



# COMPARISON OF THE INJURY SEVERITY BETWEEN IN-DEPTH DATA AND THE NATIONAL STATISTICS

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# State of the art

In 2016, traffic accidents in Germany resulted in ...

- 3.206 **fatally** injured persons
- 67.426 **seriously** injured persons
- 329.240 **slightly** injured persons
  
- socio-economic costs of approx. 34,4 billion € (2015)  
(thereof 14,3 billion € due to accidents w/ personal damage)

One main question is:

**Does the official road traffic accident statistics tell us the full truth?**

**Answer:** It will not. Because it **can** not.

# Limitations

- ❌ Aspect of **underreporting**
  - especially single accidents of bicyclists, motorcyclists
  
- ? Aspect of „**over-reporting**“
  - actual occurrence of whiplash injuries, commotio cerebri (cerebral concussion)
  
- ✅ Lack of conceptual clarity within many definitions
  - definition of official injury severity is related to the **duration of hospitalization** (not actual injury severity)
    - no injuries, but >24 hours in hospital: *seriously injured*
    - died after 32 days after the accident: *seriously injured*
  - Missing official definitions for further distinctions („schwerverletzt“ vs. „schwerstverletzt“)
  - translation issues („*seriously*“ vs. „*severely*“ = „schwer“)
  
- ✅ Documentation process by the police, other investigators etc.)

# Comparison of police data and GIDAS data

## Background

The **police** is **coding the injury severity** for each person involved in an accident. This information is later transferred to the Statistical Office of the federal state and finally to the national authorities.

The information is usually **gathered directly on the accident scene** (from the medical staff).

**Usually**, the police inquires the “final” injury severity 24 hours after the accident.

However, the level of **accuracy depends on** the probable **injury severity**.

- |                     |   |
|---------------------|---|
| → fatally injured   | } very reliable (additional reporting by the hospital)<br>increasing reliability with increasing severity (MAIS),<br>uncertainty in special cases |
| → seriously injured |   |
| → slightly injured  |   |

- Special cases:
- Persons that go to a physician in private practice (and do not inform the police)
  - Persons that actually have severe injuries but do not want to stay in the hospital
  - Persons that stay in the hospital for other (not trauma-related) reasons

# Comparison of police data and GIDAS data

## Method

Use of **GIDAS data** from the years 2005 to 2017; complete cases only (less 2016/2017 cases)

Identification of persons meeting the following conditions:

- only **drivers, riders, pedestrians** with **known injury severity**
  - uninjured occupants are not coded in the police report
  - even if coded, the seating position is not coded
- **identical age** (to ensure correct match between participant data)
- **police report and/or EUSKa data available**

Data set: **34.136 persons** in 18.667 accidents

Comparison of injury severity (official definition) between police data and GIDAS coding

**Use of unweighted data** → Usual weighting processes base on injury severity

# Comparison of police data and GIDAS data

## Results

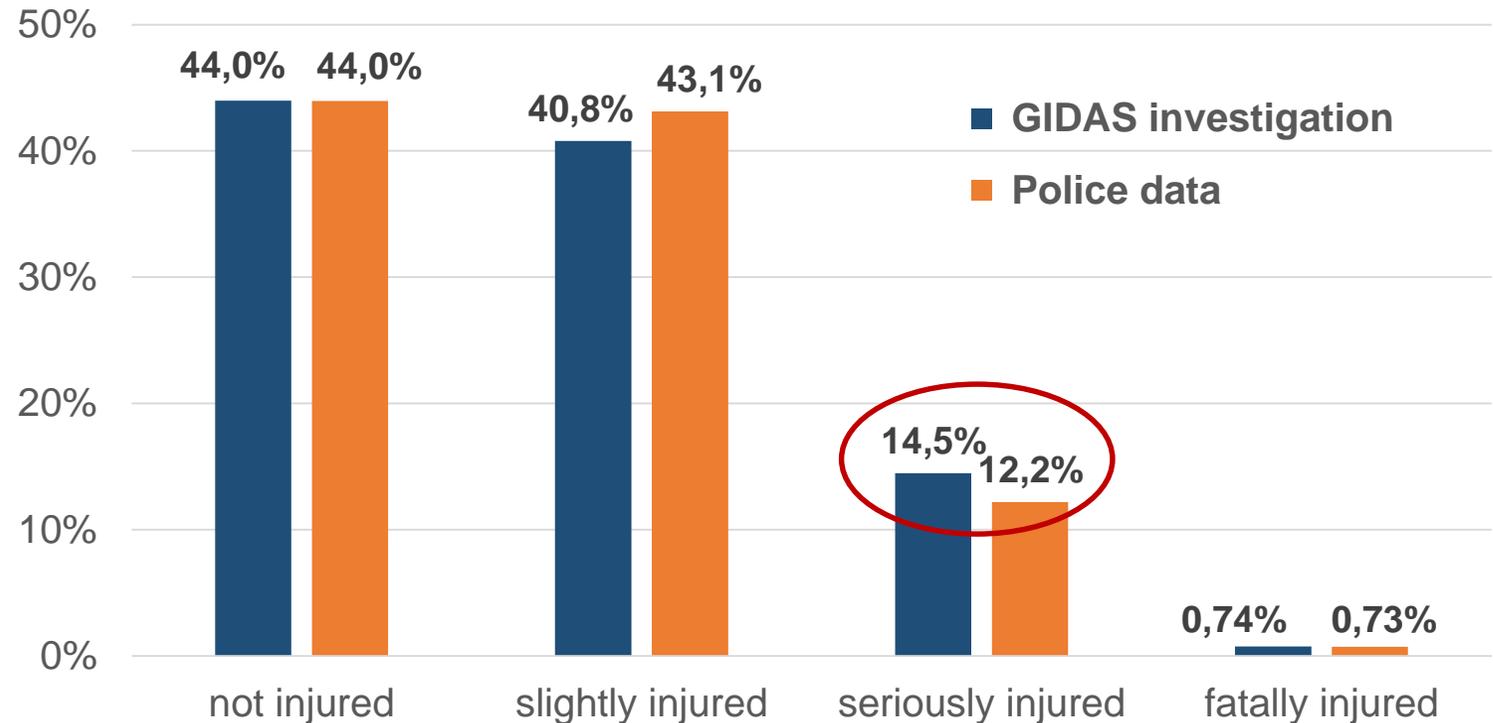
The distribution of injury severity looks quite similar at first glance.

However, the share of seriously injured persons is nearly 20% higher (14,5% vs. 12,2%) according to the GIDAS data.

Differences at fatalities:  
**249** (police) vs. **254** (GIDAS)  
(2,0% relative difference).

→ More detailed analyses  
necessary

Injury severity - GIDAS investigation vs. police data  
(n = 34.136 drivers, riders, pedestrians)



# Comparison of police data and GIDAS data

## Results

Out of 34.136 considered persons ...

... **92,4%** were coded **identically**

... **7,6%** were coded **differently**

Some differences between both data sources are quite balanced or not very frequent, e.g.

- not injured vs. slightly injured
- not injured vs. seriously injured (seldom)

However, the GIDAS investigators coded **much more persons as seriously injured** which are slightly injured according to police data.

Furthermore, GIDAS counts **more people as fatally injured** than the police did (low case numbers).

		Police data			
		not injured	slightly injured	seriously injured	fatally injured
GIDAS	not injured	14.507	482	25	3
	slightly injured	484	13.752	378	
	seriously injured	14	1.179	3.745	3
	fatally injured			11	243

# Comparison of police data and GIDAS data

## Single case analysis (subsample of cases)

The following table provides some reasons for differences in both data sources:

		Police data			
		not injured	slightly injured	seriously injured	fatally injured
GIDAS	not injured	[correct]	<ul style="list-style-type: none"> <li>• acute stress disorder</li> <li>• shock</li> <li>• pregnant women</li> </ul>	<ul style="list-style-type: none"> <li>• surveillance in hospital (e.g. hypertension / suspected heart attack due to shock)</li> </ul>	<ul style="list-style-type: none"> <li>• heart attack prior to / after accident</li> </ul>
	slightly injured	<ul style="list-style-type: none"> <li>• heart attack prior to accident, but slight injuries due to accident</li> </ul>	[correct]	<ul style="list-style-type: none"> <li>• discharge from hospital against doctor's advice</li> <li>• ambulant treatment</li> </ul>	[not applicable]
	seriously injured	[not applicable]	<ul style="list-style-type: none"> <li>• hospitalization longer than expected / estimated at the accident scene</li> </ul>	[correct]	<ul style="list-style-type: none"> <li>• death not trauma-related (e.g. aneurysm) or after 30+ days</li> </ul>
	fatally injured	[not applicable]	[not applicable]	<ul style="list-style-type: none"> <li>• death within 30 days (due to stroke, COPD etc.)</li> </ul>	[correct]

# Comparison of police data and GIDAS data

## Results – Consequences for the German road traffic accident statistics

If the GIDAS data is *assumed* to be correct (and the observed differences occur in all other regions resp. federal states in Germany), the figures of 2016 would have changed as follows:

Original data		Change
3.206 <b>fatally</b> injured persons	+ 2,0%	3.270 persons
67.426 <b>seriously</b> injured persons	+ 18,8%	80.104 persons
329.240 <b>slightly</b> injured persons	- 5,4%	311.373 persons
socio-econ. <b>costs</b> : 34,4 billion €		approximately similar

- ① *The possible range in the fatality numbers is not high (→ within current annual variations)*
- ② *The number of seriously injured persons is around 15-20% higher.*
- ③ *There are approx. 5% less slightly injured persons.*

# Comparison of police data and GIDAS data

## Sources of discrepancies between GIDAS and police data

The **phenomena** of differences between GIDAS and police data can be **overserved in both GIDAS investigations areas** (Dresden: 93,5% of persons w/ identical coding; Hannover: 91,2%)

The duration of **hospitalization** is **not always** clearly **depending on the trauma**.

Other reasons / motivations for keeping patients (generally / longer) in the hospital:

- pregnancy
- risk of / suspected heart attack or stroke
- pre-existing illnesses (especially for elderly patients)
- alcohol / drug impairment
- social reasons (e.g. family members that have been seriously injured in the same accident; injured persons w/o personal background for health care at home)
- (economic reasons of the hospital)
- ...

# Further injury severity definitions

What means “seriously” or “slightly” injured actually?

Do we use the correct metric for injury severity?

- Official definition
- Abbreviated Injury Scale (AIS) / MAIS
- Injury Severity Score (ISS) / New Injury Severity Score (NISS)
- Berlin Polytrauma definition
- KABCO definition (e.g. US accident data)
- others (ICD, AO etc.)

# Correlation of injury severity measures

## I) Fatality rates depending on the used AIS codebook

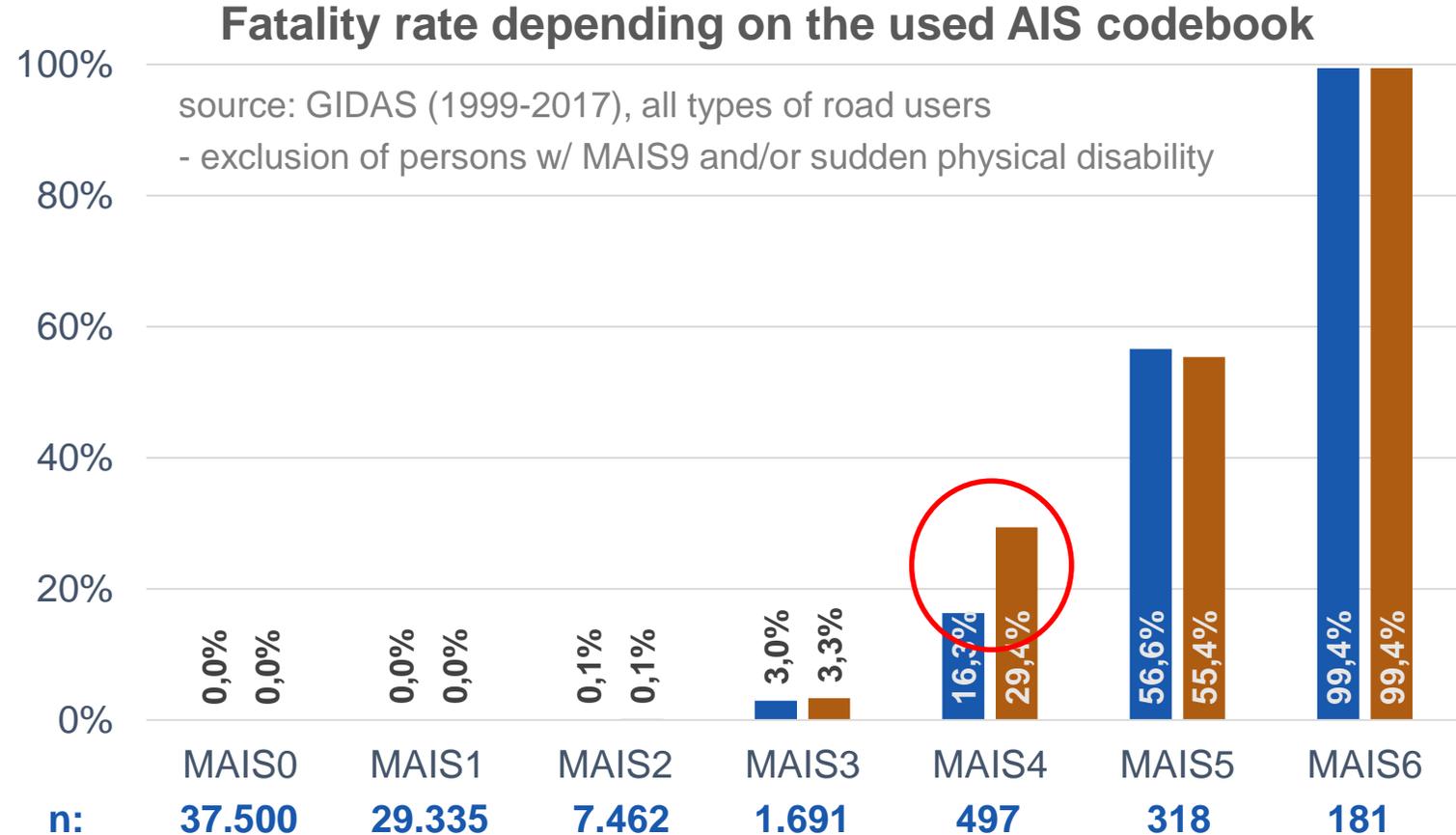
The AIS score (1-6; 9) assesses the severity of an injury and is strongly linked to the fatality risk.

Use of two AIS codebooks:

- AIS1990 Revision **1998** („MAIS98“)
- AIS2005 Update **2008** („MAIS08“)

MAIS6 is not necessarily linked to death (but very likely).

Remarkable differences can be obtained for MAIS4.



# Correlation of injury severity measures

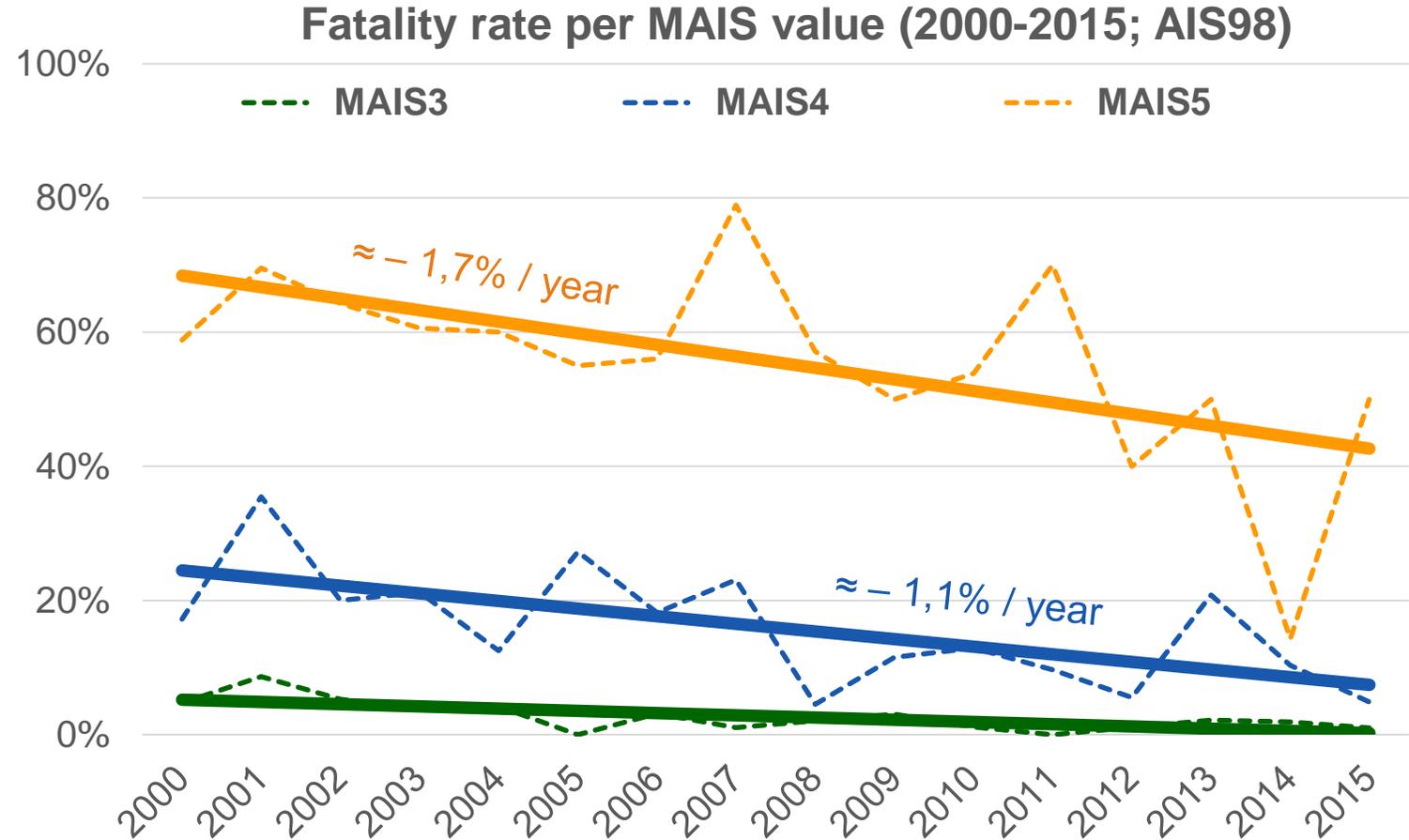
## II) Fatality rate over time – Do we see any progress in trauma surgery?

Consistent coding of injuries within GIDAS according to AIS1998 codebook since 1999

Analysis of the fatality rate for each accident year (AIS98)

Oscillating curves are a result of small case numbers.  
(MAIS3/4/5:  $\approx 100/30/20$  per year)

→ Clear trend towards decreasing fatality rates as a result of advanced trauma surgery / rescue services



# Correlation of injury severity measures

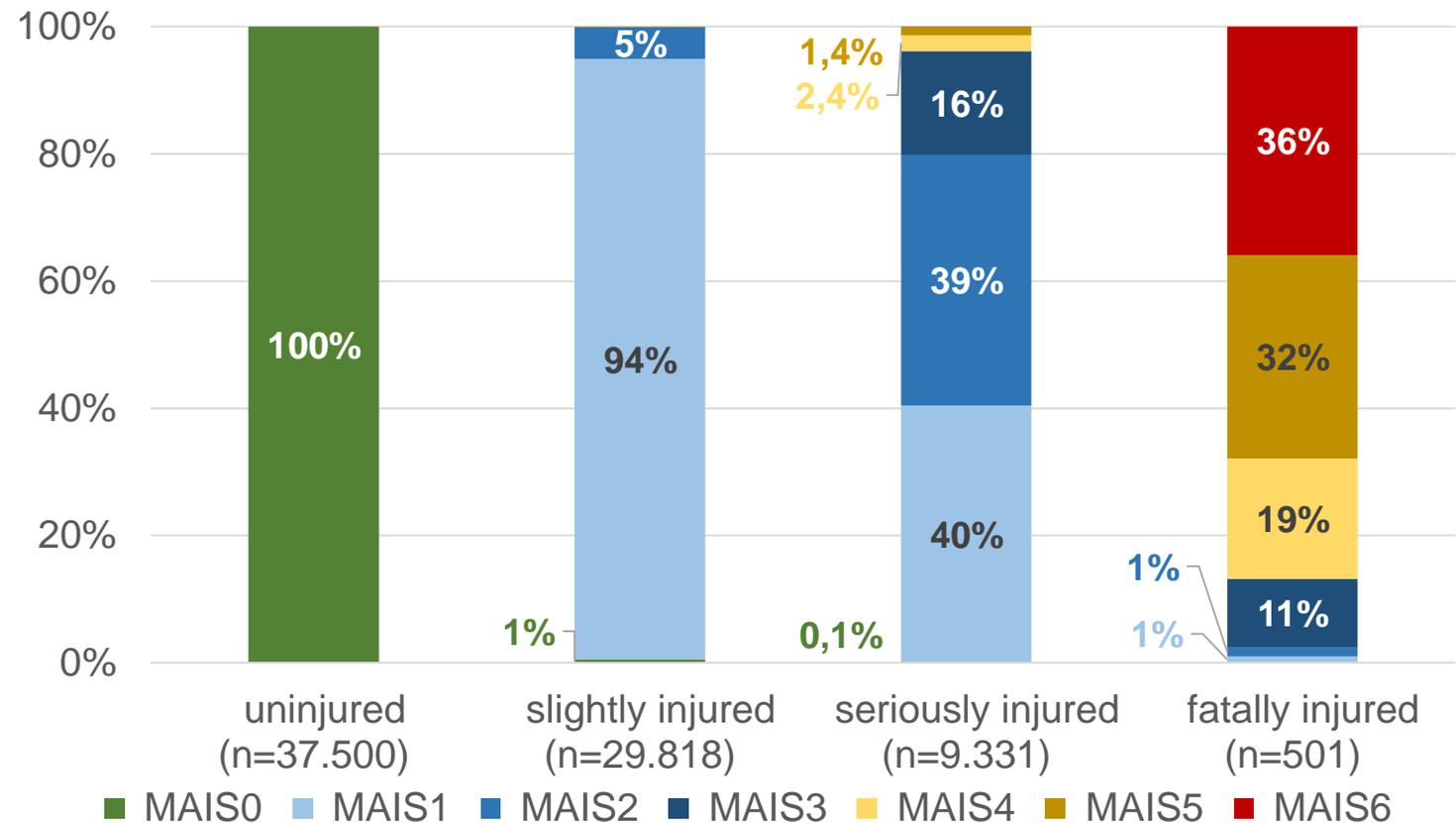
## III) Comparison between “Official definition“ vs. „MAIS“

**Slightly injured** persons mostly suffer AIS1 injuries only. However, MAIS1 is not automatically linked to „slightly injured“.

**Seriously injured** persons show similar proportions (ca. 40%) of the severity levels MAIS1 and MAIS2. MAIS3 accounts for 16%, MAIS4+ makes up around 4%.

87% of the **fatalities** suffered at least AIS4 injuries but every 8<sup>th</sup> fatality died due to an MAIS<4.

MAIS08 values vs. official injury severity levels



# Correlation of injury severity measures

## III) Comparison between “Official definition“ vs. „MAIS“

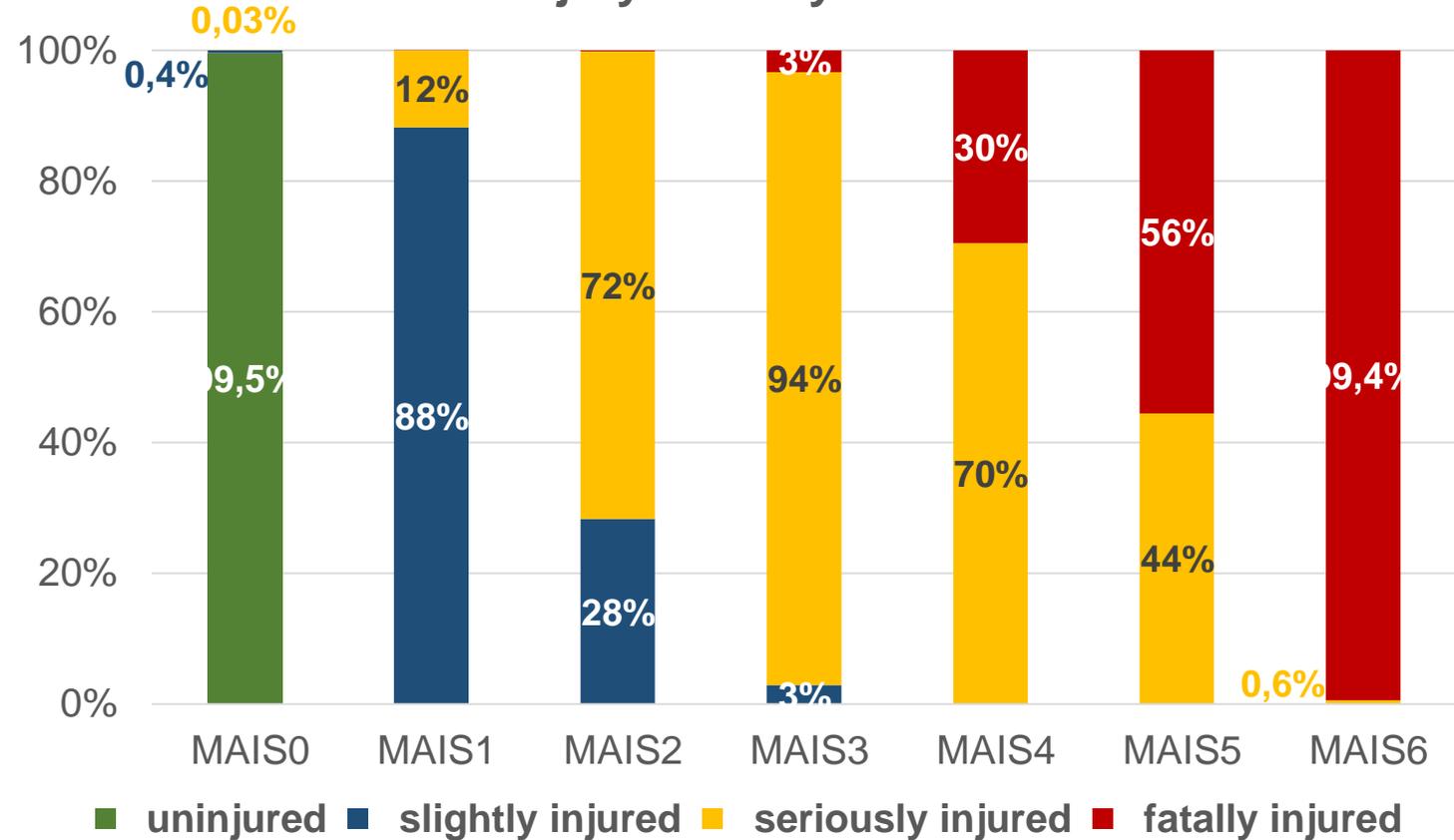
Very few people without injuries (MAIS0) get an ambulant or in-patient treatment.

7 out of 8 MAIS1 injured persons and more than one quarter of MAIS2 injured persons are „slightly injured“.

MAIS2 injuries w/ ambulant treatment: simple fractures (ribs, clavicle, sternum, fingers), CC or ligament ruptures

MAIS3 clearly linked to “seriously injured”, then (MAIS4+) increasing fatality risk.

Official injury severity levels vs. MAIS98



## Limitations and remarks

Although the data quality in GIDAS is supported by hundreds of routines, input logics and case-by-case checks, the database still contains **coding errors**.

The actual differences between GIDAS and police data may be higher than shown as in some cases the **GIDAS investigation teams just adopt the police information** (e.g. in case of missing consent form, late arrival on accident scene).

The used police data also comes different sources. Some codings (especially in older cases) only base on the **police report** whilst the data in recent accidents comes from the **EUSKa system** (including additional data processing and plausibility checks by police / authorities).

The **AIS coding** in GIDAS is **not done by physicians** but by medical investigators in the teams (usually medical students or experienced paramedics).

# Summary

Every data source including accident data is influenced by **under-reporting** (also quite likely over-reporting). A complete survey about all traffic accidents is as likely as the vision of zero traffic fatalities.

The injury severity coding may vary between different data sources, depending on the method and purpose of investigation. The **injury severity** in GIDAS and police data **differs** in about every **13<sup>th</sup> case**.

The majority of differences between both data sources result from:

- **inconsequent inquiries** by the police in combination with **special situations**
- interference between trauma-related consequences and **other physiological deficiencies**

The injury severity according to the “**official definition**“ and **MAIS** base on different metrics and thus, only shows a moderate correlation.

The **MAIS** is an **appropriate metric** for the description of the physical injury severity but not enough for all purposes. (The progress in trauma surgery requires regular updates of the MAIS as the fatality rates drop over time.)

# Thank you for your attention!



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