

# Long term effect of ADAS on driver behavioural adaptation

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# The ISA system – overview



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- ISA is an ADAS, which assists driver's speed control task.
- It caps the max speed at which the car can travel according to local speed limits stored in the on-board computer.



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# The ISA system – operational features

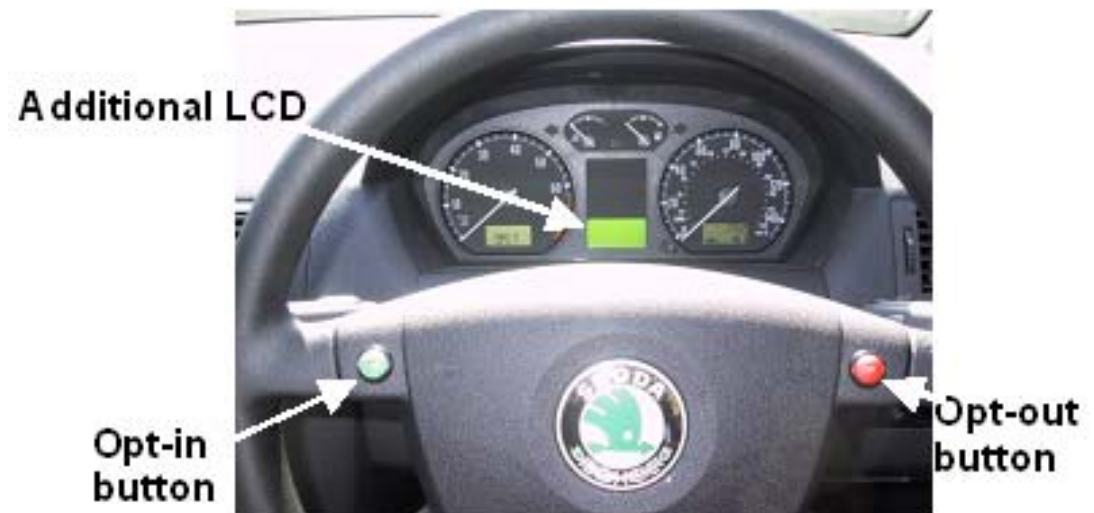


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The system is turned on by default upon ignition, but the driver can override the system temporarily

- The ISA control would be resumed when one of the following three conditions was met:
- The vehicle's speed dropped below the current speed limit.
- The vehicle reached a new speed zone.
- The driver voluntarily opted back in.



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# The ISA system



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The overridable feature of the ISA system provides an opportunity to look into how drivers interact with the system:

- how often the system was overridden?
- what affected the pattern of overriding?

Two measures were adopted to identify the pattern of overriding behaviour:

- *The frequency of overriding*: this serves as an indication of drivers' intention to break the physical constraint imposed by the ISA system
- *The distance travelled with system overridden*: this indicates the extent to which the effectiveness of ISA system is compromised by being overridden.



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# The UK study



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- A fleet of 20 identical cars
- 80 participants
- Each had the car for 6 months, during which ISA was activated for 4 months.
- The dataset for this analysis contains driving data of 7,493 person-day and 339,889 km.



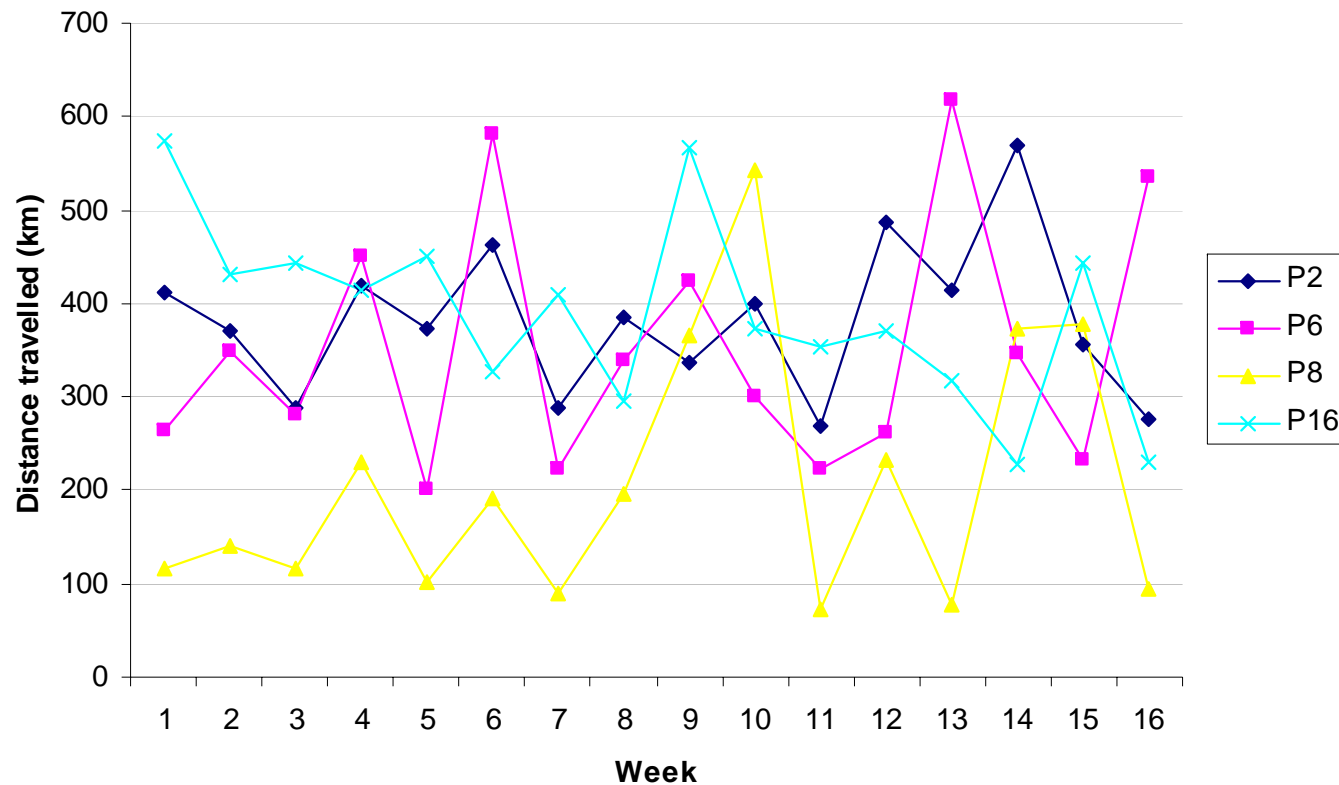
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# How to measure system exposure: distance or time?



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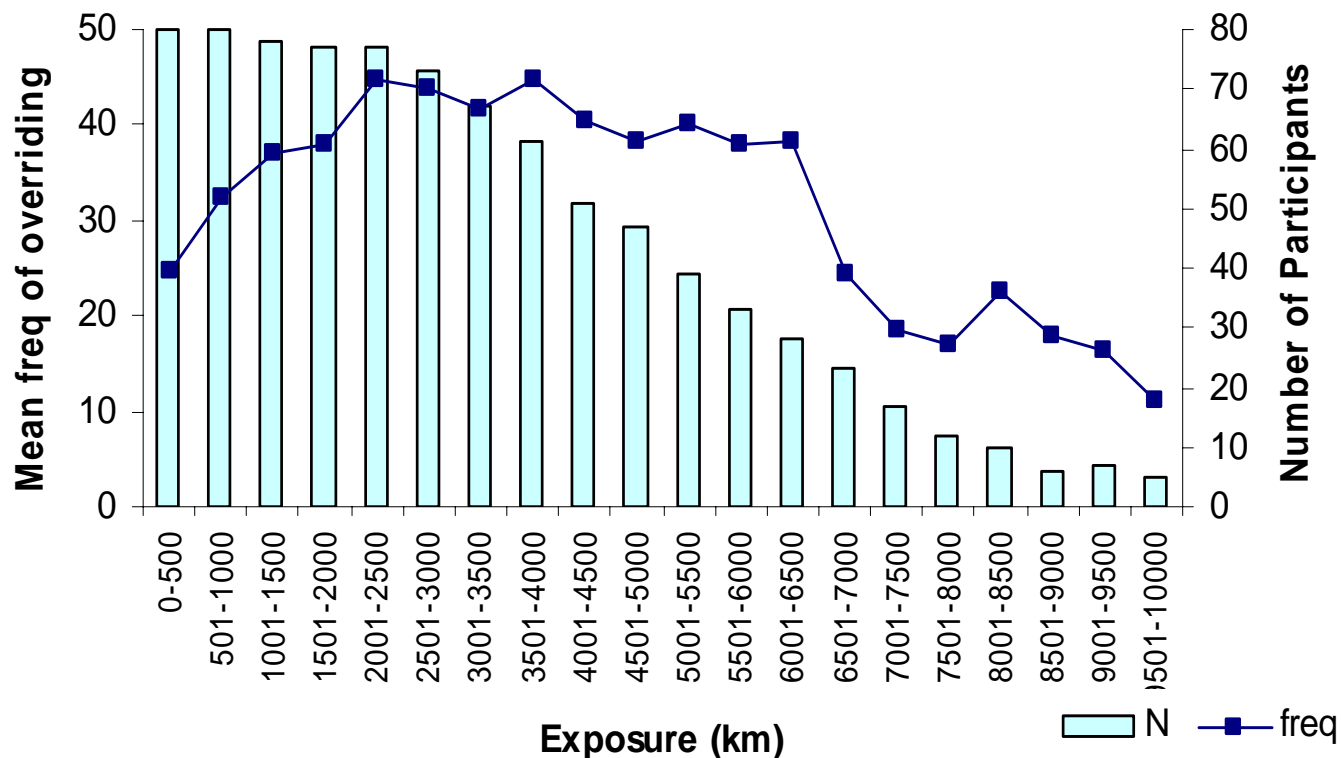
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# How did the pattern of overriding change along exposure?



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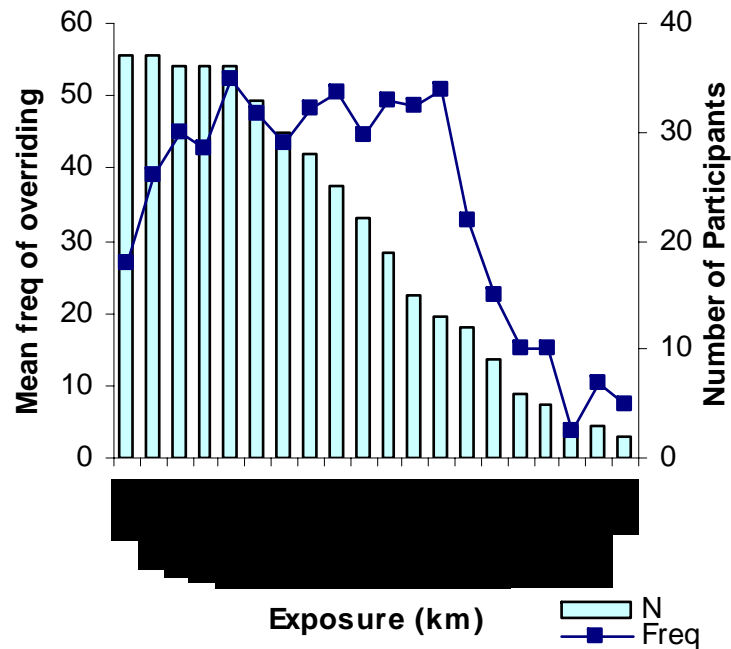
# The effect of driver characteristics



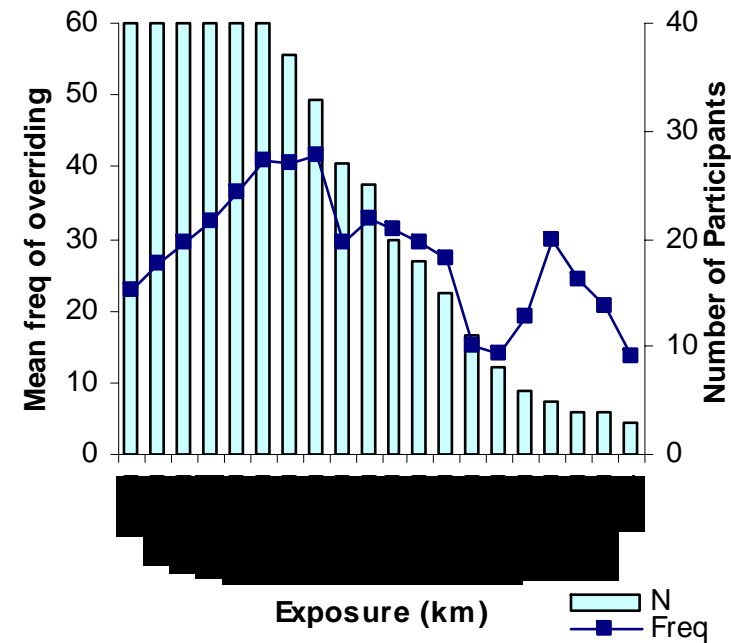
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### Intenders



### Non-intenders

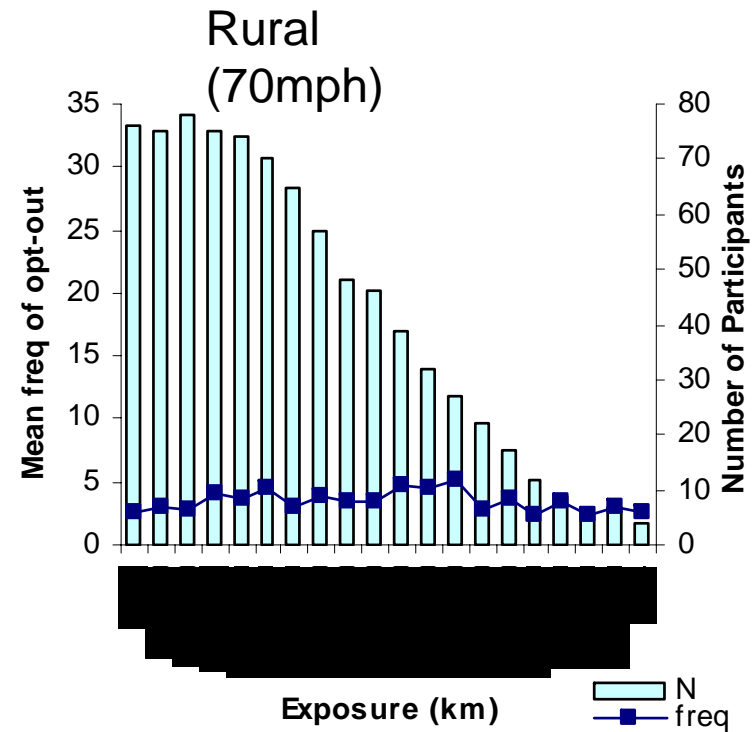
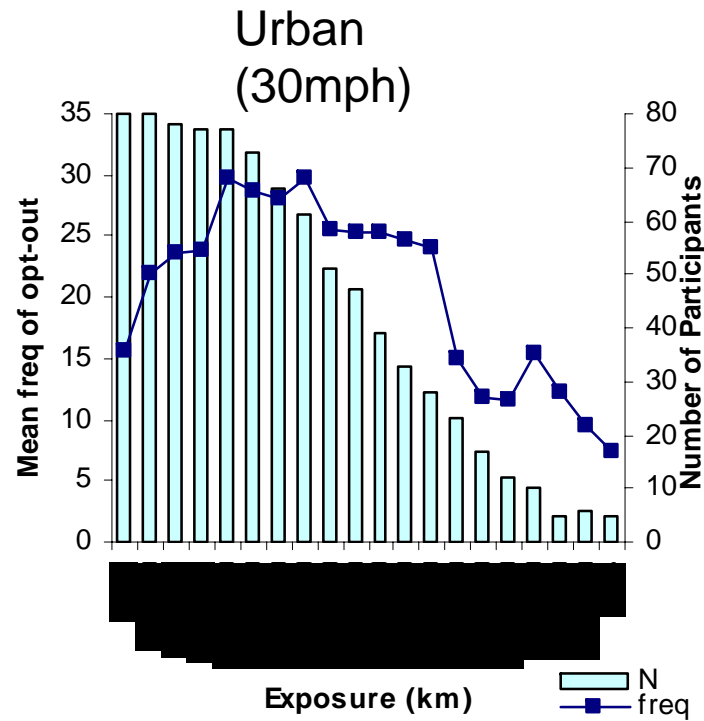


# The effect of driving environment



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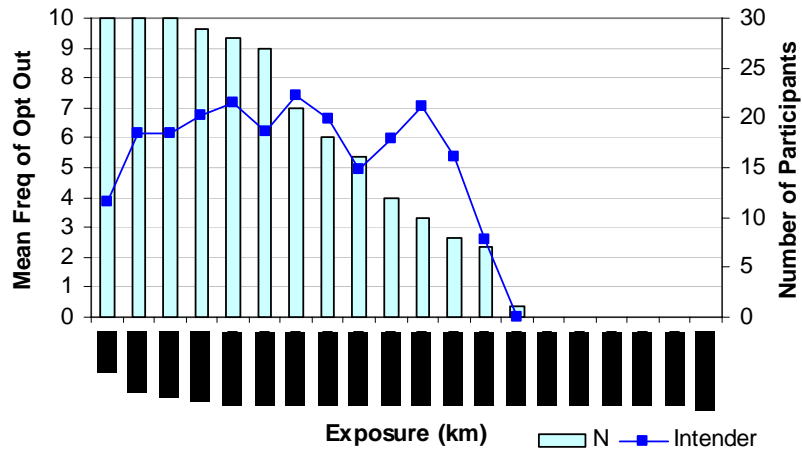
# The effect of driving environment



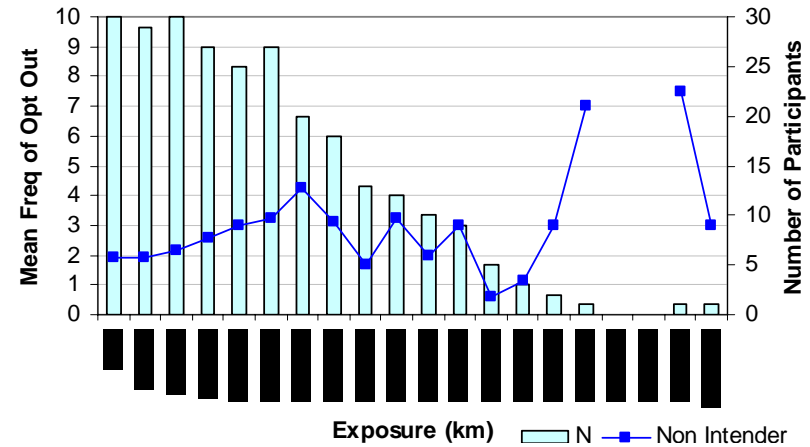
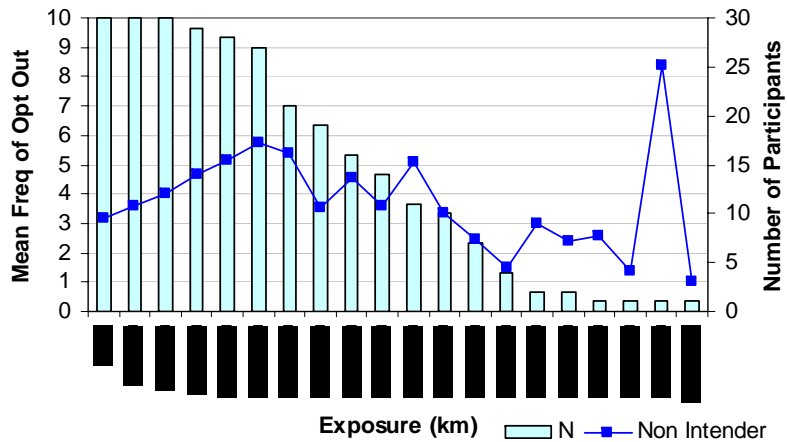
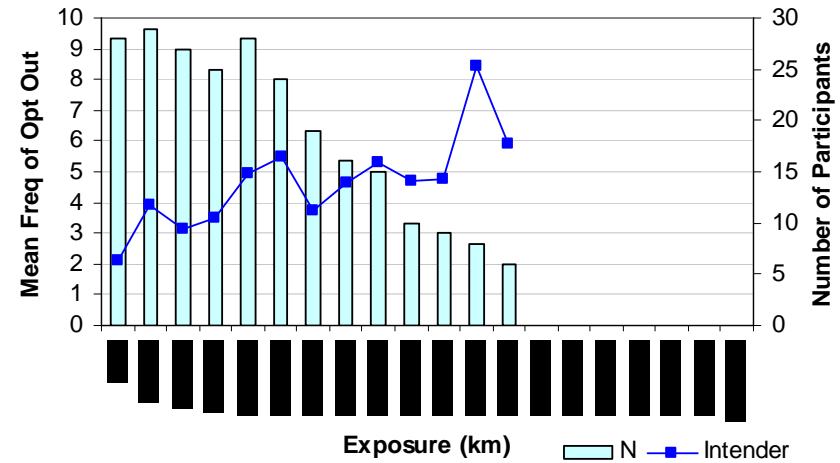
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## Weekdays



## Weekends



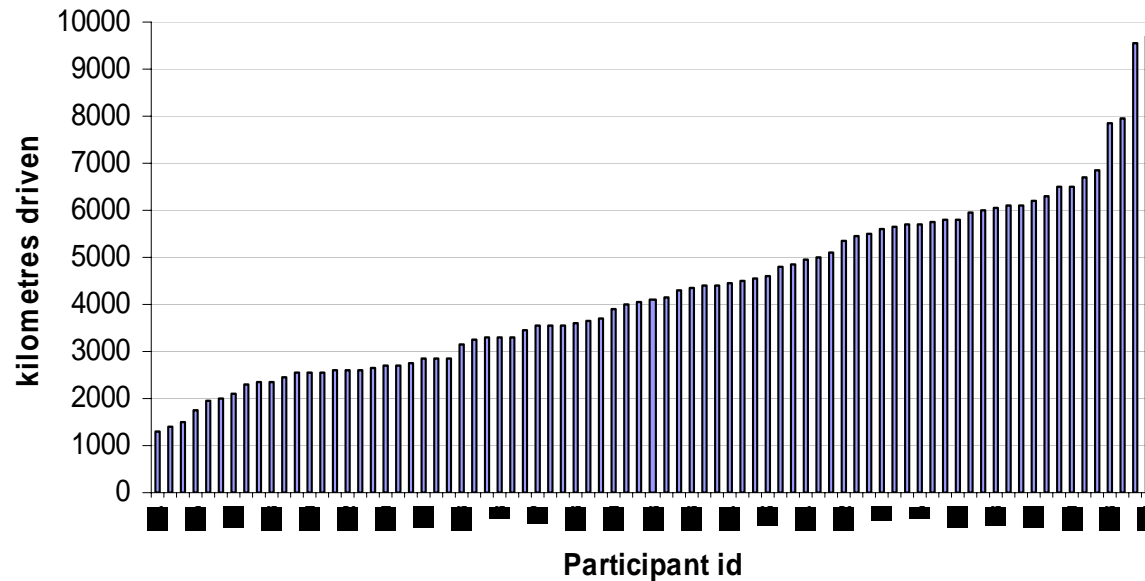
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# Alternative analysis based on mileage groups



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Participant group (km driven)	Number of participants
0 – 1999	6
2000 – 2999	18
3000 – 3999	13
4000 – 4999	16
5000 – 5999	13
6000 – 6999	9
7000 – 7999	2
8000 – 8999	0
Over 9000	2



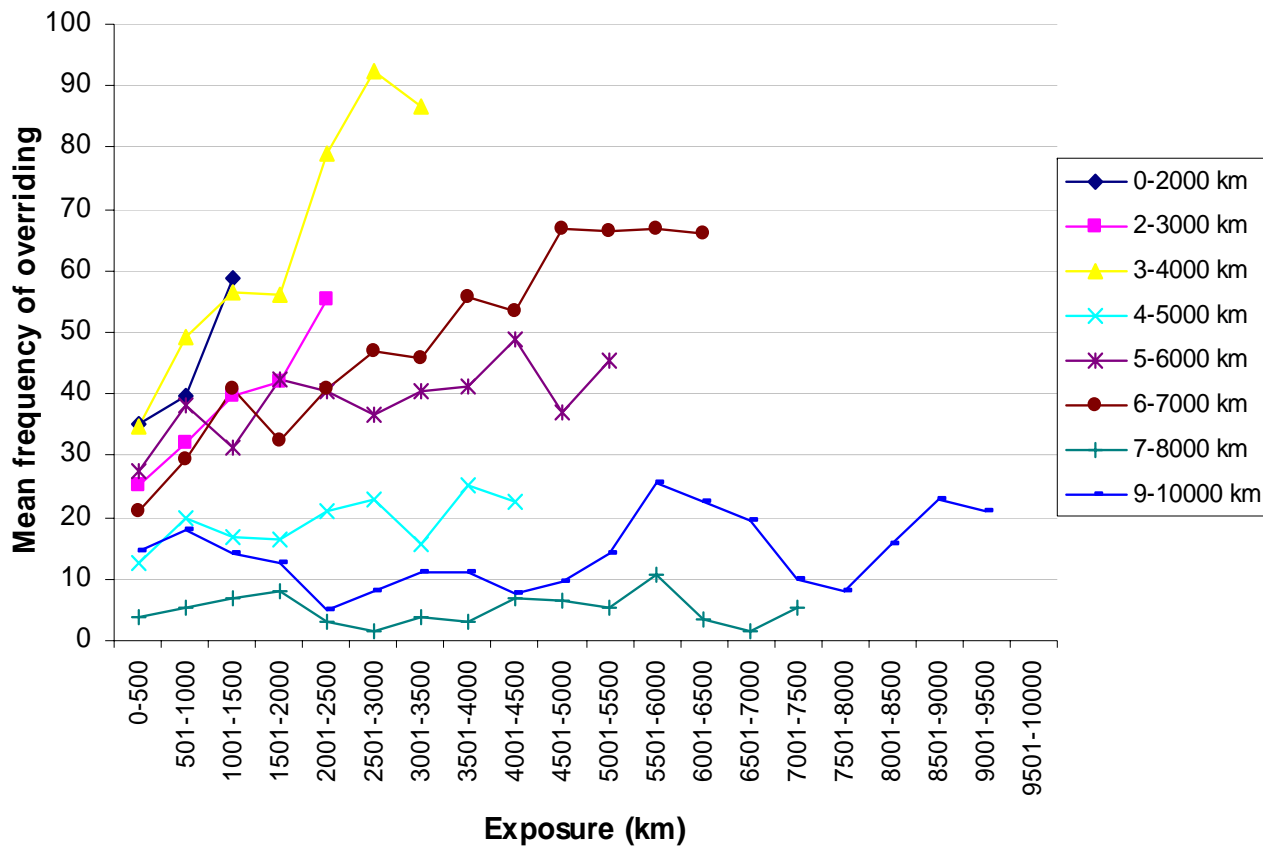
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# Overriding pattern based on mileage groups



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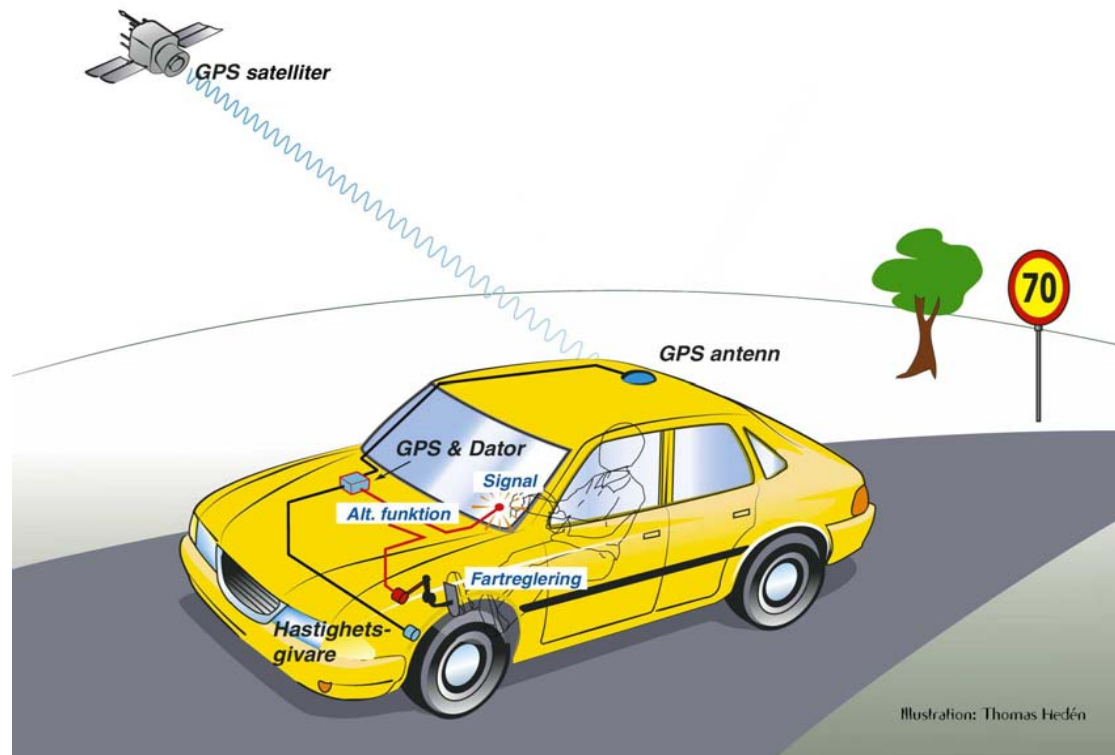


# The Swedish study



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# Data characteristics



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- The data were collect during a trial with 284 vehicles equipped with an Active Accelerator Pedal (AAP) system in the city of Lund in 1999-2002.
- Data used for this analysis were from 173 vehicles.
- The time each vehicle was equipped with the AAP varied between 6 and 11 months.
- Both private motorists and fleet drivers were included.



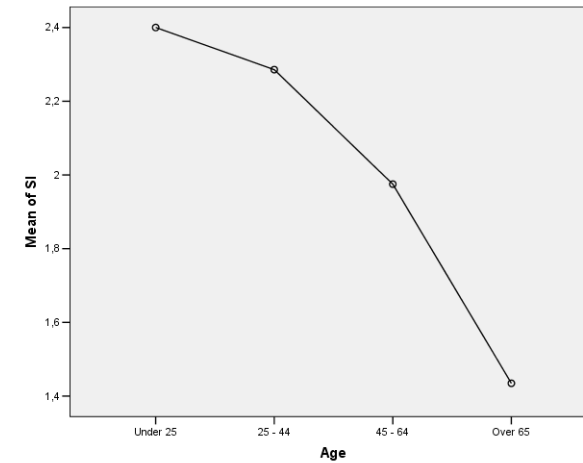
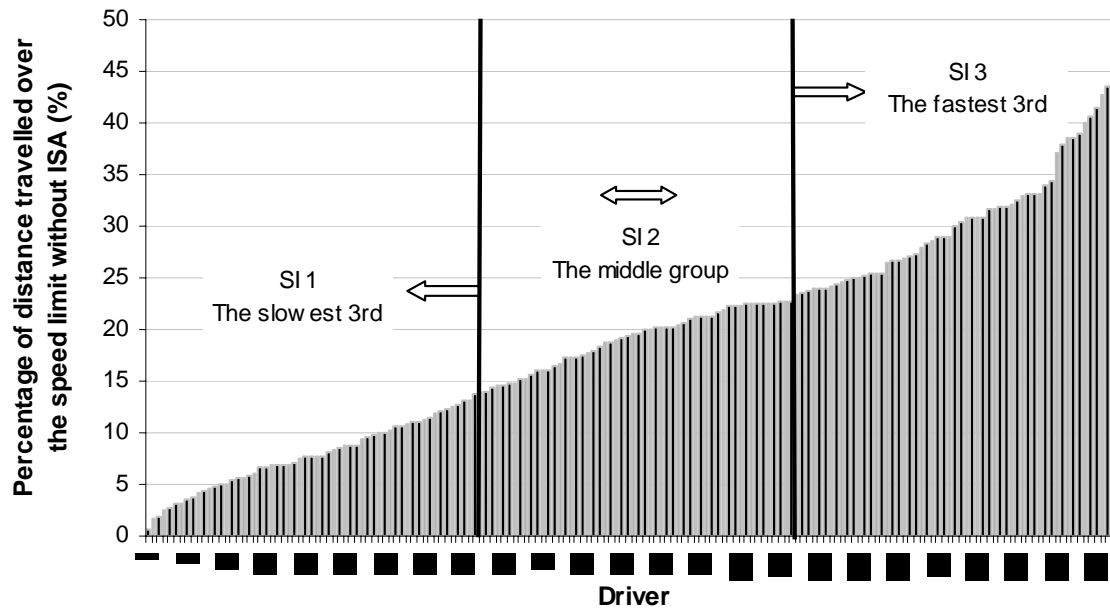
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# Categorisation of participants



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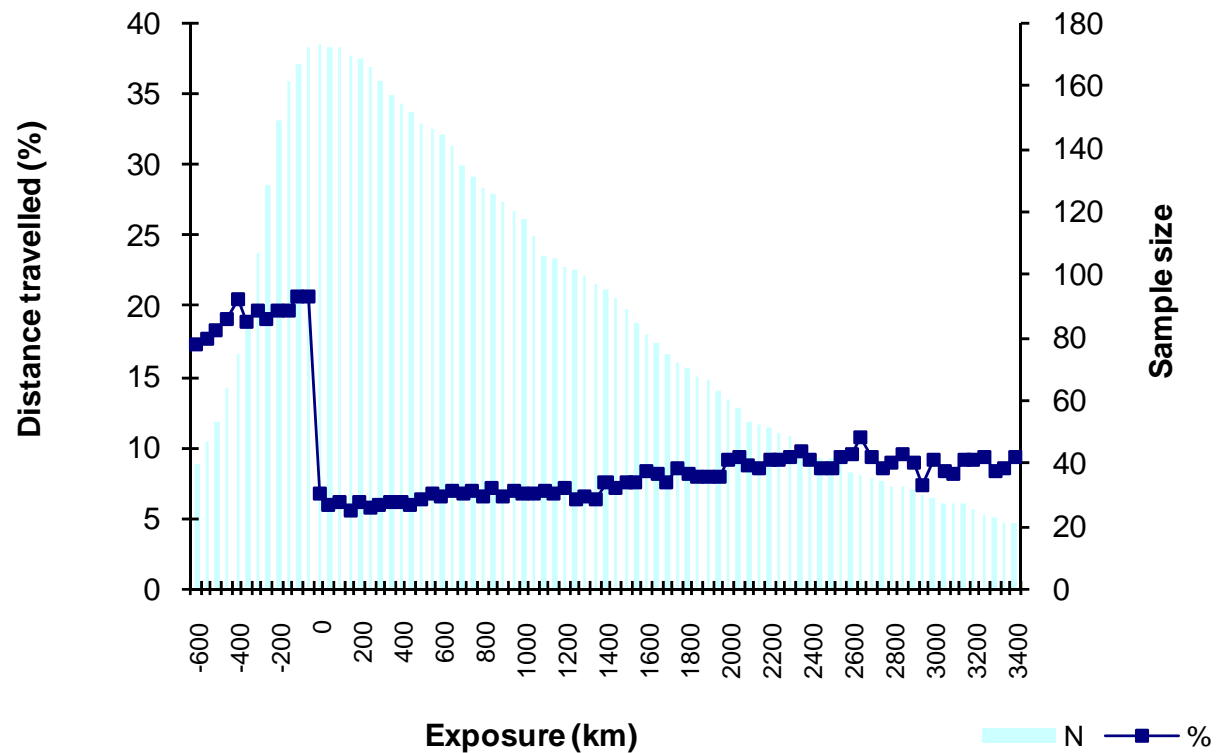
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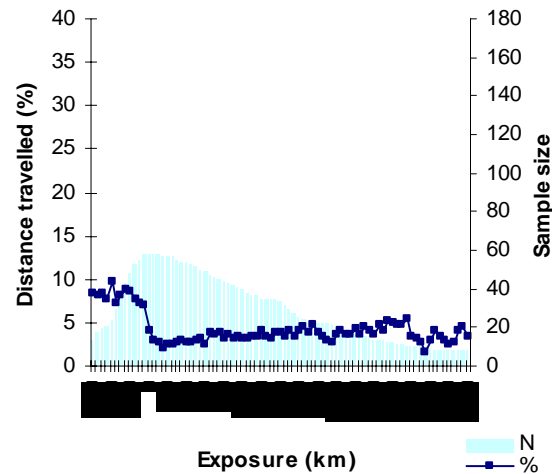
# The effect of driver characteristics



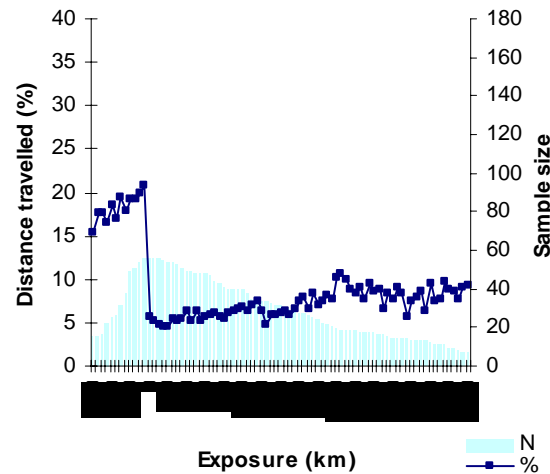
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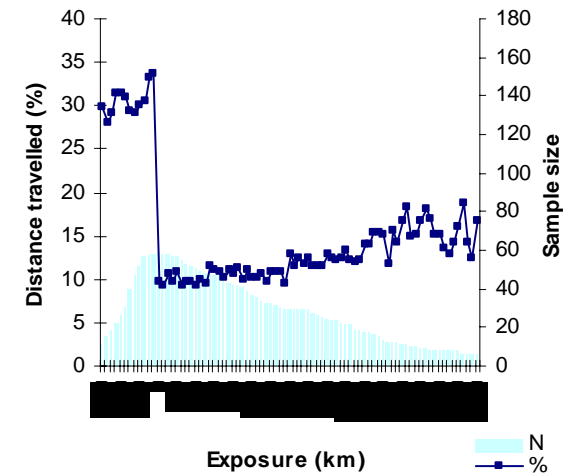
### Slow drivers



### Medium drivers



### Fast drivers



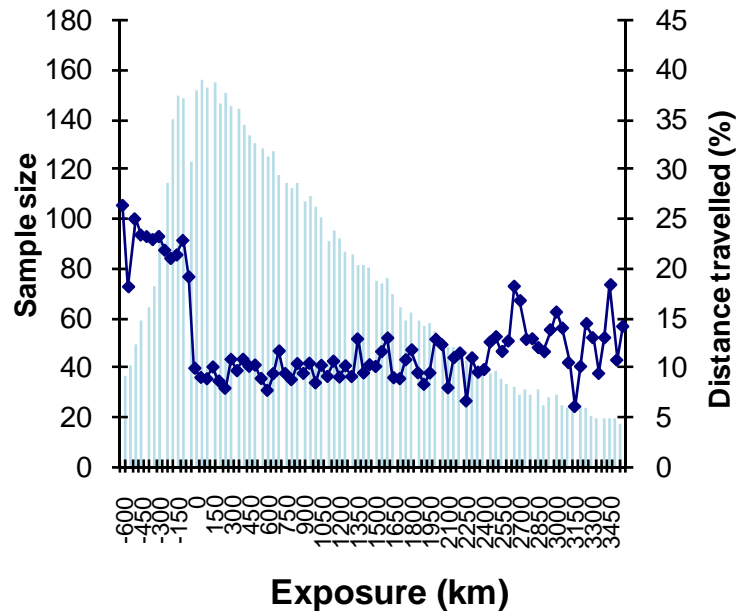
# The effect of driving environment



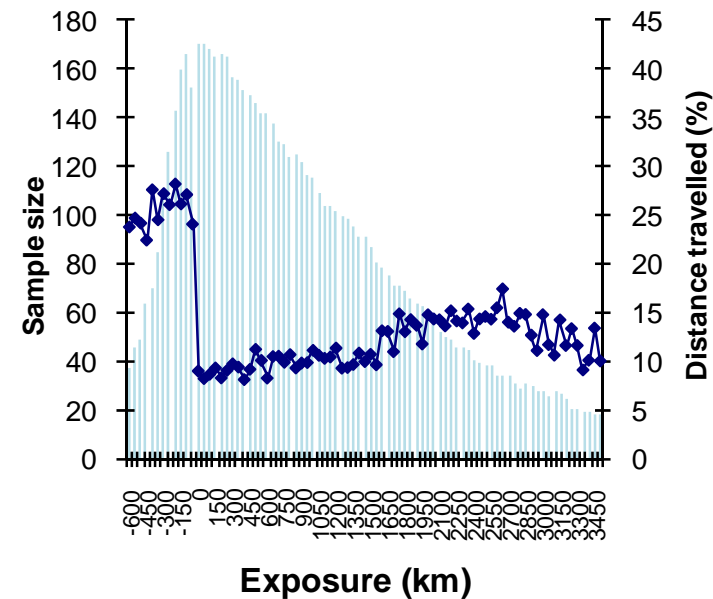
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### 30 km/h roads



### 70 km/h roads

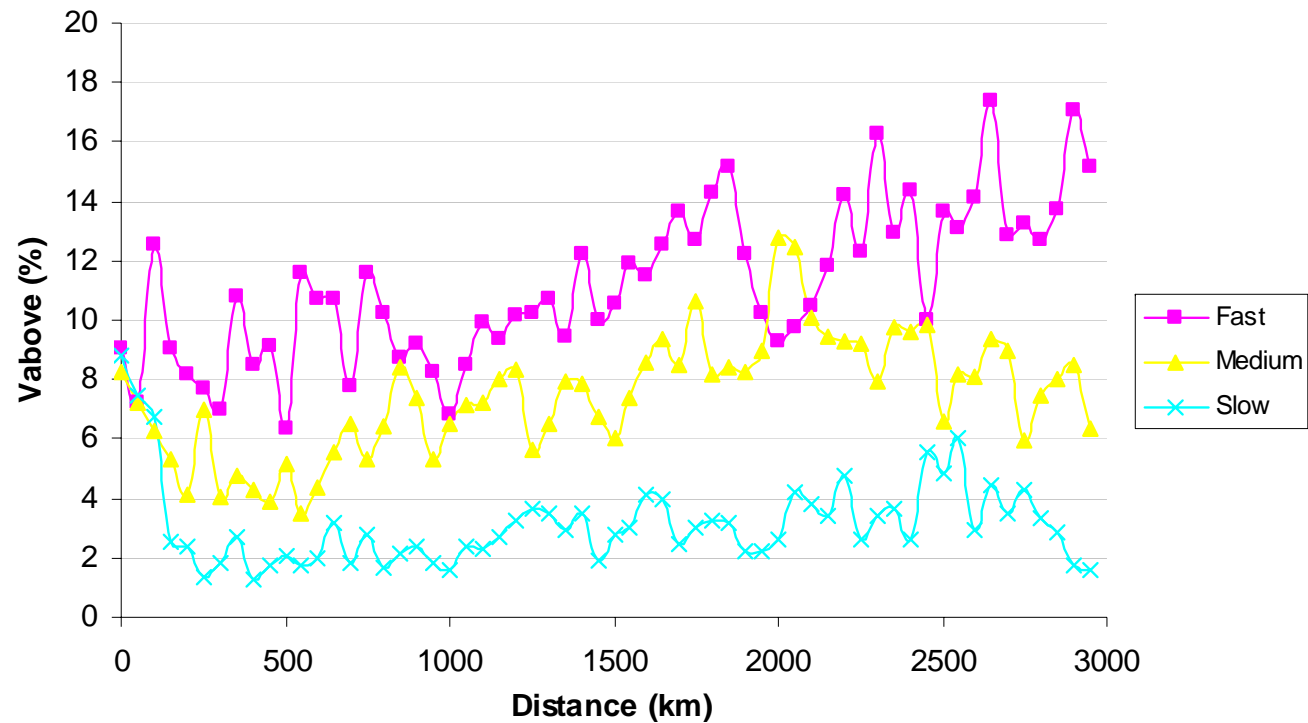


# Overriding pattern based on higher mileage drivers



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# Major conclusions



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Evidence generally suggests that the longer the drivers had the ISA system, the more frequent they overrode the ISA system or the higher proportion of their distance driven with ISA overridden.

Both the UK and Swedish data demonstrate that how drivers interact with the ISA system depends on:

- **driving environment**, e.g. urban or rural environment, as well as general traffic conditions imposed by different types of roads and time of week. These findings reflect the influence of situational variables on drivers' behavioural adaptation in the presence of an ADAS system; in AIDE languages, this refers to the environment element in the DVE model.
- **driver characteristics**, e.g. whether the driver intends to speed or not, and whether the driver is an observed speeder. It is therefore important to understand and accommodate for individual differences when deploying an ADAS system; in AIDE languages, this refers to the driver element in the DVE model.



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