



# The Science Behind Intelligent Speed Assistance

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# Speed and crash risk

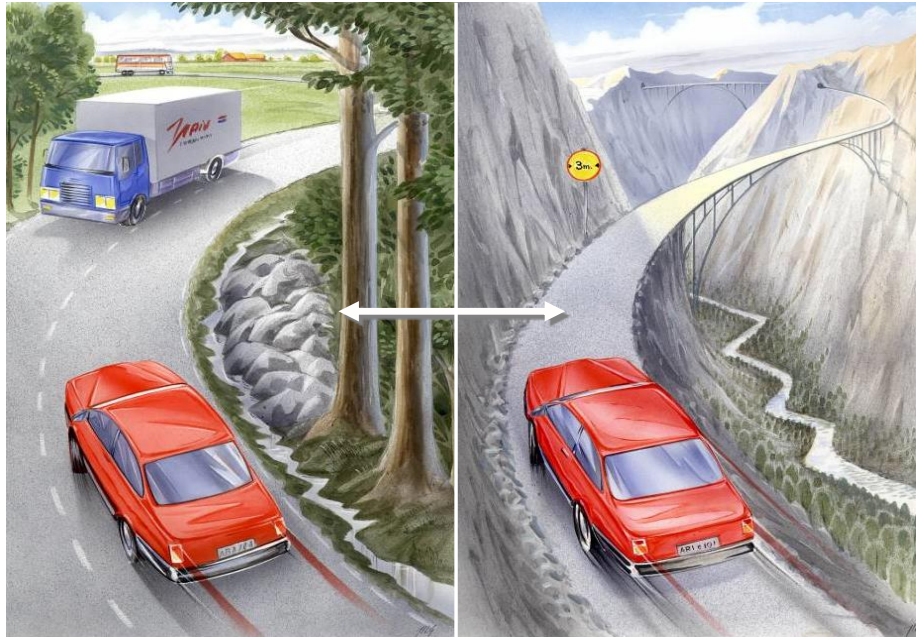
“Speed remains a very important risk factor. It has a greater effect on the number of accidents and injury severity than almost all other known risk factors.”

Rune Elvik, *The Power Model of the relationship between speed and road safety: Update and new analyses* (2009)

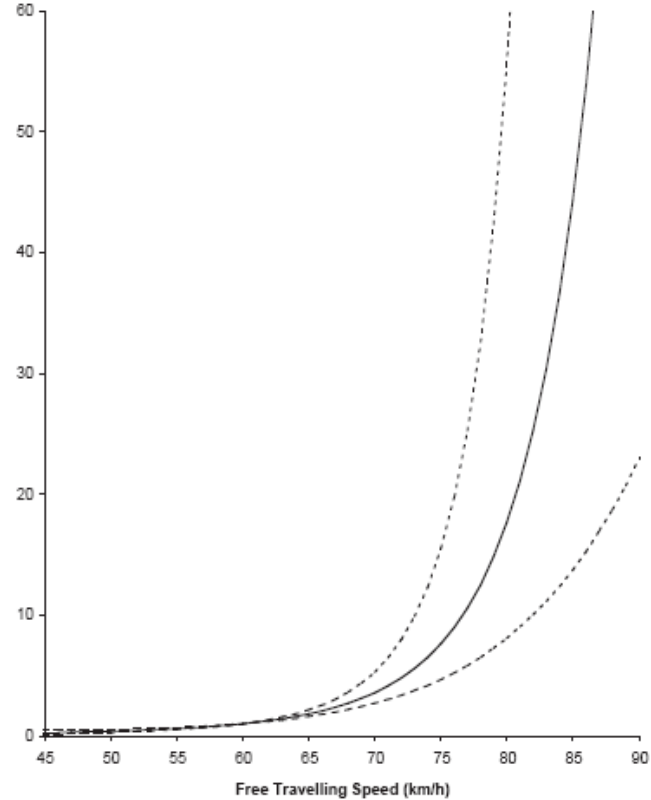
# We know a lot about speed and risk



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Relative Risk of Casualty Crash Involvement



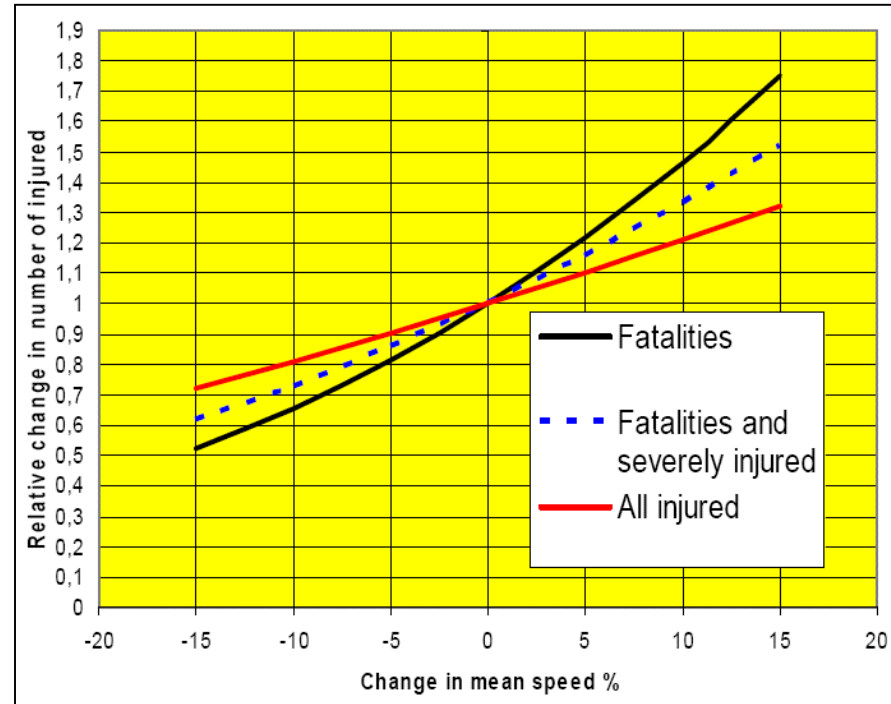
# Severity: the power model



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Andersson and Nilsson, 1997;  
Nilsson, 2004; Elvik et al., 2004;  
Elvik, 2009:

- Injury accidents go up approximately with the proportionate change in speed squared for a length of road
- Serious injury accidents with speed cubed
- Fatal accidents with speed to the fourth power

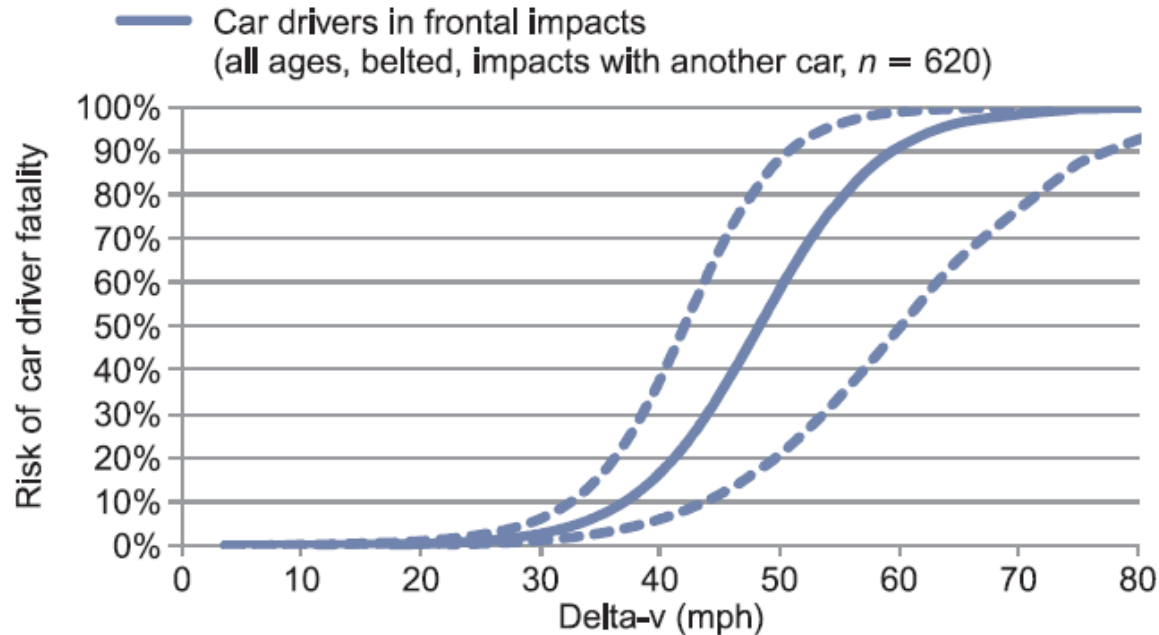


Source: Nilsson, 2004

# Collision speed and the risk of car driver death in frontal collisions



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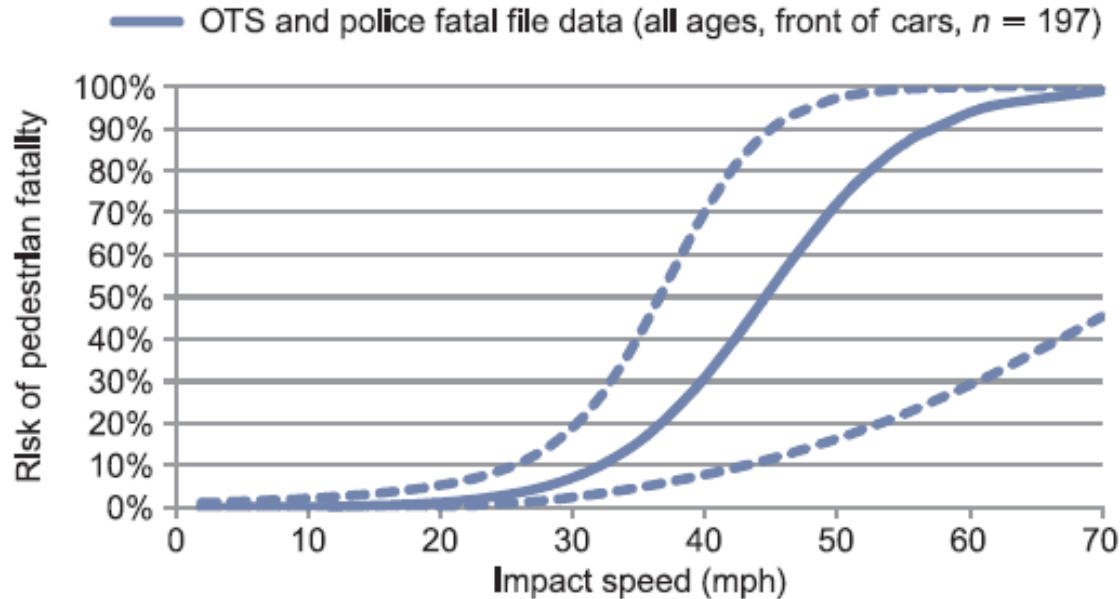
Source: UK DfT, 2010

(dashed lines show 95% confidence interval)

# Collision speed and the risk of pedestrian death



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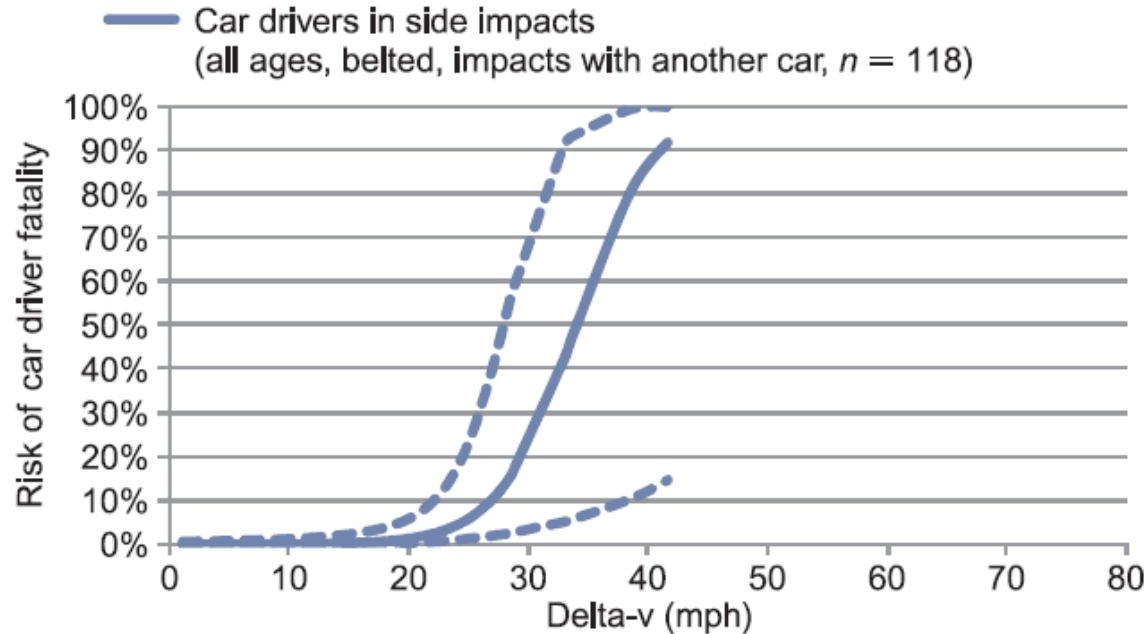
Source: UK DfT, 2010

(dashed lines show 95% confidence interval)

# Collision speed and the risk of car driver death in side collisions



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Source: UK DfT, 2010

(dashed lines show 95% confidence interval)





# Does Ireland have a speeding problem?



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## Proportion of vehicles speeding (RSA Survey, 2013)

	Cars	Rigid Trucks	Artics
Urban roads	58%	58%	62%
Rural roads, including motorways	25%	61%	67%
Motorways	21%	75%	84%

# Real-world trials



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Sweden 1999-2002

Denmark (2000-2001 and 2005-2008)

Finland (2001-)

ISA-UK (2001-2006)

Two projects in Belgium (2001-2002)

France (2002-2006)

Austria (2003-2004)

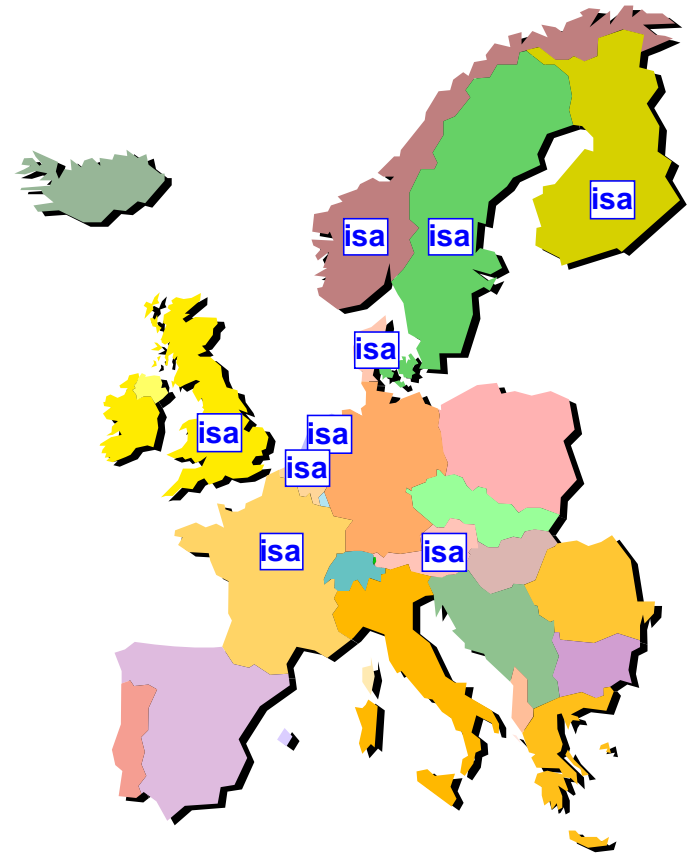
Norway (2005-)

+

Australia (TAC SafeCar and NSW)

Japan (Soft Car)

USA





What is the impact of ISA on driver behaviour?

# The ISA-UK trials



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2 urban trials  
(1 private motorists, 1  
fleet)

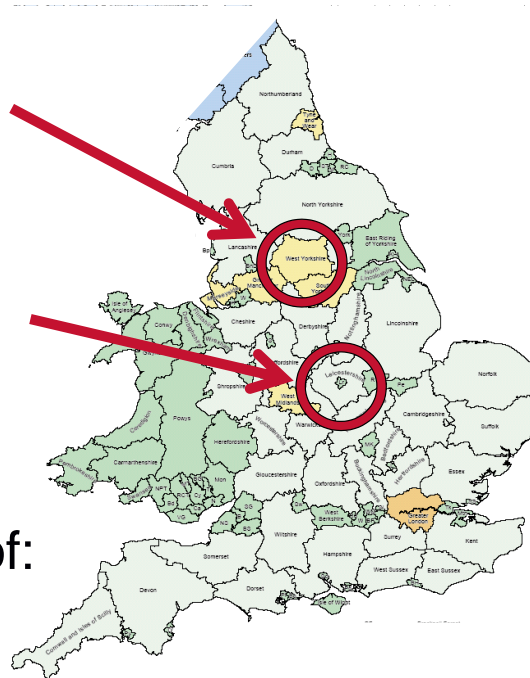
2 rural trials  
(1 private motorists, 1  
fleet)

79 drivers with a mix of:

Younger / older

Male / female

Speeding intenders / non-intenders

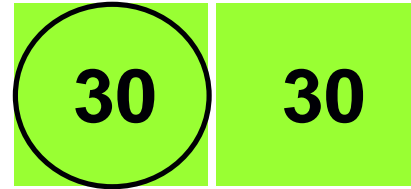


# An overridable assisting system



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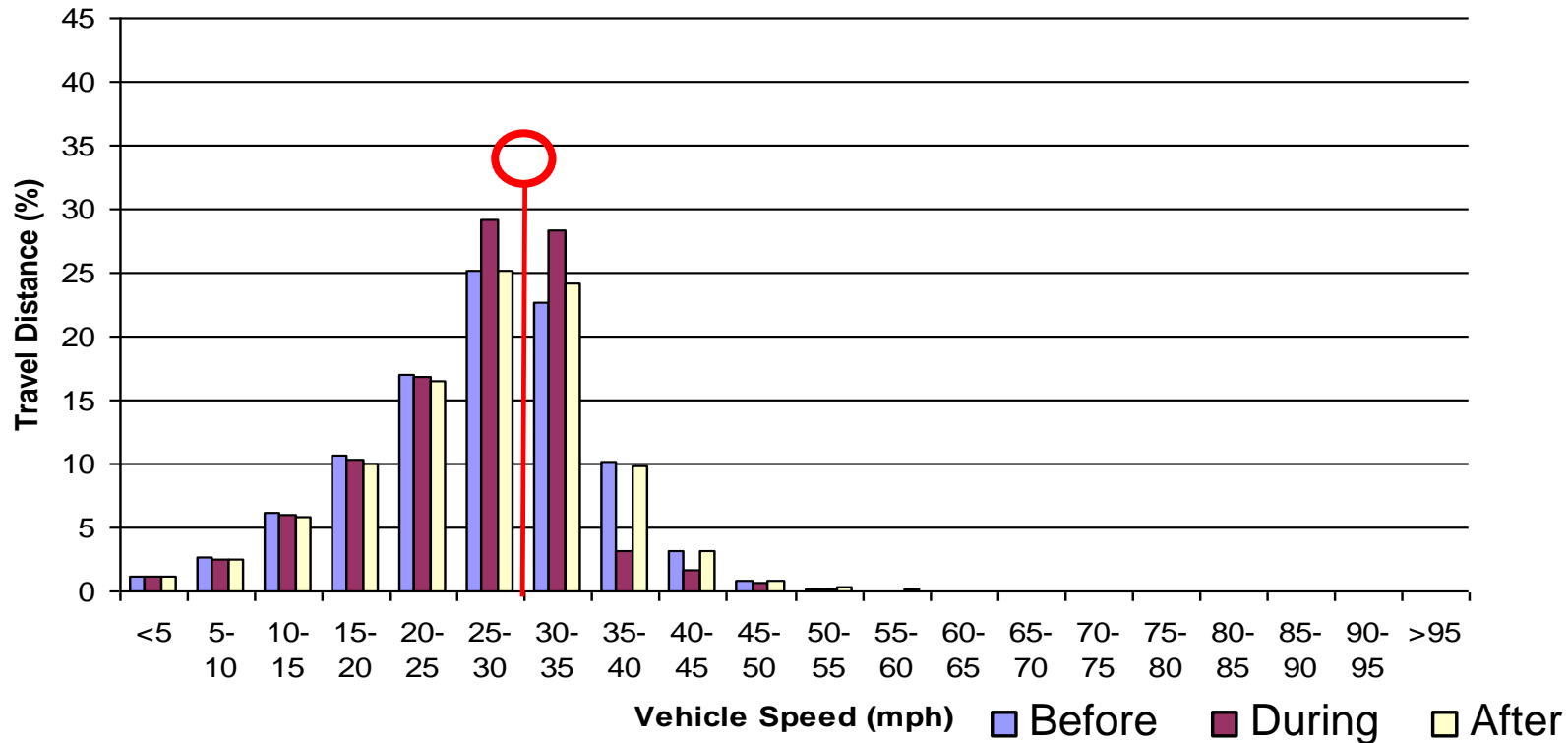
- System that limited speed to the prevailing limit (no acceleration beyond limit)
- Drivers could override at will
- Vibration on throttle pedal to prevent over-throttling



# Speed distribution on 30 mph (50 km/h) urban roads



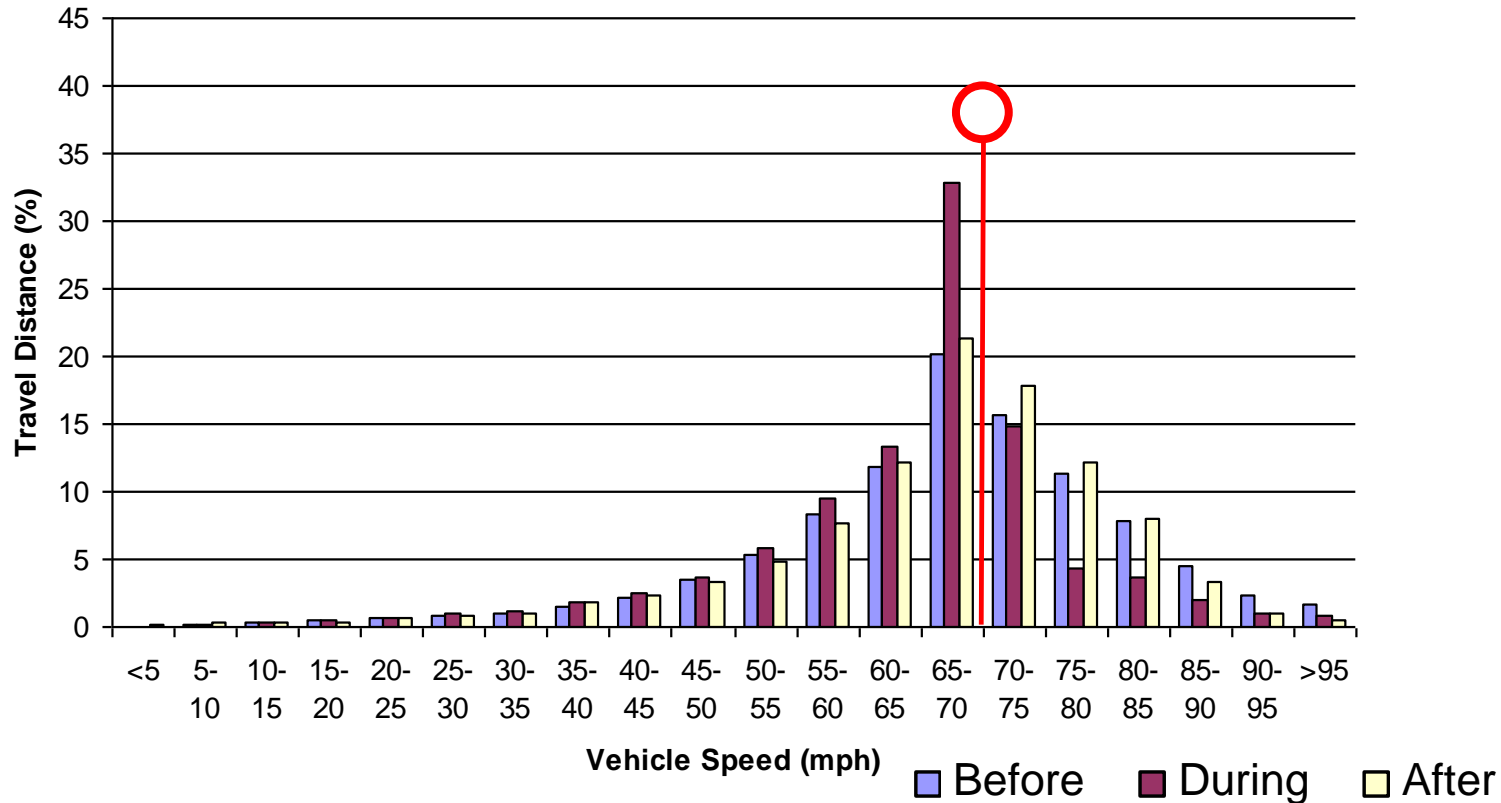
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# Speed distribution on 70 mph (110 km/h) roads



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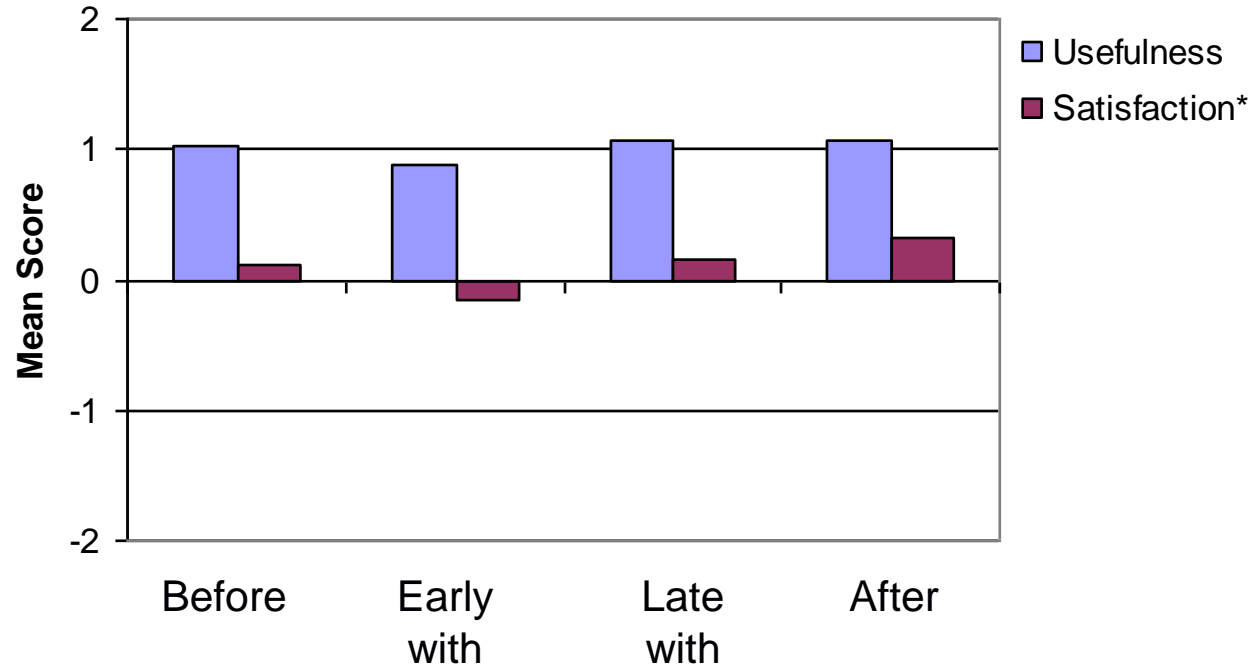
What about driver attitudes?

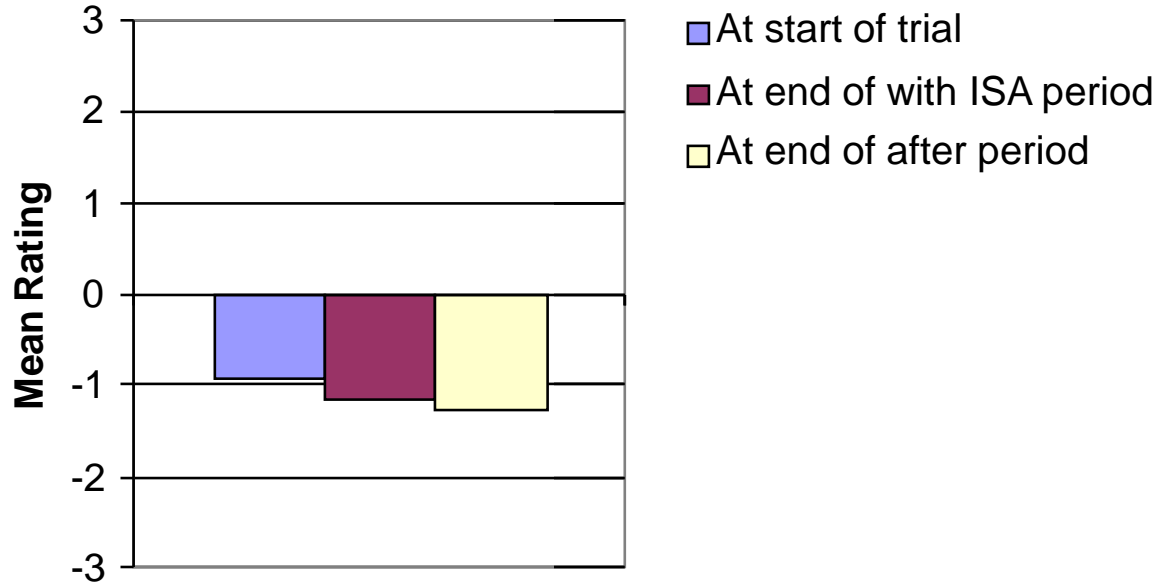


# Acceptability



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Mean intention to speed



How many crashes would ISA save?

- Based on models from the literature relating speed to crash risk (e.g. Kloeden et al., 2001, 2002)
- These models have been calculated from real-world data
- *They are not drawn from the police reported contributory factors for accidents*

# Great Britain: estimated risk reduction by type of ISA



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## Estimated Reduction in Injury Accidents for Vehicles with ISA

ISA Variant	Reduction
Advisory ISA	-2.7%
Assisting (Overridable) ISA	-12.0%
Assisting (Non-Overridable) ISA	-28.9%

= -50%  
for fatal  
crashes

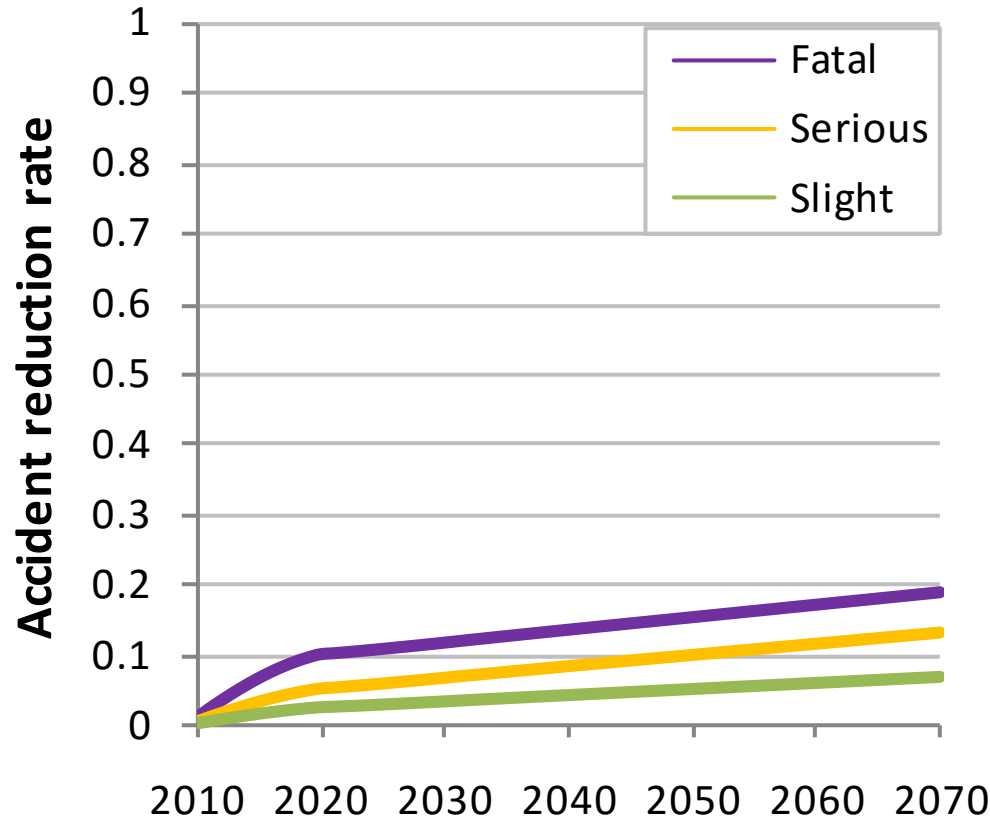


What is the importance of regulation?

# GB accidents saved over time for under the Market Driven scenario



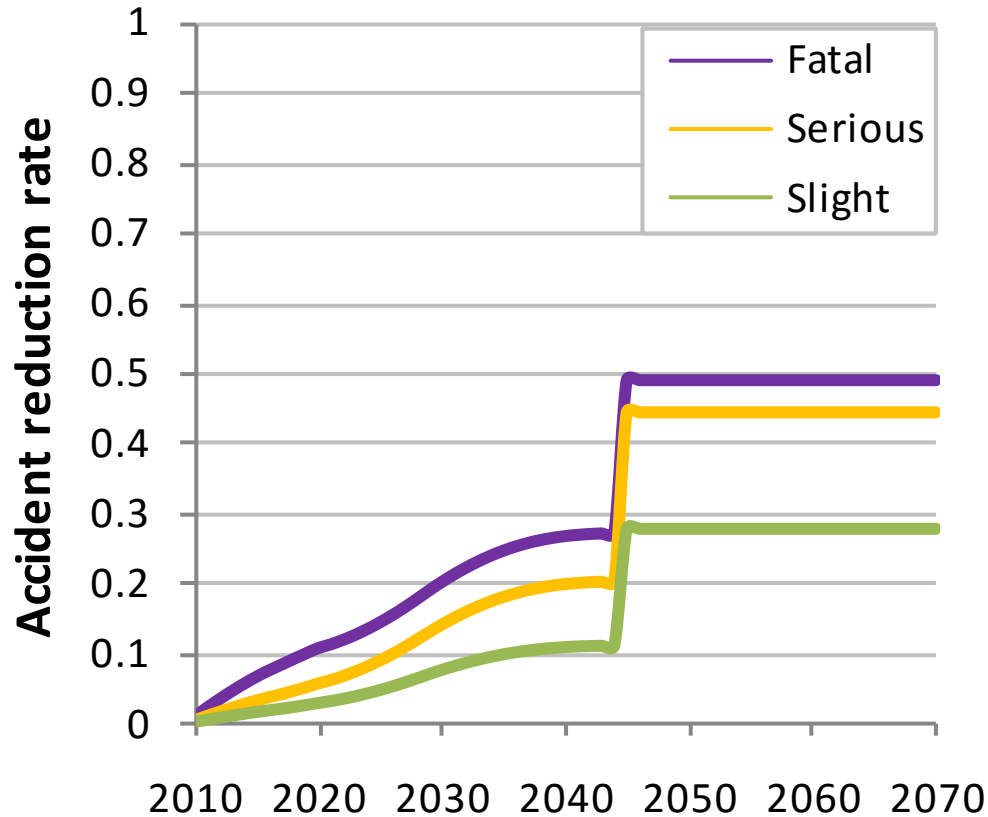
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# GB accidents saved over time for the Regulation scenario



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## GB Crashes Saved from, 2010 to 2070

	Slight Crashes	Serious Crashes	Fatal Crashes
Market Driven scenario	4%	8%	13%
Regulation scenario	15%	25%	30%

- Benefit to cost ratios (accidents + fuel + CO<sub>2</sub>):
  - Market Driven scenario 3.4
  - Regulation scenario 7.4

- Both scenarios are winners
- The harder the push for ISA and the “stronger” the system, the greater the benefits
- Shows the importance of regulation
- Much of the potential of ISA, e.g. to replace traditional and costly traffic calming, was not counted



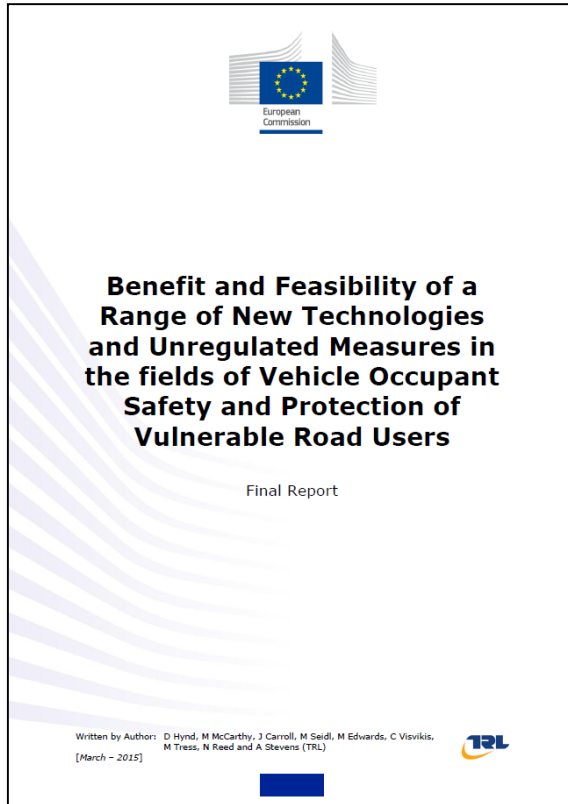
# Confirmation from Norway

Vaa et al. (2014) examined the safety potential for Norway of a number of driver assistance systems, including Adaptive Cruise Control, alcolocks, seatbelt reminders, Electronic Stability Control and fatigue warning.

Their conclusion was:

“The most effective driver support system is ISA.”

- Sets minimal safety standards for new vehicles sold in Europe
- General Safety Regulation (GSR) study to consider the potential of *crash avoidance* technologies to supplement *crash mitigation* technologies (published March 2015)
- Sets the European regulatory agenda for 2016 onwards
- Actual outcome in terms of legislation is co-decision of Commission, European Parliament and Council



## Active Safety

“Based on the evidence reviewed, the following measures were considered to be likely to be cost-beneficial and could on that basis be taken into consideration:

- Enhanced AEB with collision mitigation
- **Intelligent speed adaptation**
- Lane keep assist
- Reversing detection and reversing camera systems
- Emergency brake light display”

## Active Safety

Code	Measure	Feasible?	BCR	Legislate?	Recommendations/Notes
<b>AEB</b>	Expansion and enhancement of AEB, BAS and LDW to avoid or mitigate collisions, including inter-urban, city and those with VRU	✓	~ 1	●	Greatest casualty benefit for AEBS is for M1 then N1 vehicles, although cost-benefit less clear than for N2/N3. System cost estimates suggest 'city safety' systems may be getting to the breakeven cost point
<b>ISA</b>	Speed limiters controlled by road speed limit (speed assist, intelligent speed adaptation)	✓	> 1	●	BCR > 1 for 6 Member States, for voluntary activation (switched on/off by the driver) and mandatory activation, and public acceptability of the systems considered to be growing. BCR higher for mandatory activation system, but both have positive BCR

- ISA is a well-proven technology with very significant safety benefits
- Regulation is necessary to maximise the impact of ISA on European traffic injuries and deaths
- It is therefore logical to push the European Commission to follow up on the recommendations of the GSR report and regulate to fit new vehicles with an overridable assisting ISA system



Thank you for your attention!

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