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Effectiveness of Safety Cameras

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- Personal Injury Accidents (PIA's) or Personal Injury Collisions (PIC's) are proportional to the average speed:

$$PIC's \propto \bar{V}$$

- TRL Report 421 (2000)





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- Injury Severity (AIS) is proportional to DeltaV cubed – Peak Virtual Power Sturgess 2002:
- $AIS \propto \Delta V^3$
- DeltaV is proportional to the posted speed limit:
- $\Delta V \propto PSL$
- Average speed is proportional to the posted speed limit
- $\bar{V} \propto PSL$

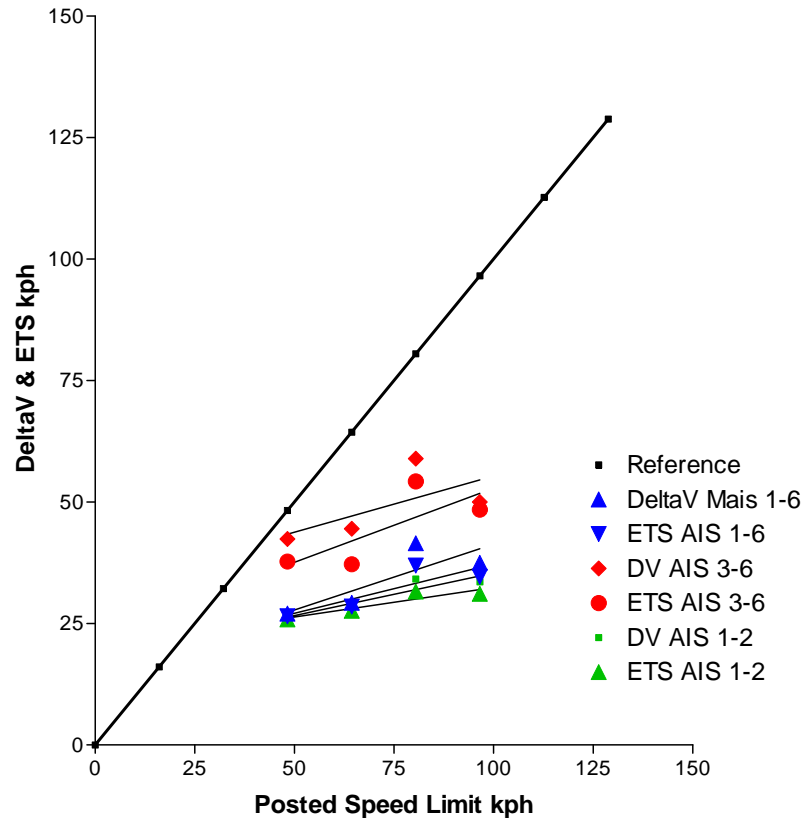




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Mean DeltaV and ETS vs Posted Speed
Limit and Injury Severity 'A' Roads
CCIS1998 - 2005
Passenger cars only
Frontal Impact (10-2 o'clock)
Drivers 16+





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- Hence combining all the effects

$$AIS \propto \bar{V}^4$$

- So for a before and after study

$$\text{Injury Sev.Red}^n \propto \left(\frac{\bar{V}_{after}}{\bar{V}_{before}} \right)^4$$

- In agreement with Nilsson's 2004 empirical estimate





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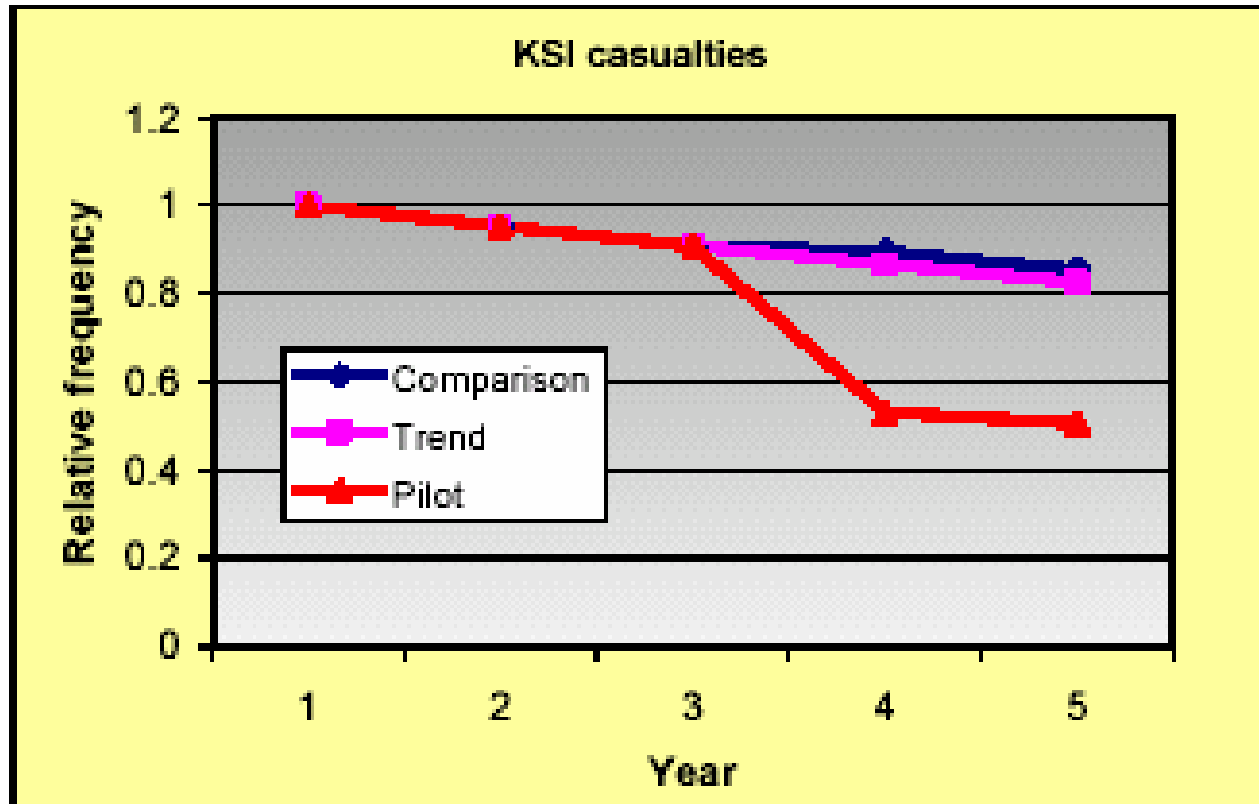
- DfT February 2003 report on fixed and mobile speed cameras
- Average speed at speed camera sites was down by 10% or 3.7 mph.
- There was a 35% reduction in people killed or seriously injured (KSI's); and
- There was a reduction in Personal Injury Accidents (PIAs) of 6%





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- Reduction of PIAs in line with Taylor MC, Lynam DA and Baruya A (2000). *The effects of driver speed on the frequency of road accidents.* TRL Report 421
- Injury Severity reduction
 - Current research injury severity $\propto V^4$
 - 10% reduction in average speed = $(0.9)^4 = 0.66 =$
34% reduction in injury severity
 - Good estimate of actual results





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- **DfT study 2005**
- Occupants
- Reduction in average speed
 - Fixed Urban 0.88
 - Fixed Rural 0.82
- Cameras in study
 - Fixed Urban 444
 - Fixed Rural 57





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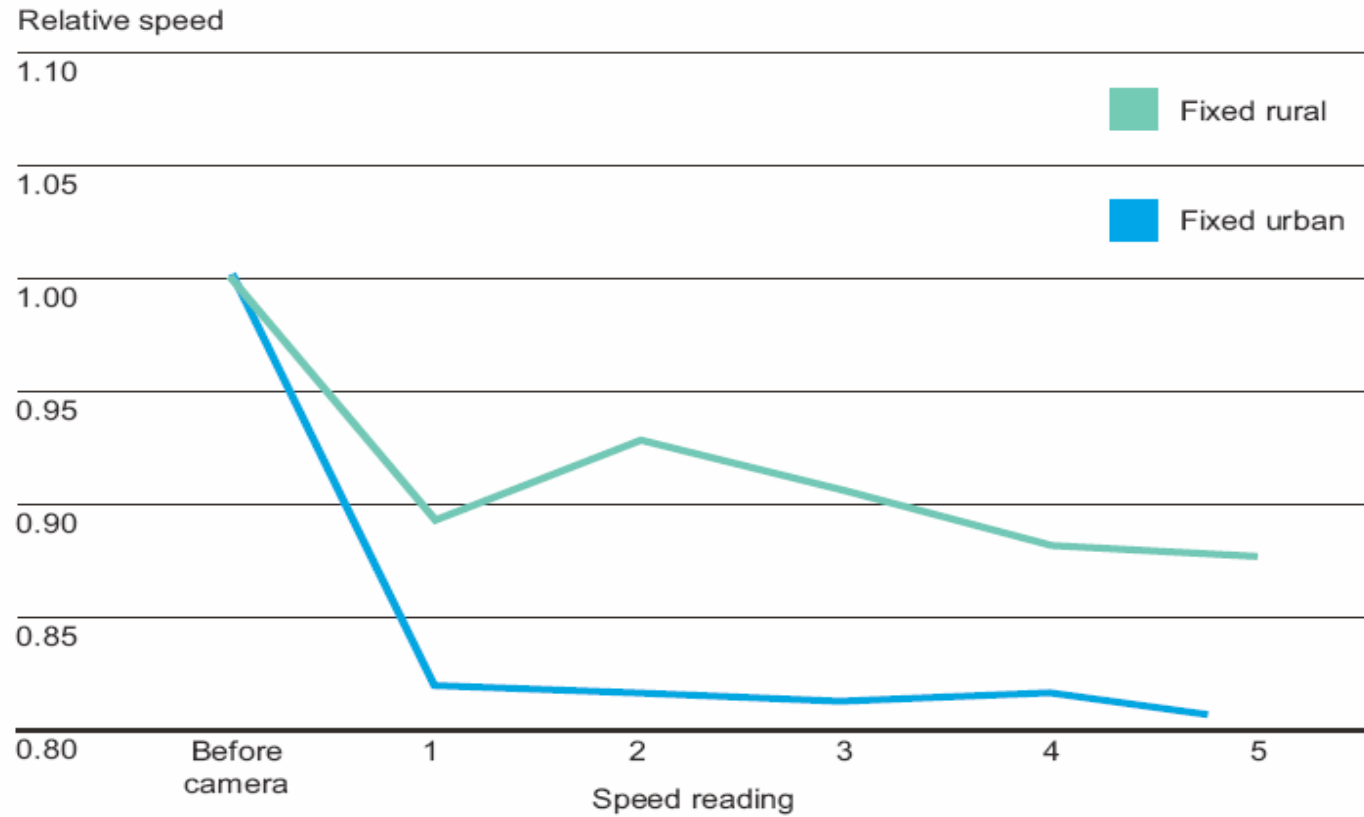
- Weighted changes in average speed
 - $F/U = 0.78$
 - $F/R = 0.09$
 - Total = $0.87 = 0.13$ reduction
- Before/After = $(0.87)^4 = 0.57 = 43\%$ reduction
- Actual 49%





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- **Conclusions**
 - Nilsson found V^4 relationship empirically
 - Current theory based on Peak Virtual Power predicts V^4
- **Peak Virtual Power closely predicts effectiveness of Safety Cameras**

