

# The use of the Abbreviated Injury Scale in the Swedish Road Safety effort

## The definition of a serious injury

**Hans-Yngve Berg, Ph. D**

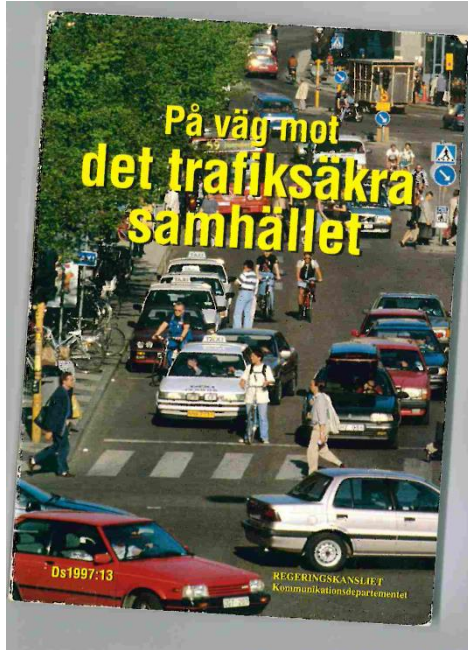
Senior Road Safety Analyst

# Systematic approach in road safety work

1. Define the burden and nature of road casualties/injuries
2. Get commitment and support from decision makers
3. Establish road safety policy
4. Define institutional roles and responsibilities
5. Identify road safety problems
6. Set road safety targets
7. Formulate strategy, action plan
8. Allocate responsibility for measures
9. Ensure funding
10. Apply measures with known effectiveness
11. Monitor performance

### 3. Establish Road Safety Policy

In October 1997 the Parliament passed a new bill on Road Traffic Safety, "*Vision Zero*".



“Vision Zero means that (eventually) no one will be killed or seriously injured within the road transport System”

**A policy need definitions to be operative**

Seriously injured ??

# Long term consequence?

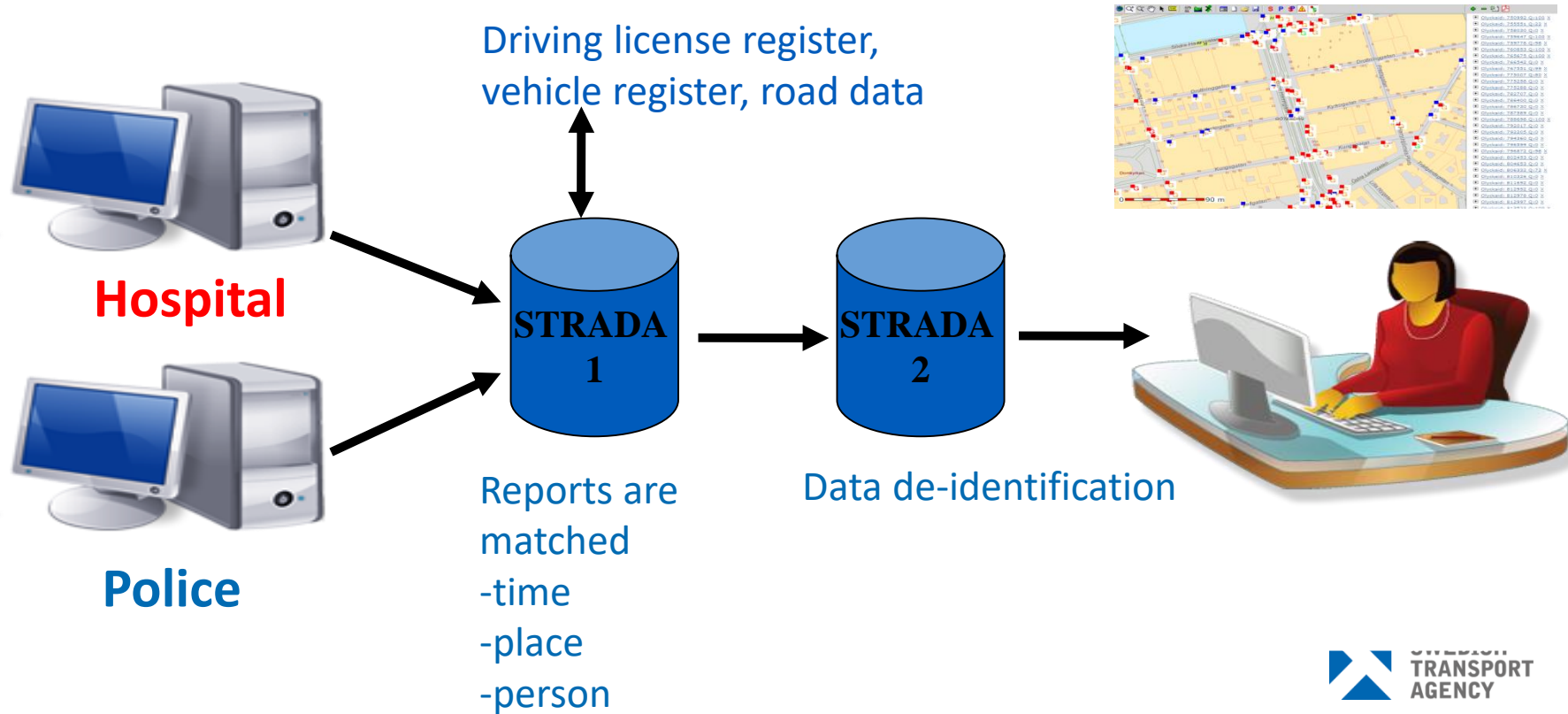
Low correlation between the immediate outcome of an injury and the long term life consequence!

Gustafsson et al. Traffic Inj Prev 2015, Malm et al. Ann. Adv. Automot. Med. 2008

# Today's definition of Seriously Injured in Sweden

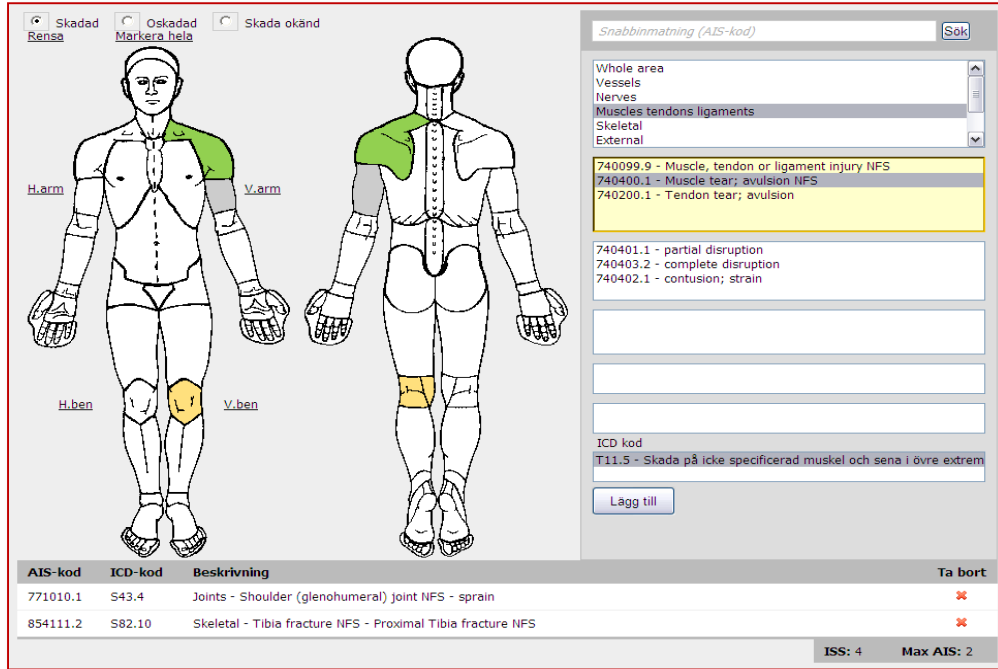
- A seriously injured person is someone who has suffered an injury leading to at least one percent permanent medical impairment.
- "Medical impairment" is a term used by insurers to assess degrees of disability regardless of cause.

# Swedish TRaffic Accident Data Acquisition



# STRADA

## Swedish TRaffic Accident Data Acquisition



The screenshot displays the STRADA software interface. On the left, there are two human body diagrams: a front view and a back view. The front view shows green shading on the shoulders and yellow shading on the knees. The back view shows green shading on the upper back and yellow shading on the knees. Labels 'H.arm', 'V.arm', 'H.ben', and 'V.ben' are placed near the corresponding limbs. At the top, there are radio buttons for 'Skadad Rensa', 'Oskadad Märkera hela', and 'Skada okänd'. Below the diagrams is a table with columns for AIS-kod, ICD-kod, Beskrivning, and Ta bort. The table contains two rows of injury data. On the right, there is a search box 'Sökinmatning (AIS-kod)' and a list of injury codes with descriptions. The first three items are highlighted in yellow.

AIS-kod	ICD-kod	Beskrivning	Ta bort
771010.1	S43.4	Joints - Shoulder (glenohumeral) joint NFS - sprain	✘
854111.2	S82.10	Skeletal - Tibia fracture NFS - Proximal Tibia fracture NFS	✘

ISS: 4    Max AIS: 2

Injuries are coded in great detail by trained staff at the hospital

- Abbreviated Injury Scale (AIS)
- Max AIS (MAIS)
- Injury Severity Score (ISS)
- International Classification of - Diseases (ICD 10)
- Reaction Level Scale (RLS)
- Functional Capacity Index



# Injuries in police records and in hospital records



Grunduppgifter Databas: **Hela databasen** Källa: **Polis och/eller sjukvård** Nivå: **Olyckor**  
Datum/tid Datum: **2015-01-01 - 2015-01-31**  
Geografi Kommun: **Solna**  
Platsbeskrivning  
Trafikant  
Händelse  
Skador och vård



© Lantmäteriet - Koordinat (SWEREF99 TM): 6582871, 671888 - Skala 1:15118

# „Threat-to-life”

**AIS** (Abbreviated Injury Scale)

1971, updated several times, latest 2015

Injuries are categorized by nine different body parts and it's severity.

Abbreviated injury Score

AIS-Code ▲	Injury ◆	Example ◆	AIS % prob. of death ◆
1	Minor	superficial laceration	0
2	Moderate	fractured sternum	1 – 2
3	Serious	open fracture of humerus	8 – 10
4	Severe	perforated trachea	5 – 50
5	Critical	ruptured liver with tissue loss	5 – 50
6	Maximum	total severance of aorta	100
9	Not further specified (NFS)		

**MAIS** (Maximum AIS)

The highest AIS-score

# Serious from a health perspective – how to measure, narrate and describe?

- Risk of permanent medical impairment
- Standardized instruments as a measure of health outcome, eg. EQ-5D, SF-36 etc.
- In-depth interviews
- Etc.

Content of inj. databases:

- ICD
- AIS
- ISS
- MAIS

”Transformation”

Examples of health measures/outcome:

- Physical, psychological, social...
- Number of persons Perm. Med. Imp.
- Loss of quality of life
- Etc.

# RPMI + Strada = seriously injured

Table 3- Risk of Permanent Medical Impairment (RPMI) on 1%+ level (i.e. 1-99%). Numbers in percent

	AIS1	AIS2	AIS3	AIS4	AIS5
Head	8.0	15	50	80	100
Cervical Spine	16.7	61	80	100	100
Face	5.8	28	80	80	n.a.
Upper Extremity	17.4	35	85	100	n.a.
Lower Extremity and Pelvis	17.6	50	60	60	100
Thorax	2.6	4.0	4	30	30
Thoracic Spine	4.9	45	90	100	100
Abdomen	0.0	2.4	10	20	20
Lumbar Spine	5.7	55	70	100	100
External (Skin) and Thermal Injuries	1.7	20	50	50	100

## Risk of Permanent Medical Impairment (RPMI) in Road Traffic Crashes

Sigrun Malm, MSc, Maria Krafft, PhD, Anders Kullgren, PhD, Anders Ydenius MSc  
Folksam Research, Stockholm, Sweden and Karolinska Institutet, Solna, Sweden

Claes Tingvall, Prof  
Swedish Road Administration, Borlänge, Sweden and Monash University Accident Research Centre, Melbourne, Australia

Gustafsson M, Stigson H, Krafft M, Kullgren A. (2015)

Risk of Permanent Medical Impairment (RPMI) in Car Crashes Correlated to Age and Gender, Traffic Injury Prevention, 16:4, 353-361,

Table 2

Number of injured persons based on their 'most serious' injury divided by AIS level and injured body region. STRADA 2013.

Body region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 1-5
Head	2048	727	238	67	31	3111
Cervical spine	4962	141	48	3	6	5160
Face	525	265	8			798
Upper extremity	2466	8155	14	1		10,636
Lower extremity and pelvis	1741	2941	750	11	3	5446
Thorax	408	383	259	31	8	1089
Thoracic spine	254	122	27	3	3	409
Abdomen	19	51	30	11		111
Lumbar spine	280	129	18	2		429
External (skin) and thermal injuries	14,118	136	1			14,255
Total	26,821	13,050	1393	129	51	41,444

Berg, H-Y, J Ifver, M. Hasselberg (2016).

Public health consequences of road traffic injuries – Estimation of seriously injured persons based on risk for permanent medical impairment, Transportation Research Part F 38 (2016) 1-6

# Yearly report

## Analysis of Road Safety Trends 2011

*Management by Objectives for Road Safety Work,  
Towards the 2020 Interim targets*

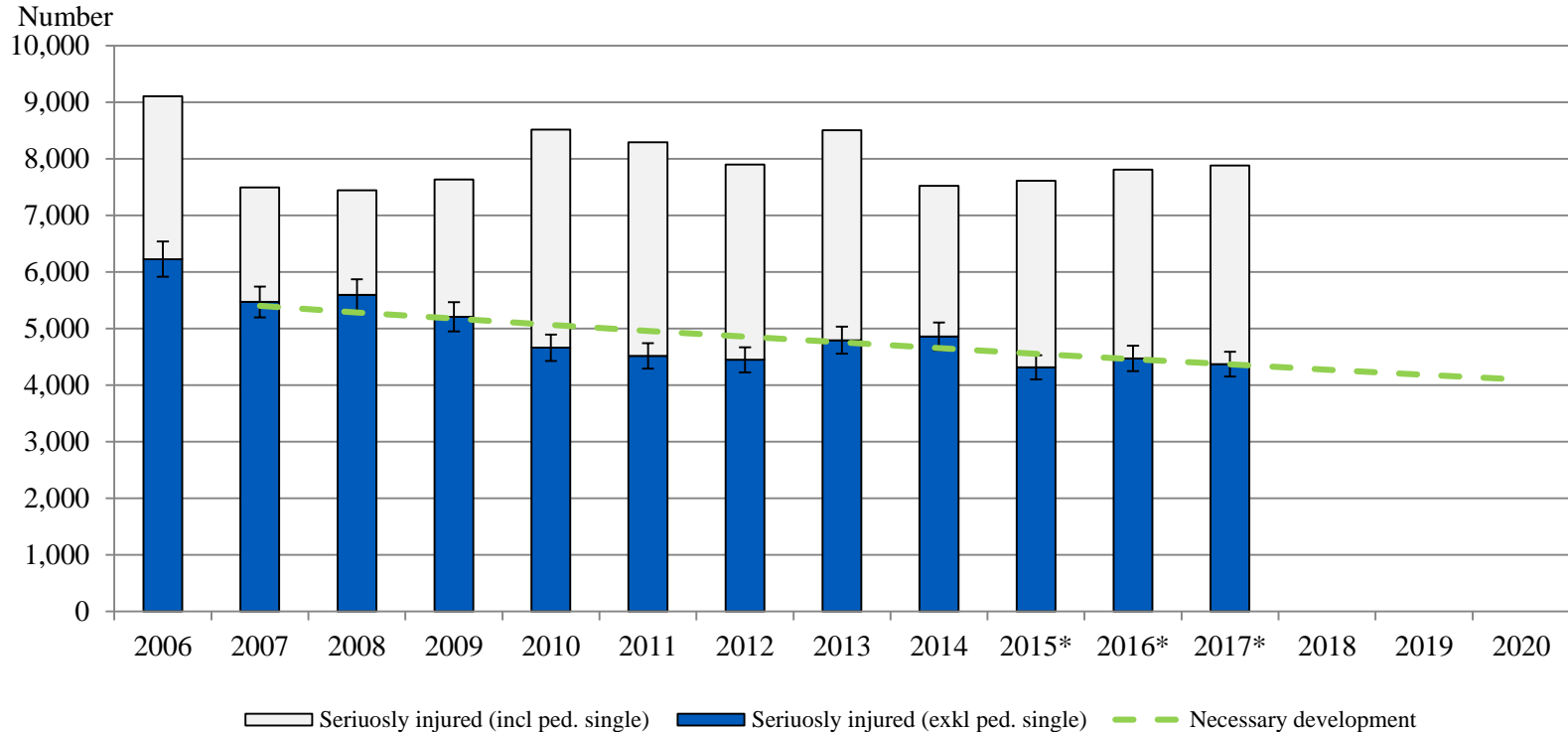


# ”Safety performance indicators”

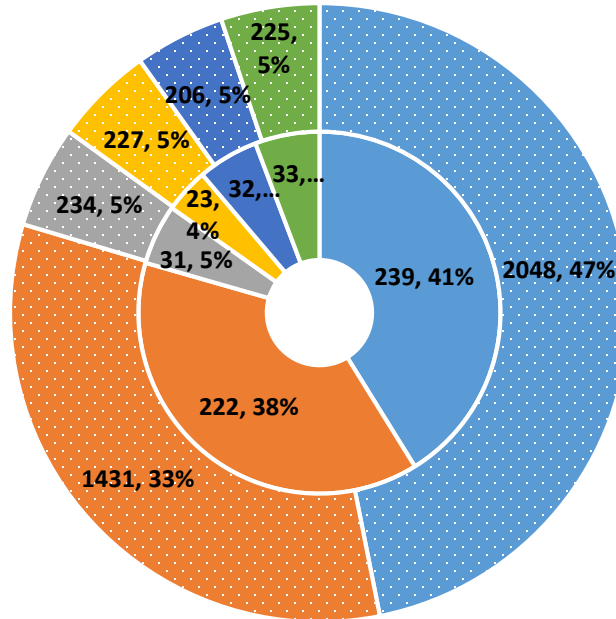
Indicator	Start	Today 2017	Year 2020
Fatalities	440	253	220
Seriously injured	5400	4400	4100
1. Speed compl., state roads	43 %	45 %	80 %
2. Speed compl., municipalities	64 % (2012)	67 %	80 %
3. Alcohol (0,02%)	99,71 %	99,74 %	99,90 %
4. Seat belt use	96 %	98 %	99 %
5. Helmet use			
- Bicycle	27 %	44 %	70 %
- Moped	96 % (2012)	98 %	99 %
6. Safe cars (EuroNCAP)	20%	72 %	80 %
7. Safe MC (ABS)	9 %	44 %	70%
8. Safe state roads	50 %	76 %	90 %
9. Safe ped., bicycle., moped passageways in urban areas	19 % (2013)	27 %	35 %
10. Municipalities with a good quality of maintenance of pedestrian and cycle paths	15 % (2013)	36 %	70%

# Number of seriously injured 2006-2017

and necessary development towards year 2020. (incl./excl. pedestrian "single")



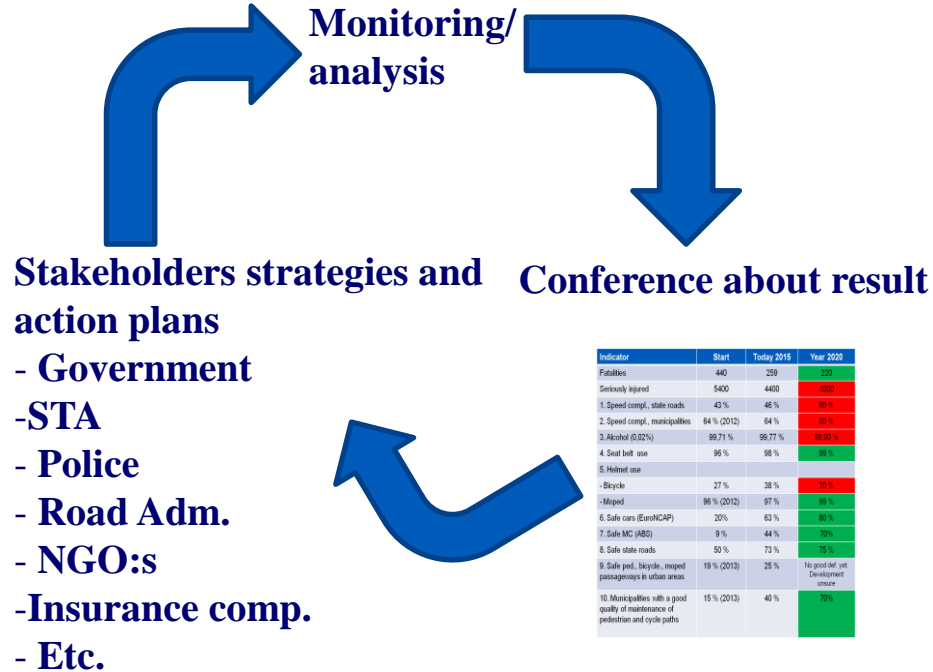
# Percentages and number of seriously injured (PMI $\geq 1\%$ and PMI $\geq 10\%$ ) divided by mode of transport, 2017



■ On a bicycle ■ In a car ■ On a motorcycle ■ On a moped ■ Pedestrian ■ In a bus/lorry/others



# Strategies action plans and monitoring



# RPMI + Strada = seriously injured

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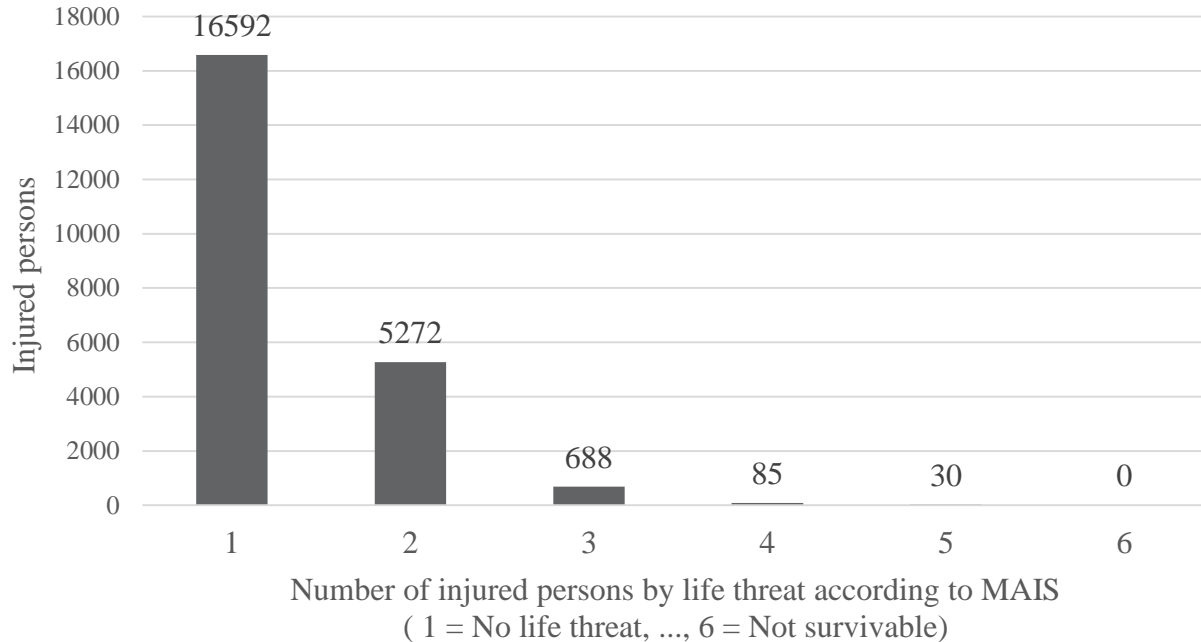
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# Distribution of injured persons by AIS in Strada, 2018



# 6th IRTAD Conference: Better Road Safety Data for Better Safety Outcomes, Marrakech, 10-12 October, 2017



## **Marrakech Declaration on Better Safety Data for Better Road Safety Outcomes**

4. Fatality data are not sufficient to understand road safety problems fully. Information on injury crashes is essential for a more complete picture of road safety. IRTAD supports the definition of a "seriously injured road casualty" as a person with injuries assessed at level 3 or more on the Maximum Abbreviated Injury Scale i.e. "MAIS3+", which can be derived from the International Classification of Diseases (ICD). It is recommended to further study the impact of different levels of injuries on the quality of life and health losses, as an example lifelong disability.

# Conclusion

- The international MAIS trauma scale (maximum abbreviated injury score) has been used as the EU definition of serious road traffic injuries since 2014. The 'scale 3 and more' (MAIS3+) is the one that applies to serious injuries today.
- Victims of RTIs has a high risk of impoverished health after the crash even after low threat to life injuries.
- For policy making and regulation it is essential to pay attention to the fact that negative consequences of RTIs can be long-term and can arise even for apparently minor injuries an minor injurious events.
- The definition of a serious injury is very important issue that need to be addressed for global road safety and Agenda 2030