Seriously Injured in road accidents in Italy: MAIS3+ cases by national hospital discharge data

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Background

✓ The **2020 target** set by the United Nations and the European Commission is a further halving, since 2010, of the number of deaths in road accidents in Europe and globally. Although a specific target was not launched, the decrease in the number of serious injuries is recommended too.

✓ In compliance with the recent programs for road safety and the new 2020 targets, to establish new standards for an international and **harmonized definition** of serious injury in road accidents was required.

✓ In **2013**, the European Commission’s policy orientations on road safety 2011-2020 document was disseminated.

✓ In **2015**, the European Commission defined guidelines for Eu28 countries. **Italy**, part of the Eu CARE experts group, **adopted definitions and methods** using Hospital Discharge data for identifying serious injuries.
Definitions and methods

The European Commission defined specific guidelines to classify the seriousness of injuries. The use of the existing scale of the trauma AIS (Abbreviated Injury Scale) and, specifically, MAIS (Maximum Abbreviated Injury Scale) was approved.

Following the international recommendations and creating synergies among other national organisations, as Ministry of Transport and Ministry of Health, Italy calculated the number of serious injuries in road accidents, based on the Hospital Discharge Data (source Ministry of Health).

Hospital patients for acute in ordinary admission regime with a diagnosis included among ICD9-CM (Trauma) and associated to the external codes for Road accidents were considered. Readmissions and deaths within 30 days were excluded.

The use of Hospital Discharge, as recommended, ensures the correct assessment of injury severity, gathering these data do not require the development of new structures or processes as the information normally already exists in hospital data bases.
ICD 9 Mapping: MAIS 3+ conversion

Association Advancement of Automotive Medicine AAAM owner and licensee of injury coding products, provided to European Commission, under contract, and to Eu28 countries, two different mappings for International Classification of Diseases (ICD) revisions 9 and 10 into the code MAIS3+, MAIS<3, or indeterminable.

Italy adopted the IC9-AIS conversion table to apply to Hospital Discharge data.

ICD9 Mapping example
Total list 2500 records

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>1 = AIS 3, 4, 5, 6</th>
<th>0 = AIS 1,2</th>
<th>9 = cannot determine</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>Fracture Of Vault Of Skull</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.0</td>
<td>Closed Fracture Of Vault Of Skull Without Mention Of Intracranial Injury</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.00</td>
<td>Closed fracture of vault of skull without mention of intracranial injury; unspecified state of consciousness</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.01</td>
<td>Closed fracture of vault of skull without mention of intracranial injury; with no loss of consciousness</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.02</td>
<td>Closed fracture of vault of skull without mention of intracranial injury; with brief [less than one hour] loss of consciousness</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.03</td>
<td>Closed fracture of vault of skull without mention of intracranial injury; with moderate [1-24 hours] loss of consciousness</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.04</td>
<td>Closed fracture of vault of skull without mention of intracranial injury; with prolonged [more than 24 hours] loss of consciousness and return to pre-existing conscious level</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Hospital Discharge Data, in Italy, is based on the collection of information about each patient discharged from the public hospital and private institutions throughout the country (National Laws 1991, 1993 and 2005 updates). Data source is the Ministry of Health.

The Hospital Discharge records, in compliance with the privacy laws, are filled in by the doctors who have treated the patient hospitalized. The Hospital Discharge information is mandatory in case of hospitalisation and day hospital. It does not apply to medical consultation or social care facilities.

The information is collected and coded (ICD9_CM) by the Regional Health System and sent to the Ministry of Health. It describes the clinical aspects of hospitalization (diagnosis and relevant symptoms, surgery, mode of discharge...)

Since 2010 the information about the External Cause of admission and discharge is included (ICD9 E classification), useful to identify injuries due to road accidents.

In Italy every year:
- 9 million of hospital discharge in total;
- 600,000 for trauma and poisoning
Road accidents in Italy: an overview on 2001-2016 data

2016 vs 2015
- Road Accidents: +0.7%
- Victims: -4.2%
- Injured: +0.9%

Road accidents and Injured scale

Killed scale

Target 2020 in 2016:
- 2,714 victims
- 569 observed out of the expected

Injured

Killed

Road accidents

In 2016:
- 373,286 victims
- 212,997 injured

2016 vs 2015:
- Road Accidents: +0.7%
- Injured: +0.9%

Bruzzone S., Crialesi R. Istat - Seriously injured in road accidents in Italy
The number of seriously injured in road accidents, in 2016, was **up 9% from the previous year**.

During the period 2012-2016, the ratio between serious injuries and deaths progressively increased, passing from 3.5 injured for each death in 2012 to 5.3 in 2016.

In 2016, the serious injuries represented **about 7% out of the total** injured noticed by Police. This percentage, which gradually increased over the last five years, was also linked to an **improvement in quality and coverage of all injuries information** among HDD.

Unknown cases: **code 9 MAIS3+ represents 3.9 % out of total injuries for road accidents HD in 2016**

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**Table: Seriously injured in road accidents: Years 2012-2016**

<table>
<thead>
<tr>
<th>Years</th>
<th>Serious injuries in Road Accidents HDD (MAIS3+) *</th>
<th>Killed in Road Accidents **</th>
<th>Serious Injuries per one road death</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>13,112</td>
<td>3,753</td>
<td>3.5</td>
</tr>
<tr>
<td>2013</td>
<td>12,899</td>
<td>3,401</td>
<td>3.8</td>
</tr>
<tr>
<td>2014</td>
<td>14,493</td>
<td>3,381</td>
<td>4.4</td>
</tr>
<tr>
<td>2015</td>
<td>15,901</td>
<td>3,428</td>
<td>4.7</td>
</tr>
<tr>
<td>2016</td>
<td>17,324</td>
<td>3,283</td>
<td>5.3</td>
</tr>
</tbody>
</table>

**Source:** Ministry of Health *, Istat **

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**Daily killed and seriously injured average: Year 2016**

- **9** killed
- **44** seriously injured

Bruzzone S., Crialesi R. Istat - Seriously injured in road accidents in Italy
In 2016, in Italy, the total Serious Injury rate is equal to 28.6 (*100,000) Males 39.9 and Females 17.9

The Serious Injury rate is higher for people over 70 years old and 20-29 than the other age classes. Males show a clear disadvantage in respect of females.

The ratio Serious Injuries/Deaths is higher for over 50 years old and aged 0-9 and 10-19.

To notice that children 0-9 years old data concern very few cases.
The percentage of **Seriously Injured vulnerable users in 2016** was approximately 33% in total:

14% Motorcyclist

10% Cyclists

9% Pedestrians

67% drivers and passengers of other vehicles

*Istat processing on Ministry of Health data*

The percentage of **Serious Injuries in 2016** were mainly (~70%) due to:

- Fracture
  - of vault of skull and face bones
  - of rib(s), sternum, larynx, and trachea
  - of pelvis and neck of femur
  - of tibia and fibula
- Cerebral laceration and contusion
- Subarachnoid, subdural, and extradural hemorrhage, following injury
- Traumatic pneumothorax and hemothorax
- Injury to heart, lung and spleen
### Serious injuries in Italy by geographical area

#### Serious injuries per one road death, by hospital discharge geographical area in Italy. Years 2012-2016

<table>
<thead>
<tr>
<th>HOSPITAL DISCHARGE GEO-AREA</th>
<th>Year 2012</th>
<th>Year 2013</th>
<th>Year 2014</th>
<th>Year 2015</th>
<th>Year 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-west</td>
<td>3.3</td>
<td>3.8</td>
<td>4.5</td>
<td>4.4</td>
<td>5.2</td>
</tr>
<tr>
<td>North-east</td>
<td>3.3</td>
<td>3.5</td>
<td>3.4</td>
<td>3.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Centre</td>
<td>3.5</td>
<td>3.4</td>
<td>4.6</td>
<td>5.1</td>
<td>5.8</td>
</tr>
<tr>
<td>South</td>
<td>3.3</td>
<td>4.3</td>
<td>4.8</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Islands</td>
<td>4.9</td>
<td>4.1</td>
<td>5.6</td>
<td>4.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Italy</td>
<td>3.5</td>
<td>3.8</td>
<td>4.4</td>
<td>4.7</td>
<td>5.3</td>
</tr>
</tbody>
</table>

During 2016, Regions in the Centre of Italy, show a number of Serious Injuries per one death higher than the national average (5.8 vs 5.3)

Source: Ministry of Health - Hospital Discharge Data - Istat – Survey on Road accidents resulting in death or injury
Serious injuries in EU countries

Serious injuries per one road death in EU

Serious injury MAIS3+ in EU: data availability

2016 data for BG, IT, SE;
2015 data for FI, NL, PT;
2014 data for CY, CH, BE, DE, ES, FR, PL, SI, UK
Source: European Transport Safety Council - Annual PIN report. Year 2017

Differences between countries, sometimes relevant, could be due not only to the road accidents national pattern but also to slight discrepancy in coding.
Conclusions

✓ During the period 2012-2016, in Italy, the number of serious injuries and the ratio between serious injuries and deaths progressively increased.

✓ The increase was, realistically, due the road accidents pattern but also to an improvement in quality and coverage of all injuries information among hospital discharge data.

✓ The main goal is the improvement of the coverage level of all injuries information in Hospital Discharge Data, to reach a correct and more detailed SI calculation.

✓ Furthermore, the next step, in Italy, in medium term, could be the Linkage between Police and Hospital data sources, with the aim to reduce risk of both underreporting and misreporting.

✓ As regards linking of data, the principles of integrity and data protection must be kept in mind.
Highlights from Italian Road Accidents statistics

Road accidents in Italy. Year 2016

- Pedestrians: 570 fatalities, 21,155 injured, -5% (-20.2), +3% (-4.2)
- Pedal cycles: 275 fatalities, 16,413 injured, +10%, -15%, +1%
- Motorcycles: 657 fatalities, 43,388 injured, -17.5, +0.9, +1%
- Passenger cars: 1,470 fatalities, 145,135 injured, +2%
- Mopeds: 116 fatalities, 11,517 injured, +10%, -9%
- Heavy goods vehicles: 136 fatalities, 7,009 injured, -13%, -2%

Causes of road accidents:
- 16% distracted driving
- 15% failing to obey a precedence or the traffic light signals
- 11% speed excess

Deaths (within 30 days) and injuries by vehicle category number include all drivers and passengers. All percentage variations are from 2015.

https://www.istat.it/en/archive/202807

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