

Identifying Future Heavy Truck Safety Technologies and Estimating Likely Benefits

Presented to
SAE Government Industry Meeting

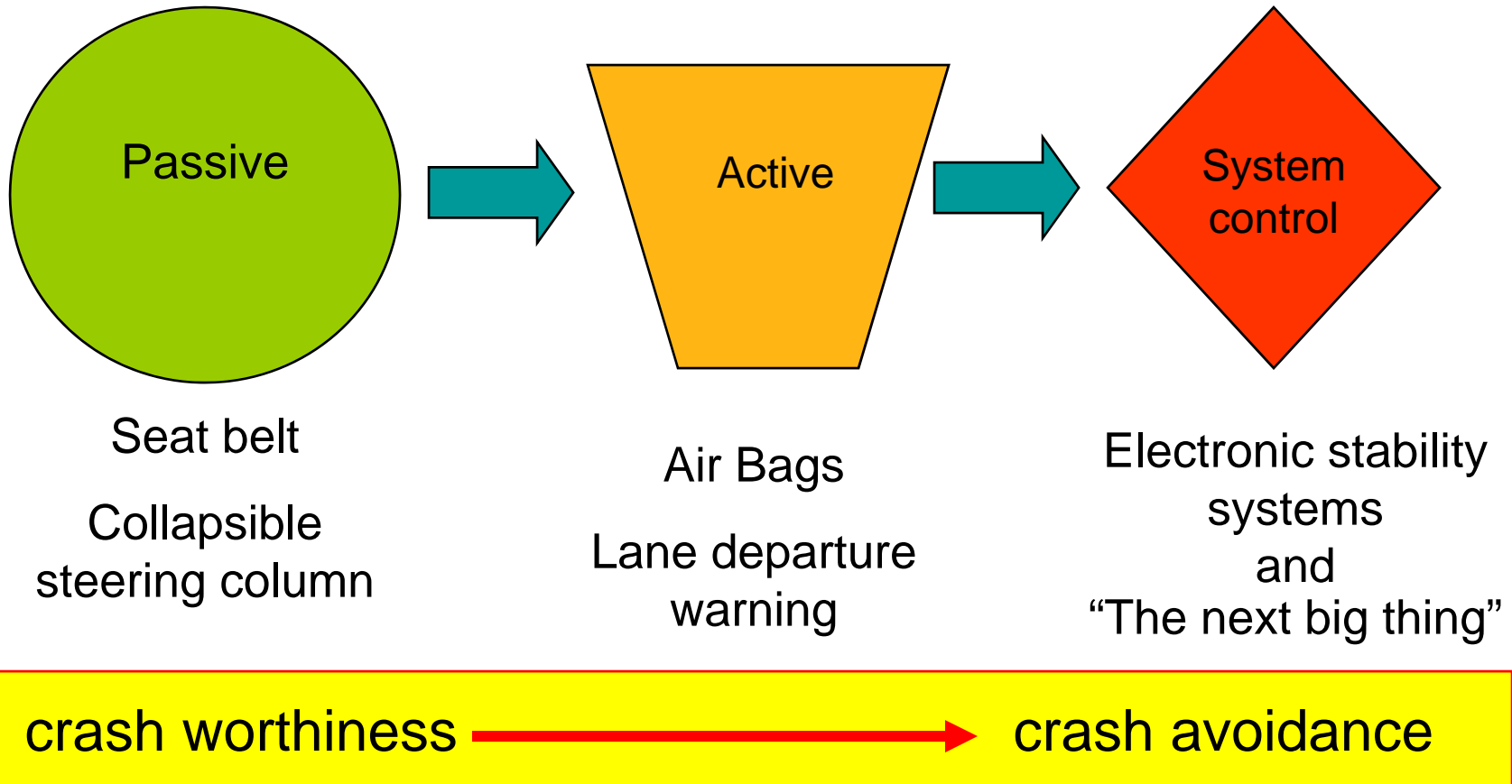
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Overview

- **Evolution of safety technologies**
- **Describing the essential elements of safety assessment**
- **Discuss technical methods of assessing performance benefits**

Evolution of Safety Innovation



How Systems are Evolving

- Private sector is a large contributor to successful innovation – Government raises the bar and ensures uniform implementation
- Future safety technologies will continue to grow in technical complexity will tend to be transparent to the driver
- New safety technologies will be difficult to predict (ESC is a good example)

Collapsible steering column

- 1968 Collapsible steering columns mandated
- 1981 NHTSA estimated columns added \$19.30 / vehicle (adjusted to 2000)
- prevented 23,000 injuries and 1,300 fatalities per year

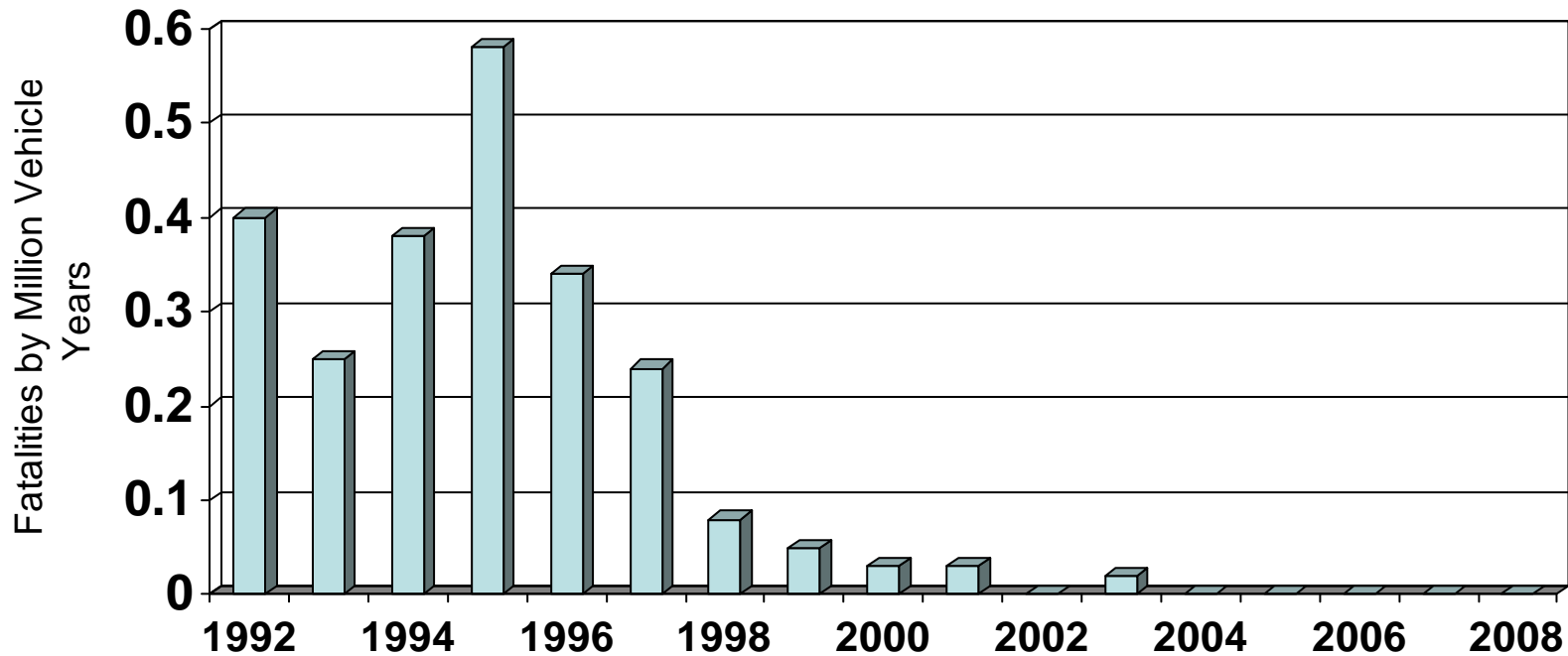
Passive Components (e.g. seat belts)

- 1956 Ford & Chrysler offer front lap belts as options
- 1958 Saab introduces seat belts as standard equipment
- 1968 passenger car seat belts are mandated
- Estimated benefit 109,000 lives saved for the period 1991-2001 (NHTSA)

Active Components (Airbags)

- 1974 GM introduces airbags as option
- 1989 airbags are mandated
- Estimated benefit 25,782 lives saved as of 2008 (NHTSA)
- Unforeseen consequences can occur and the key is how well they are addressed

Children Fatally Injured by Passenger Airbags



Source NHTSA – Jan 2008

Trends in Safety Technology

- Trend is towards crash avoidance and in-vehicle crash data capture
- Technologies are becoming more complex and highly integrated with the vehicle systems
- Supplementing driver limitations through active vehicle control offers substantial benefit
- Estimating benefits in advance of introducing the technologies is becoming more complex

Examples for Heavy Truck

- Fully integrated stability systems using GPS road maps to modify vehicle speed in advance of curves
- GPS VII systems that control approach speed to congestion
- Stunning innovative ideas that we cannot foresee

Estimating Benefits - before deployment

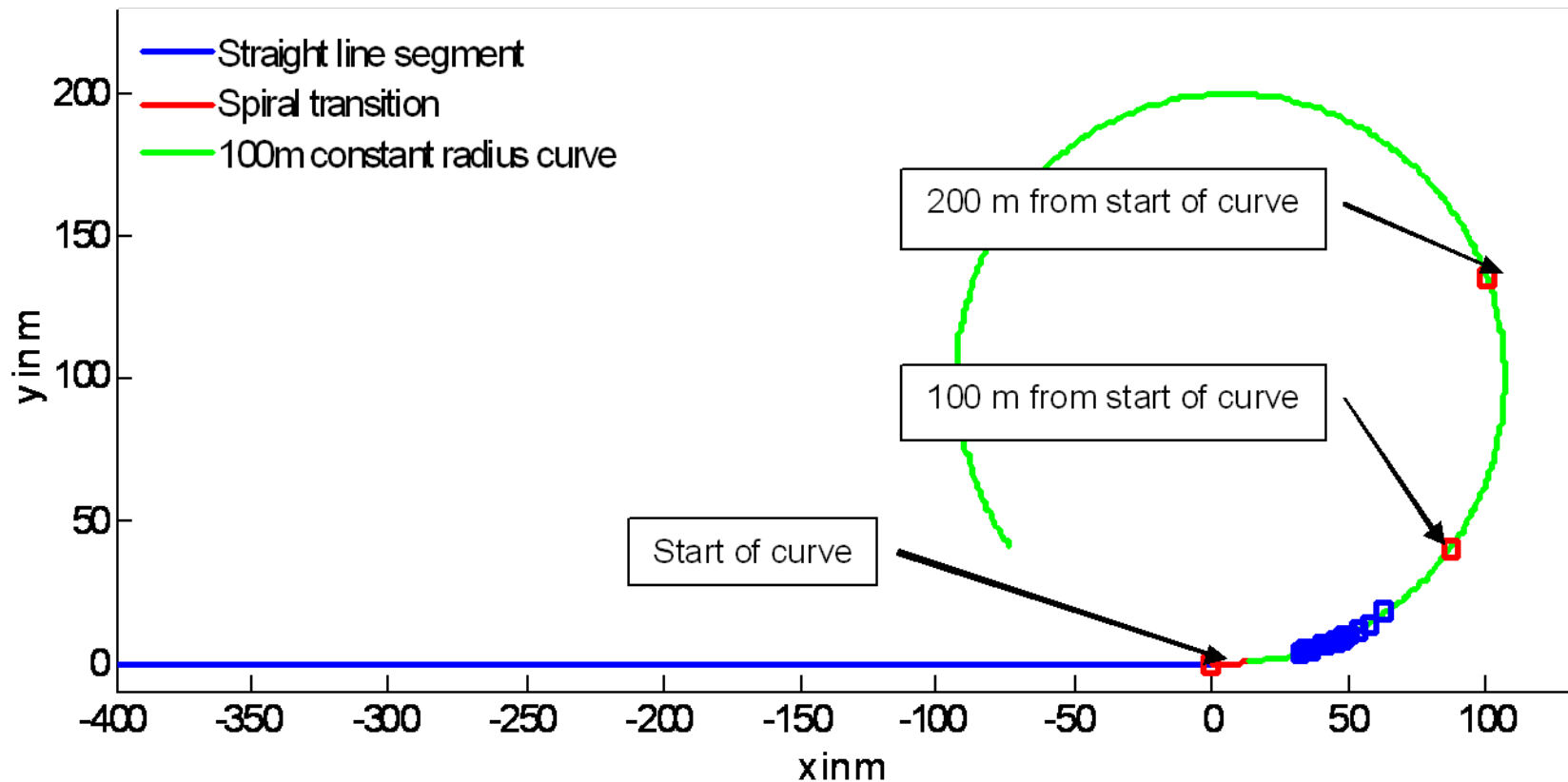
- Requires thorough understanding of the technology function and how it affects safety (highly creative process)
- The use of categorical crash data can be problematic – clinical crash analysis can help support this
- The LTCCS information database is invaluable and should be strengthened

Example – Analysis of Heavy Truck ESC Systems

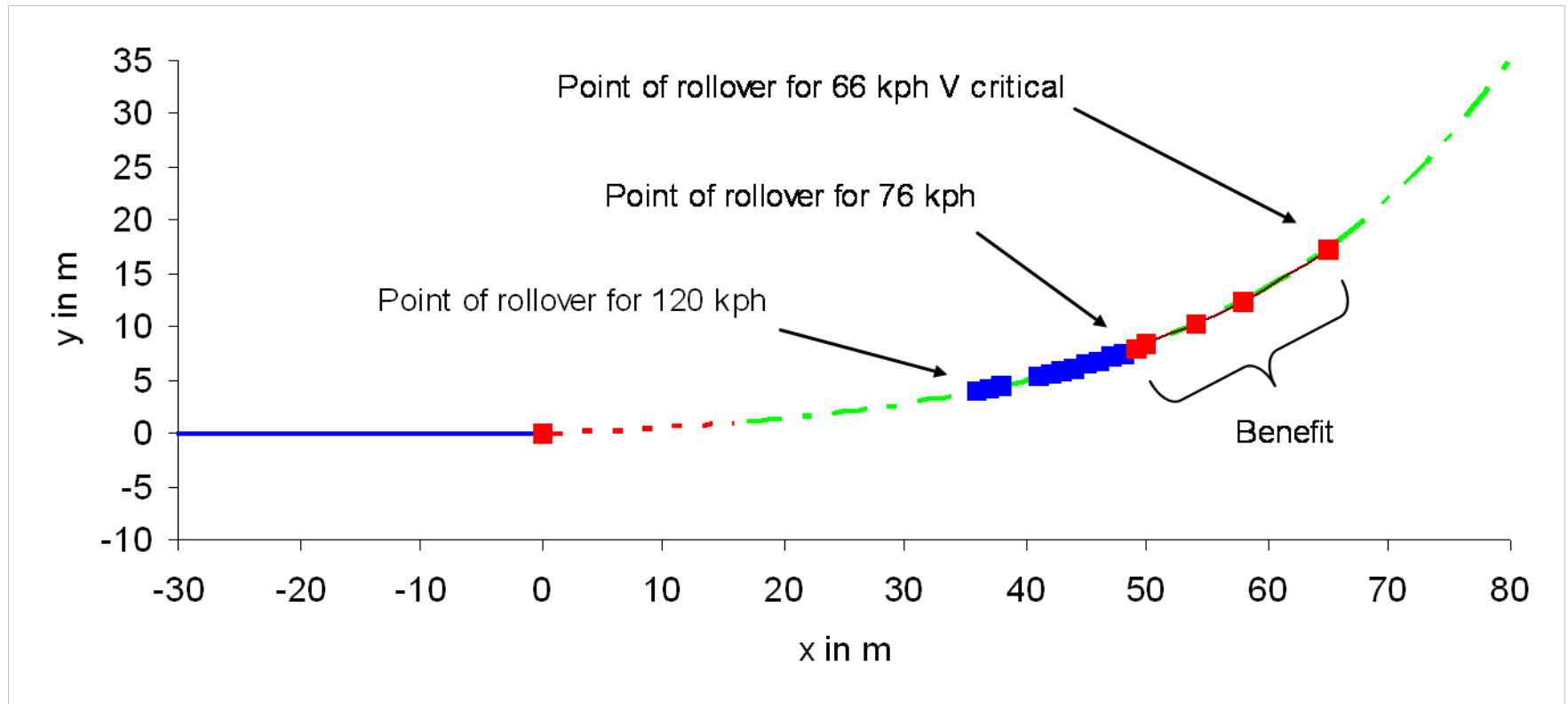
Question – How does ESC prevent rollovers in a curve?

- Simple – slows the vehicle down
- But is it really that simple.....

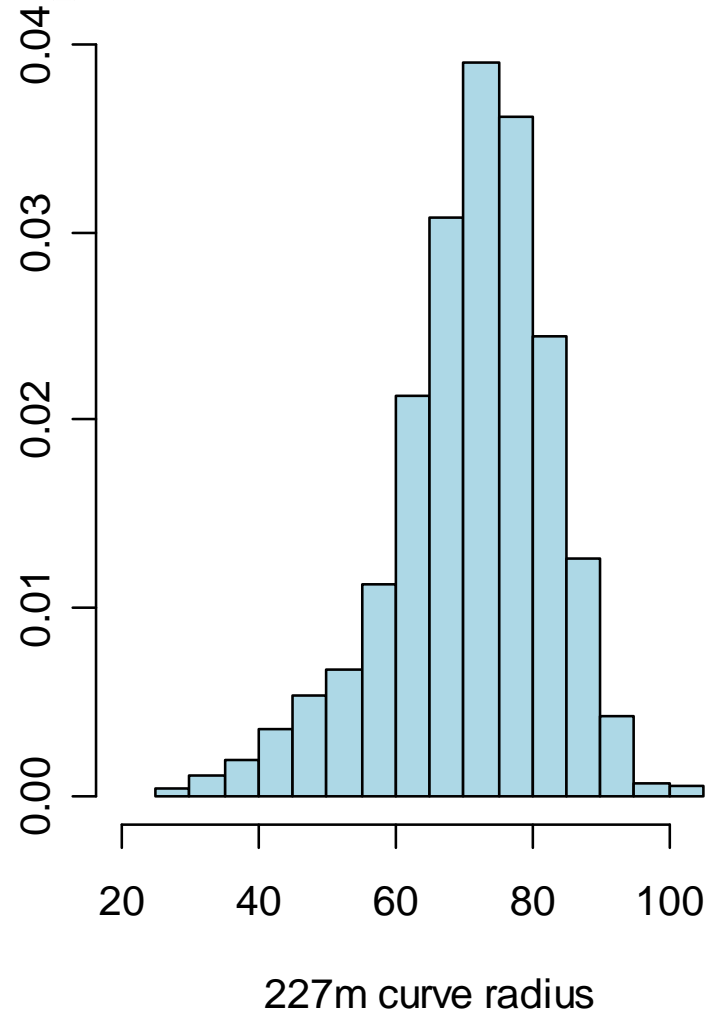
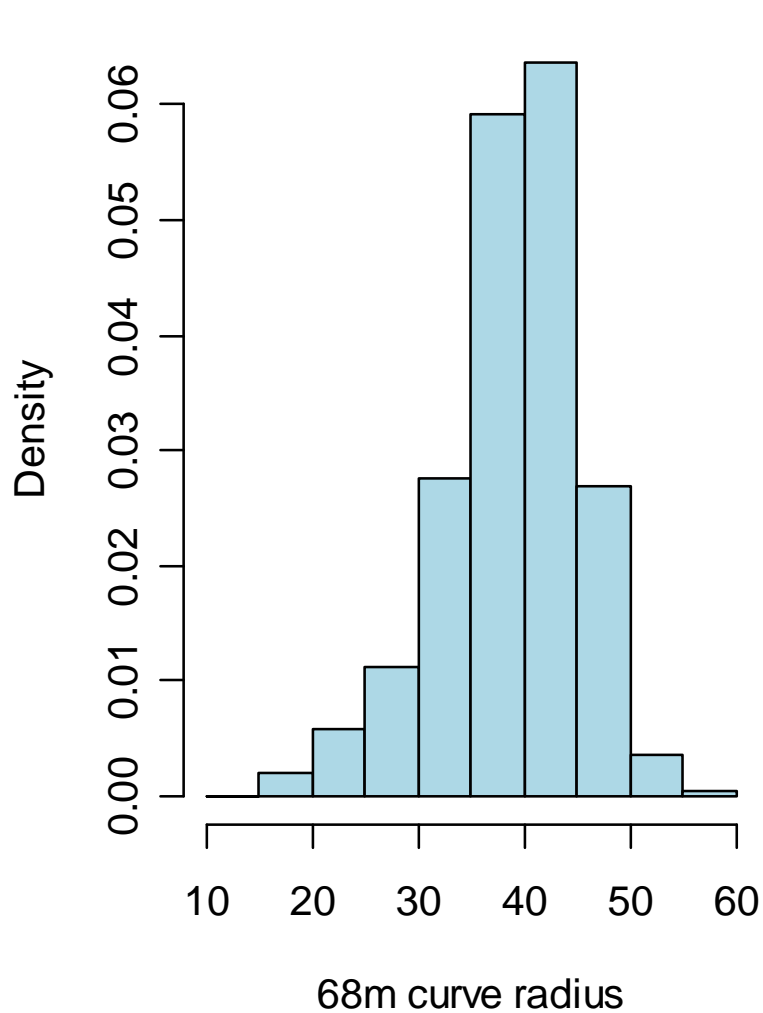
Rollover Spatial Relationship

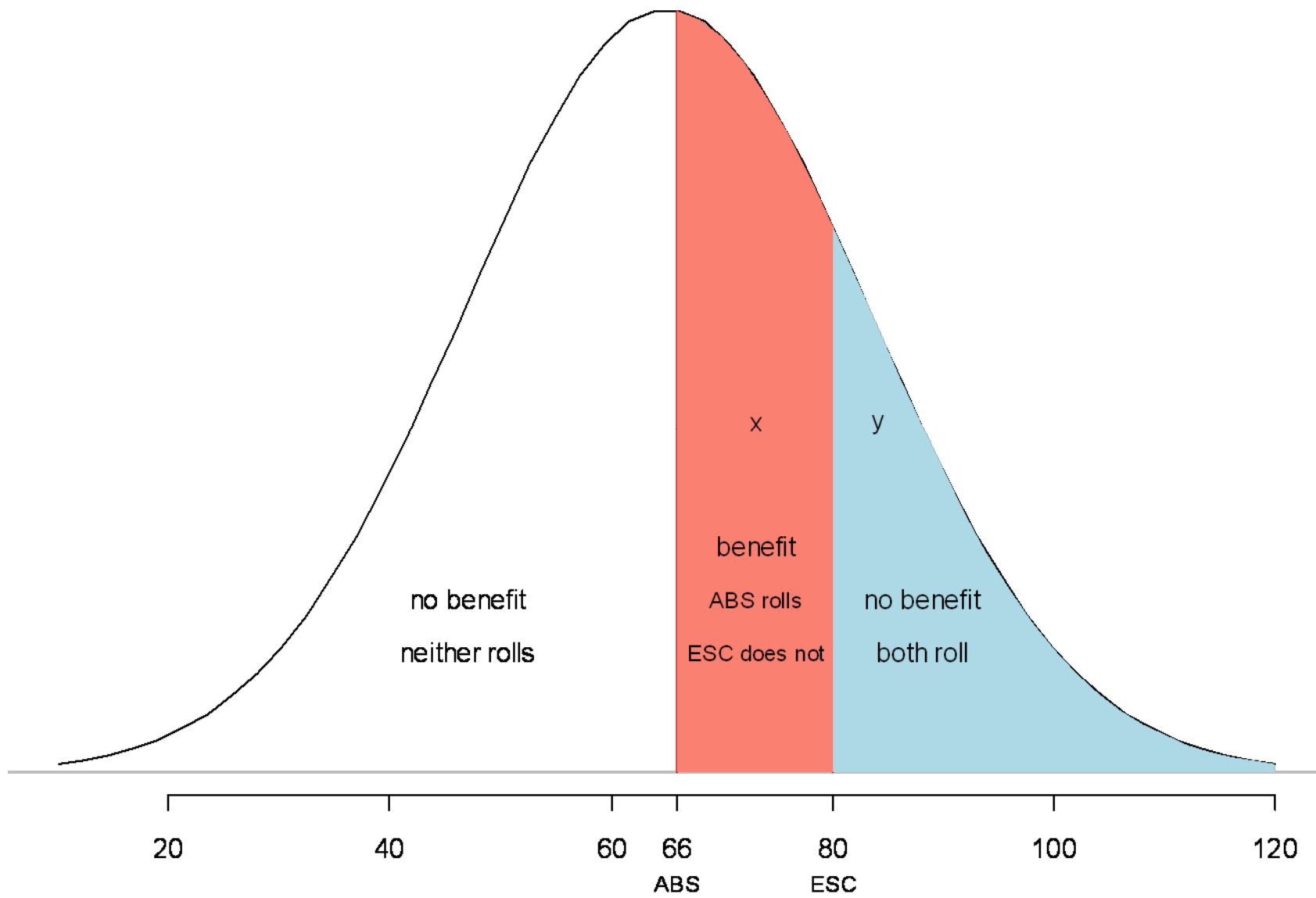


Separating Curve Entry Speeds



Using Naturalistic FOT Data to Estimate curve Entry Speed variation





Conclusions

- Evaluation of future safety systems will be ever more challenging
- Singular reliance on categorical data is not sufficient
- Engineering judgment, advance statistical methods and human factors will become increasingly critical in technology benefits assessment
- Information databases such as LTCCS and naturalistic driving are vital components in the tool box