TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

VISION ZERO ACADEMY

STRIVING FOR EXCELLENCE IN TRANSPORT SAFETY

Results – Safety Benefits of implemented measures

Results – Safety Benefits of Implemented Measures

Anna Vadeby, Researcher in traffic safety at VTI

Content

- Traffic safety effects of implemented safety measures
  - 2+1 roads
  - New speed limits on rural roads
  - New speed limits on urban roads
  - Traffic safety cameras

2+1 roads

- 1990's: 25% of fatalities and 20% of severely injured occurred on 3 500 km of total 100 000 km national roads.
- 13 m wide roads
- Main problem **head-on** and **run-off** crashes causing more than 70 % of all fatalities.
- Solution was a **redesign to a 2+1** road with medium barrier
- First 2+1 road in 1998

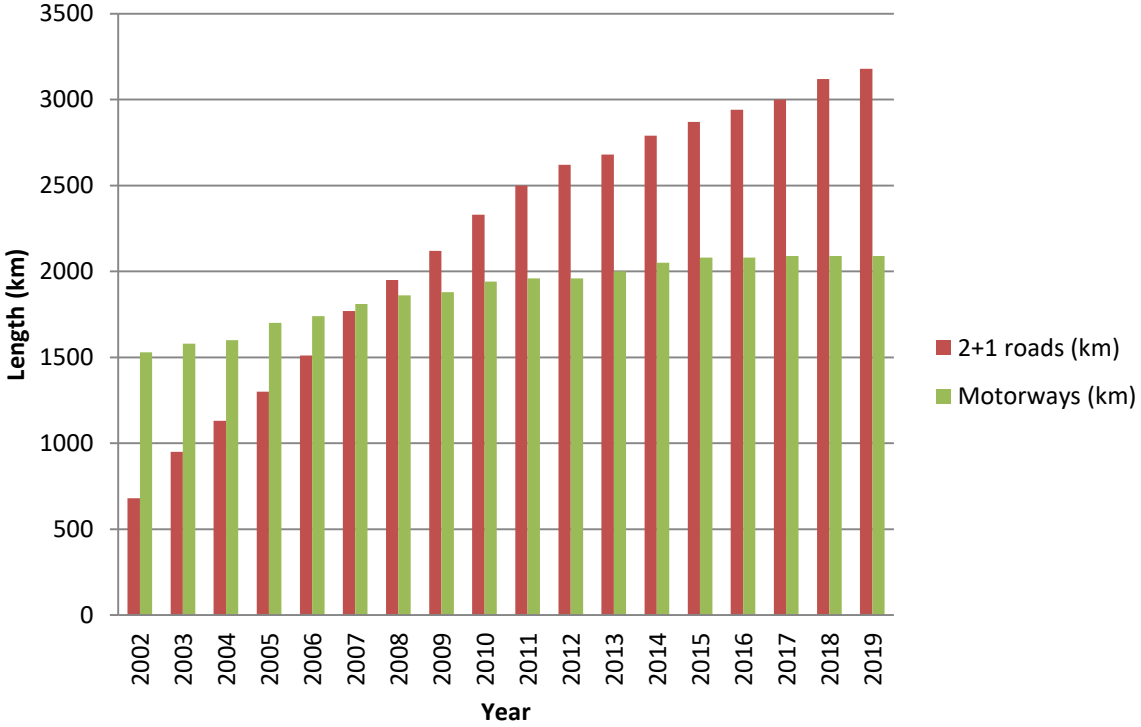
Traffic safety effects (2009)

- Fatalities decreased by 77 %
- Fatalities and seriously injured decreased by 51 % (110 km/h) and 63 % (90 km/h)
- All injury crashes – no major changes
- Safety level (FSI-rate) for 2+1 roads is about the same as for motorways (links)
- Median cable crashes rather frequent

Speed on 2+1

- Average speed (cars) increased ~2 km/h at speed limit 90 km/h
- Floating car studies confirm a good level-of-service at high traffic flows, up to 1 300-1 400 veh/h in one direction
- Capacity estimated to be some 1 600-1 700 veh/h in one direction during a 15 minutes period (a capacity loss of some 15%)

Scope of 2+1 roads compared to motorways



Narrow 2+1 roads (9 m-roads)

- Started 2009
- 9 m rural roads broadened (2+1)
- Narrow 2+1 roads - share of passing lanes 15–30% compared to 40% for 13-m roads.
- Speed limit raised from 90 to 100 km/h

Results

- **Excluding junctions:** Fatalities and seriously injured decreased 63%. Injury accidents decreased 27%

- **Including junctions:**

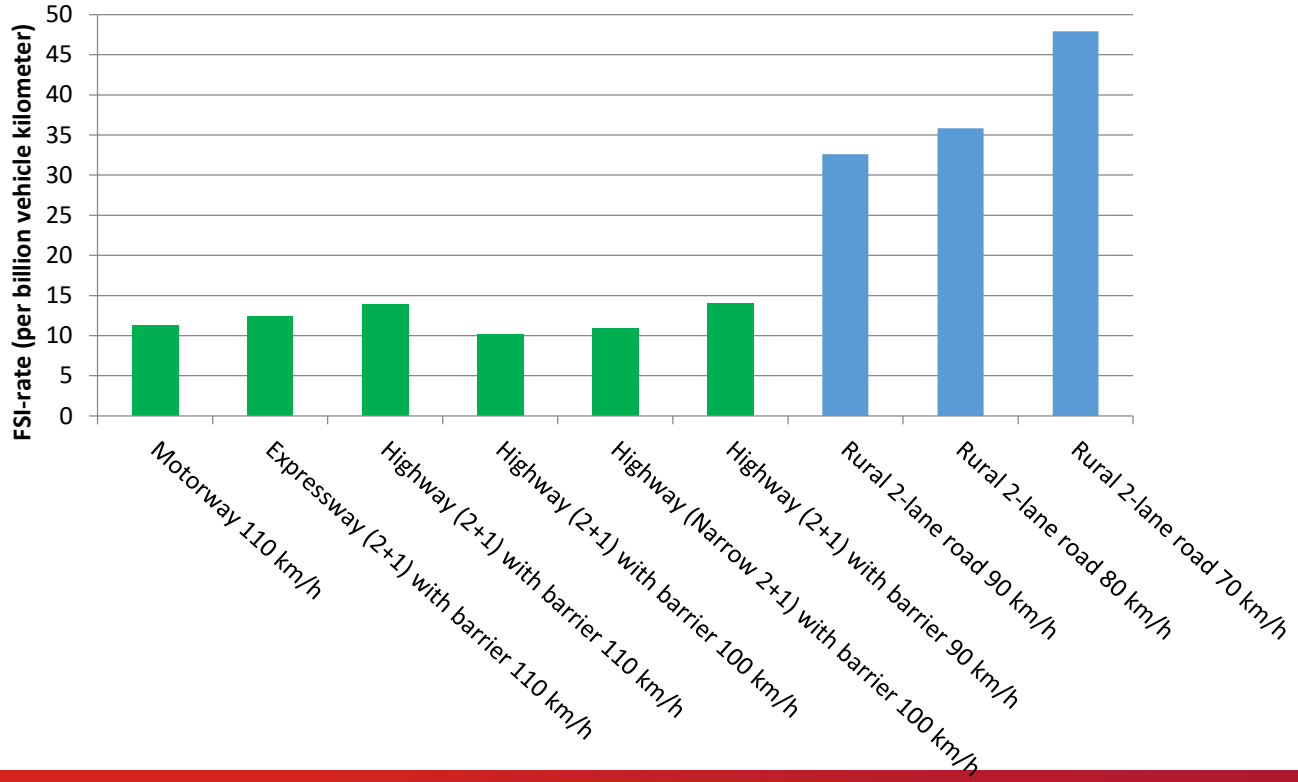
  FSI decreased 50 %

  Injury accidents decreased 20%

Note

- The after-period is short
- The data material is rather small

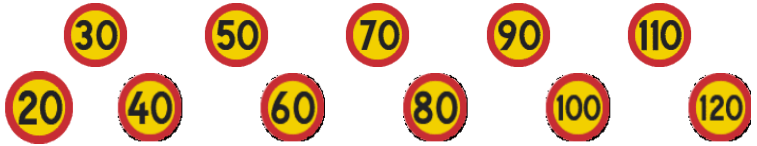
Comparison of FSI-rate different road types



New speed limit system in Sweden in 2008

Old speed limit system

New speed limit system



- Review of the national rural road network, first time since 1971
- Guidelines for different roads: speed limits adapted to the safety classification of each road

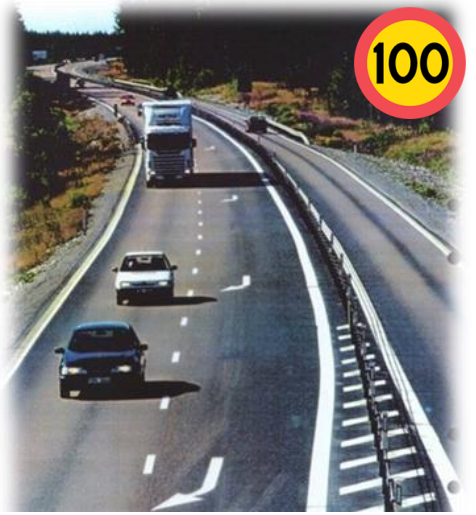
But also

- Balance between traffic safety, environment, mobility/accessibility and regional differences
- Gradual implementation 2008 and 2009, still ongoing

Implementation

- Reductions mainly at 2-lane roads with poor safety standard
- Increases mainly on 2+1 roads to 100 km/h, and on motorways with high standard to 120 km/h

Year	Increased speed limit (km)	Decreased speed limit (km)
2008	1 000	2 500
2009	1 600	15 000



Speed limits on rural roads

70 km/h: default speed limit on rural roads

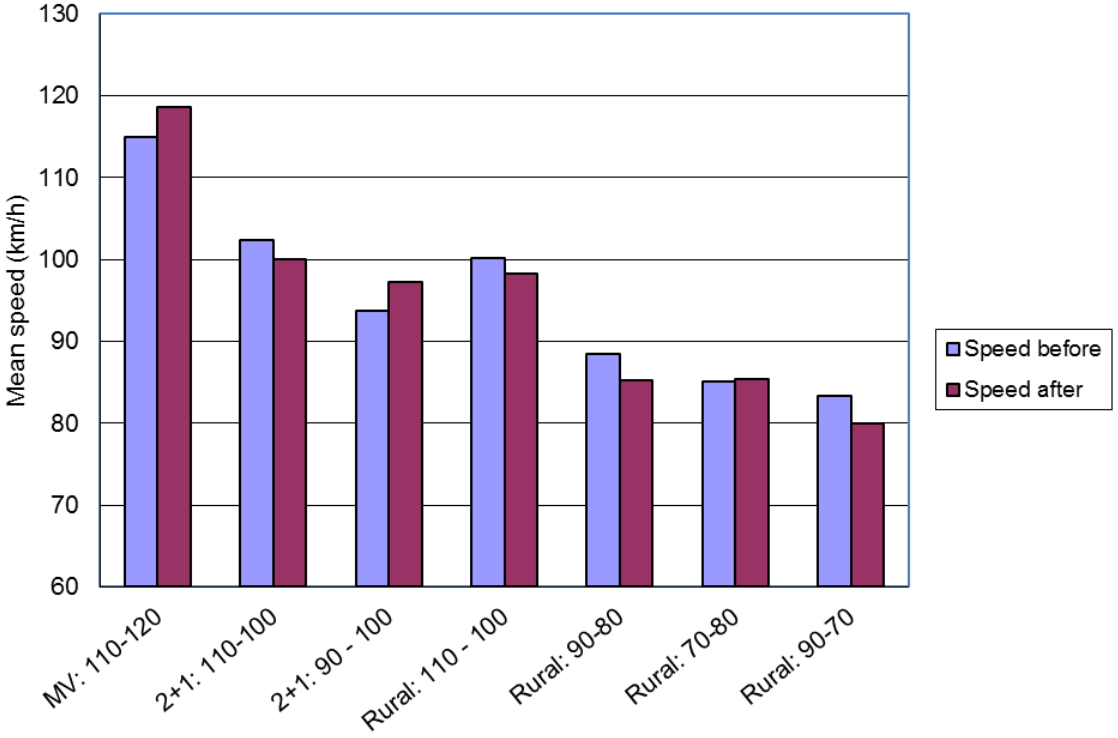
80 (90) km/h: 2-lane roads (milled rumble strips in middle of road)

100 km/h: 2+1 roads with median barrier

110 km/h: motorways

120 km/h: motorways with high standard and low traffic flow

Results: Mean speed passenger cars



- All changes (except 70-80) are statistically significant
- No significant changes for trucks with trailers
- No significant changes in mean speed on controls

Results: Crashes

Fatalities and seriously injured:

- A reduction of 17 fatalities per year.
- Main reduction of fatalities on rural roads 90 - 80 km/h (-14 deaths per year).
- Few fatalities in several groups and no significant changes in these groups.

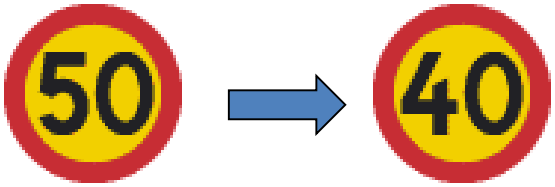
Seriously injured

- Seriously injured on motorways 110 – 120 km/h increased by 15 per year.
- For 2+1 roads, 110 – 100 km/h the number of seriously injured decreased by 16 per year

Speed limits in urban areas - Recommendations Traffic Safety

Safety Level	Conflicts VRU-car	Conflicts car-car (intersections)	Conflicts car-obstacle	Conflicts car-car (oncoming traffic)
High	≤ 30 km/h	≤ 50 km/h	≤ 60 km/h	70 km/h
Medium	40 km/h	60 km/h	70km/h	80 km/h
Low	≥ 50 km/h	≥ 70 km/h	≥ 80 km/h	≥ 90 km/h

Evaluations of new speed limits in Urban Areas



- Mean speed decreased by 2 – 3 km/h
- Mean speed before the change 43 km/h
- P85 decreased by 2 km/h
- An increase of speed violations in the short term
- Long term?

Traffic safety cameras

Evaluation

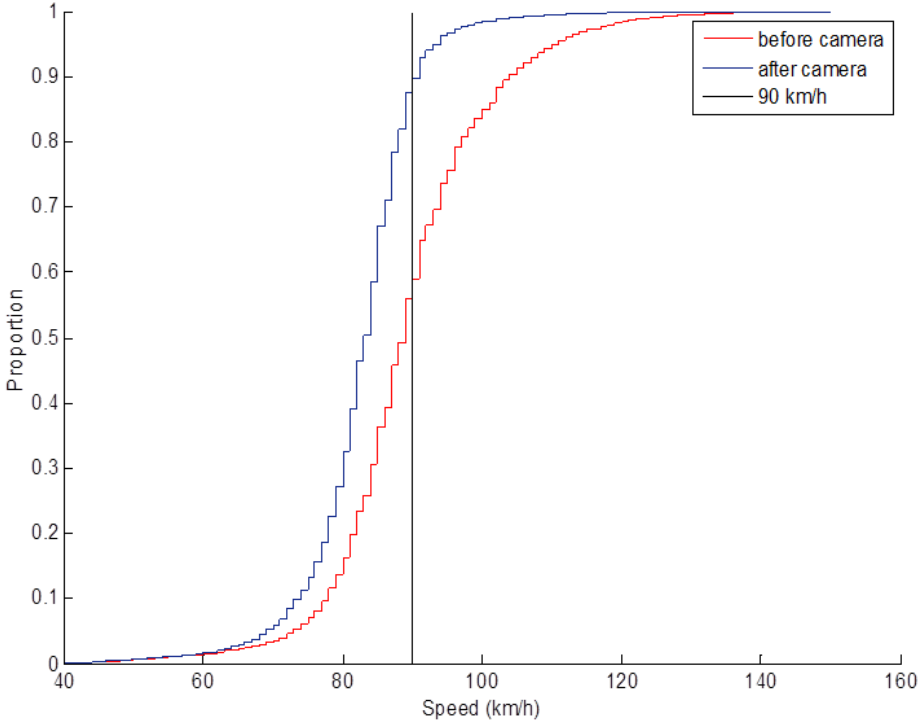
Speeds

- Mean speeds decreased 4,3 %
- Greatest impact on roads with 70 km/h (high speed before)
- Percentage drivers exceeding speed limit decreased 35%
- The fastest drivers reduced their speed the most

Crashes:

- number of fatalities decreased by 30%
- number of seriously injured and fatalities decreased by 25%

Speed distribution



Speed cameras reduce

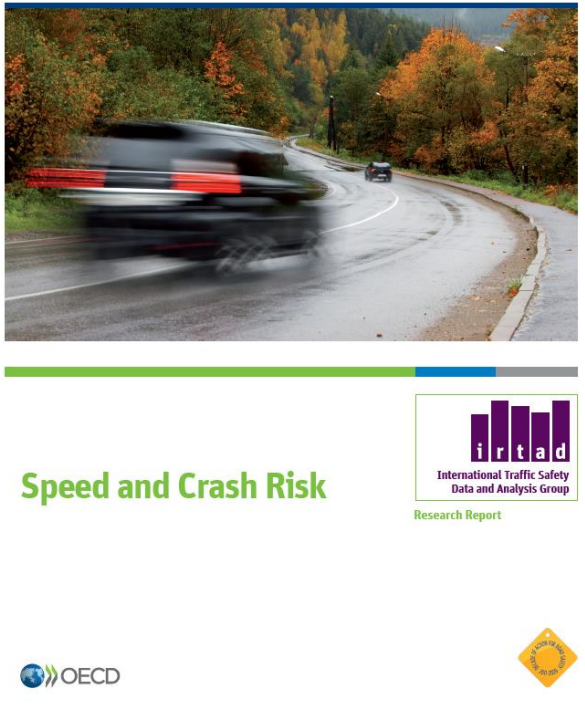
- the standard deviation,
- P85 and
- drivers exceeding the speed limit

by far more than they reduce the mean speed

Similar experiences from other countries

IRTAD-report: based on 11 cases from 10 different countries which recently experienced either a change in speed limits or a wide implementation of automatic speed control.

Main conclusion: 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.




Thank you for your attention!
anna.vadeby@vti.se

References

- Vadeby, A., Forsman, Å. (2014) Evaluation of New Speed Limits in Sweden: A Sample Survey. Traffic Injury Prevention, Vol 15(8), pp 778-785. DOI: 10.1080/15389588.2014.885650.
- Vadeby, A., Forsman, Å. (2017) Traffic safety effects of new speed limits in Sweden. Accident Analysis and Prevention (accepted for publication). DOI: 10.1016/j.aap.2017.02.003.
- Vadeby, A., Forsman, Å. (2016) Traffic safety effects of new speed limits in Sweden. In: Proceedings of the 17th International Conference on Road Safety on Five Continents, Rio de Janeiro, Brazil, 17 –19 May, 2016.
- Vadeby, A., Forsman, Å. (2017) Changes in speed distribution: Applying aggregated safety effect models to individual vehicle speeds. Accident Analysis and Prevention, Vol. 103, 20-28. DOI: 10.1016/j.aap.2017.03.012.
- Vadeby, A. (2016) Traffic safety effects of narrow 2+1 roads with median barrier in Sweden. In: Proceedings of the 17th International Conference on Road Safety on Five Continents, Rio de Janeiro, Brazil, 17 –19 May, 2016.
- Carlsson, A. (2009) Evaluation of 2+1 roads with cable barrier. Final report. VTI rapport 636A.
- Swedish Road Administration (STA), 2009. The Effects of Automated Road SafetyCameras on Speed and Traffic Safety. Swedish Road Administration, Borlänge,Sweden (Publication no. 2009:162).
- ITF (2018) Speed and crash risk. ITF Research Report. International Transport Forum, Paris, France.