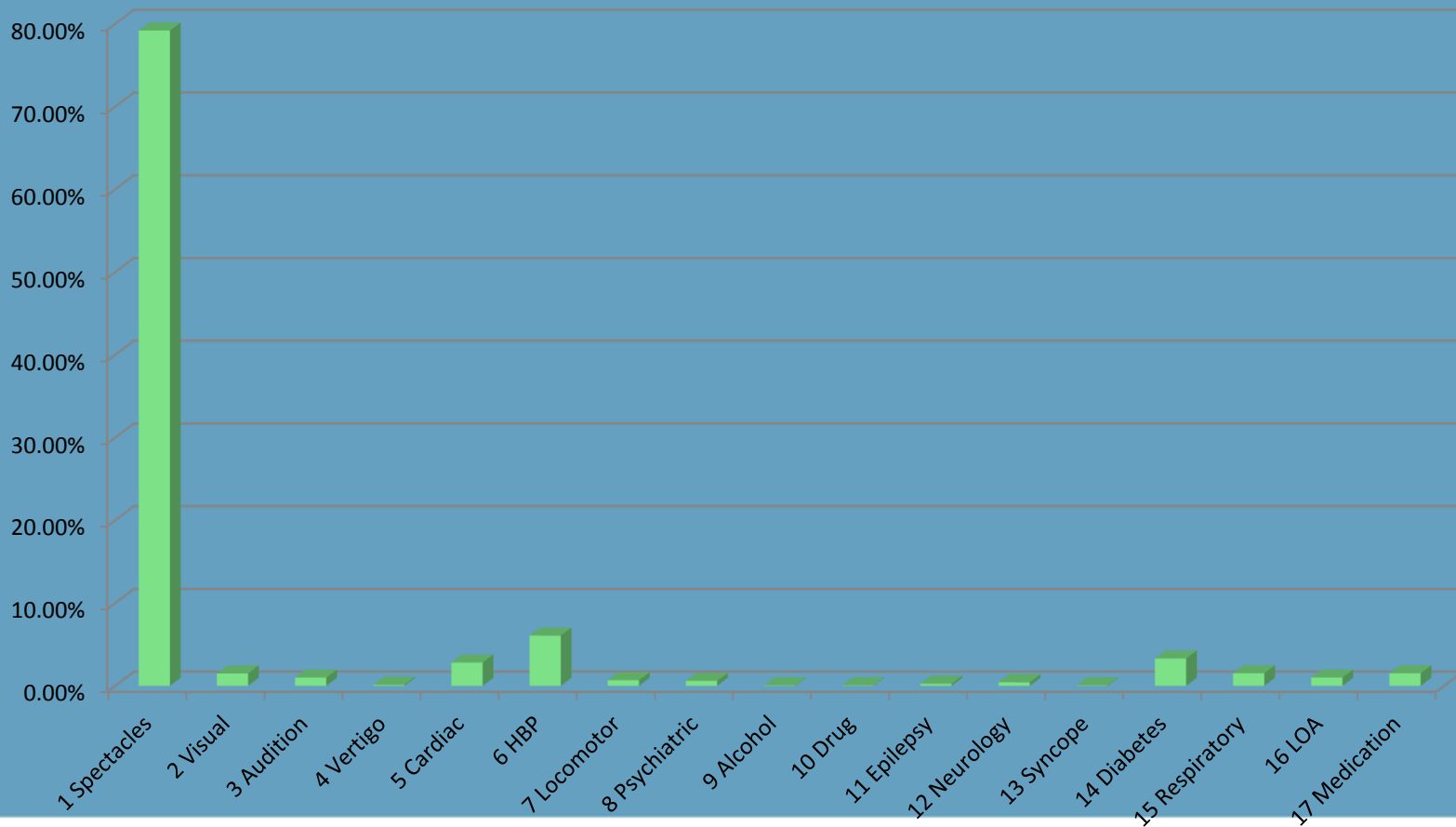
Self-reporting – Psychiatric conditions

Chart showing two red 3D bars: "Psychiatric Dx" at 190,877 and "Declaration" at 11475, with a vertical axis from 0 to 200,000.
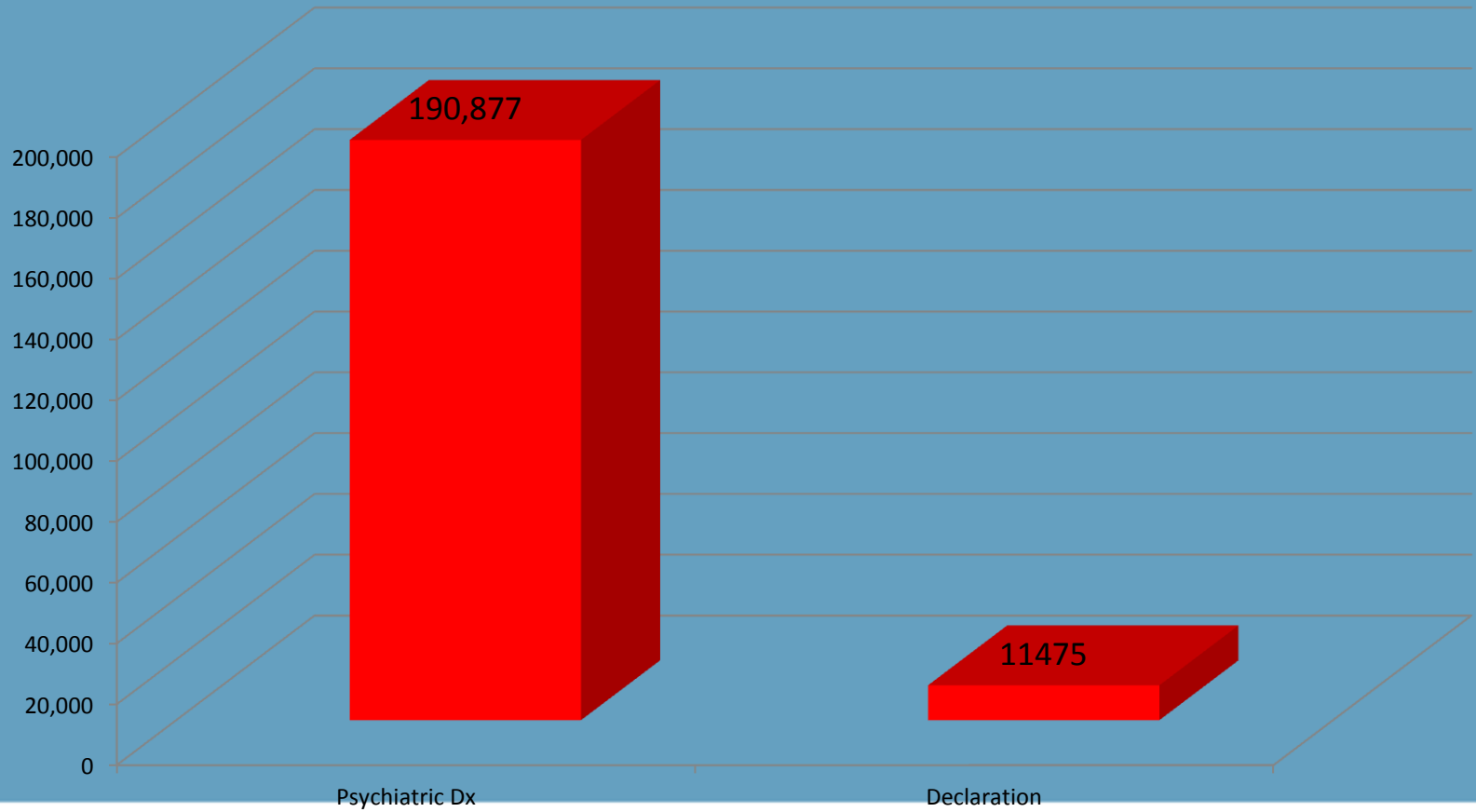
Self-reporting –drivers >75
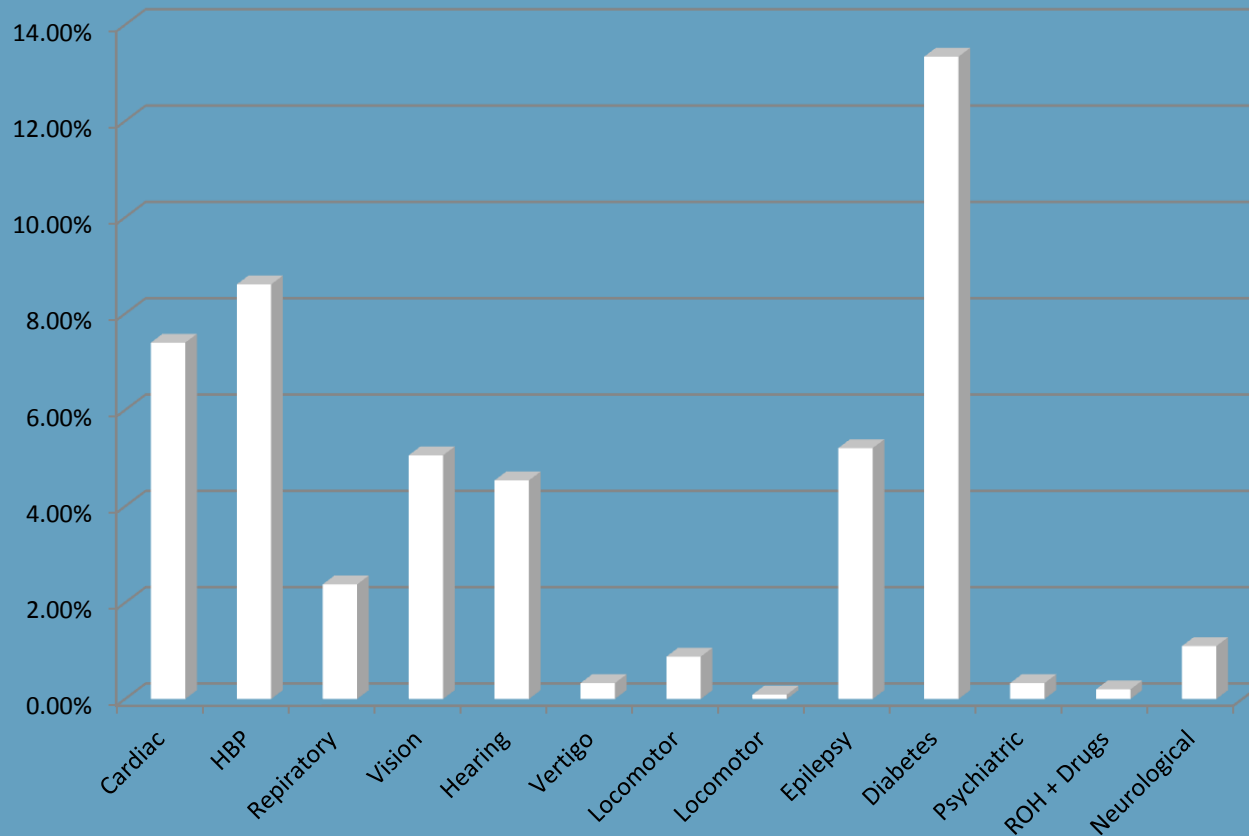
% of those with the condition who have reported it to the SAAQ

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Non-declaration rates

Cardiac	92,60%	Epilepsy	94,79%
HBP	91,39%	Diabetes	86,66%
Respiratory	97,62%	Alcohol +	99,80%
Vision	94,94%	Neurology	98,90%
Audition	95,46%	Syncope	99,91%
Vertigo	99,67%	Locomotor	99,12%

Physician reports – Drivers >75

Angina	25.00%	Infarctus	35.76%
Cardiac failure	24.03%	HBP	80.32%
Respiratory (asthma, etc)	28.93%	Visual	98.20%
Epilepsy	37.59%	Diabetes	88.93%

Reporting: physicians versus drivers

	MD	Dvr
Cardiac conditions	64.61%	5.21%
High blood pressure	80.82%	6.06%
Respiratory (asthma, etc)	28.93%	1.59%
Vision	98.20%	2.95%
Epilepsy	37.59%	3.43%
Diabetes	88.93%	17.59%

Self-reporting - Conclusions

Most drivers do not report medical conditions that are believed to affect driving status

Most voluntary reports submitted by drivers concern medical conditions with little effect on driving

Physicians' reports are a more reliable source of accurate information on drivers' medical status

Drivers >75 report more and have more medical conditions than younger drivers

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But ….

We have not demonstrated a link between reporting/not reporting and road safety

That's the next step.

Crash risk associated with a medical condition

Condition	Overall Crash Risk
Alcohol Abuse and Dependence	H**
Dementia	H**
Epilepsy	Ranges from H* to***
Multiple Sclerosis	H**
Psychiatric disorders	Ranges from H* to H**
Schizophrenia	H**
Sleep apnoea	Ranges from H**to H***
Cataracts	H**

H*   Relative Risk: 1.1-2.0
H**   Relative Risk: 2.1-5.0
H***   Relative Risk: 5.0+

Charlton 2010

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Crash risk associated with a medical condition

- Alcohol Abuse and Dependence   1.58
- Dementia   1.45
- Epilepsy   1.84
- Multiple Sclerosis   1.75
- Psychiatric disorders   1.72
- Sleep apnea   ----
- Cataracts   0.86

Vaa, 2003

Our results

- Alcohol Abuse and Dependence   1.32
- Dementia   0.82
- Epilepsy   1.42
- Multiple Sclerosis   1.12
- Psychiatric disorders   1.32
- Schizophrenia   ----
- Sleep apnea   1.08
- Cataracts   1.10

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SAAQ 2013

Multiple conditions

# of conditions	OR	CI (95%)
1	1.18	(1.16-1.20)
2	1.35	(1.32-1.38)
3	1.48	(1.43-1.52)
4 or more	1.54	(1.54-1.59)

Multiple conditions

# of conditions	Male	Female
0	1.00	1.00
1	1.14	1.26
2	1.27	1.48
3	1.35	1.69
4 or more	1.38	1.84

(However, males versus females = 1.60

Conclusions

In a driving population subjected to a medical review programme with mandatory age-based controls:

Crash risk is slightly higher for those with a medical condition believed to affect driving

Drivers with multiple conditions have higher crash risk

Conclusions

Female drivers with multiple conditions have the highest relative crash risk

Substance abuse, psychiatric conditions and epilepsy are the diagnoses with the highest crash risk for individual diagnoses

Respiratory disorders are associated with a moderate increase in crash risk

Conclusions

Older people have higher fatality rates in road accidents, principally due to increased fragility and anti-coagulation status

The emphasis must be on avoiding the accident that will affect an older person's autonomy while maintaining their mobility

Self-reporting alone is an inefficient means of identifying drivers with medical conditions

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Conclusions

Mobility does not equal "the car"

Questions?

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