

Finland: Converting ICD to AIS codes

ETSC PIN Talk: Reducing serious injuries in Europe
4 November 2025

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Reporting serious injuries – process

- Current method was developed, tested and documented in 2014¹. Regular reporting of serious injuries started in 2015.
- Basic elements: National Care Register for Health Care², MAIS3+ criteria and the ICD-AIS map (AAAM)³.
- Based on the personal identification number or ICD-10⁴ external cause V00-V99 (Traffic Injuries), patients involved with traffic crashes in Care Register are identified.
- Patients' treatment periods, outpatient visits and ICD-10 injury diagnoses (S00-T79) from the Care Register are extracted.
- Two datasets from the Care Register:
 1. data based on personal identification numbers (from police statistics)
 2. data based on ICD-10 external cause
- Data processing for both datasets (e.g. removal of overlaps, linking accidents and treatment periods/visits etc.), including **classification of the severity of all injuries using the ICD-AIS map (AAAM)**.
- 2 Statistics Finland is responsible for the reporting process in practice.

¹ Airaksinen, Kokkonen (2014):
*Tieliikenteessä vakavasti
loukkaantuneiden määrän arviointi
VAAKKU (in Finnish, English
summary).*

² Care Register covers information on
treatment periods in inpatient care
and outpatient visits in public and to
some extent in private healthcare.

³The Association for the
Advancement of Automobile
Medicine:
aaam_icd10map_v1.0_Feb2015

⁴International Classification of
Diseases 10th Revision

Converting ICD-10 diagnoses to AIS

The conversion process is technically easy and simple.

Based on the ICD-10 injury diagnose code, the ICD-AIS map determines if the injury is

- minor (0=AIS 1-2),
- serious (1=AIS 3+) or
- cannot determine (9).

All patients with at least one AIS 3+ injury are considered as seriously injured (MAIS 3+).

The result is not perfect, but for now we can live with it.



Table 5

ICD-AIS map severity rating (AIS 3+ or not) of injuries by ISS body region.

ICD-AIS map rating result	Head and neck	Face	Chest	Abdominal or pelvic content	Extremities	External	Total
Correctly classified	252 (75%)	123 (76%)	337 (63%)	127 (66%)	454 (82%)	5 (24%)	1298 (72.0%)
Misclassified serious as minor	25	2	111	49	29	0	216 (12.0%)
Misclassified minor as serious	22	1	29	2	1	3	58 (3.2%)
Undetermined (minor injury)	6	0	3	10	7	0	26 (1.4%)
Undetermined (serious injury)	9	0	0	3	8	0	20 (1.1%)
Missing code	20	36	59	1	55	13	184 (10.2%)
Total	334	162	539	192	554	21	1 802 (100%)

1549

Not all errors are relevant in identifying of seriously injured patients.

The most frequent and problematic errors are due to

- multiple fractures of ribs (S22.4)
- injuries of visceral organs (S36.X, S37.X)
- some open fractures of extremities (S42.X, S52.X, S62.X, S82.X, S92.X, S32.7) and
- specific head injuries (S02.0, S06.3, S06.6) with e.g. prolonged unconsciousness.

Table 6A

Misclassified, missing, and undetermined ICD-10 codes in severity rating by ICD-AIS map.

	Misclassified codes (n)	Missing codes (n)	Undetermined codes (n)
Head and neck	S02.0 (7) S06.0, S06.2 (4), S06.3 (11) S06.4 (3), S06.6 (8) S12.0, S12.1 (2), S12.2 (3) S13.0, S14.3 S15.0 (3), S15.1 (2)	S01.7 (5) S02.01, S02.71 (2) , S02.7 (3) , S06.7 S12.7 (5) , S15.7 (2) S16.0	S06.8 (12) , S06.9 S07.9 S19.8
Face	S02.4 (2), S02.41	S00.7 (4) , S01.7 (8) , S02.30 , S02.47 (3) , S02.53 , S02.54 S02.7 (11) , S02.70 (2) , S02.71 (2) S02.80 , S03.21 , S06.28	
Chest	S12.2 S22.0 (4), S22.3 (6), S22.4 (91) S23.0 S27.0 (7), S27.2 (2), S27.3 (26) S29.0 S32.0	S22.1 (57) S26.8 (2)	S27.6, S27.9 S29.8
Abdominal or pelvic content	S32.0 (3), S33.0, S34.2, S34.4, S35.5 S36.0 (17) , S36.1 (13) , S36.2 , S36.4 S37.0 (10) , S37.2 , S37.3	S36.7	S35.8, S35.9 S36.8 (7) S36.9 S37.8 (3)
Extremities	S25.3 S32.0, S32.1, S32.5 S42.3 (2) , S42.4 S52.0 , S52.2 (2) , S52.5 , S52.6 (2) S65.0 S82.1 (4) , S82.2 (6) , S82.3 (4) , S82.4 , S82.8	S32.7 (26) , S33.7 S47.0 S51.1, S51.7, S52.4 (4) S60.7 (2), S61.7, S61.8 S62.4 (3) , S62.7 (3) S72.7 (2) S82.7 S92.7 (4) , S93.2 (3) T01.9	S35.8, S44.8, S57.8 S63.4, S66.1 S77.1 (4) S87.0, S87.8 (4) S89.9
External	T21.2, T21.3 T24.3	T00.9 (12) , T01.9	

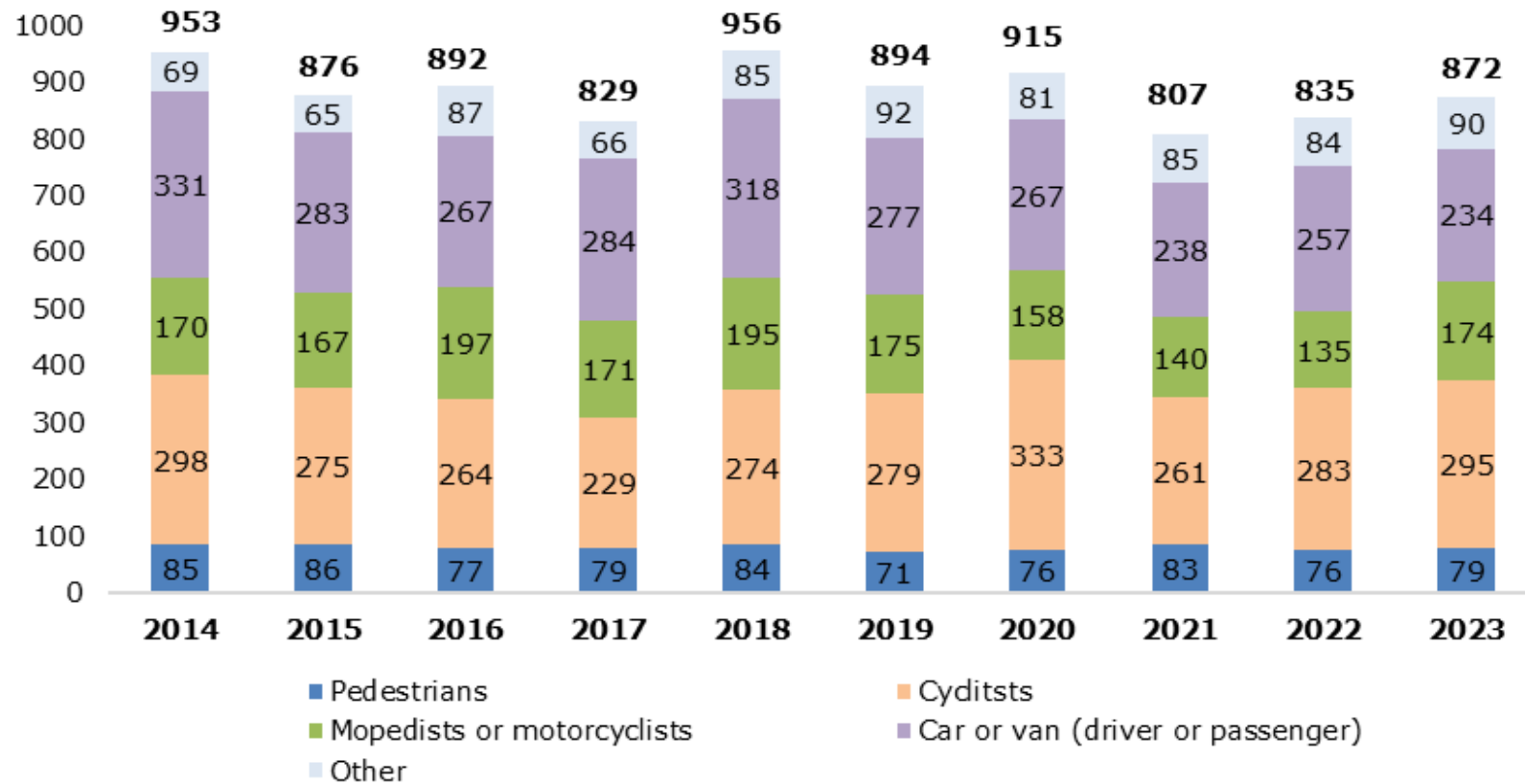
Airaksinen N, Heinänen M, Handolin L. The reliability of the ICD-AIS map in identifying serious road traffic injuries from the Helsinki Trauma Registry. *Injury* 2019;50: 1545–5.



Time series – seriously injured

Seriously injured (MAIS 3+) 2014–2023

source: Statistics Finland

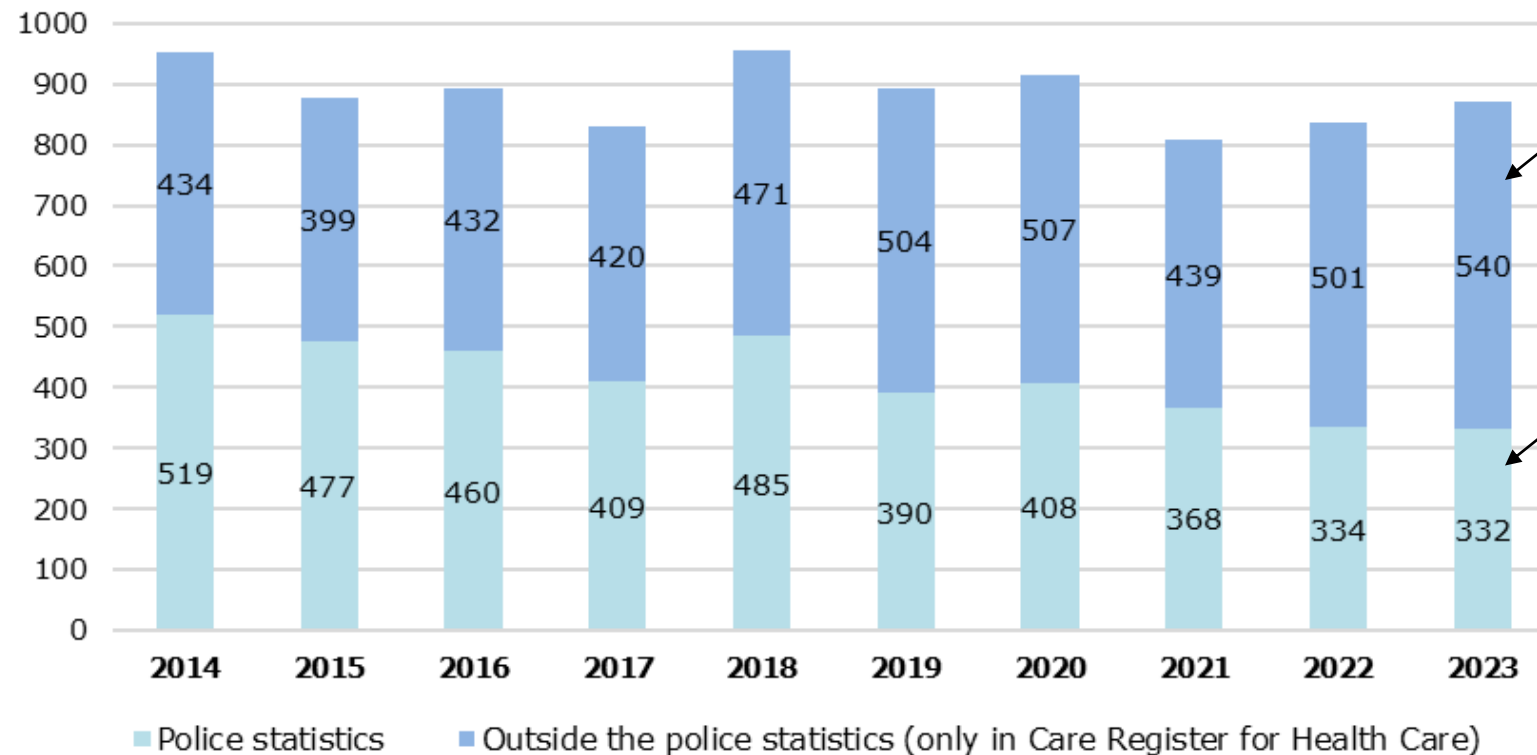


The code for electric scooters has also been implemented: V00.8 Accident on other pedestrian conveyance (including **electric scooters**, electric wheelchairs, other electric pedestrian mobility equipment, baby carriages)

Data on seriously injured – two different datasets

Seriously injured (MAIS 3+) 2014–2023

source: Statistics Finland



Data 2 ~60%: Number of persons, road user group, age, sex, location of treatment facility
– no other information

Data 1 ~40%: good background information of the crash according to the police statistics of road traffic crashes



Considerations

...regarding the conversion

- ☹️ Based on studies⁵ ICD-AIS-map underestimates the number of seriously injured by 21-34%.
 - We are very aware of the problems: many injury codes can be minor or serious -> our ICD-10 codes are not detailed enough.
- ☹️ There are also some errors in coding of ICD-10 external cause and diagnoses in the Care Register.

...regarding the reporting of serious injuries

- ☹️ Lack of background information about the crash in more than half of the cases.
- ☹️ The reporting delay is too long.
- ☹️ We have established method and quite long time series already in use.
- ☹️ We are aware of the shortcomings of the method.
- ☹️ The method clearly highlights the lack of coverage of police statistics.

The investigation of traffic crashes resulting serious injuries has launched in Finland. The aim is to obtain more extensive, accurate and up-to-date information on serious road traffic accidents and to provide information for traffic safety work.

Thank you for your attention!



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