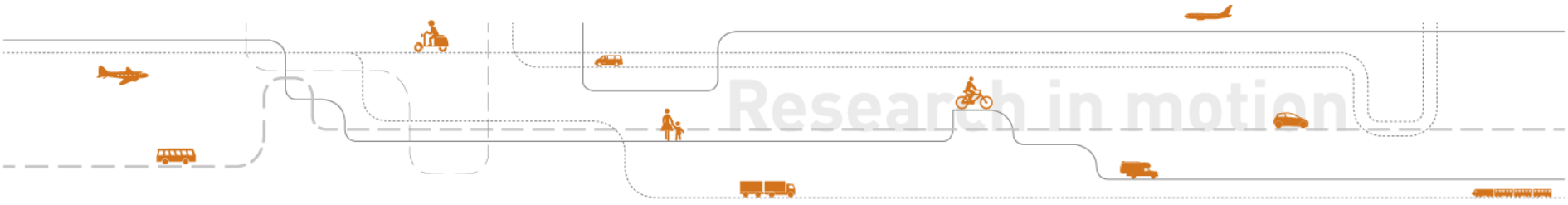
Road safety impacts of connected and automated vehicles

Webinar on sustainability impacts of connected and automated driving, October 27, 2020

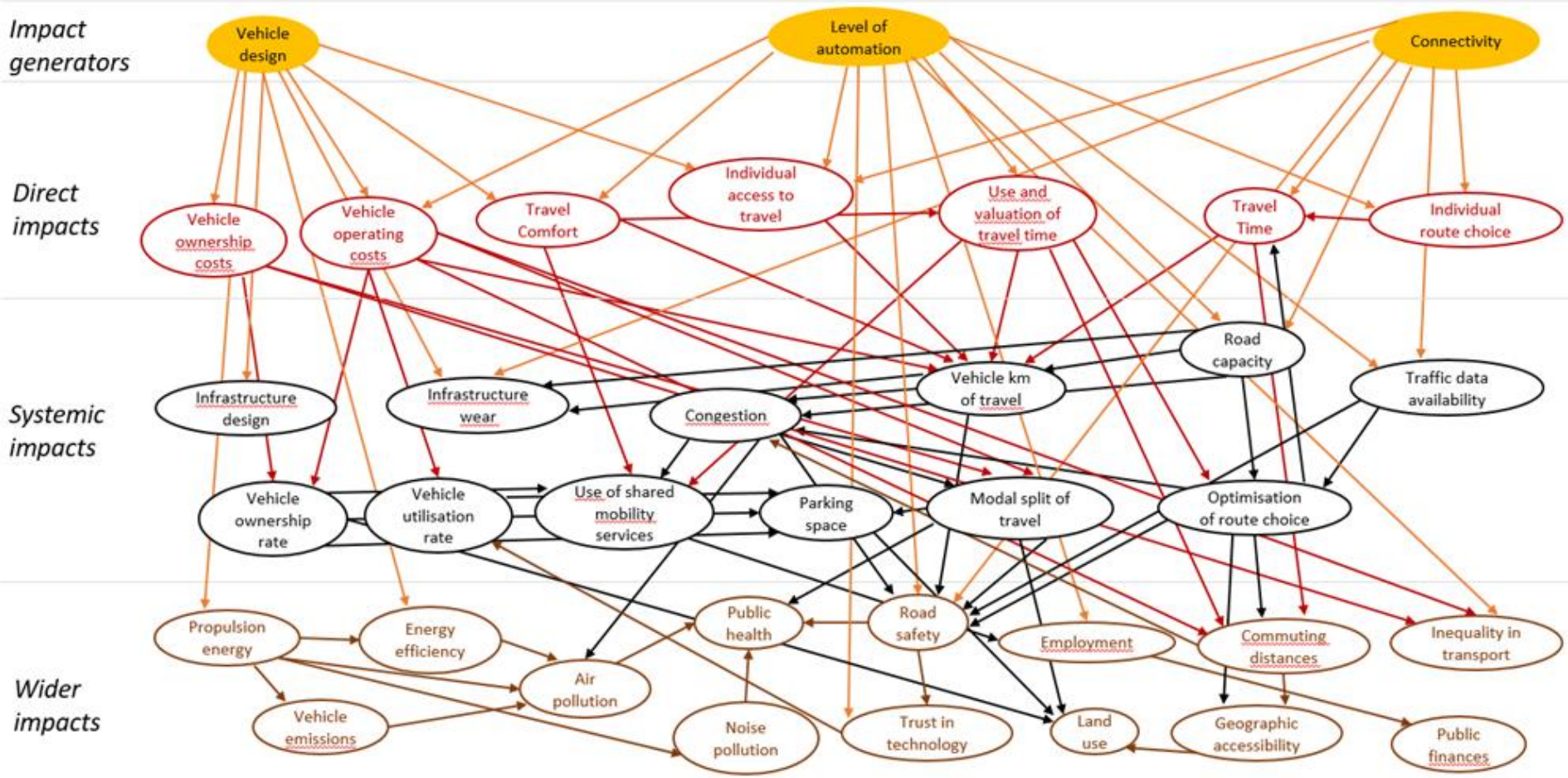
Rune Elvik, Institute of Transport Economics
(re@toi.no)



There are great expectations

- Connected and automated vehicles are expected to:
  - *Reduce congestion*
  - *Reduce travel time and make it less wasteful*
  - *Reduce the number of accidents*
  - *Reduce local pollution and global warming*
- What do we know about road safety impacts?
- Can these impacts be predicted?
- What methods have been used to predict impacts?
- Can we say anything about uncertainty in impacts?

Primary impacts



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Traffic simulation is widely used

- Microsimulation can specify vehicle functionalities
  - *The choices made strongly influence the results of simulation*
- Impacts are modelled as a function of the market penetration rate of connected and automated vehicles
- Studies tend to agree on the direction of an impact, but differ greatly with respect to its magnitude and the form of its relationship to the level of market penetration

- It is sometimes possible to synthesise the results of several studies

Road safety impacts

- Estimates are available for:
  - *Rear-end and lane change on motorways*
  - *Crashes in signalised junctions*
  - *Crashes in roundabouts*
  - *Crashes in priority junctions*
  - *Crashes involving pedestrians or cyclists*
- All estimates are based on micro simulation of traffic
- All estimates refer to traffic conflicts
- Conflicts are often defined as time-to-collision less than 1.5 seconds

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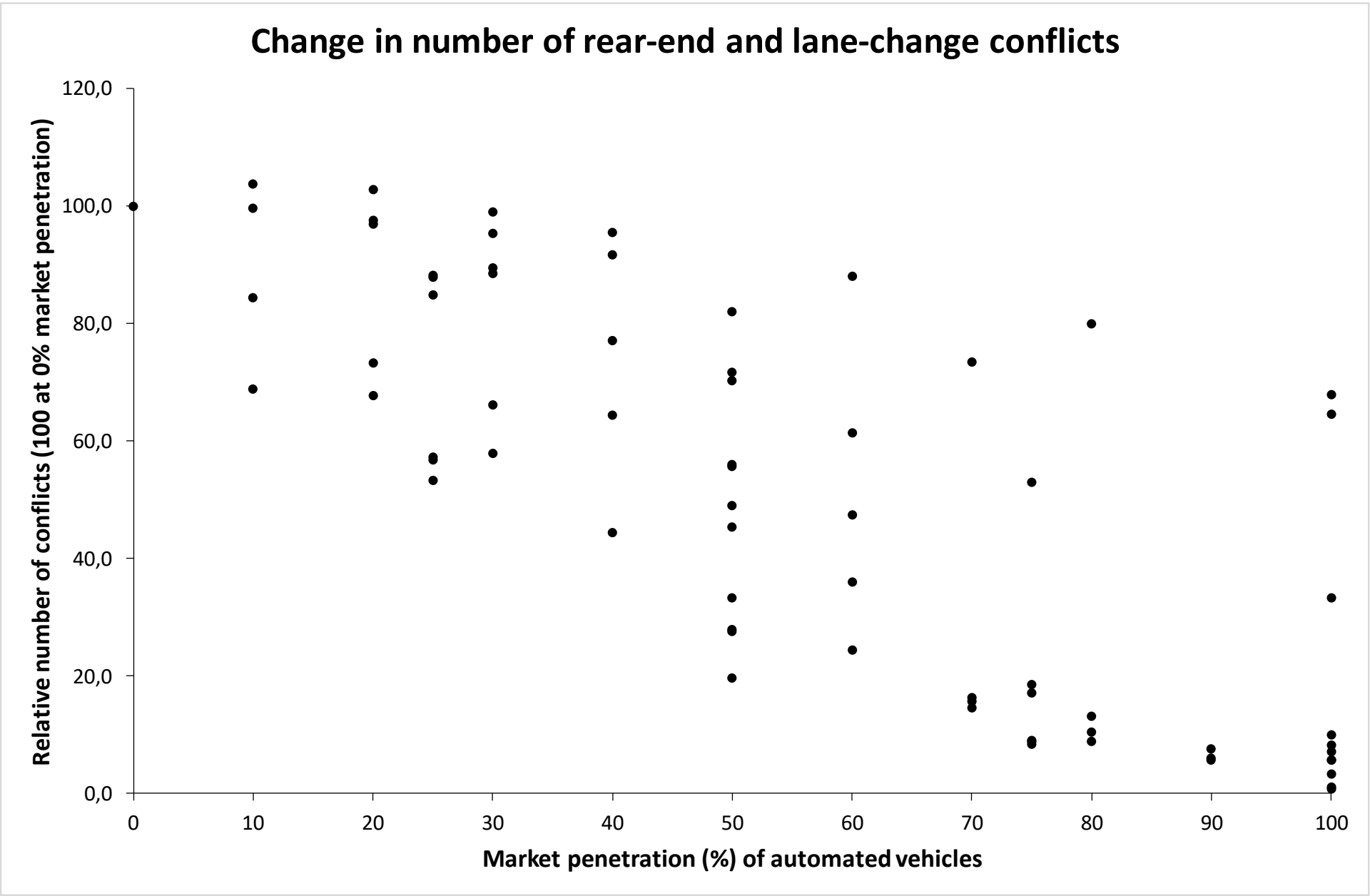
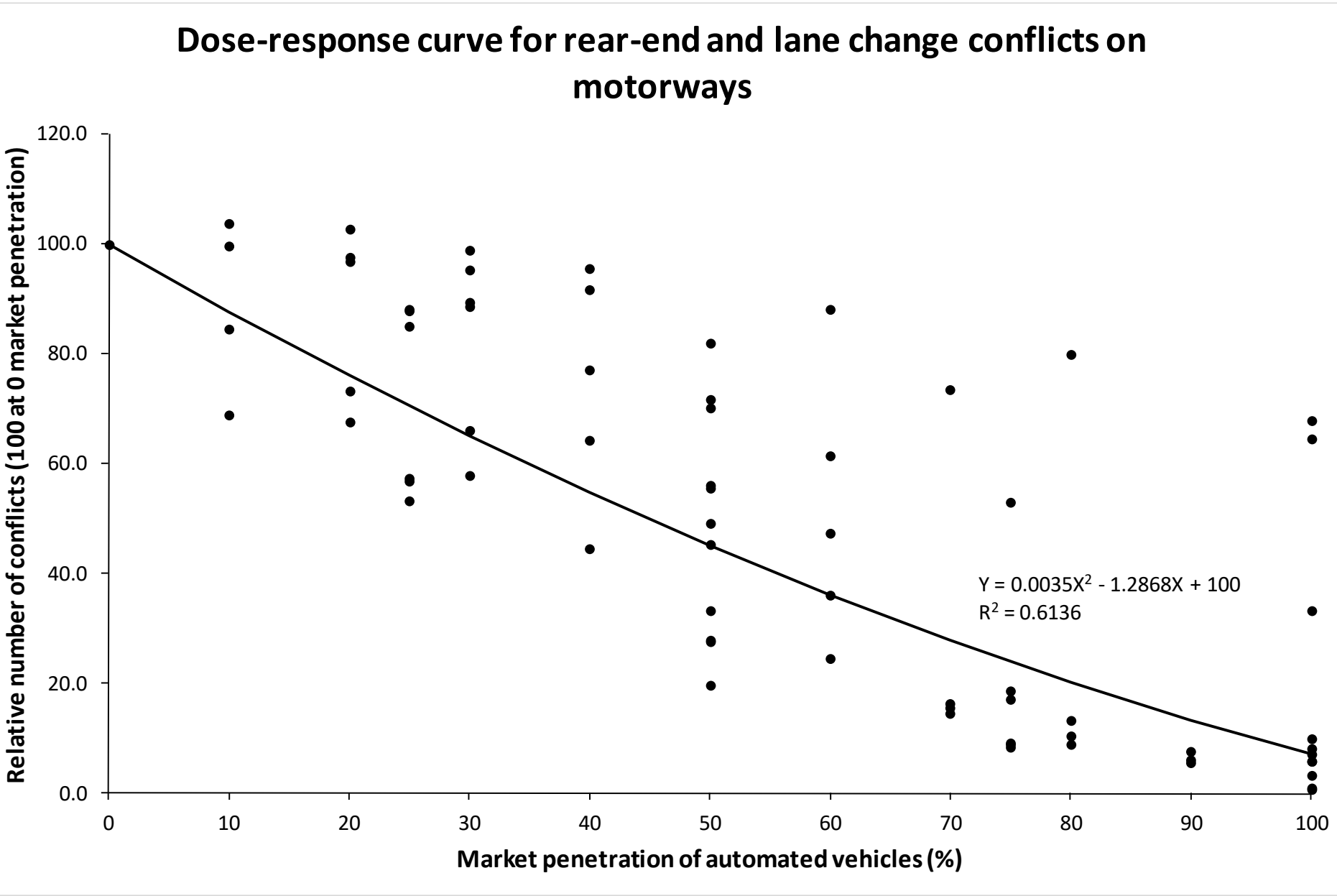
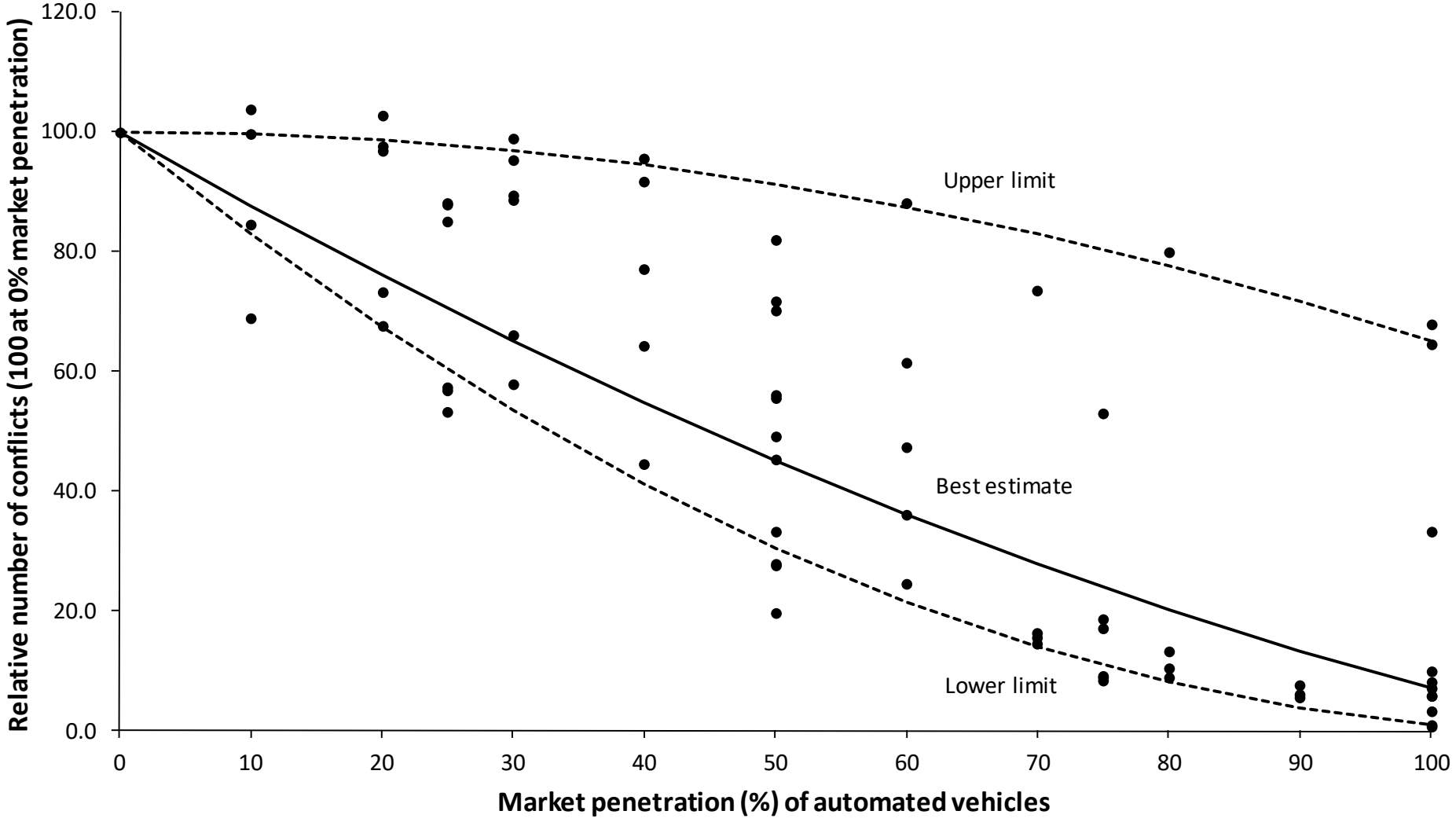
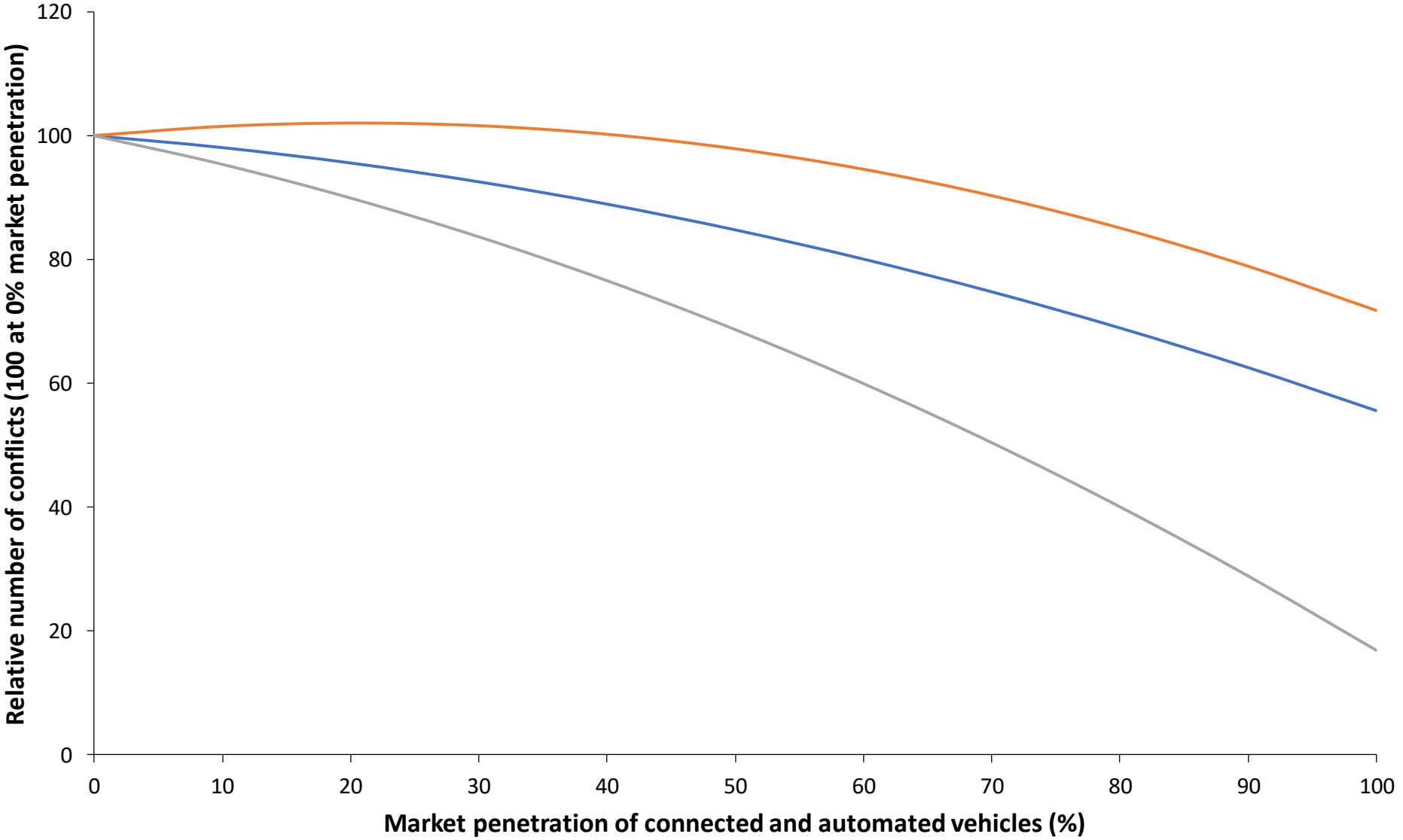

Change in number of rear-end and lane-change conflicts
Relative number of conflicts (100 at 0% market penetration)
120,0
100,0
80,0
60,0
40,0
20,0
0,0
0
10
20
30
40
50
60
70
80
90
100
Market penetration (%) of automated vehicles


Dose-response curve for rear-end and lane change conflicts on motorways
Relative number of conflicts (100 at 0 market penetration)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0
10
20
30
40
50
60
70
80
90
100
Market penetration of automated vehicles (%)
Y = 0.0035X2 - 1.2868X + 100
R2 = 0.6136

Uncertainty of dose-response curve for rear-end and lane-change conflicts



Synthesised impact functions for urban junctions



There is great uncertainty

- There is consensus that safety will improve when all vehicles are connected and automated
- Estimates of how much safety will improve vary widely
- Potential behavioural adaptation has not been studied extensively
- Impacts on non-automated road users (pedestrians, cyclists) remain poorly known

- Studies do not lend themselves to formal synthesis by means of meta-analysis