

Definition of a serious injury and its metric used in the Swedish road safety efforts

A proposal to amend the R.E.1

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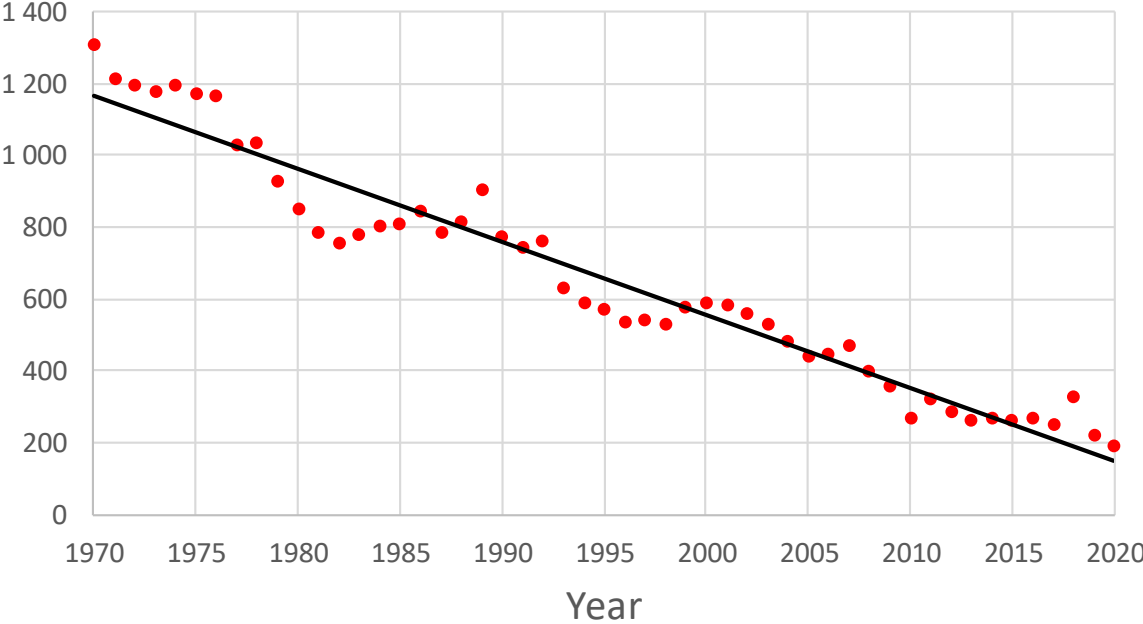
Sweden 2020



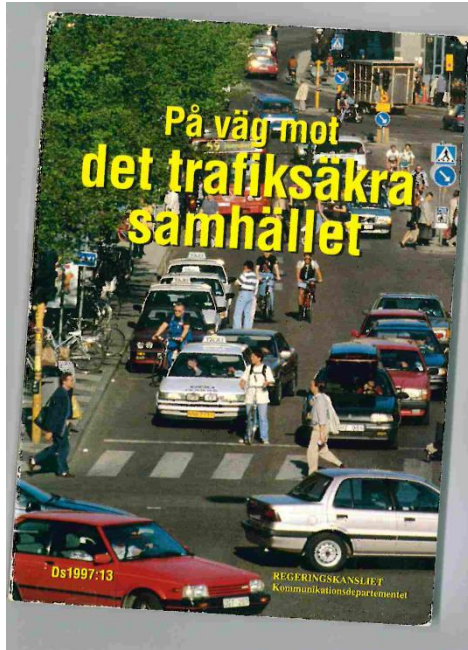
- **Population** 10 MILJ
- **Motorvehicles** 5 MILJ
- **Motorcycles** 0.3 MILJ
- **Mopeds** 0.2 MILJ
- **Driving licenses** 5.9 MILJ
- **Fatalities** 190
- **Seriously injured** ~ 3850 (2019)

Road traffic fatalities in Sweden 1970-2020

Fatalities



The Swedish Road Safety Policy



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

“Vision Zero means that no one should be killed or seriously injured within the road transport System”

**A Road Safety Policy need to be
connected to definitions and metrics to
be operative**

Seriously injured ??

Long term consequence

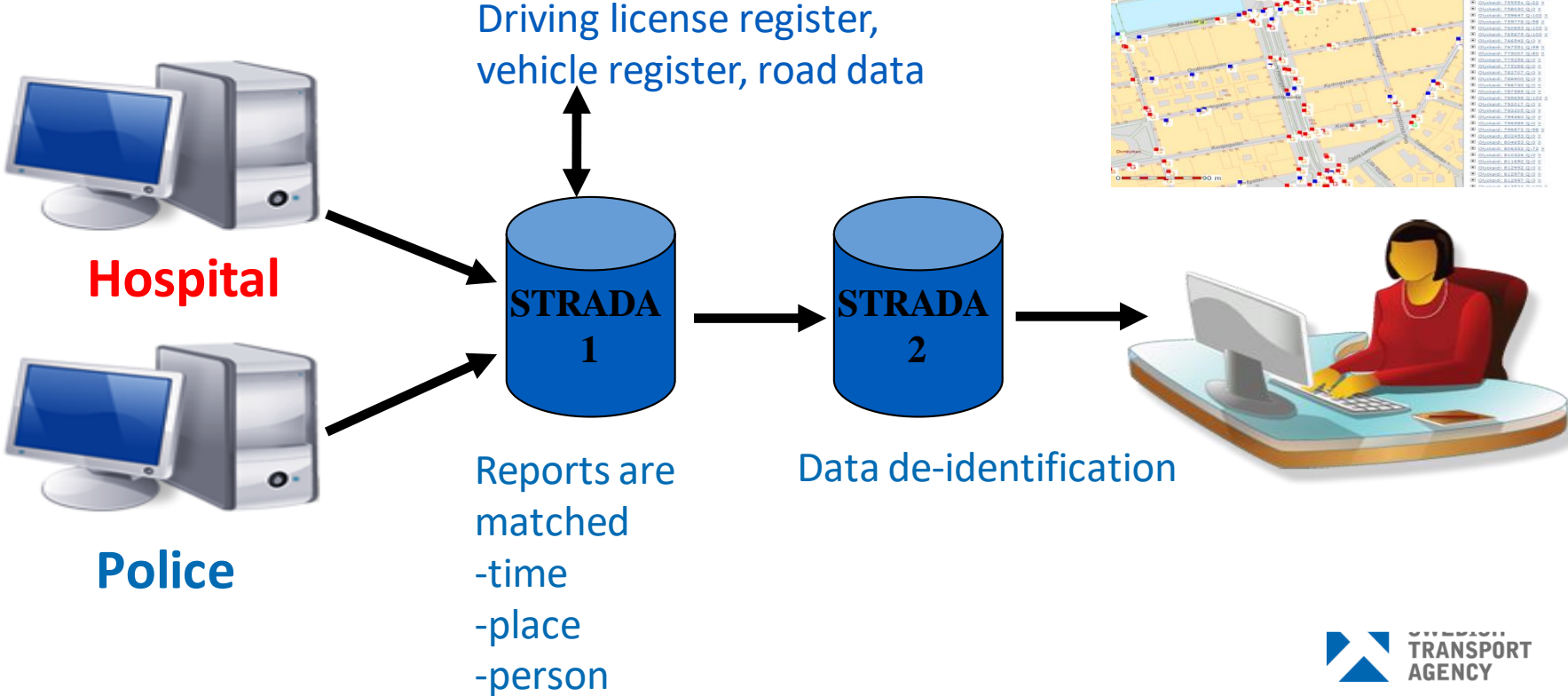
Low correlation between the immediate outcome of an injury and the long term life consequence!

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

Today's definition of Seriously Injured in Sweden

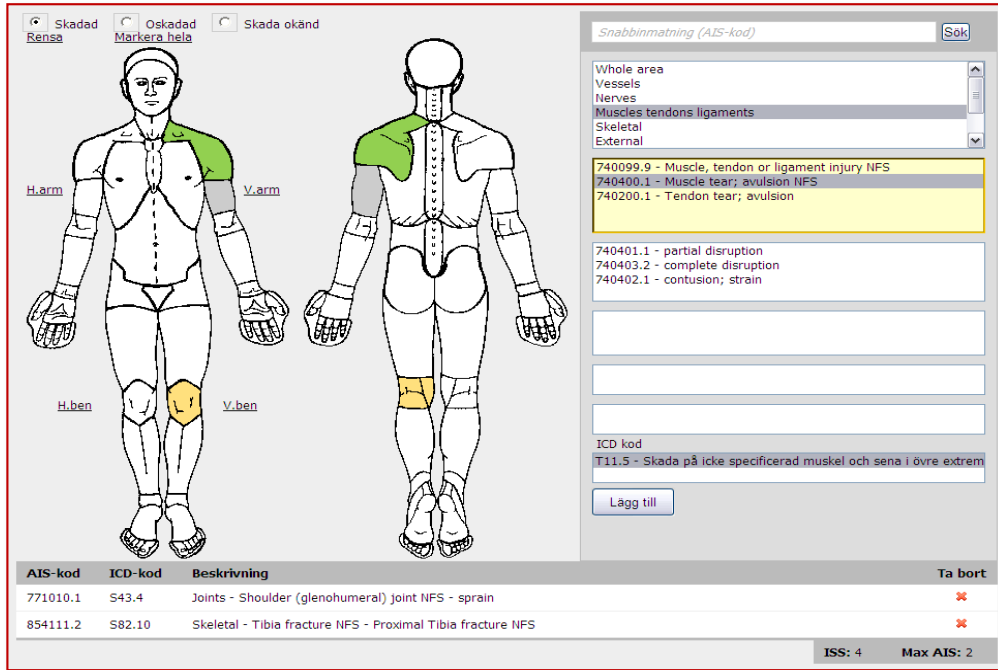
A person who has suffered at least one percent permanent medical impairment from a road traffic injury

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 (front and back views) with colored markers indicating injury locations: green for the upper torso/shoulder area and yellow for the lower leg/knee area. Labels 'H.arm', 'V.arm', 'H.ben', and 'V.ben' are visible. The top navigation bar includes buttons for 'Skadad Rensa', 'Oskadad Märkera hela', and 'Skada okänd'. The main panel on the right is titled 'Snabbinmatning (AIS-kod)' and contains a search bar and a list of injury codes. The list includes:

- 740099.9 - Muscle, tendon or ligament injury NFS
- 740400.1 - Muscle tear; avulsion NFS
- 740200.1 - Tendon tear; avulsion
- 740401.1 - partial disruption
- 740403.2 - complete disruption
- 740402.1 - contusion; strain

Below the list, there are input fields for 'ICD kod' and a button 'Lägg till'. The ICD code entered is 'T11.5 - Skada på icke-specificerad muskel och sena i övre extrem'. At the bottom, a table shows the selected injury codes and their descriptions:

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	✘

At the bottom right of the interface, it shows 'ISS: 4' and '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

RPMI x STRADA = number of 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

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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

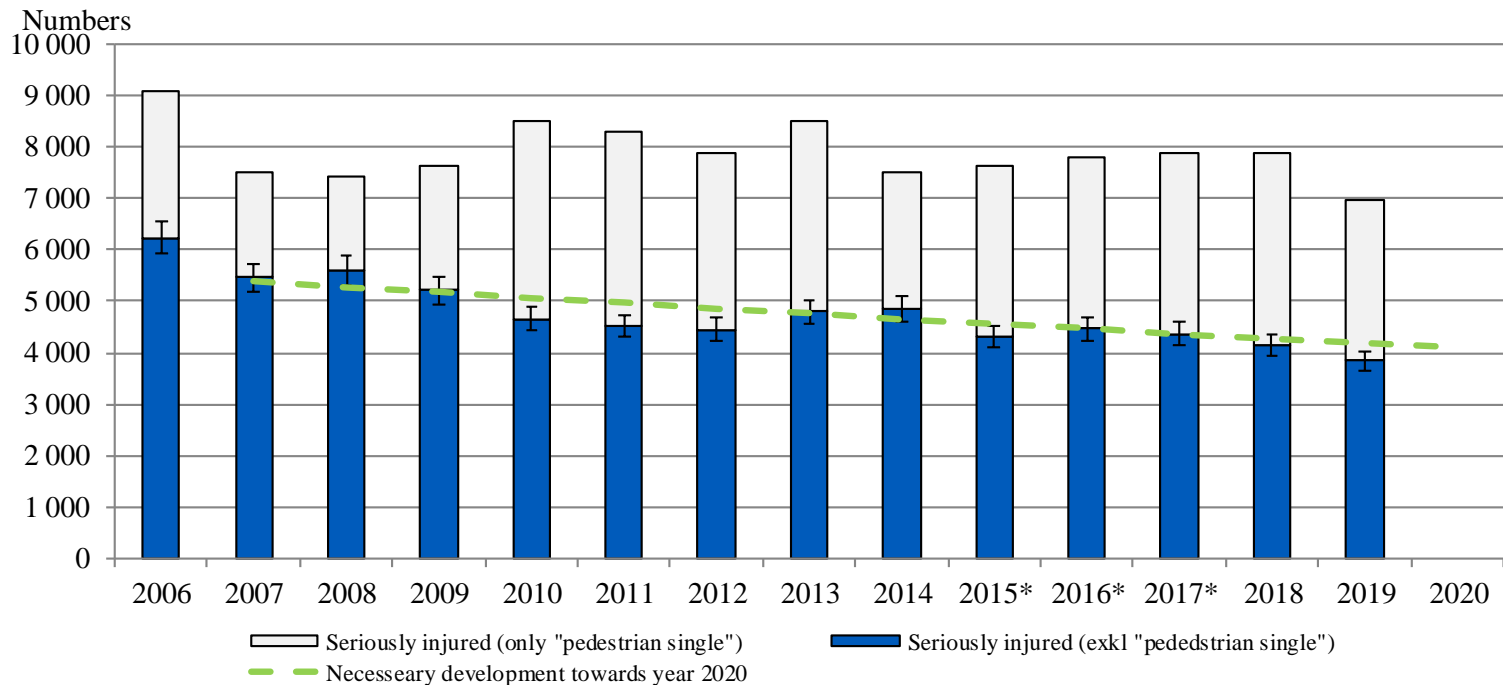
Berg, H-Y, J Ifver, M. Hasselberg (2016).

Publichealth 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

Number of seriously injured 2006-2019

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

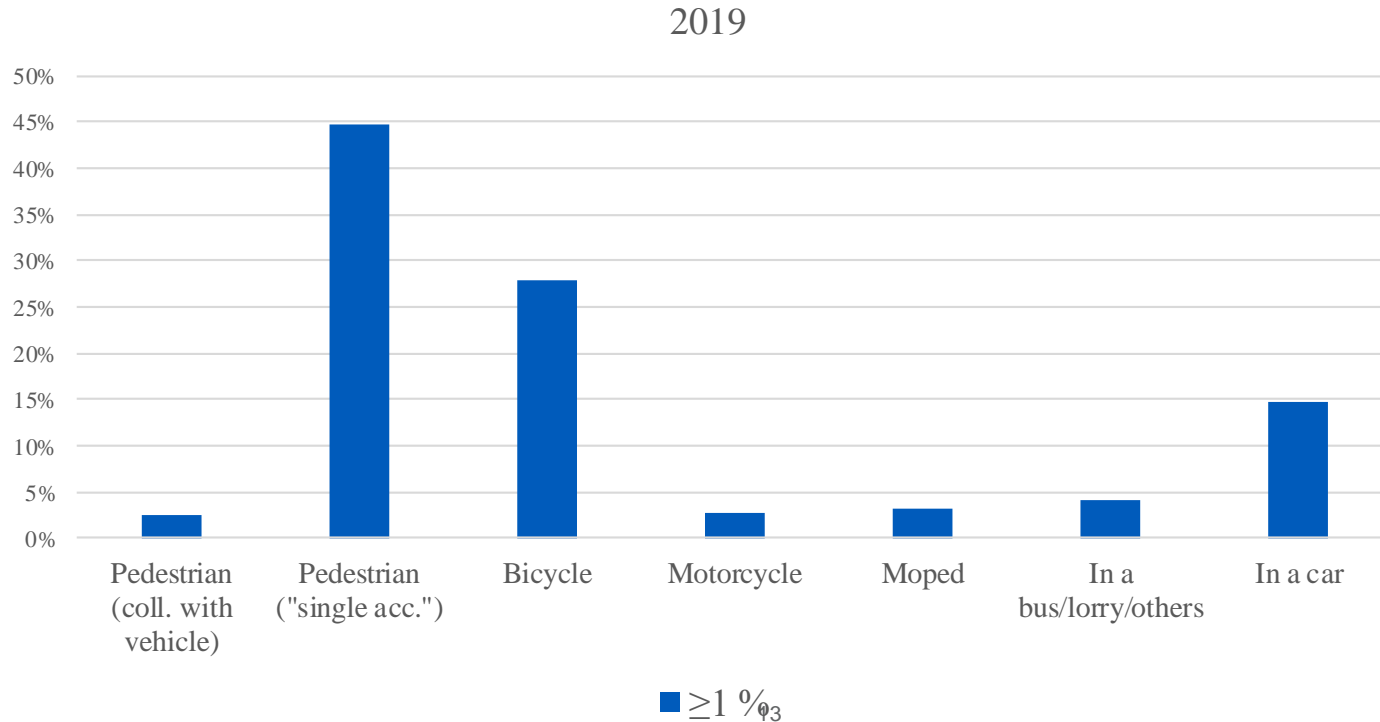
Swedish goal by 2020 is maximum 4100



The use of the new definition and its metric...

has shifted the prevention focus from fatalities on state roads towards seriously injured in urban areas

Percentages of seriously injured ($PMI \geq 1\%$) divided by mode of transport, 2019, total 6952, incl. "pedestrian single"



Conclusion

- For policy making and prevention is it essential to pay attention to the fact that negative consequences of RTIs can be long-term and can arise even for apparently minor injuries and minor injurious events.
- Victims of RTIs has a high risk of impoverished health after the crash even after injuries with a low threat to life.
- A definition of a serious injury and a connected metric(s) can increase the focus towards the injury problem and especially towards vulnerable road users
- A definition of a serious injury is important for global road safety, amending R.E.1 with a definition and a metric can support this
- Amending the R.E.1 is in line with the ITC-strategy and the WP.1 responsibility for UN SDG targets 3.6 and 11.2