Speed changes and crash risk - a case based study within IRTAD

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Content

- **Objectives** of the report (based on 11 case studies from 10 countries)
- What do **we know** about speed changes and crashes?
- Sample of **4 cases** from 4 countries
- **Conclusions** and **recommendations**

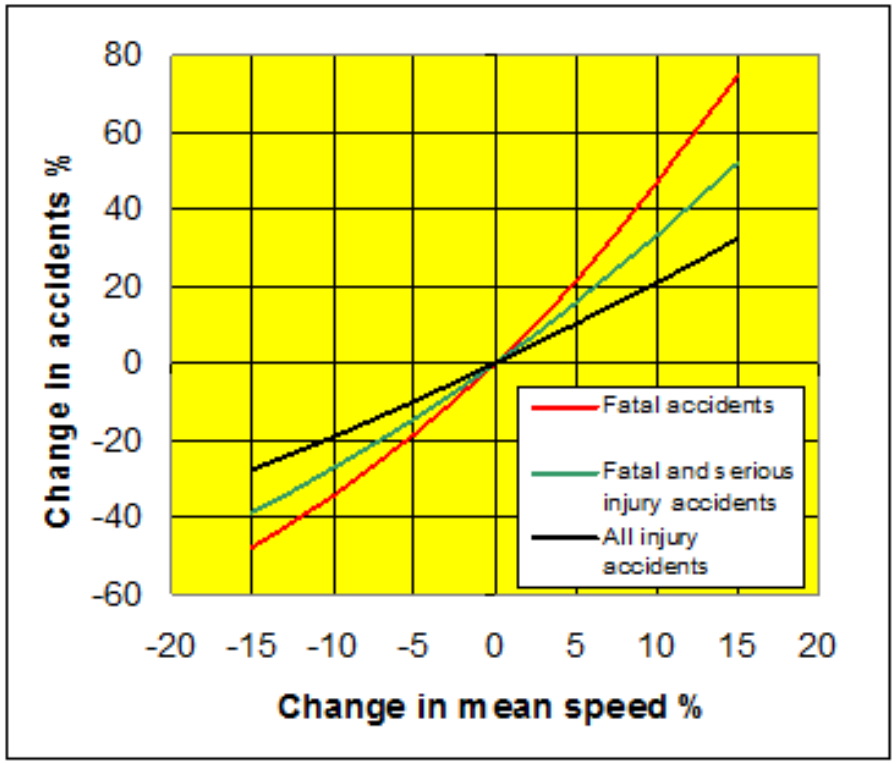
Objectives of the report

- Produce an accessible report based on **case studies** from countries which recently experienced either a **change in speed limits** or a wide implementation of **automatic speed control**.
- Document objectively the relationship between speed changes and crash risks.
- Assess how data from actual case studies match the theoretical and empirical models available.

What we know about speed changes and crashes

Power model (Nilsson 2004, Elvik, 2009)

$$crashes\ after = crashes\ before * \left(\frac{speed\ after}{speed\ before}\right)^{exponent}$$



Exponential model (Elvik, 2013)

$$crashes\ after = crashes\ before * e^{\beta(speed\ after - speed\ before)}$$

Cases collected in the report

Both speed and crash data required

Changes in speed limits

Hungary: Decrease in speed limit inside built-up areas (1993)

Hungary: Increase in speed limit outside built-up areas (2001)

Australia: Decrease in speed limits in urban areas (1997 – 2003)

Denmark: Increase in speed limit on part of the motorway network (2004)

Norway: Environmental speed limits on major roads in the city of Oslo (2004)

Sweden: A fundamental change in speed limits on rural roads (2008, 2009)

Israel: Increase in speed limits on selected rural roads and mv (2011, 2013)

Introduction of automated speed enforcement

France: Implementation of nationwide automated speed enforcement (2003)

United States: automated speed enforcement in 14 corridors in the city of Charlotte, North Carolina (2004)

Italy: Speed section control, Safety TUTOR, on motorways (2005)

Austria: Section control (2012)

Case Hungary

Urban areas: 1 March 1993

- Decrease of speed limit, from 60 km/h to 50 km/h
- Covering 32 % of the state road network.
- Motivation: improvement of road safety, part of modification of Hungarian Highway Code.

Rural areas: 1 May 2001

- Increase of speed limit
    - from 120 km/h to 130 km/h on motorways
    - from 100 km/h to 110 km/h on semi-motorways
    - from 80 km/h to 90 km/h on rural roads
- Covering 68 % of the state road network.
- Motivation: political decision, part of the modification of HHC.

Results Hungary

Urban areas (60-50 km/h)

Speed: Decreased 8%

Fatalities: Decreased 18%

Rural areas (80 – 90 km/h)

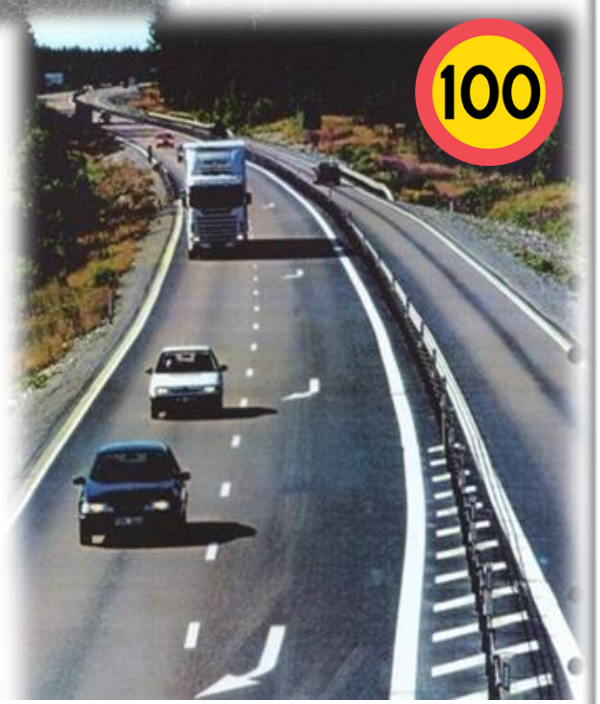
Speed: Increased 3%

Fatalities: Increased 13%

Case Sweden

Increases and decreases of speed limits in 2008 and 2009

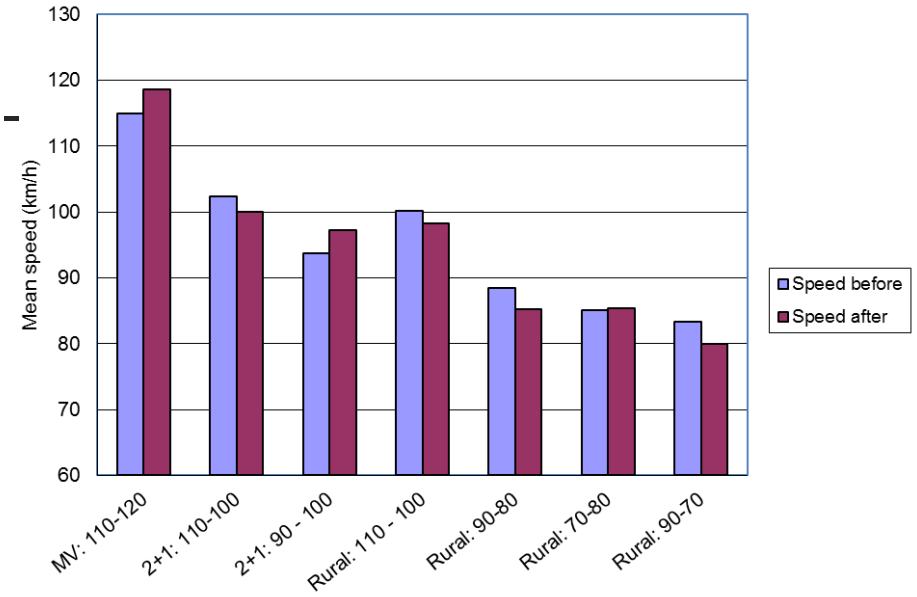
- Reductions mainly at 2-lane roads with poor safety standard
- Increases mainly on 2+1 roads to 100 km/h and on MV with high standard to 120 km/h
- **Motivation:** Speed limits adapted to safety classification, balance between safety, environment and mobility/accessibility



Results Sweden:

Speed

- Increase of speed limit 10 km/h - increased mean speed by 3-4 km/h
- Decrease of speed limit by 10 km/h – decreased mean speed by 2-3 km/h.



Crashes

- **Rural 90 – 80:** fatalities decreased by 41%
- **Motorways;** increase of seriously injured by more than 100 %

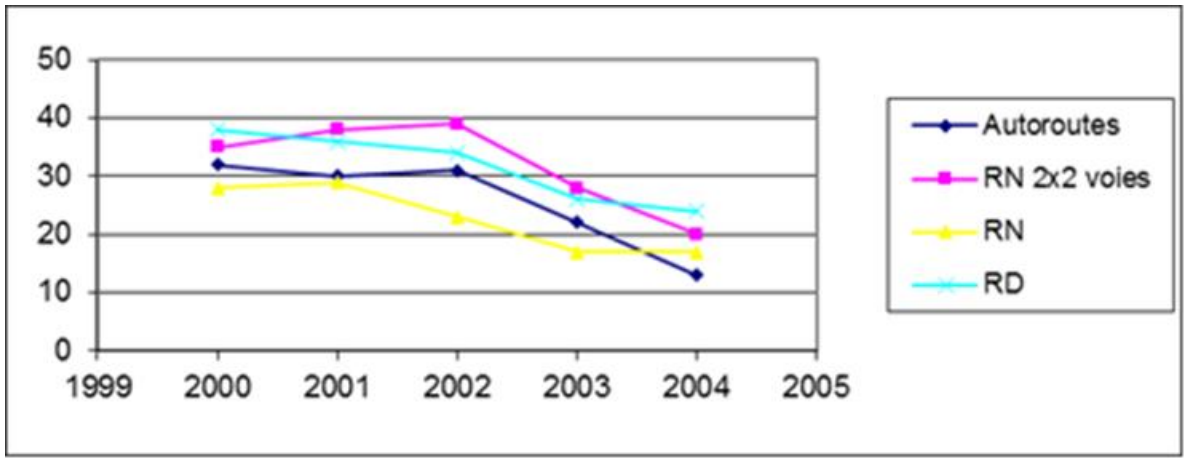
Case France

Introduction of automated speed cameras in 2003

- Motivation: President Chirac decided in 2002 to make road safety one of three major national priorities
- Between 2003 and 2009, 1661 fixed speed cameras were implemented supplemented by 932 mobile speed cameras.
- Large echo in the media and in social network about the increased number of fines due to excess speed

Results France

% exceeding speed limit + 10 km/h rural areas / interurban motorways.

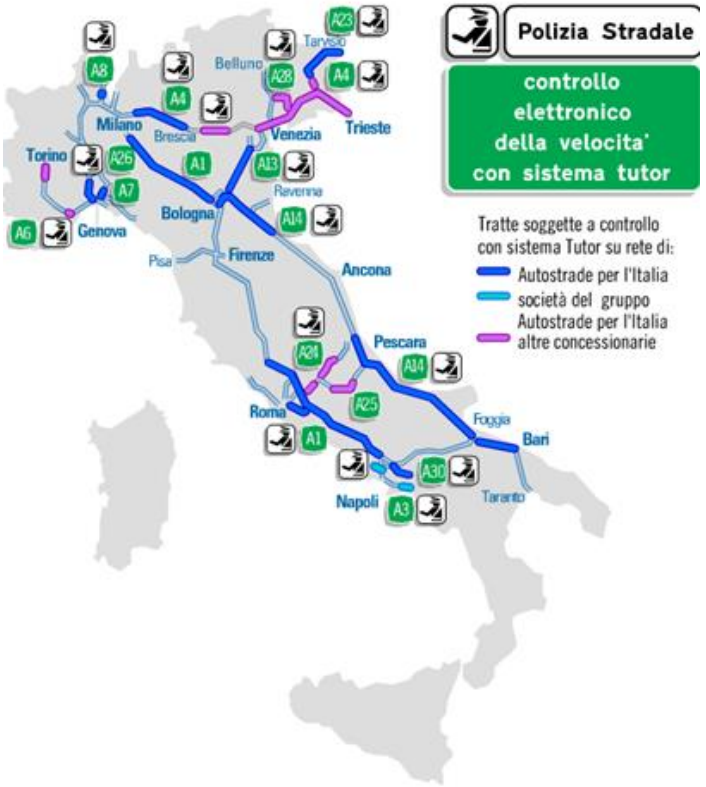


- **Speed:** From 2002 – 2005; average speeds fell by almost 9 km/h on secondary roads and almost 8 km/h on highways
- **Crashes:** (4 studies) Decrease in fatalities:
  - Rural areas 25-35%
  - Urban motorways 38%

Case Italy

Implementation of Section Control (TUTOR)

- System introduced in 2006
- A total of 320 P2P speed camera sites, covering 2900 km of MV network
- **Motivation**: improve road safety.
- In 2012, system applied to 3 expressways
- Further implementation planned on regional and provincial highways



Results Italy

A56 urban motorway

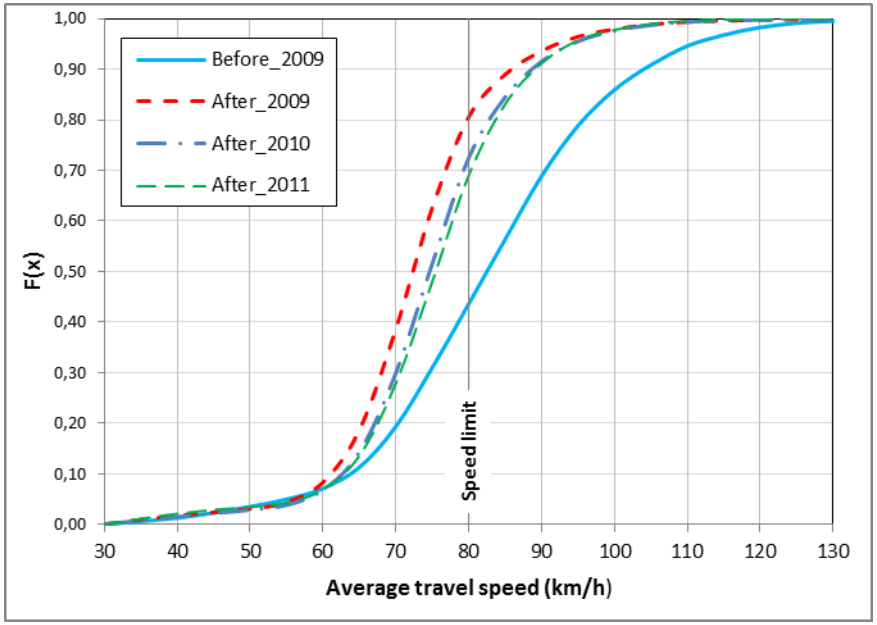
Speed (Light vehicles)

- mean speed decreased by 10%
- P85 decreased by 14%

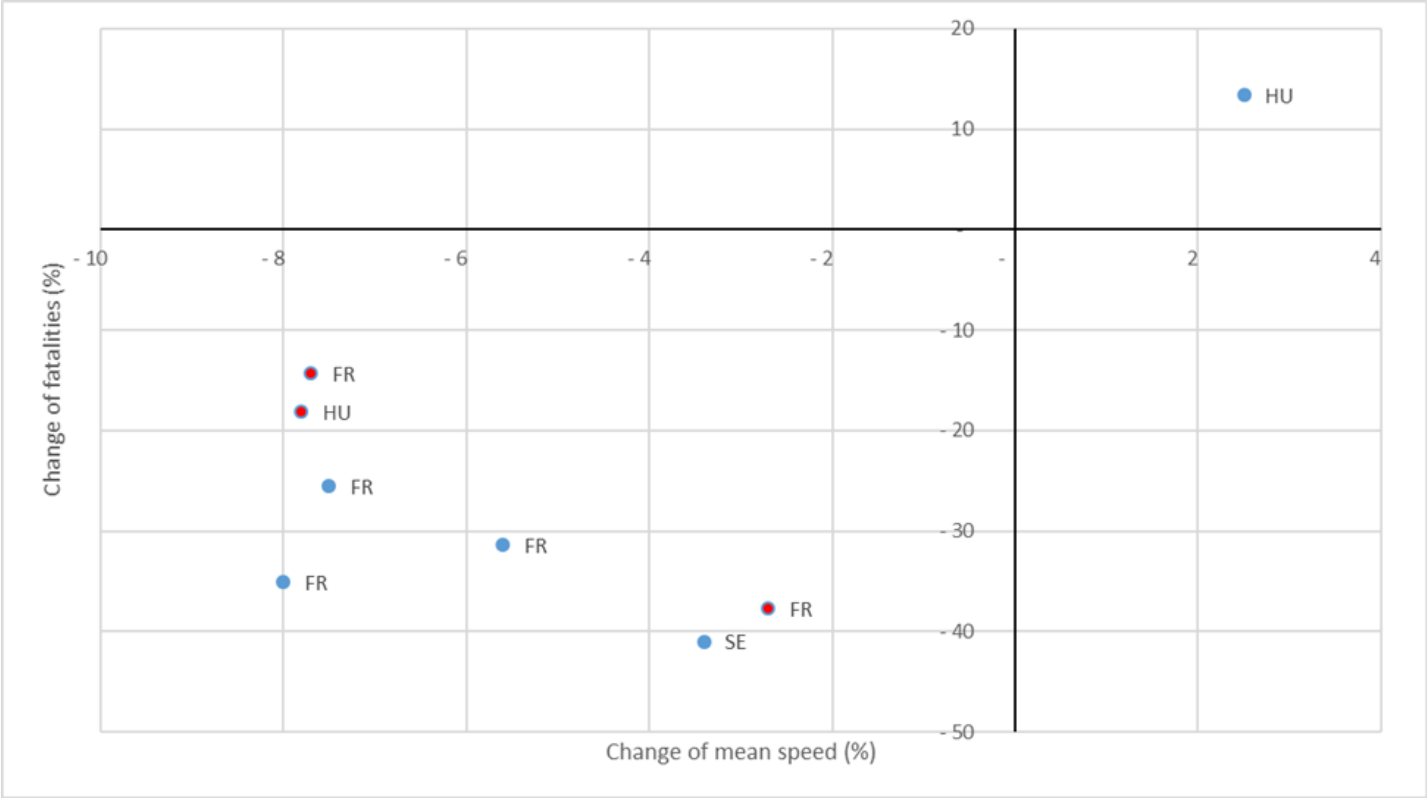
Crashes

- reduced by 32%
- greater effect for severe injury crashes

Speed of light vehicles (≤3.5 tons)



Relationship between change of mean speed and change of fatalities



Blue = rural roads; Red = urban roads

Conclusions and recommendations

- **Main conclusions:** an **increase in mean speed** is associated with an **increase in the number of crashes and injured** and a **decrease in mean speed** is associated with a **decrease in the number of crashes, fatalities and injured**.
- Both the **Power and Exponential model** can be used to estimate the expected change in the number of crashes due to speed changes.
- All **empirical results from the cases** are in the same direction as estimated by the Power and Exponential model.
- Many injured road users are **vulnerable road users**. Death risk is 4-5 times higher in collisions between a car and a pedestrian at 50 km/h compared to 30 km/h - there is a strong recommendation to reduce speed in urban areas.

Conclusions and recommendations, cont

- To reduce road trauma, i.e. fatalities and injuries, governments need to take actions to reduce the speed on our roads and also to reduce differences in speed.
- As individuals, the risks for a severe crash might seem small, but from a societal point of view, there are substantial safety gains when the mean speeds on the roads are reduced
- In addition, lower vehicle speeds contribute to reductions greenhouse emissions, fuel consumption and noise.
- If a speed limit increase is envisaged, compensation measures should be implemented, such as more enforcement or an upgrade of the infrastructure.

Thank you for your attention!

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