

Correction for underreporting of road traffic casualties in the Netherlands relevance and method

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4th IRTAD CONFERENCE

Road safety data: collection and analysis

for target setting and monitoring performances and progress

Session 4 – Data Quality and Data Linking

Seoul, 16-17 September 2009

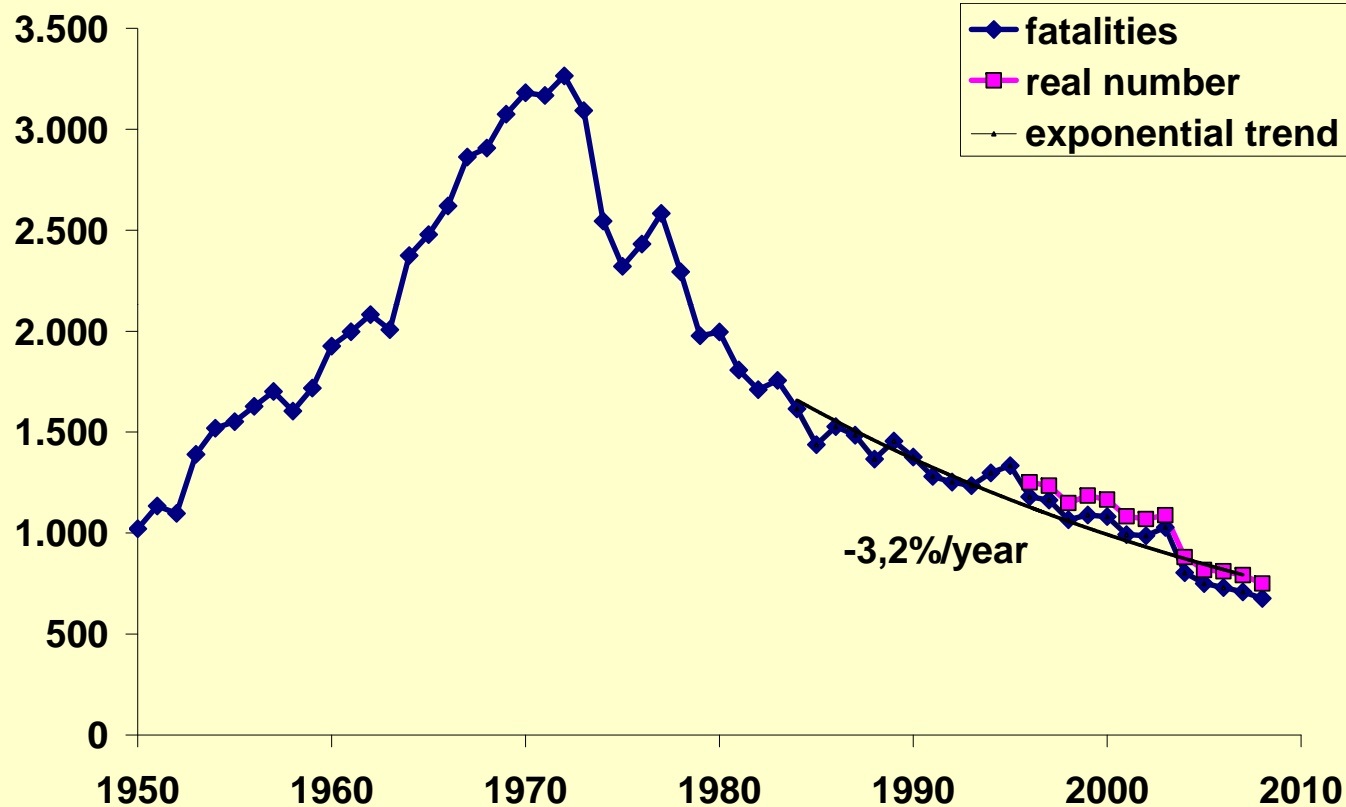


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Road traffic fatalities in NL



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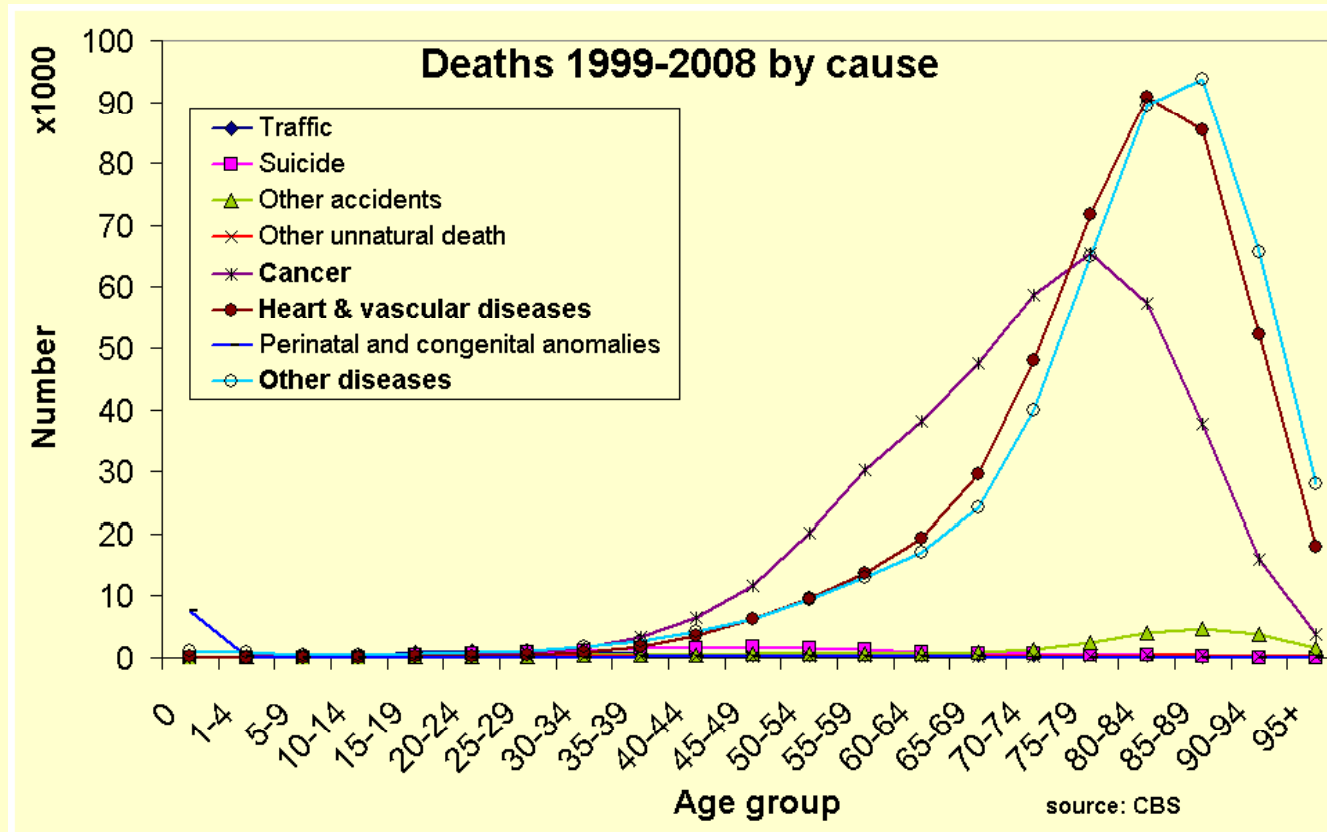
Introduction (1)

Size and nature of traffic safety problem

- The number of traffic casualties is underreported
 - Cost are underestimated
 - Effects are underestimated
 - Measures seem less effective
 - Bias causes a change in priority
- The average age of a traffic fatality is 45, young compared to other death causes (NL <1999-2008>). By comparing the effect of different measures on the number lives saved, the larger effect in gain of Life years is neglected.



Deaths by cause (1)

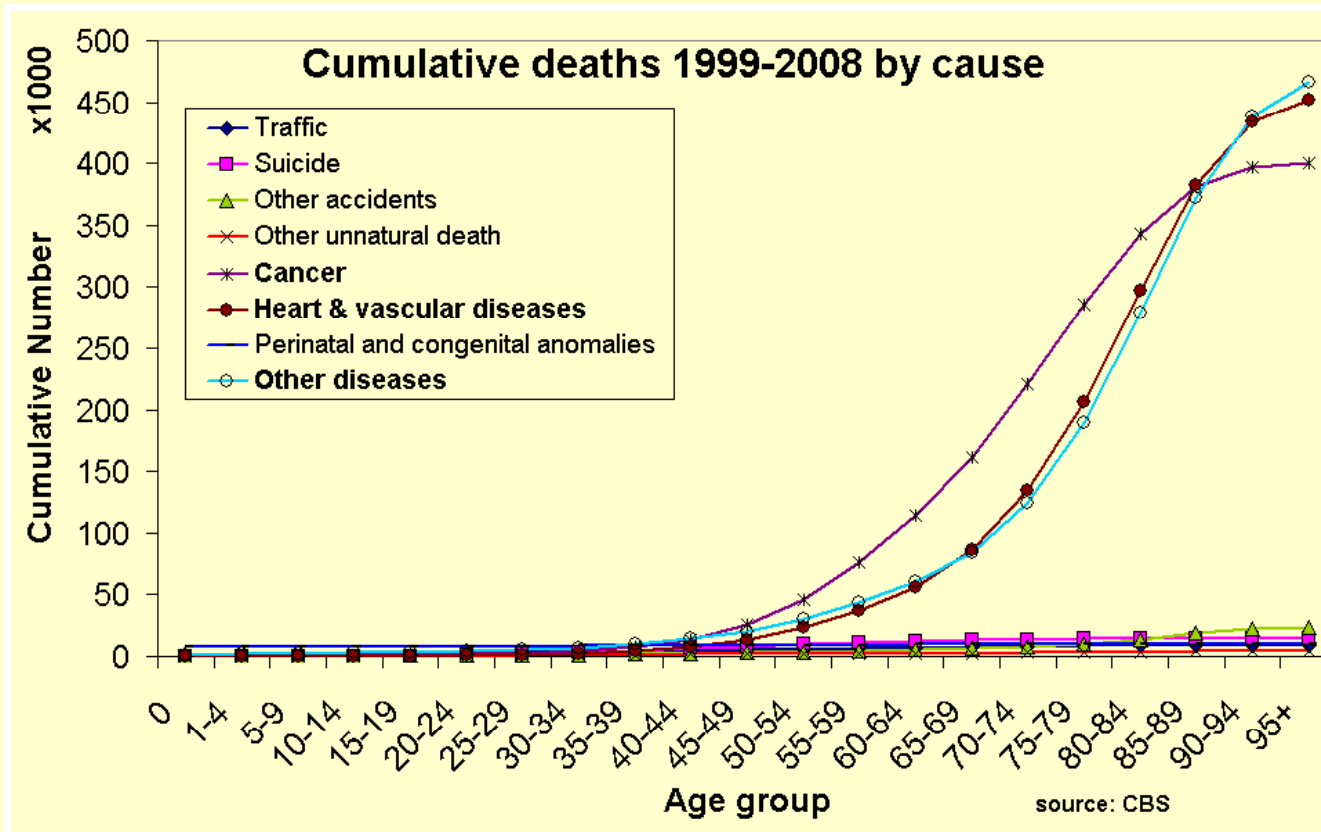


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Deaths by cause (2)



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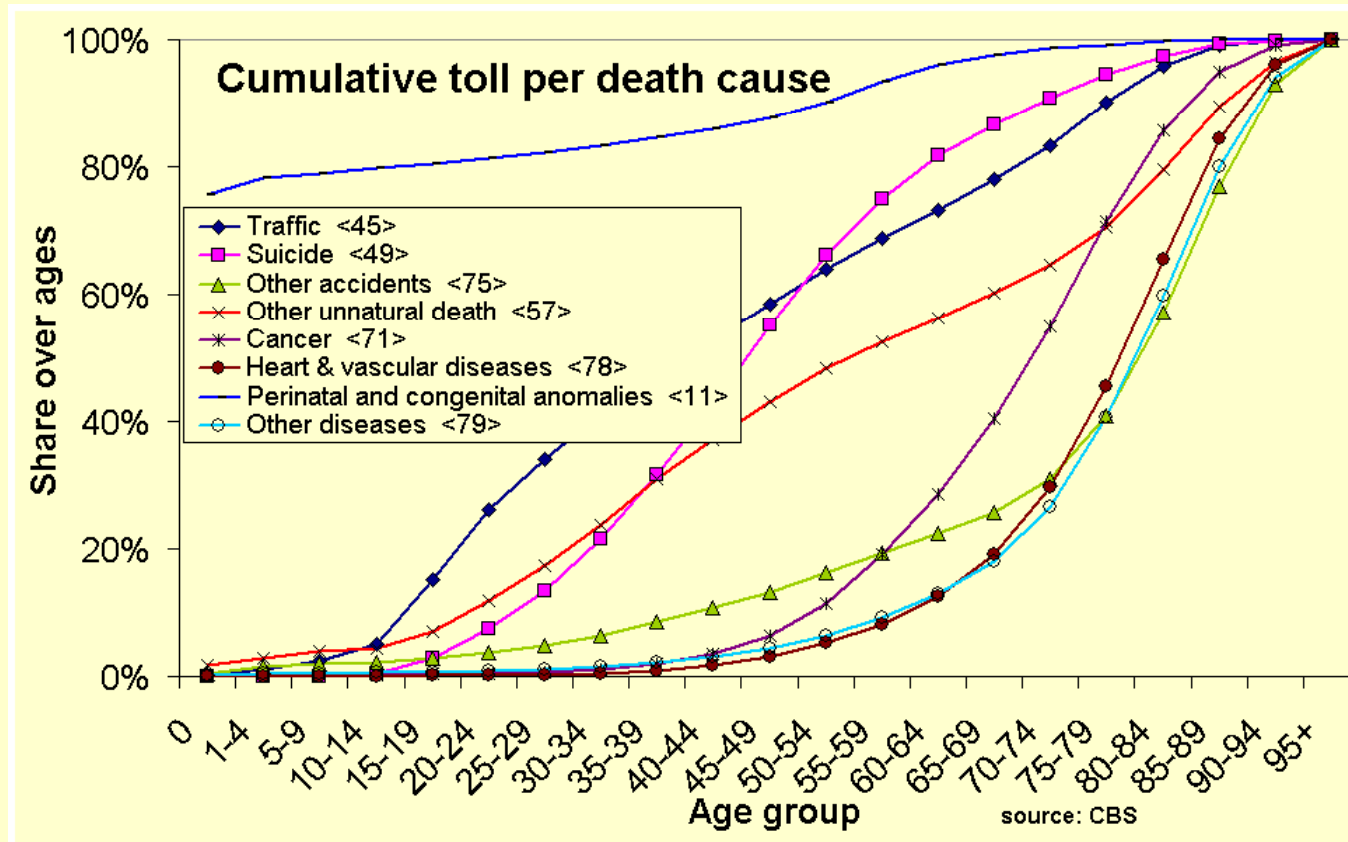


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Deaths by cause (3) potentials to gain



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Health and life expectancy

- Lower the number of deaths from a certain cause, especially for young people
- This will shift the curves to the right
- This will finally increase the number of deaths at high age for the group 'other diseases'



Underreporting (1)

- Not all crashes need to be reported (minor injury, damage only)
- Not all crashes are known to the police
- Not all cases are coded correctly in the database
- The injury is not always immediately detected
- Severity was misjudged (police is not educated to do so)

In most countries the police is the major source of crash data



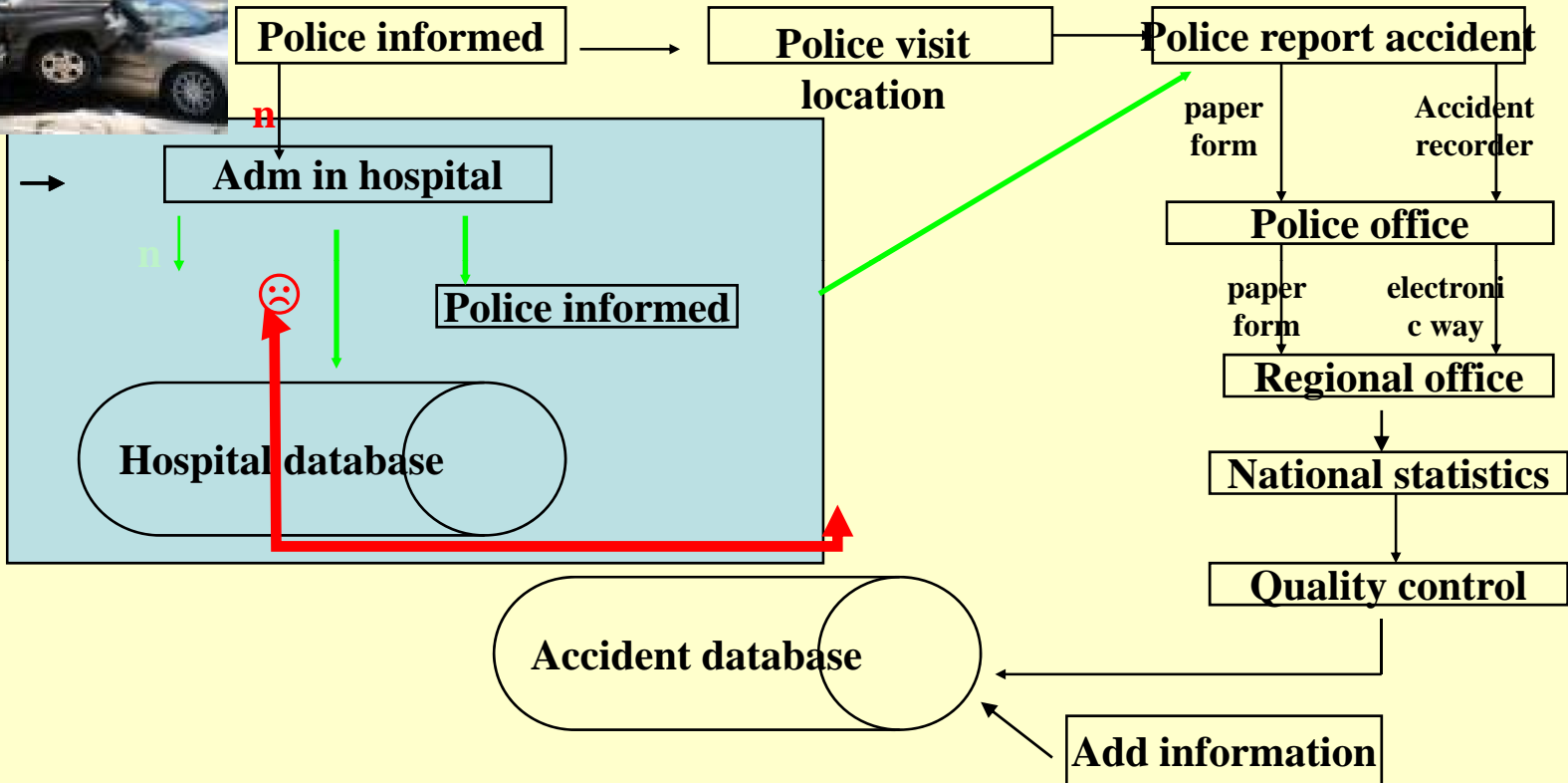
Underreporting (2)

It is important to know more about the loss of cases in each of these steps (stratified by severity and more)

- Underreporting leads to bias
 - Crashes studied are not a random sample
 - Distribution over modes, ages, road types is not correct
 - Correction factors are not equal for most crash characteristics
- Bias leads to suboptimal efficiency
 - Subgroups seem less unsafe (e.g. bicyclists)
 - Measures are developed and evaluated on their effect and effectiveness



Crash Reporting System



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Costs of road unsafety

Costs associated with traffic crashes in NL 2003, AVV(2006):

	Million €		Million €	Per Casualty
Medical costs	232	Fatalities	2,640	2.5
Material costs	3,866	Hospitalized casualties	4,655	0.25
Settlement costs	1,262	A&E casualties	767	0.008
Production loss	1,294	Slightly injured casualties	352	0.002
Traffic jam costs	125	Material Damage Only	3,912	0.002
Human costs	5,549			
Total	12,327	Total	12,327	11,7

This equals 2,6% of the GNP



Priority setting

- Within Road Safety
 - When numbers are underreported the effect of a measure will seem smaller
 - Crash types that are less well reported will show a high Cost/Effect ratio
- In comparison with other fields
 - A lot of fields are competing about where to invest the money with the most positive effect



Methods, alternative sources

- Crash file:
 - fatalities
 - injuries (hospitalized + slight + MDO)
- Alternative files:
 - fatalities: death causes, court files
 - hospitalized: medical registration (hospital in/out patients, ambulance, ...)
 - insurance, fireworks, road inspectors, ...



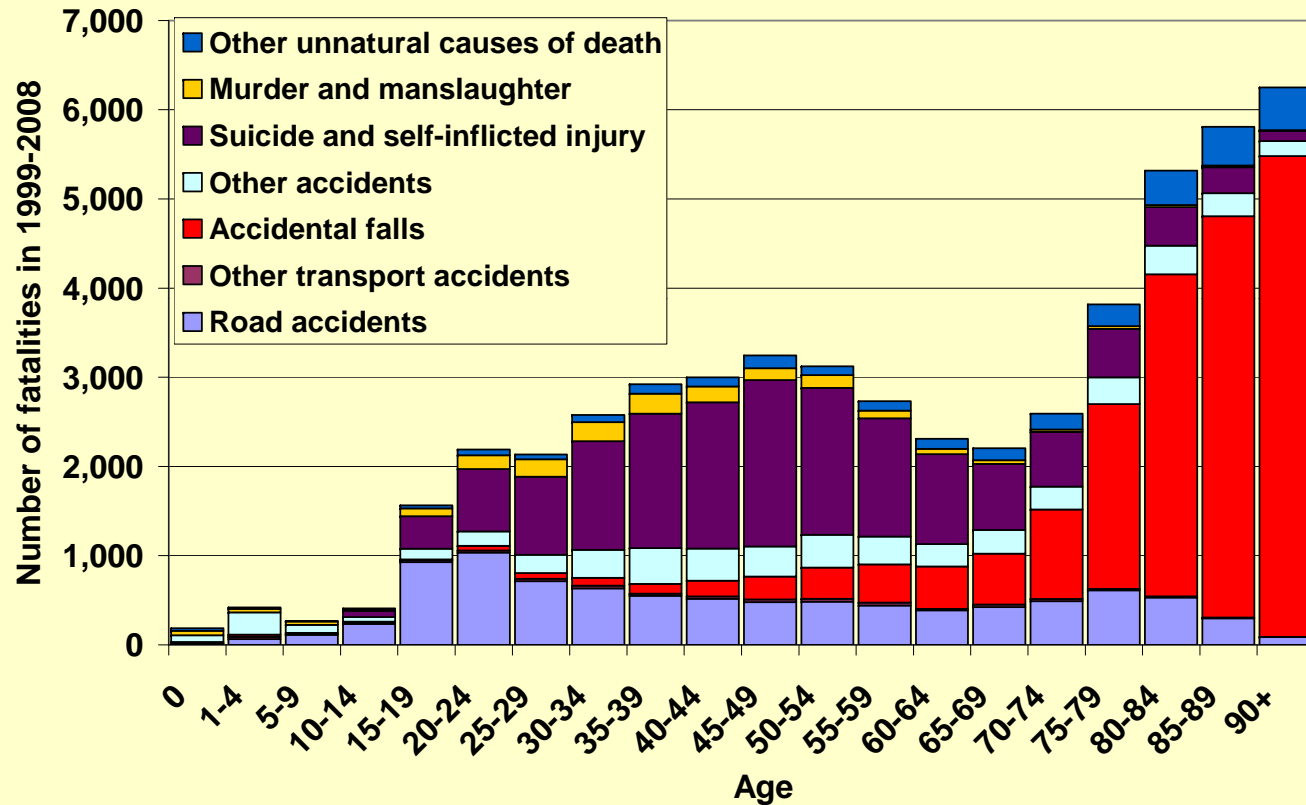
Data sources (2)

Different scope & definitions (fatalities)

- Road crashes (police):
 - traffic incidents with moving vehicles on Dutch public roads
- Death causes (population statistic, health):
 - Dutch Inhabitants all over the world,
 - unnatural death (4%) and natural death (96%),
 - date and place of death, sometimes also date / place of incident known
 - enables benchmarking with other causes of death
- Court files (crime):
 - cases of unnatural death, committed in the Netherlands



Road fatalities and other unnatural death



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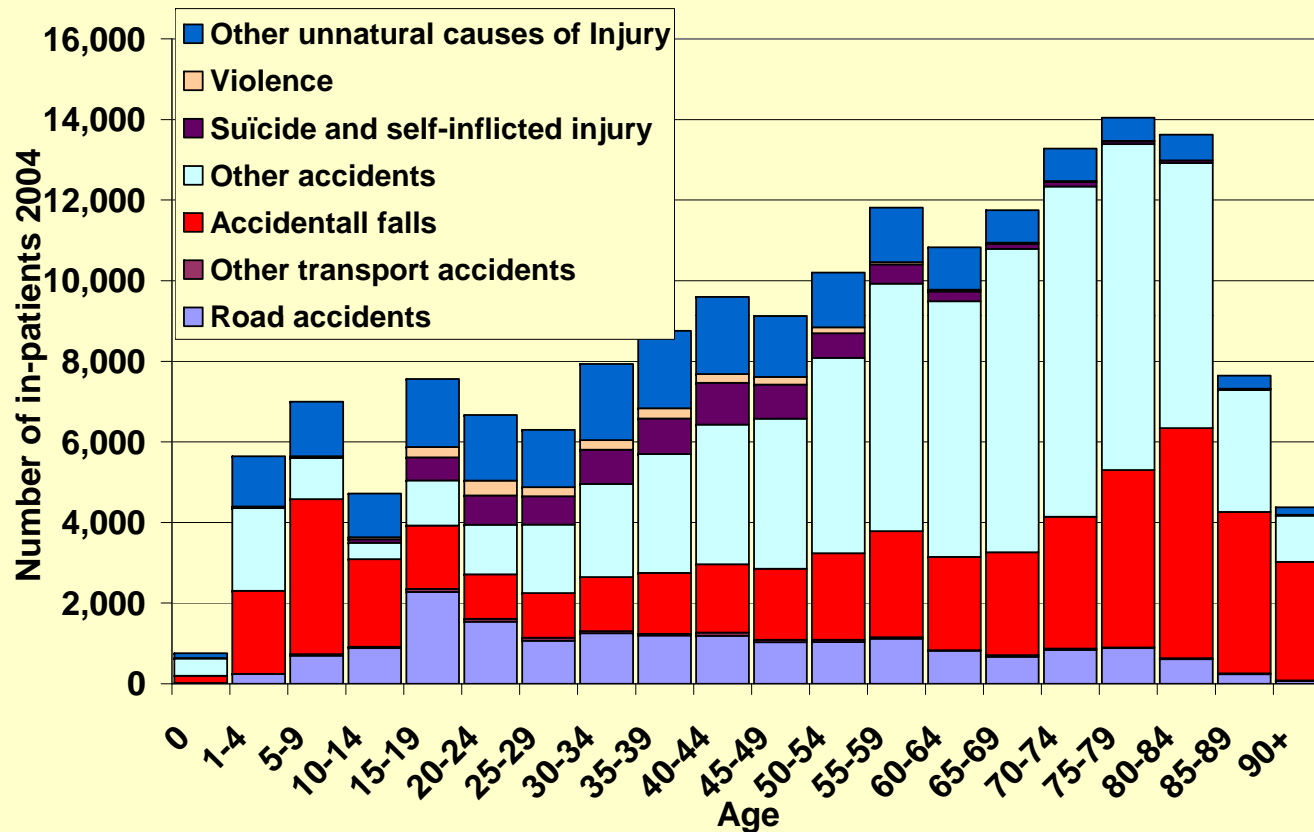
Data sources (3)

Different scope & definitions (hospitalized)

- Road crashes (police):
 - ‘all’ traffic crashes and injured on Dutch public roads (leading to hospitalization)
- Medical registration (health):
 - In-patients for treatment of diseases and injuries
 - External causes by E-code (ICD-9cm)
 - enables benchmarking with other causes of injury



Road casualties and other unnatural cause



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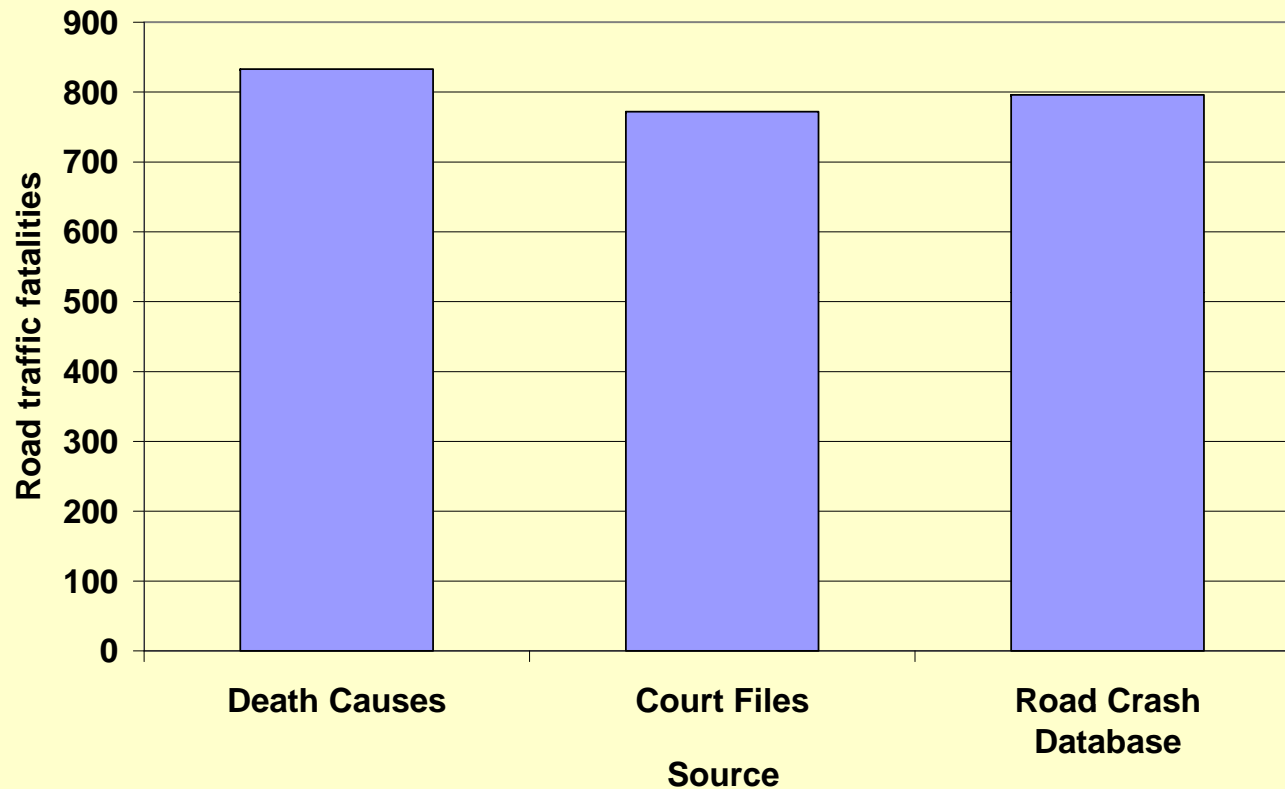


Comparison of sources

- Within the scope of a source, define the target group: road traffic, public road in the Netherlands, suicides excluded, death within 30 days, distinguish primary and secondary causes (WHO guidelines)
- Compare different sources: by total number, by groups (age group, gender, etc) or by record (match data)



Road fatalities (1)



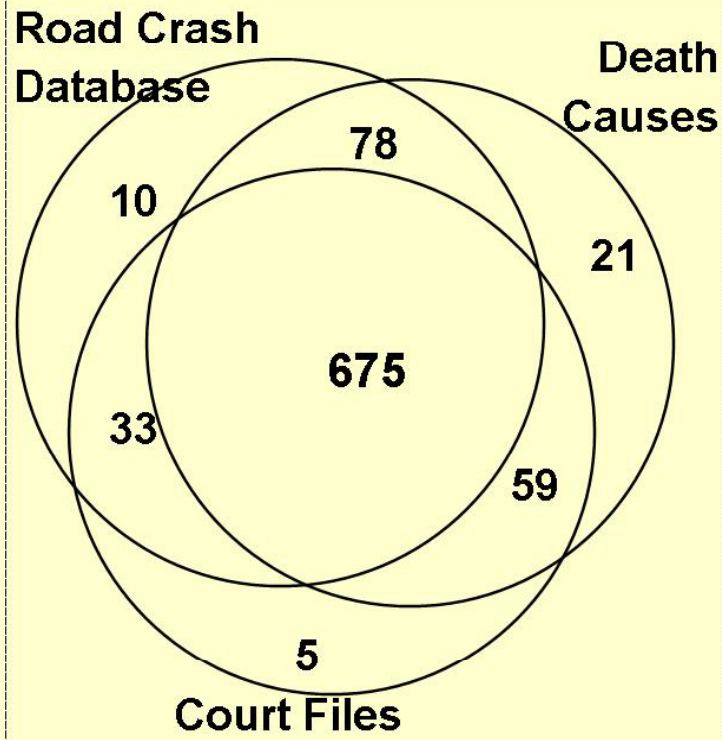
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Road fatalities (2)

NL Road fatalities 2004 N=881

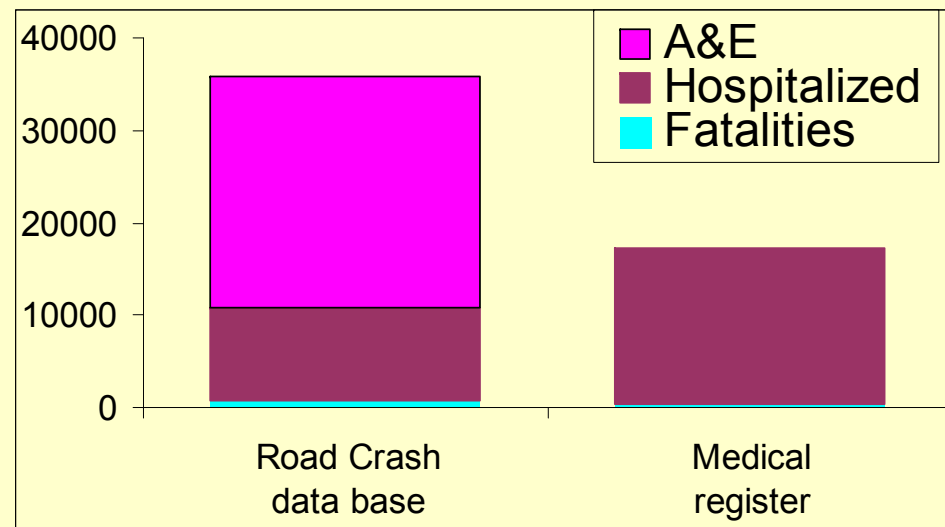


- 77% of the cases are present in all three sources
- A total of 881 different cases have been recognized, of which are present
 - 833 in the Death Cause Statistics (95%)
 - 772 in the Court Files (88%)
 - 796 in the Road Crash Database (90%)
- 19% in two databases
- 4% in only 1 database



Medical file

- Too large to compare manually
- Automated procedures that are optimized in a validation/check





Matching crash - medical

No ID present

Variables common to both files:

- Date/time of crash / hospital admittance
- Date of birth
- Gender
- Region of hospital
- Severity in police record (killed, not on the spot, hospitalized, A&E treated, slight)
- External cause of injury in hospital record (E-code within the range E810-E829)



Distance function

- If records have an identical value for a variable, their distance is 0
- If there is a small difference in a variable's value, a small distance is added
- Links are established between pairs that have each other as closest neighbour
- Links with low distance and high selectivity are matched

Small differences are tolerated



Linking study

- Data 1997-2003 were linked
- 200,766 in-patients (incl Ecodes unspecified, train, not a public road, day-treatment, fatalities, etc)
- 324,717 road casualties (incl fatalities and A&E)

Annually:

- 30,000 medical (of which 17.000 traffic ecodes)
- 46,000 road casualties (of which 12,000 hospitalized)



Intersection and rest files

1997-2003	Medical file Traffic casualties	Medical file, not a hospitalized traffic casualty	Not in Medical file	Not in medical file, not a traffic casualty	SUM
Police hospitalized	48,735	3,547	3,205	27,069	324,717
Police slight	11,497		230,664		
Not in police file	63,354	3,470	(2,826)		
Not in police file, not a traffic casualty		70,163			
SUM	200,766				



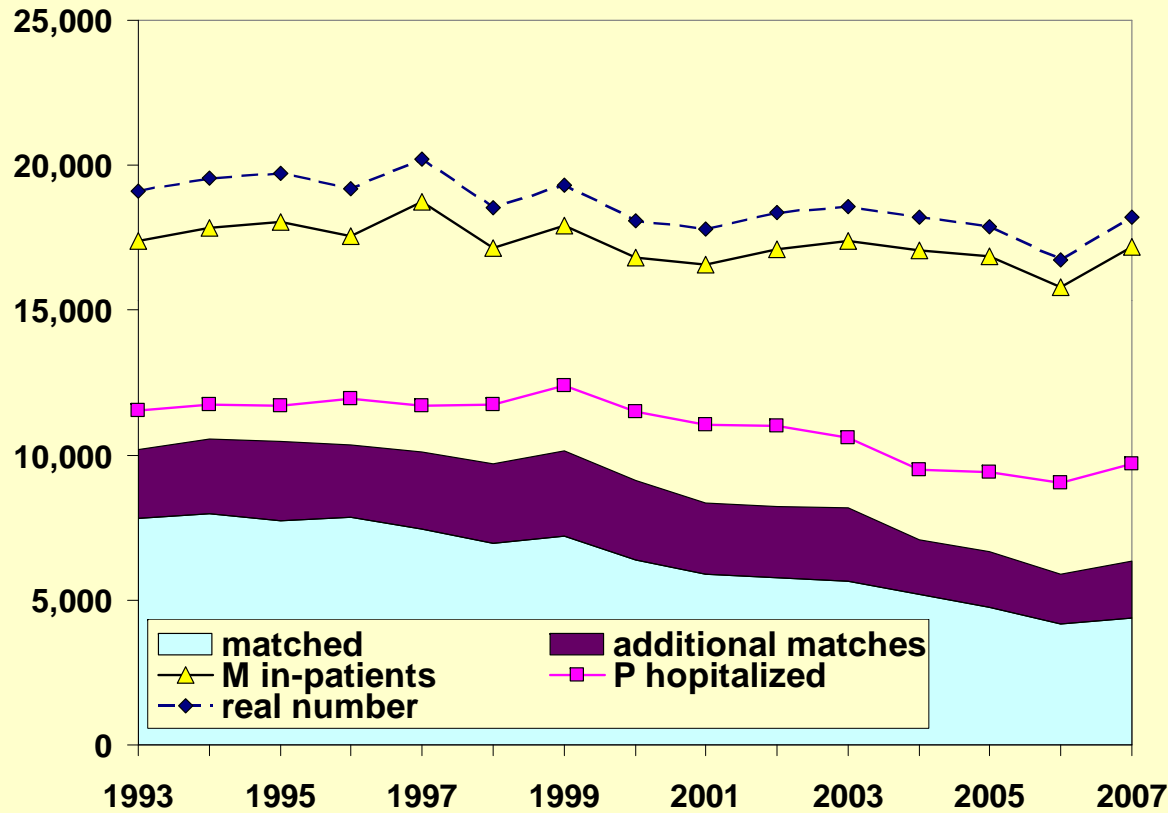
Annual average number of hospitalized road traffic casualties

Total 18,500
of which 90%
is selectable in
the medical file

police and hospital 8,605 46%	Police, not hospital 458 2,5%
hospital, not police 9,051 49%	neither police nor hospital 404 2,2%



Real number decomposition



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Medical severity

- AIS Abbreviated Injury Scale
- MAIS Maximum AIS score
- ISS Injury Severity Scale
- Directly scored or ICD derived
 - ICD-9cm, ICD-10
 - AIS1990, 1998, 2005ICDmap90 Johns Hopkins University

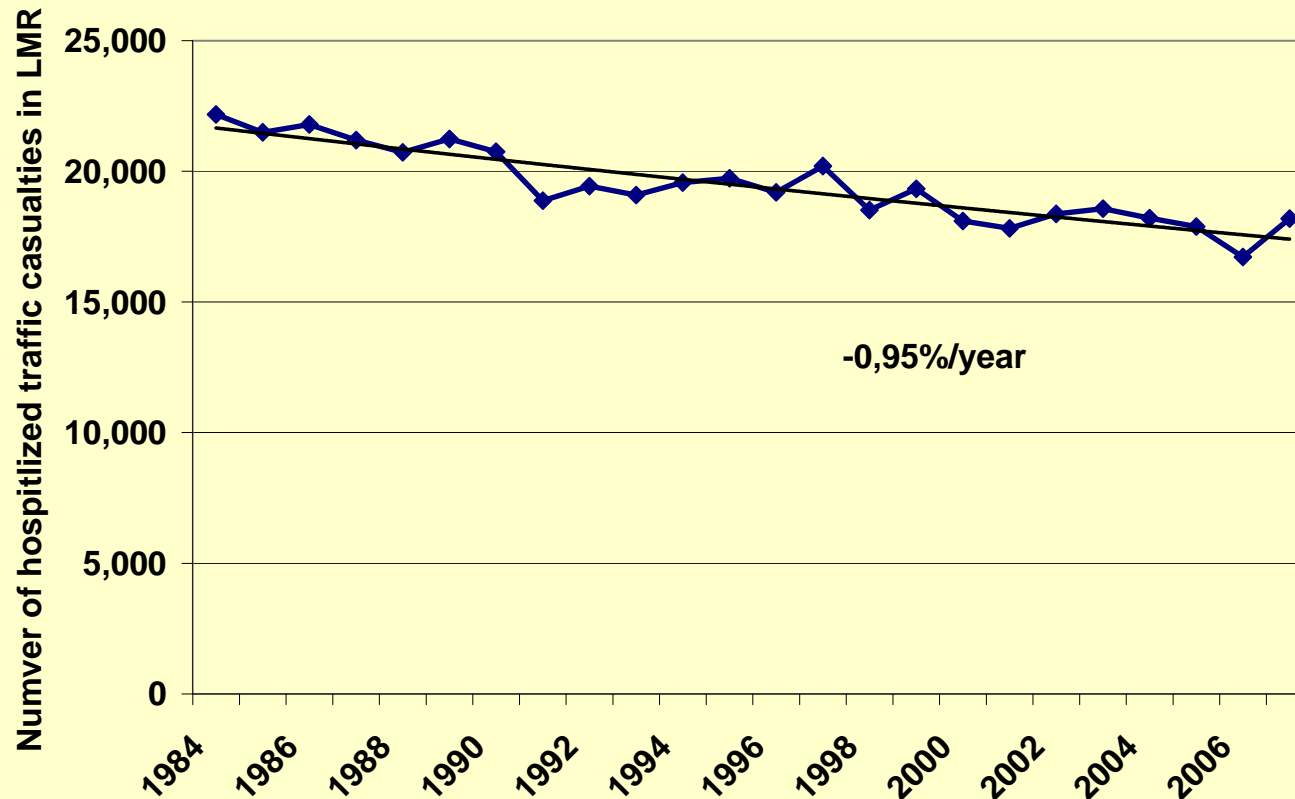


Casualties by severity

1997-2003	Casualties by police severity			
MaxAIS	hospitalized	slight	Total	share
0 no injury	4,091	1,481	5,572	4%
9 undetermined	2,090	605	2,695	2%
1 minor	14,296	4,420	18,717	14%
2 moderate	54,364	13,250	67,615	52%
3 severe	27,308	3,495	30,803	24%
4 serious	2,439	203	2,642	2%
5-6 critical / untreatable	1,491	81	1,572	1%
Total	106,080	23,537	129,617	



All hospitalized casualties



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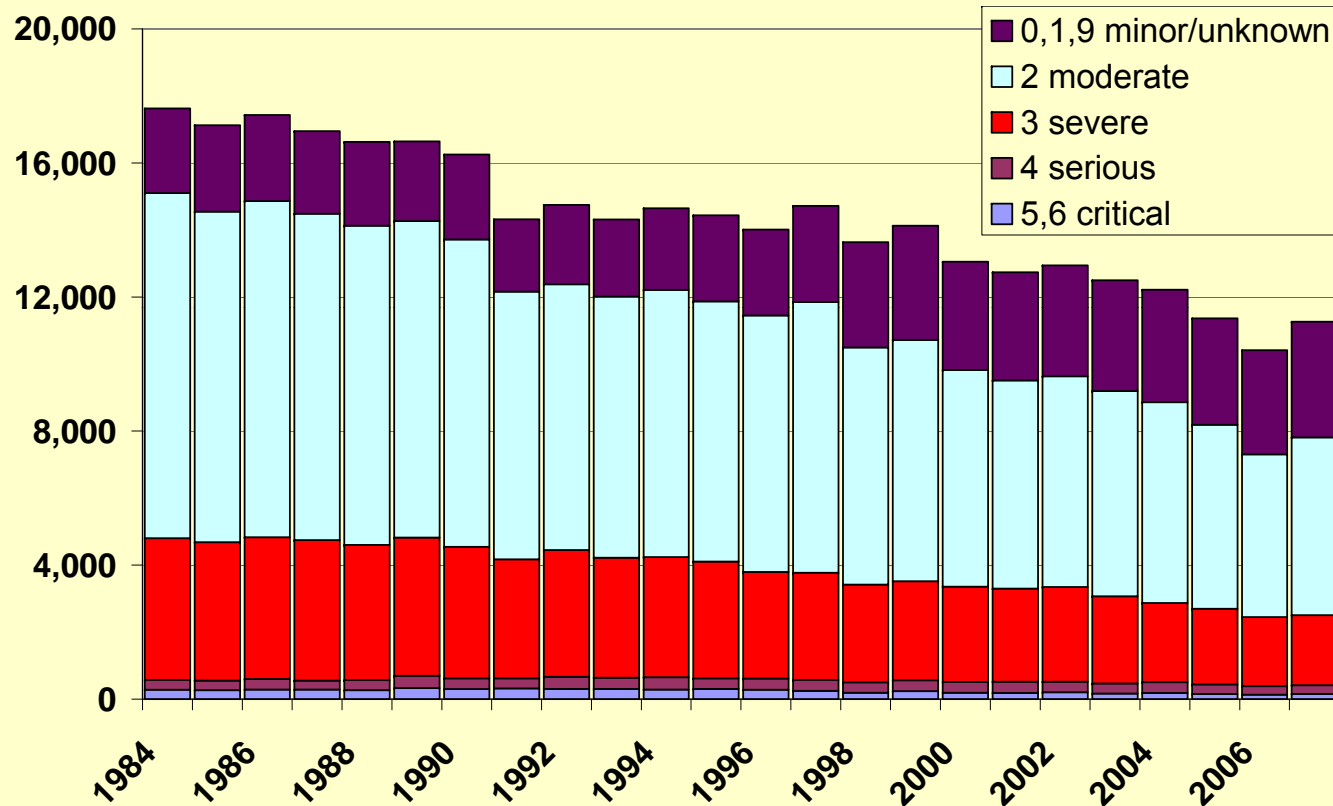


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Serious casualties in motor vehicle crashes

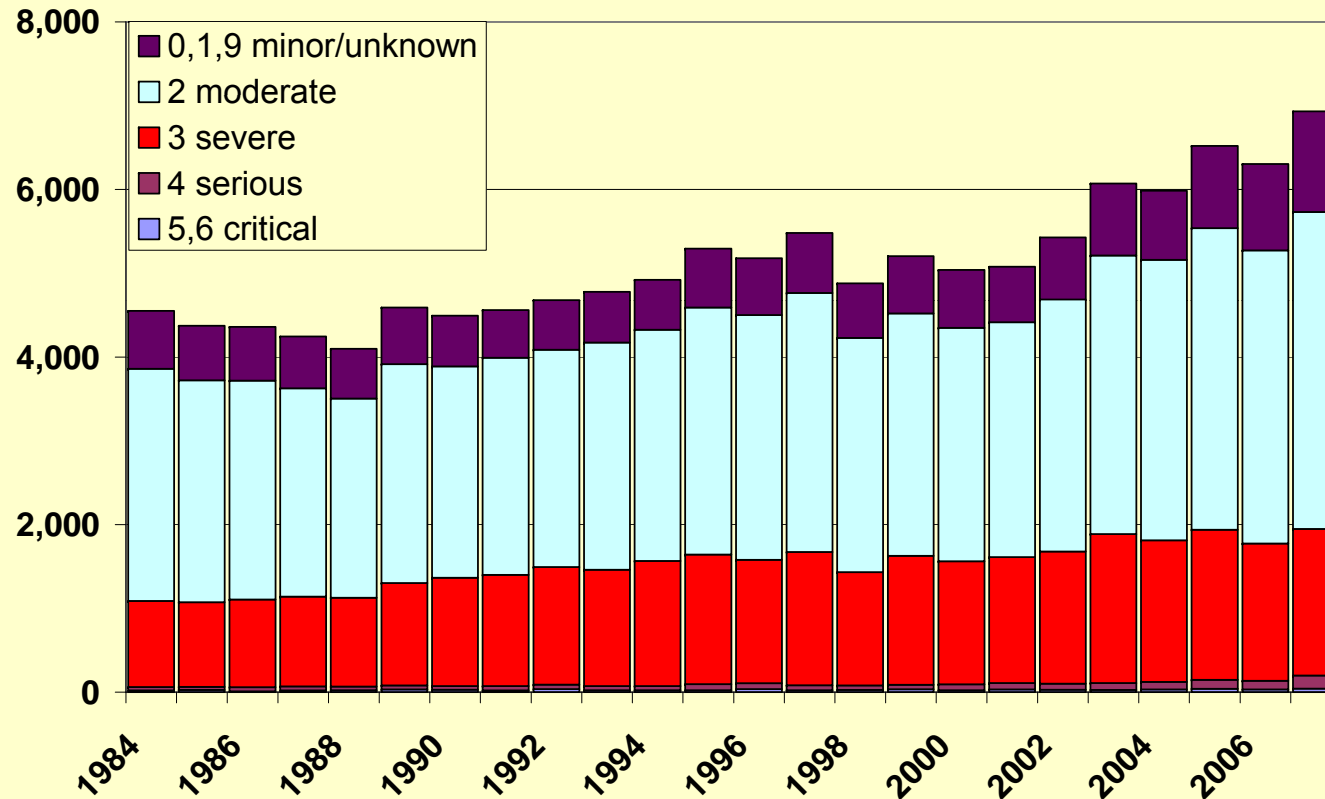


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Serious casualties in non-motor vehicle crashes



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Conclusions linking study (1)

1. The number of casualties with minor or no injury in the Medical Register increases over the years
2. The number of casualties in *motor vehicle crashes* decreases much more rapidly than the total of all hospitalized casualties. The number of MaxAIS ≥ 2 decreases with 2.9% (average 1984-2007); almost equal to fatalities (3.2%)
3. The number of casualties in crashes *without* motor vehicles involved increases over the years



Conclusions linking study (2)

4. In crashes *without* a motor vehicle involved, the share of severely injured casualties (MaxAIS ≥ 2) doubles from 20% in 1984 to 42% in 2007
5. In 2007, 25% of all hospitalized traffic casualties suffer from injuries with MaxAIS ≥ 3 .
50% of all hospitalized traffic casualties has injuries with MaxAIS = 2
6. Within the decreasing number of hospitalized, a increasing group now has been detected that falls outside the regular crash reporting (rate $< 20\%$)
Medical file does not contain crash info \rightarrow improve crash reporting and/or find other sources. Ambulance data??



Conclusions (1)

1. Underreporting is not a big problem, if it can be quantified. Neglecting underreporting is a problem, as it leads to difficulties in country comparisons and to wrong priority settings in competition with other fields
2. Bias in the reported cases is a problem, as it is more difficult to quantify it for relevant subsets of the data. Unknown bias can lead to wrong priorities within the field of road safety



Conclusions (2)

3. In order to quantify underreporting and bias, it is necessary to find or develop alternative sources (such as causes of death, hospital databases). These can be used individually as well as linked to each other
4. For the analysis of the development of the number of casualties, it is necessary to realise that the level of underreporting and/or bias is not constant in time
5. A better insight in the severity development is possible with the use of a hospital database with severity indicators (e.g. AIS)



Recommendations

1. Underreporting coefficients should differentiate by the most relevant characteristics, such as year, severity, mode and involvement of a motor vehicle
2. When real numbers are not used, the adverb 'reported' should be used, for instance. "reported hospitalized casualties"
3. Splitting of the (real) number of casualties by MaxAIS score is a good starting point to harmonize the definition of severe injury and make data more comparable



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Questions

- Thank you for your attention