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Estimating the number of seriously injured road users using the national hospital data, France, 2010-2019



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Introduction : estimating the number of seriously injured road users

- Many countries use national hospital discharge data :
- Hospitalised patients, diagnosis coded with ICD-10 (International Classification of Diseases)
- Codes S, T = type of injury (fracture of the radius, liver injury, etc)
- Codes V, W, X, Y= external cause (intentional/accidental : home and leisure injury, occupational injury, road injury...)
- In France (PMSI): external cause is missing at 70%

Method :

Is external cause completed ? Yes/no

- Among all hospitalized with a traumatic injury (codes S00-T88)
- whatever the cause ; including unknown
- **We model the probability that the external cause is completed**
- Response variable : Y (yes/no)
- Logistic model
- **Covariates :**
 - Hospital's characteristics (public/private, size, spread of activities...)
 - Patients' characteristics (gender, age, type of injury, length of stay ...)
- => **predicted probabilities** of having a documented external cause
- Inverse estimated probabilities : used as **weights**
- On the hospitalized whose external cause = road crash
- => weighed sum= **estimated total number of hospitalized from road crashes**

Method :

ICD 10 codes => AIS severity

Serious road traffic casualties = with at least an AIS3+ injury score

→ Conversion map :

for each ICD-10 injury code, assignment of an AIS \geq 3 score (yes/no/unknown)

→ About 40-50% unknown

→ For these, imputation by regression

Prob (AIS 3+/ AIS 1-2) according to hospital and patient characteristics

Results

Year	Hospitalized	MAIS3+ injuries	MAIS3+/ hospitalized	Hospitalized incidence (per 100 000 inhabitants)	MAIS3+ incidence (per 100 000 inhabitants)
2010	104 887	18 070	17,2%	167,1	28,8
2011	105 841	18 178	17,2%	167,8	28,8
2012	100 318	16 904	16,9%	158,3	26,7
2013	100 681	16 970	16,9%	158,1	26,6
2014	104 134	17 903	17,2%	162,6	28,0
2015	101 770	17 723	17,4%	158,3	27,6
2016	102 154	18 482	18,1%	158,5	28,7
2017	104 424	19 691	18,9%	161,5	30,5
2018	102 819	19 225	18,5%	160,6	29,7
2019	103 978	19 798	19,0%	160,4	30,5
Average	103 216	18 294	17,7%	161,3	28,6

Checking validity, on the Rhône county: registry vs PMSI, inhabitants of Rhône

Rhône Road trauma Registry (Rhône= crash location)			PMSI=hospitalized (Rhône=hospital location)	
Year	(hosp.) MAIS3+	MAIS3+/hospitalized	(hops.) MAIS3+	MAIS3+/hospitalized
2010	343	35,1%	319	16,5%
2011	348	37,2%	323	16,1%
2012	323	35,7%	367	19,0%
2013	343	40,4%	362	18,5%
2014	346	36,5%	480	12,3%
2015	337	34,7%	474	20,2%
2016	324	35,7%	427	20,6%
2017	352	34,4%	430	18,8%
2018	368	33,4%	492	19,9%
2019	434	33,8%	545	21,1%
Average	352	35,5%	422	17,7%

National estimates: hospitalized, MAIS 3+ by mode of transport

Mode of transport : many unknown

Documented external cause: still 30% with unknown/unspecified mode (pedestrian, cyclists, etc)

Imputation of mode :

by multinomial regression, according to age, sex, and type of injury (11 categories)

E-scooters ?

In ICD 10 CM (USA): new code V00

In France :

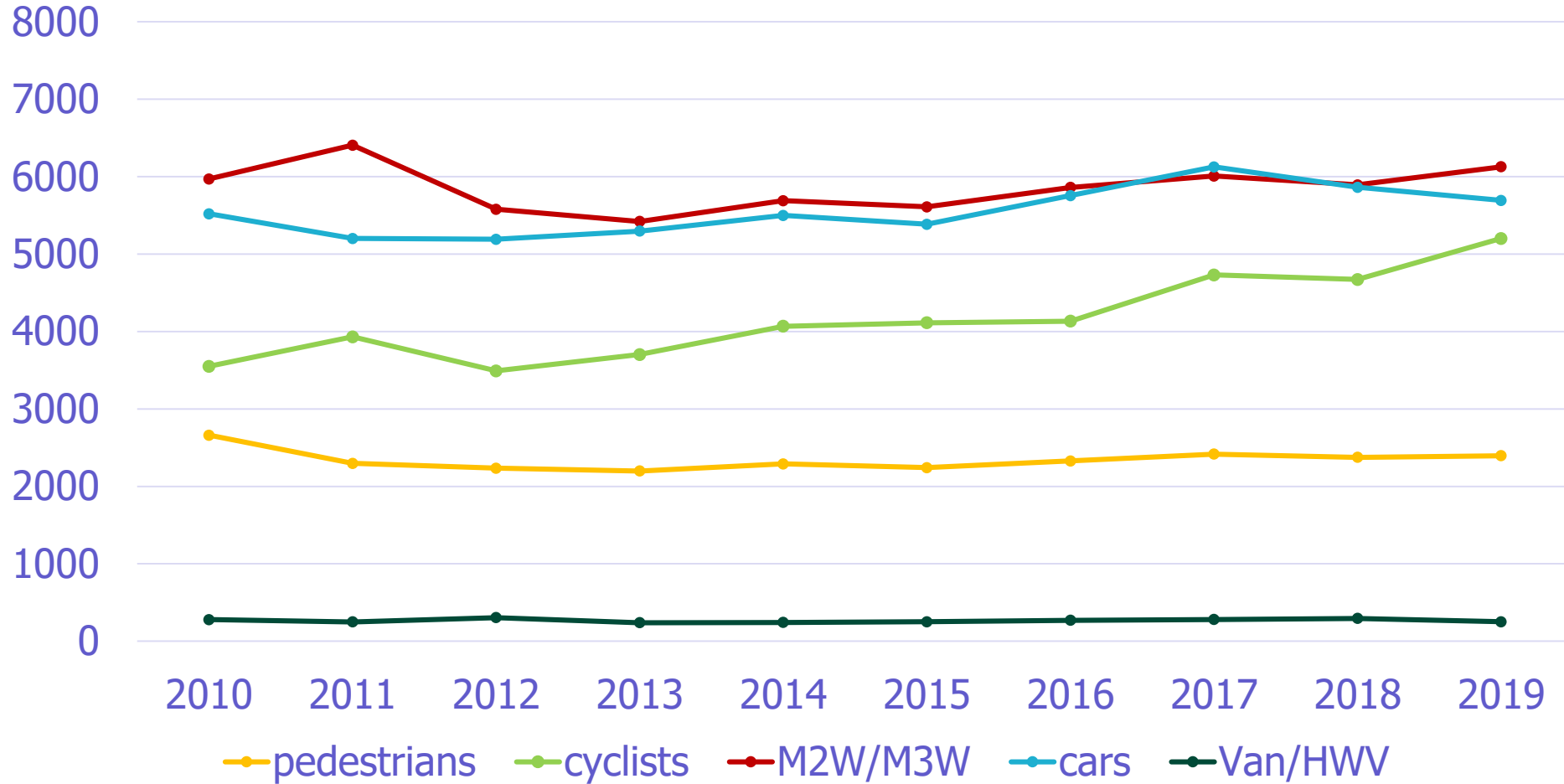
- no new code
- « scooter » is listed in pedestrian definition
- E-scooter = ?

How does the hospital staff code them ? As Pedestrians? Other ? unspecified?

Other European countries ?

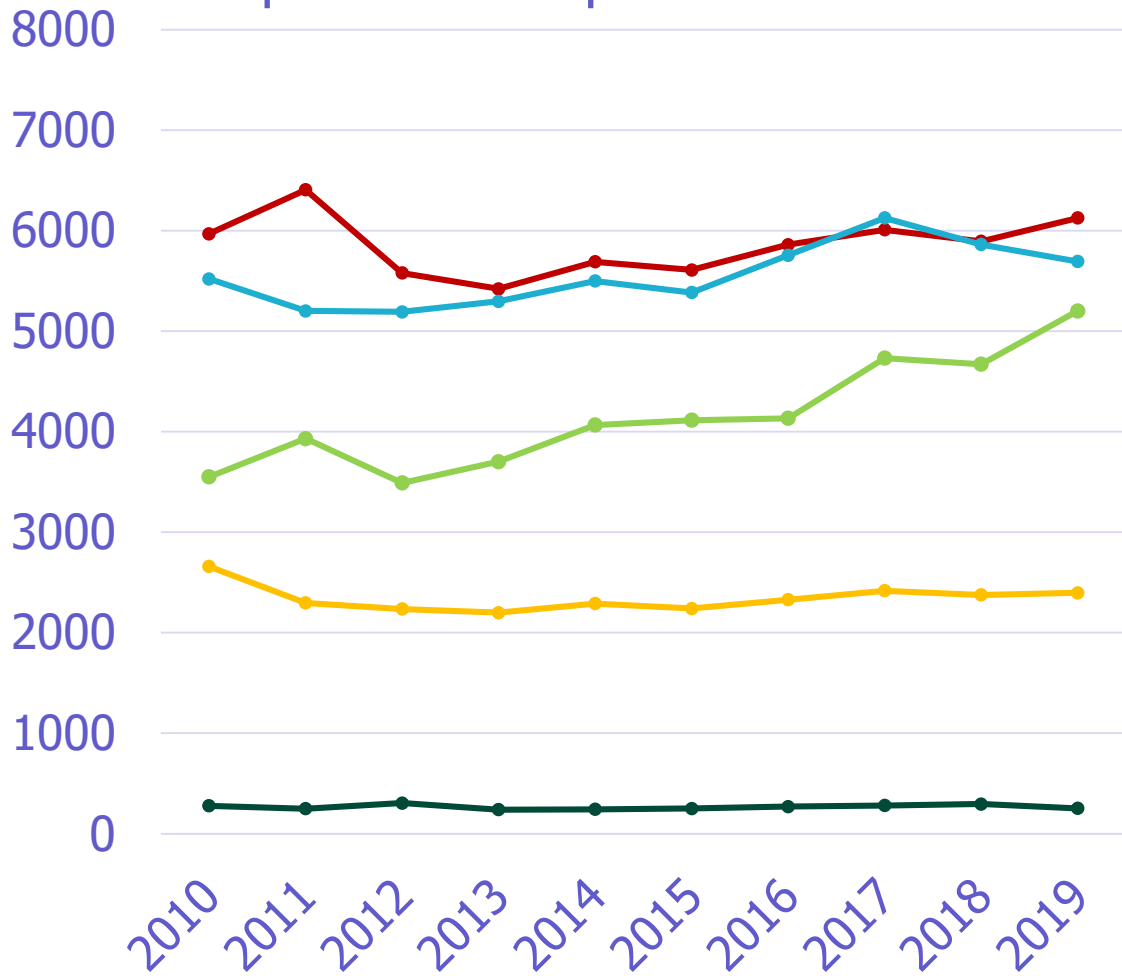
National estimates, hosp. and MAIS 3+ by mode of transport

Hospitalized and MAIS3+ road users, France

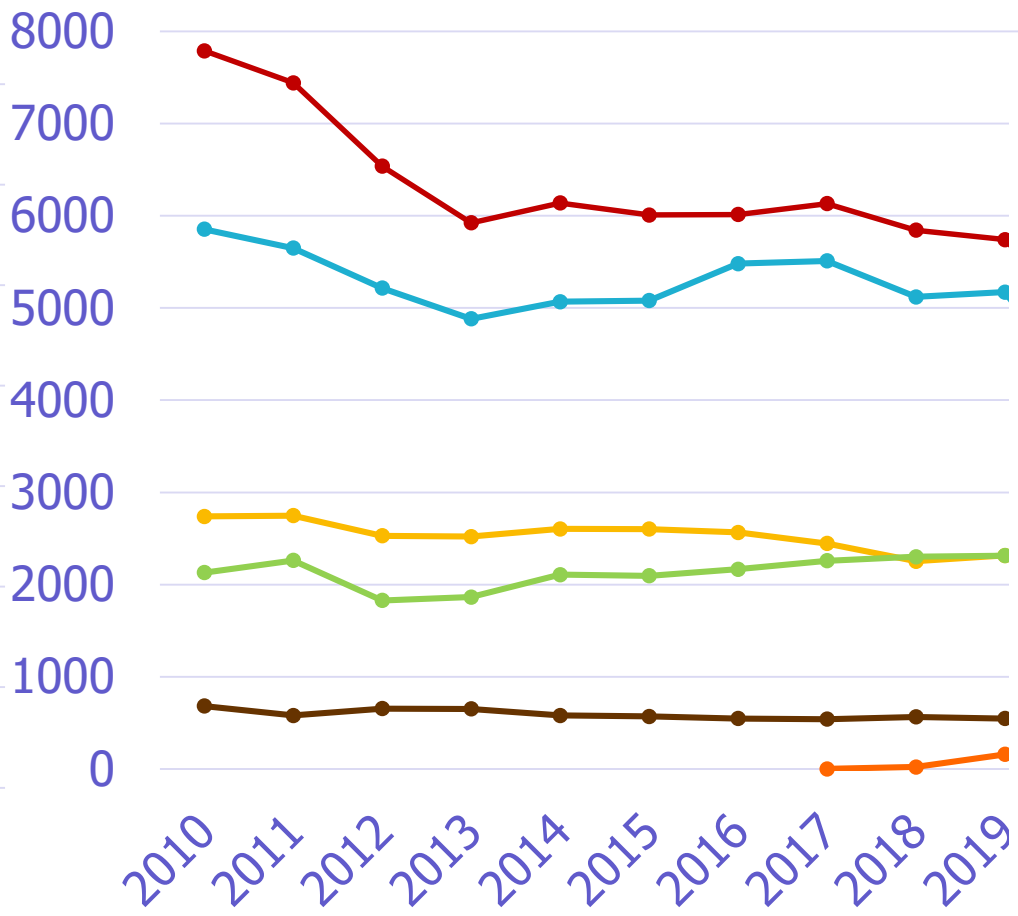


France, seriously injured road users, by mode

Hosp. data : hosp. and MAIS3+



Corrected police data, MAIS3+, France



- Pedestrians
- Cyclists
- E-scooters
- M2W/M3W
- Cars
- Other

Discussion / Conclusion

Ratio #MAIS3+/# killed

- 5.3 MAIS3+/killed in France
- 3-4 in Belgium, Italy, Portugal, Spain and Sweden (Safetycube),

No account for missing external cause (17 % in 2 countries, and ??% in the others)

- 13,2 and 11,9 in Netherlands and Switzerland: using capture-recapture and large amount of cyclists, whose ratio =24

Thank you for your attention

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**UNITÉ MIXTE DE RECHERCHE
ÉPIDÉMIOLOGIQUE ET DE SURVEILLANCE
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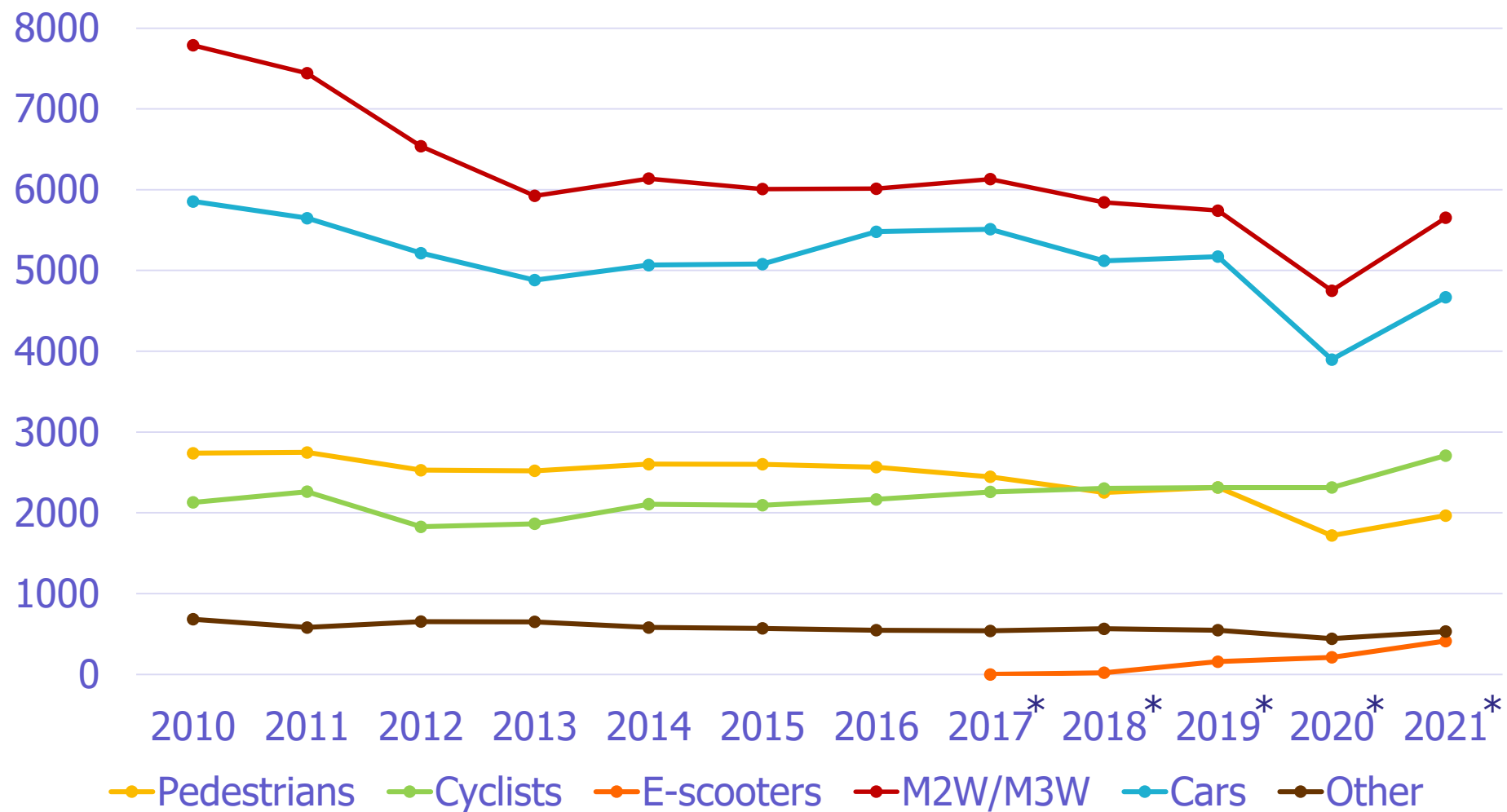
Additional slides



Year	Pedestrian	Cyclist	Motorized two-wheels	Car occupants	Van/Heavy vehicle occupants	Total
2010	2660	3550	5969	5521	278	17978
2011	2297	3931	6406	5201	249	18085
2012	2235	3491	5579	5191	305	16802
2013	2199	3702	5421	5297	239	16858
2014	2289	4067	5690	5499	242	17788
2015	2241	4114	5610	5385	252	17601
2016	2328	4133	5861	5755	271	18348
2017	2417	4731	6009	6126	281	19564
2018	2375	4671	5894	5862	295	19097
2019	2397	5201	6127	5693	252	19670
Total	23438	41592	58567	55530	2664	181791
Average	2344	4159	5857	5553	266	18179

Estimation with correction of the police data MAIS3+ by mode of transport

MAIS3+ road users, France



Method and data : selection of hospital stays

- France
- with ≥ 1 diagnostic of injury (ICD-10 : S00-T88)
- 2010-2019
- On average, every year :

