

27-28 September 2022

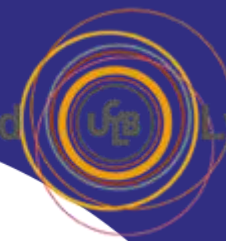
7th IRTAD Conference

# Linking a road trauma registry and hospital discharge data to improve the ICD-AIS mapping

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# Introduction : different countries, different methods

- Starting research project : no results available yet, focus on methodology
- Number of serious road traffic casualties : difficult to estimate
- European Commission : serious road traffic casualties = at least an **AIS 3+** injury score
- SafetyCube project<sup>1</sup> recommends
  - Applying correction factors to police data
  - Using hospital data
  - Police and hospital data linkage
- Most European countries : **hospital data**
- France : - correction method based on police data and the Rhône road trauma registry<sup>2</sup>  
- estimates produced from national hospitalization data<sup>3</sup>
- Problem with hospital data : injuries coded with ICD → **No severity score**

➡ **A conversion tool is necessary to obtain injury severity**

<sup>1</sup>Safetycube, Perez 2018

<sup>2</sup>Amoros et al. 2008

<sup>3</sup>Zullo et al. 2021

# Introduction : ICD to AIS

- Several conversion maps : different versions of ICD and AIS classifications
- Association for the Advancement of Automotive Medicine (AAAM) : **ICD-AIS map**<sup>1</sup>
- From **ICD-10-CM** (clinical modification, US coding) to **AIS 2005 update 2008** (AIS3+ yes/no/unknown)
- Different classifications structures → **Important number of undetermined AIS scores**<sup>2</sup>
- Map limitations :
  - Unknown severity score if ICD code = several AIS post-dot codes with different severities
  - Significant proportion of undetermined scores : ~50%<sup>2</sup>
  - Not optimal for European data<sup>3</sup>
  - Few studies with real world data, small samples<sup>4,5</sup>

➡ **Agreement between translated AIS / directly coded AIS not well enough evaluated**

<sup>1</sup> Loftis et al. 2016

<sup>2</sup> Zullo et al. 2021

<sup>3</sup> SafetyCube, Perez 2018

<sup>4</sup> Airaksinen et al. 2018

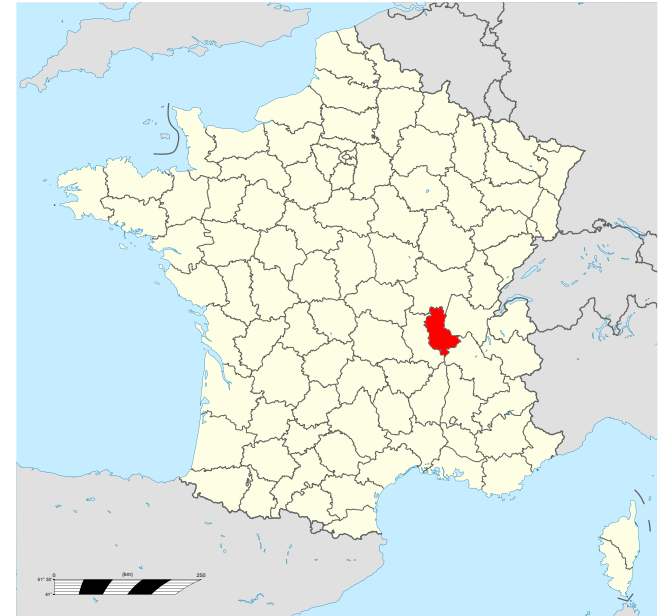
<sup>5</sup> Airaksinen, Heinänen et Handolin 2019

# Introduction : Rhône context

- Rhône road trauma registry : injury severity directly coded with **AIS** by an expert
  - 2015-2021 ~9 000 injured per year, including ~1 500 hospitalized
- Rhône county : 1.8 million inhabitants, urban (Lyon) and rural
- Hospital data (PMSI, medico-administrative database) :
  - ICD codes for all hospitalized victims in France
  - AIS severity by mapping

⇒ **Probabilistic linkage between the two**  
⇒ **Direct AIS versus translated AIS**

**Objective : Evaluate validity of translated MAIS**



# Data (and methods)

## Rhône road trauma Registry

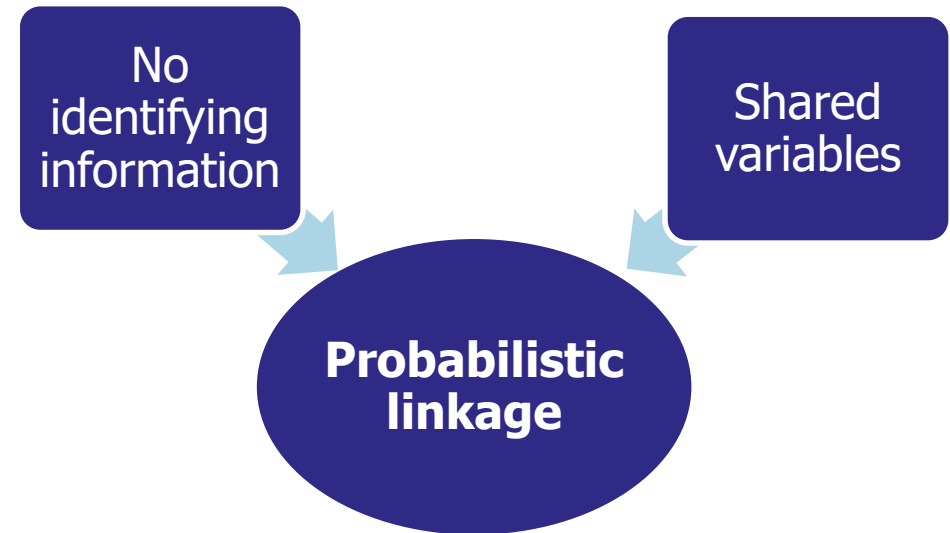
- All road accident casualties, outpatients (ED) and hospitalized
- Rhône county
- Injuries : **AIS 2005 update 2008**
- Directly coded
- Expert physician
- Focus on
  - 2015-2021
  - ~1500/year hospitalized casualties
  - Rhône county = crash location

## Hospital data (PMSI)

- Hospitalized patients
- France
- Injuries : **ICD-10**
- ICD-AIS map to obtain AIS severity
- Medical staff
- Focus on
  - 2015-2021
  - Admissions,  $\geq 1$  traumatic injury (ICD-10 codes S00-T88) ~3 300 patients/year
  - Rhône county = hospitalization place

# Methods : probabilistic linkage

- Linkage variables
  - FINESS (hospital ID number)
  - Admission date (day, month, year)
  - Discharge date (day, month, year)
  - Age
  - Gender
  - Postal code of residence
  - Type of admission
  - Type of discharge
  - Length of hospital stay
- Linkage should be conducted by a hospital data expert team
- Rhône county
- 2015-2021



# Methods

## Linked sample

- Expected size : ~7000 casualties
  - AIS severity directly coded
  - AIS severity obtained from ICD-10 codes by the ICD-AIS map
- Strength of agreement between both scores, using **Cohen's kappa**<sup>1</sup>
- Global
  - By body region
  - By road user modes (pedestrian, car, bicycle, motorcycle ...)
- **Distribution** of AIS scores for a given ICD-10 code : helps to resolve unknown AIS severity status

## Conversion maps

- AAAM : From ICD-10-CM codes to AIS severity scores<sup>2</sup>
- **Significant injury map** : From ICD-10 code to AIS severity 3+ / <3 / unknown
- **ICD-ISS map** : From ICD-10 code to AIS severity, AIS chapter (body region), ISS body region

<sup>1</sup> Cohen 1960

<sup>2</sup> Loftis et al. 2016

# Limitations

- Several ICD-10 codes : **No AIS severity** with the conversion tool (~50% with AAAM ICD-AIS map<sup>1</sup>)
- Linkage = data loss
- External cause (ICD10 V codes) poorly coded in France : **difficult identification of road casualties**
  - Traumatic injuries (S00-T88) due to **different external causes** (road crash, home and leisure injuries, occupational accidents)
- One-to-one match Registry/PMSI difficult to obtain ?
- Severe road crash casualties transferred in the Rhône county, from outside the area

<sup>1</sup>Zullo et al. 2021



# Strengths

- **Large sample size** expected
- **Reduction of unknown AIS severity** by assigning an AIS distribution

*Hypothetical example :*

ICD code	Translated AIS severity	Directly coded		Observed distribution
		RTSN code	AIS severity	
<b>S37.0</b> (Injury of kidney)	9	541699	2	60%
		541610	2	
		541612	2	
		541620	2	
		541622	2	
		541640	2	20%
		541614	3	
		541624	3	
		541626	4	10%
541628	5	10%		

- Results expected in **2023**

# Thank you for your attention

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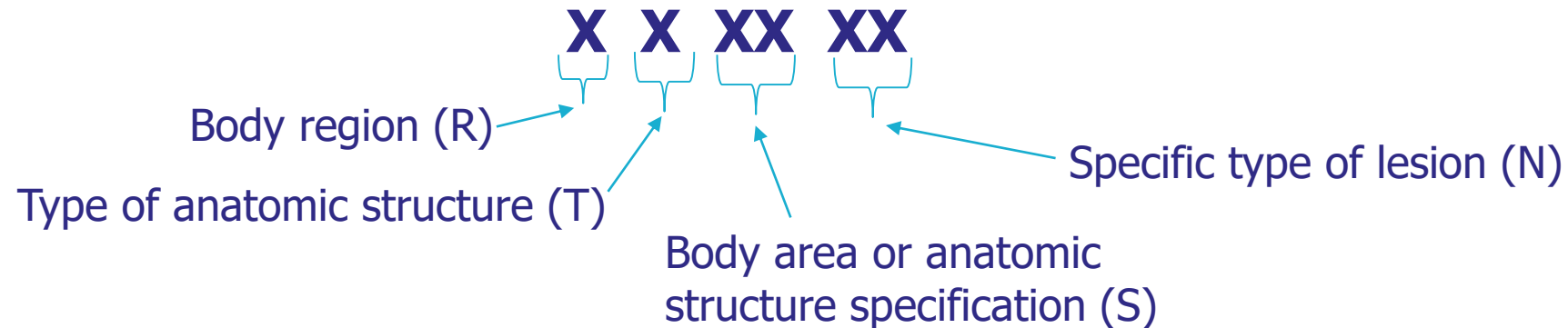
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## Additional slide

- What is AIS ?
- **Abbreviated injury scale = injury classification**



- Registry AIS expert is working on a one-to-several mapping ICD/AIS (RTSN) codes
- Conversion improvements for French data and probably European ones
- Possible extension to other AIS severity scores or study of sequelae (FCI)
- MAIS : overall severity score (if several injuries), = maximum of AIS