

Institute for Transport Studies



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# The Science Behind Intelligent Speed Assistance

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# Speed and crash risk

# Speed



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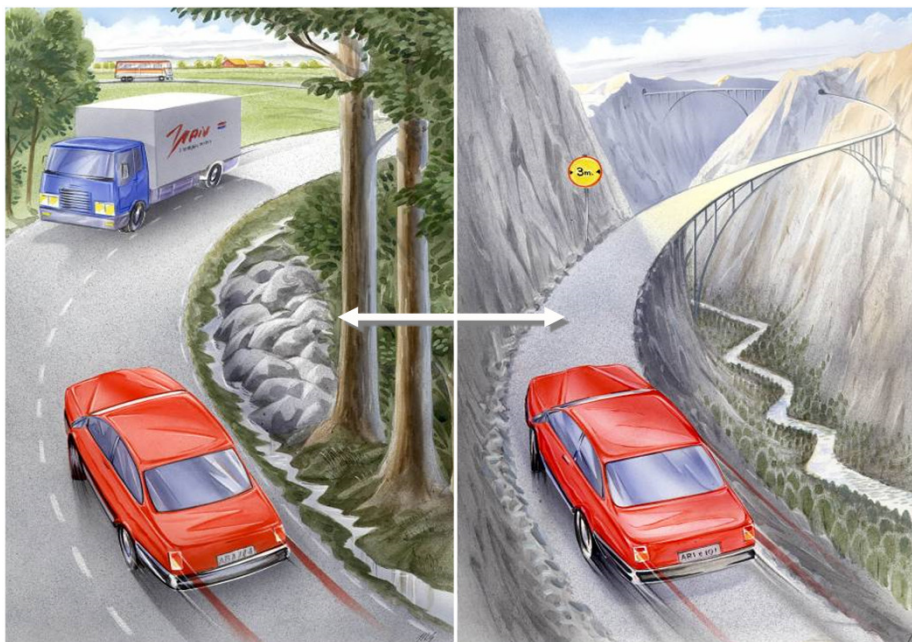
“Speed remains a very important risk factor. It has a greater effect on the number of accidents and injury severity than almost all other known risk factors.”

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

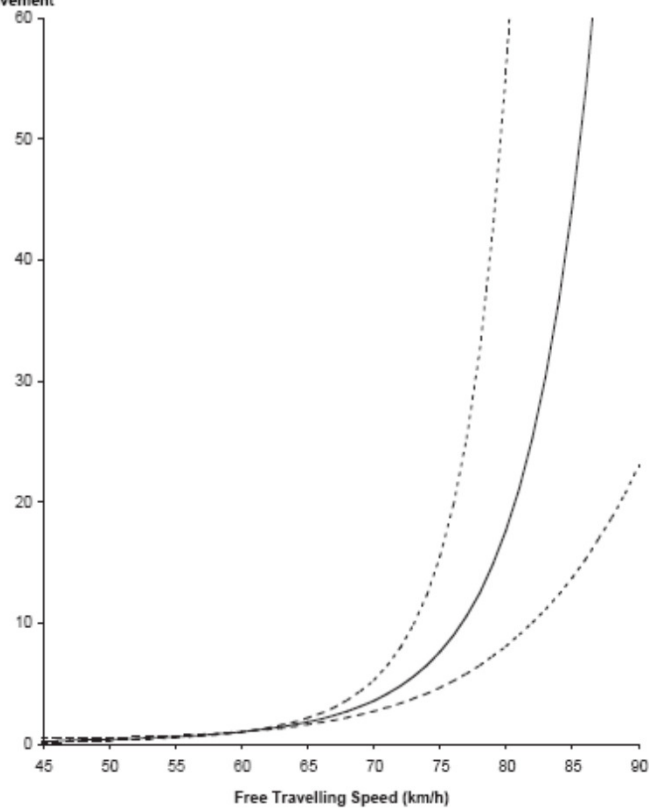
# We know a lot about speed and risk



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Relative Risk of Casualty Crash Involvement



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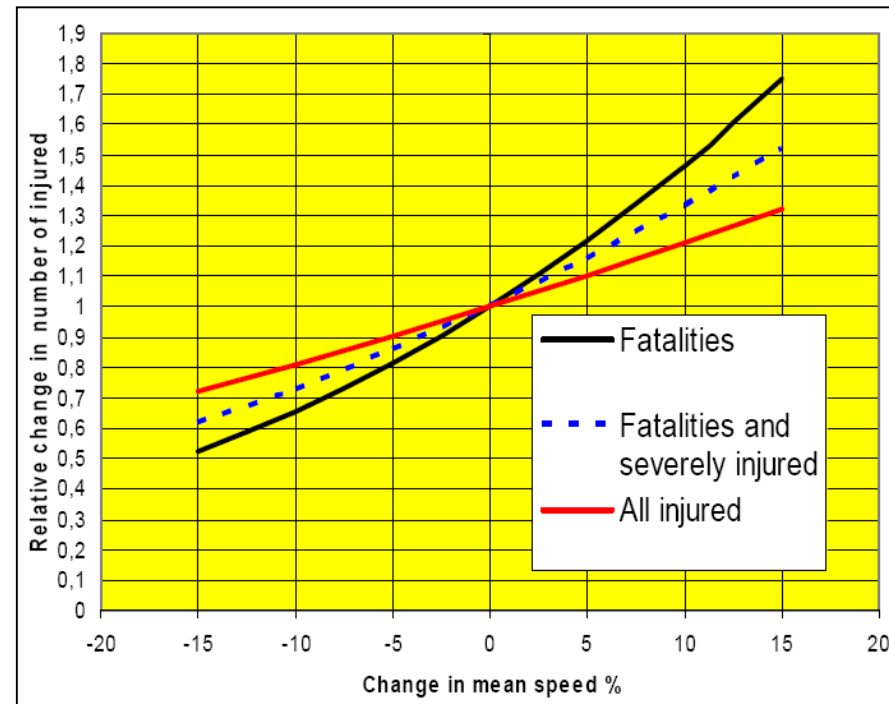
# Severity: the power model



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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



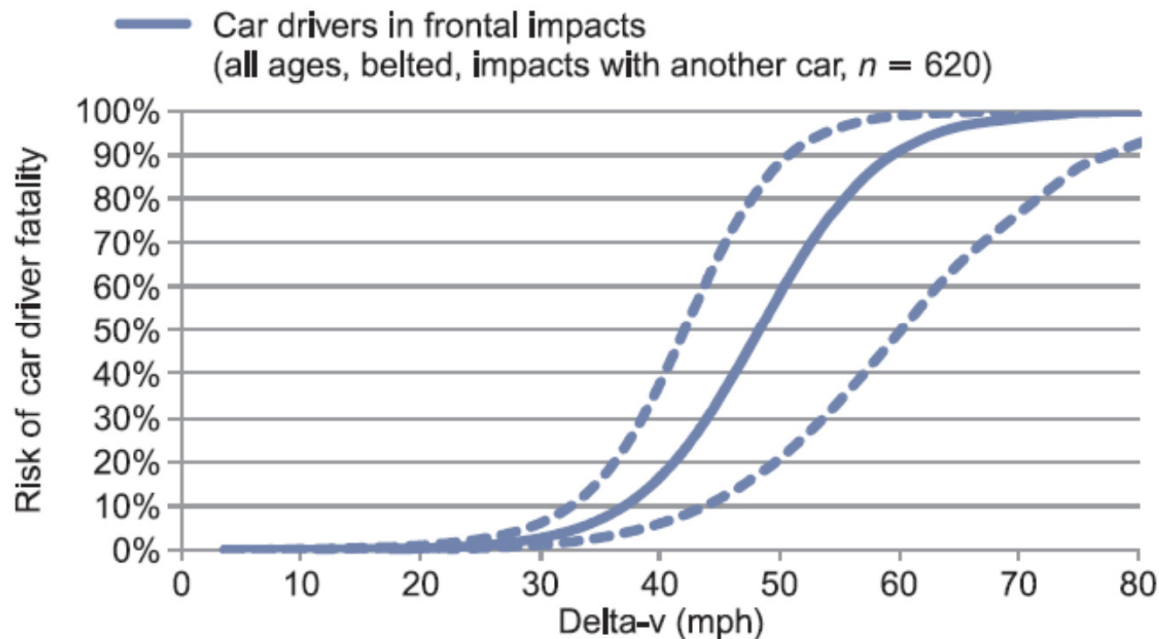
Source: Nilsson, 2004



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



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Source: UK DfT, 2010

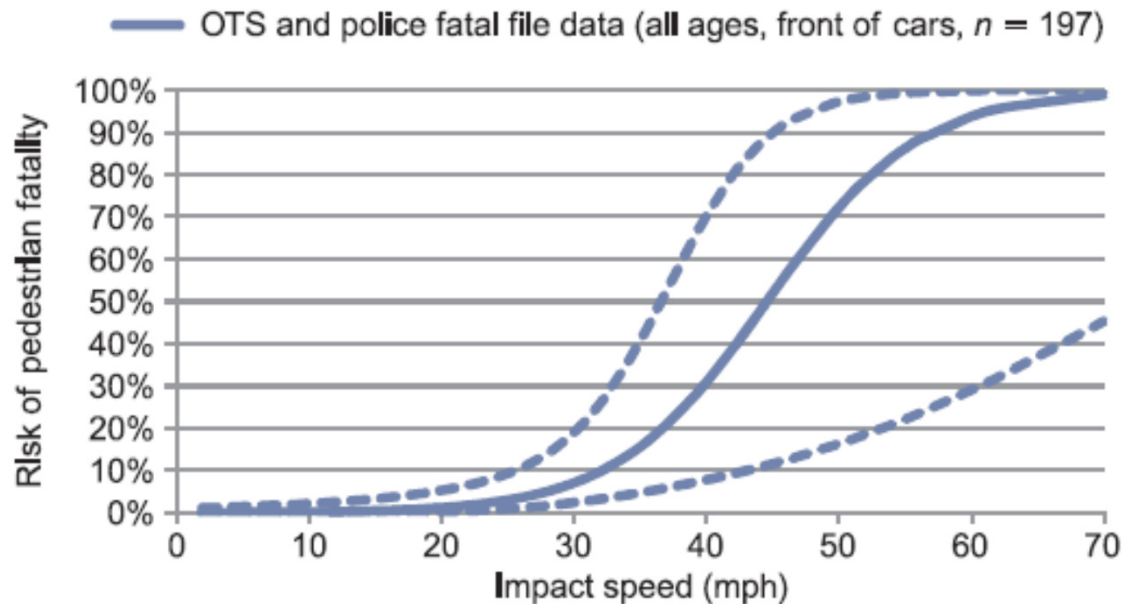
(dashed lines show 95% confidence interval)



# Collision speed and the risk of pedestrian death



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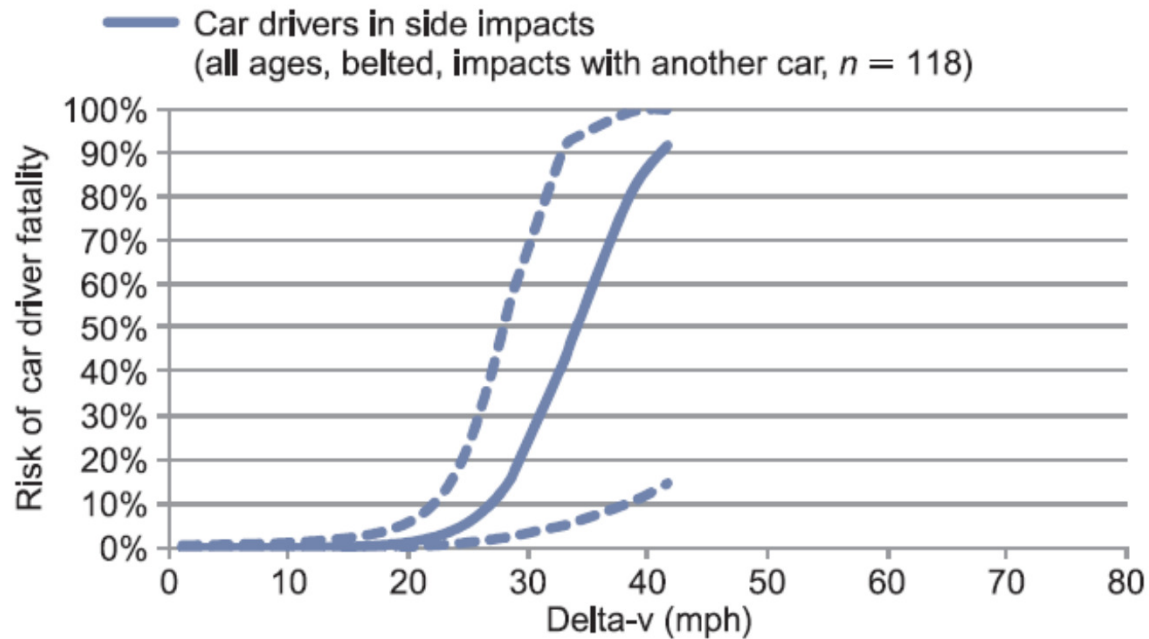
Source: UK DfT, 2010  
(dashed lines show 95% confidence interval)



# 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 Sweden (still) have a speeding problem?



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- 54% of cars and vans vehicles were driving above the speed limit on motorways in 2012 (ETSC, 2015)
- 36% of all vehicles exceeded the speed limit on municipal roads in 2015 (Vadeby and Anund, 2016)

# 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)

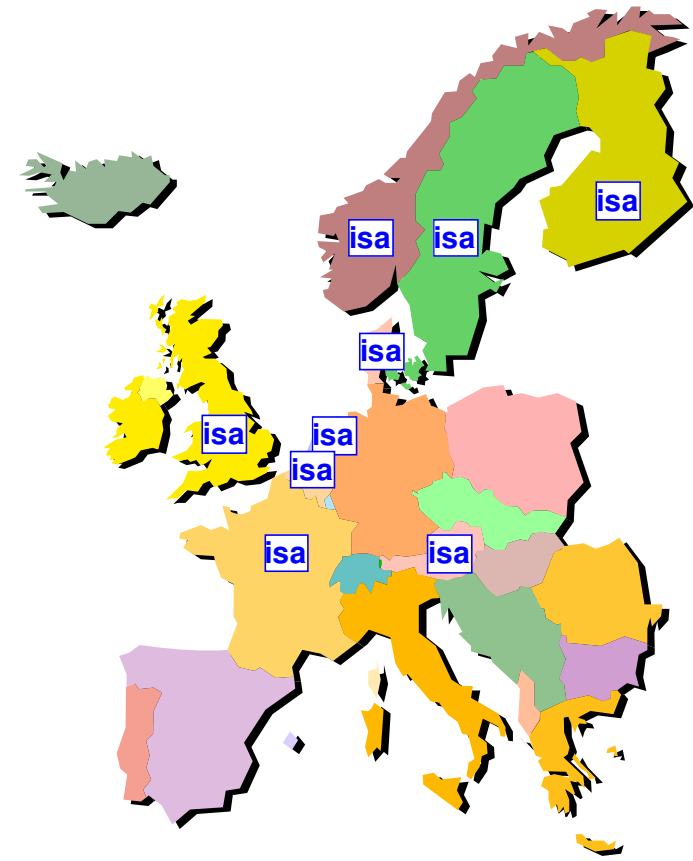
Norway (2005-)

+

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)

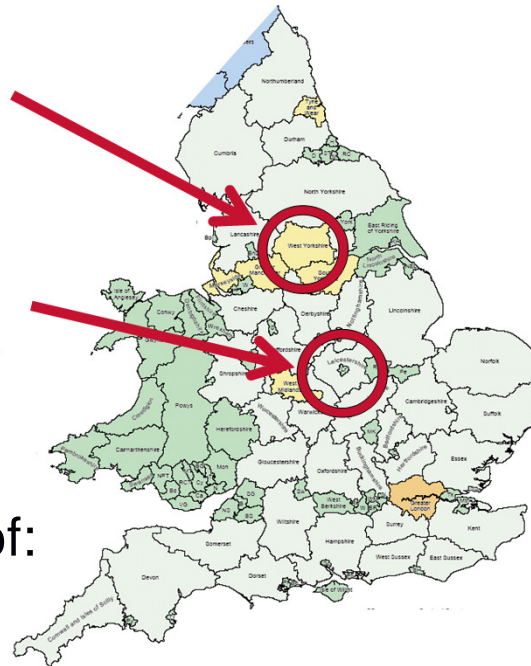
2 rural trials  
(1 private motorists, 1  
fleet)

79 drivers with a mix of:

Younger / older

Male / female

Speeding intenders / non-intenders



# An overridable assisting system



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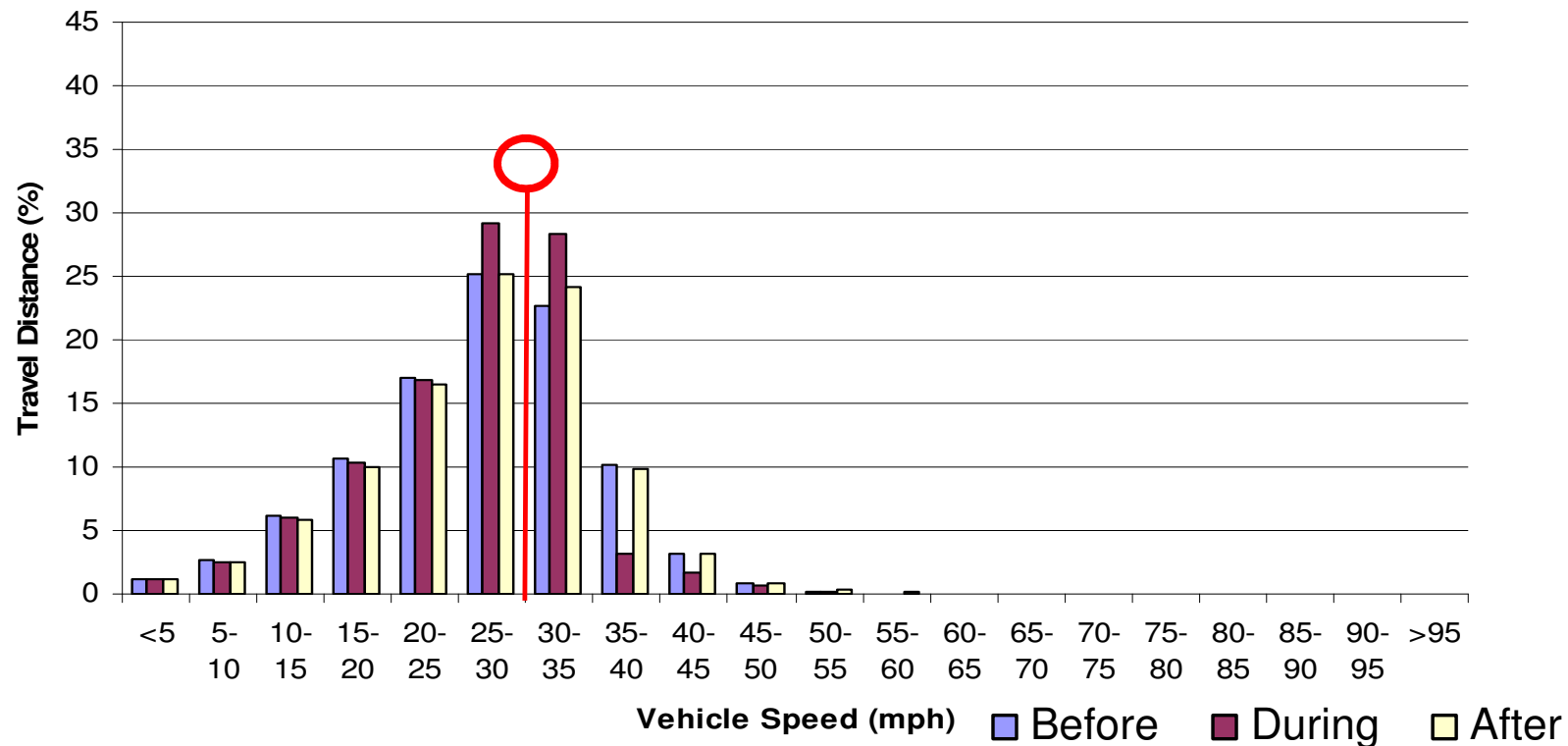
- System that limited speed to the prevailing limit (no acceleration beyond limit)
- Drivers could override at will
- Vibration on throttle pedal to prevent over-throttling



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



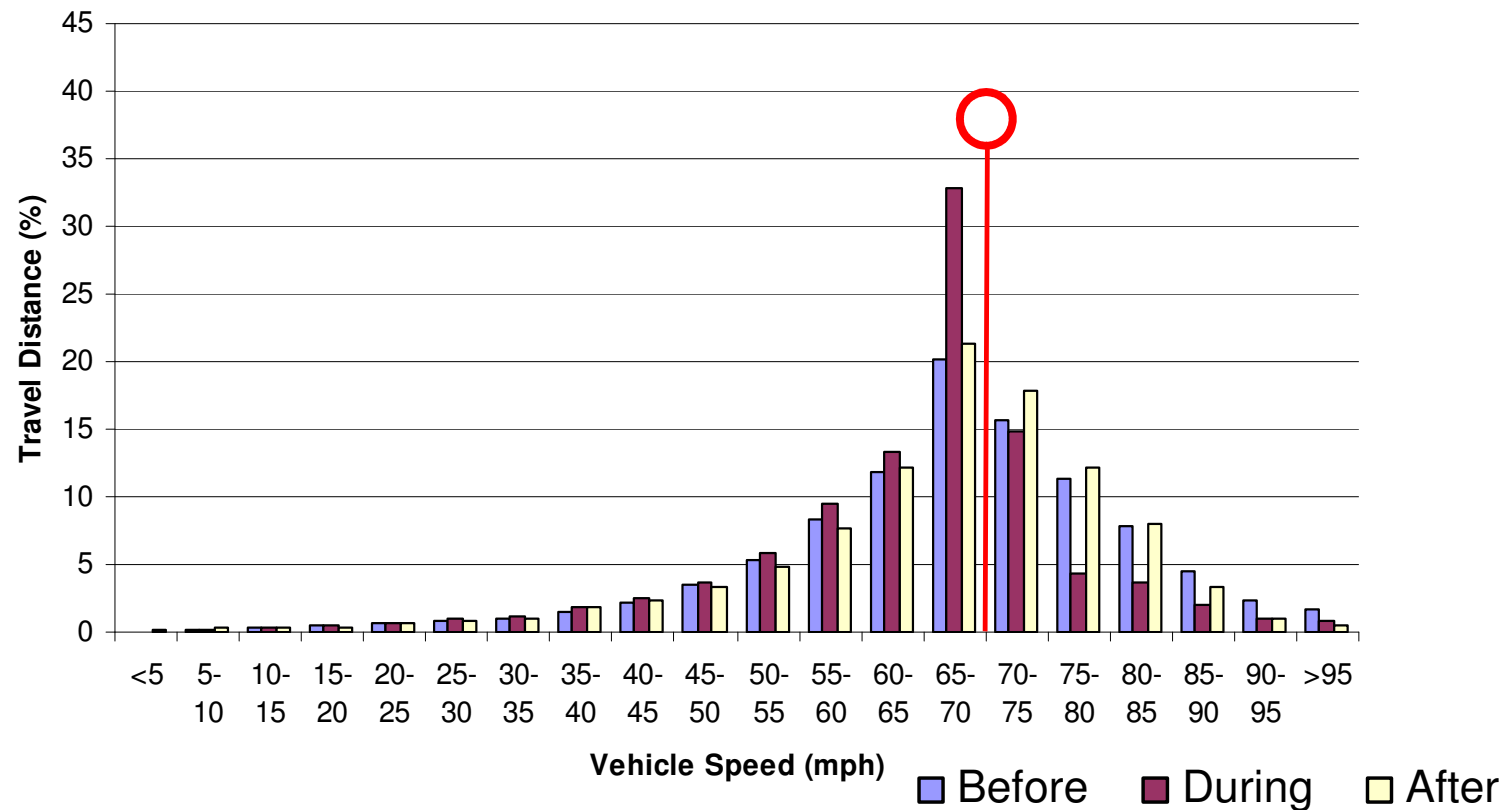
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# Speed distribution on 70 mph (110 km/h) roads



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What about driver attitudes?

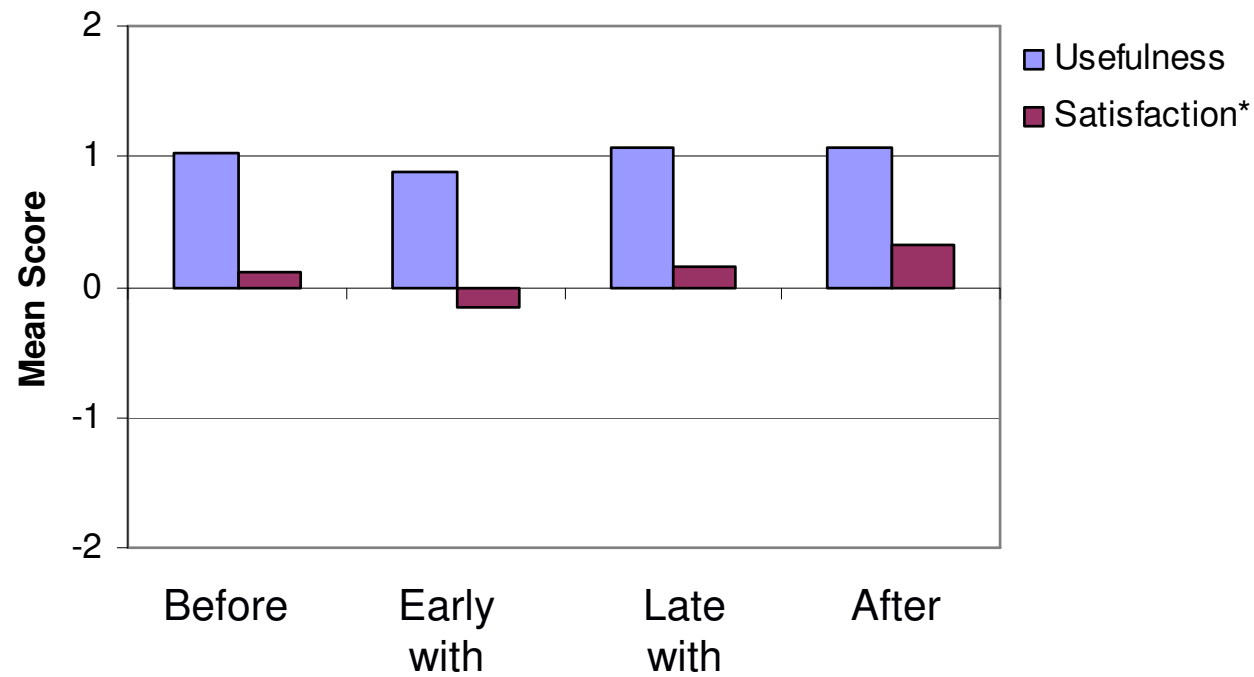
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# Acceptability



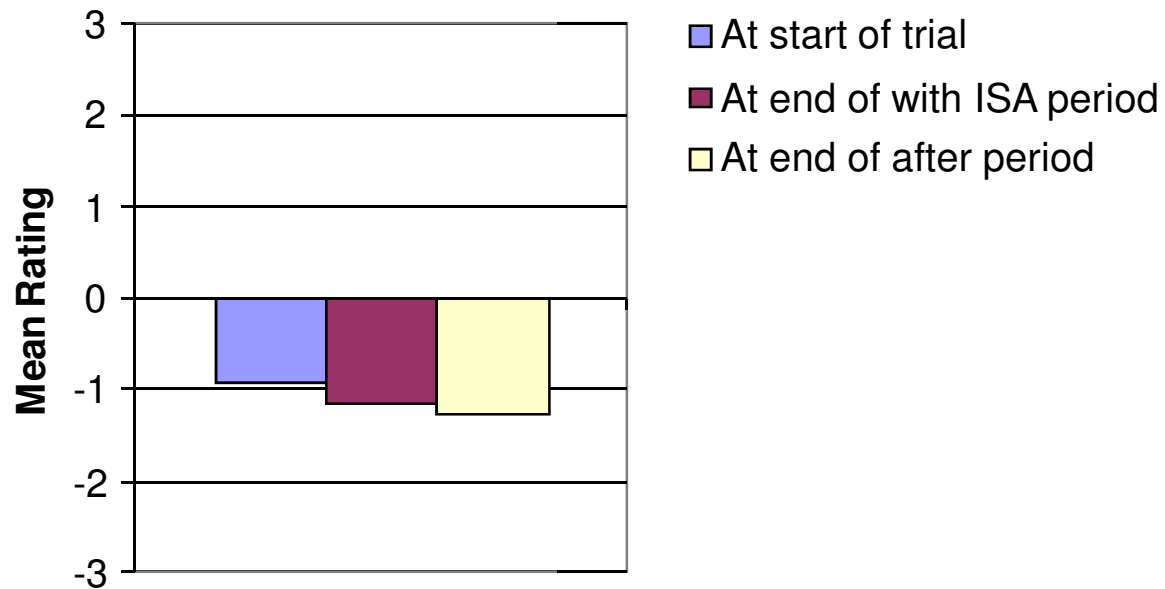
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# Intention



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Mean intention to speed





How many crashes would ISA save?

## Method for estimating accident reductions with ISA



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- 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

## The prediction from the Swedish trials



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“If everyone had ISA, there could be 20% fewer road injuries in urban areas.”

(Biding and Lind, 2002)

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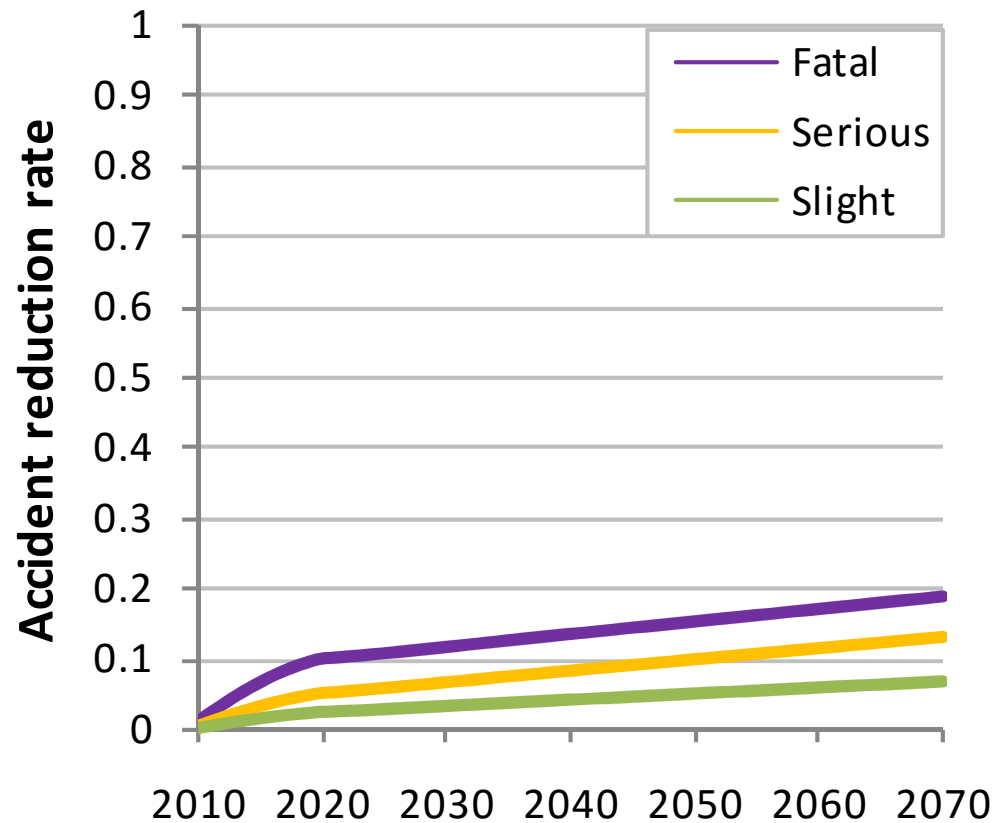


What is the importance of regulation?

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



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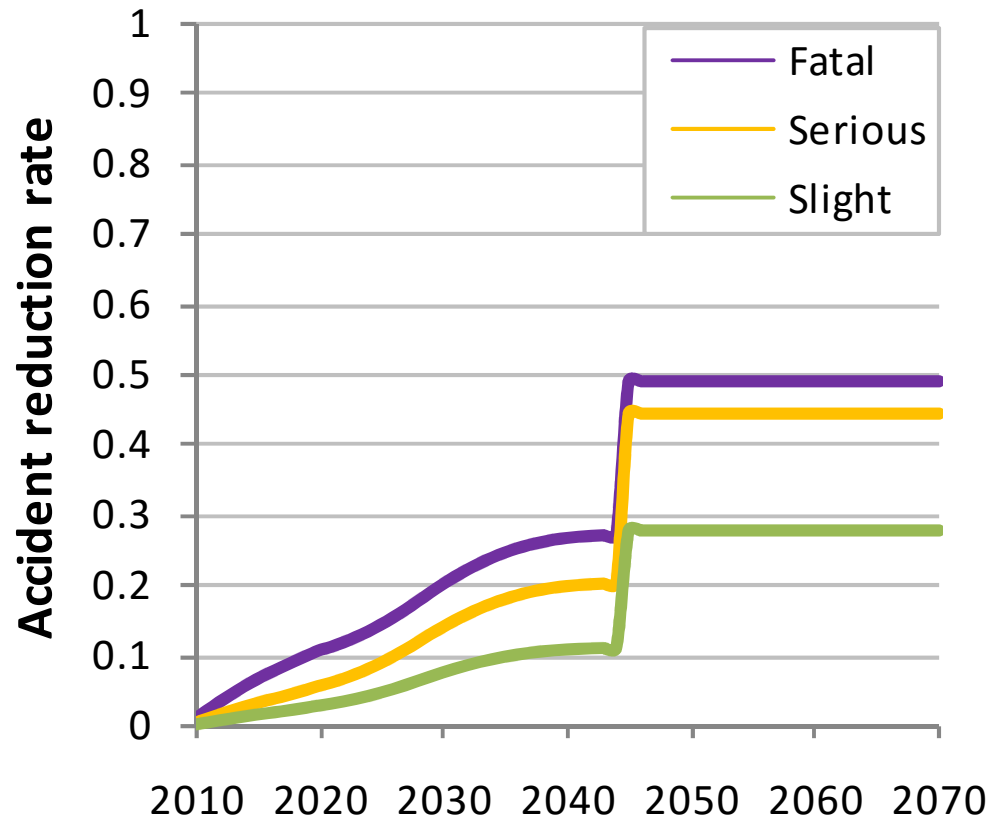




# GB accidents saved over time for the Regulation scenario



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# Comparison of predicted outcomes



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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



## Interpretation of scenario analysis



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- 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



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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.”

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Thank you for your attention!  
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