

Strandroth Inc.

Road Safety Advice, Research and Strategy

Applying crash data chain-of-events analysis

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material's contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.

Dr Johan Strandroth

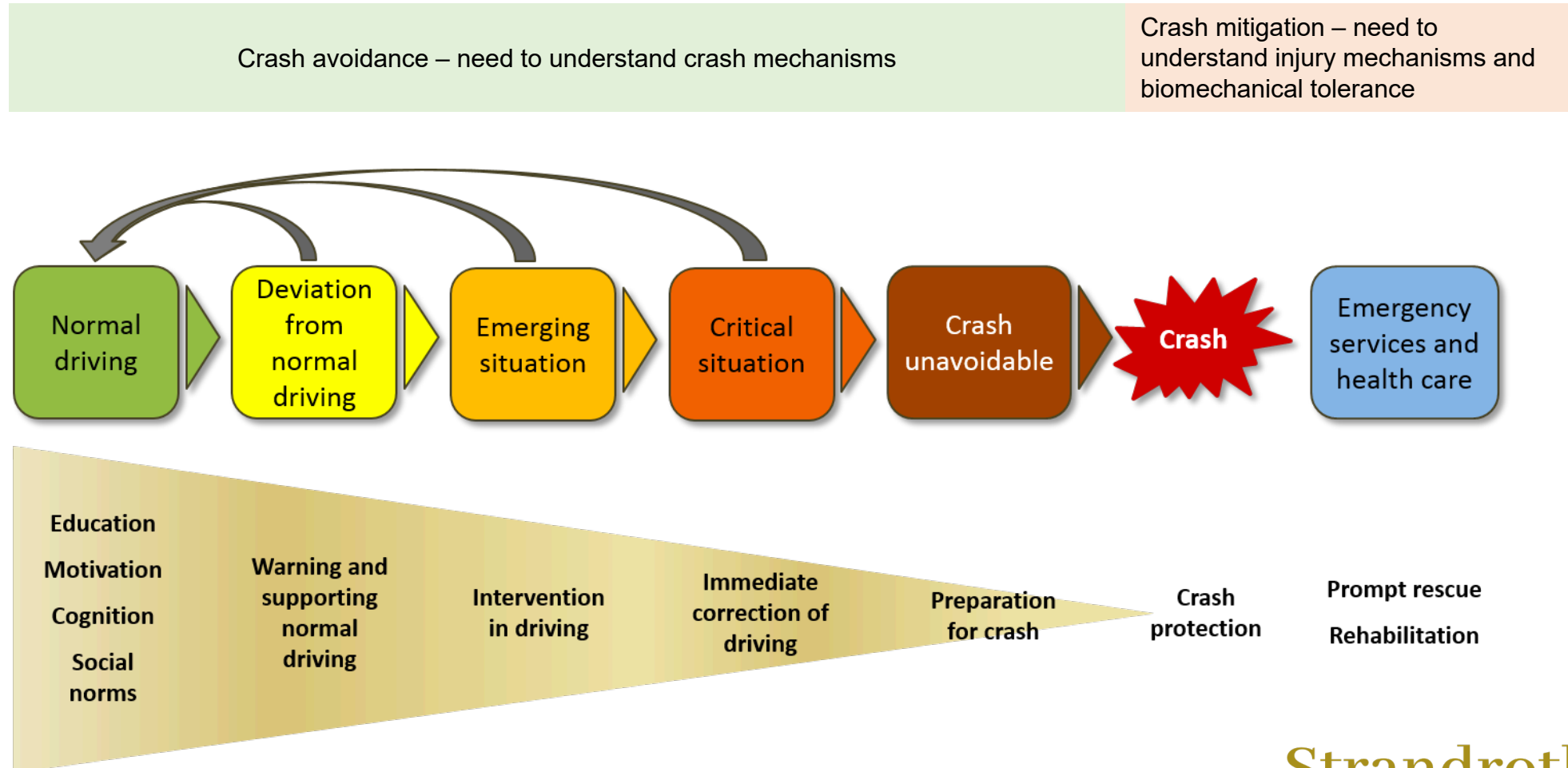
 johan@strandroth.com

 www.strandroth.com

Content

- Applying chain-of-events analysis
- Counterfactual analysis to guide interventions
- Strategic response scenarios to achieve ambitious targets

The integrated safety chain-of-events



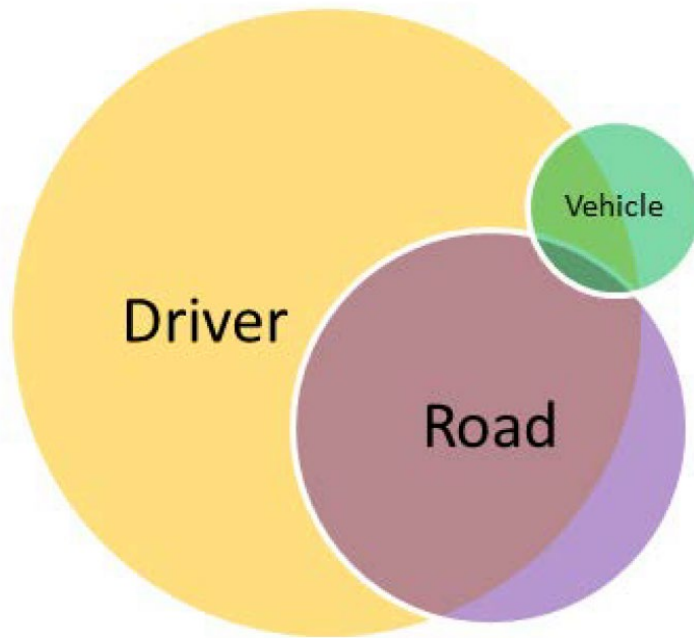
Strandroth Inc.

Road Safety Advice, Research and Strategy

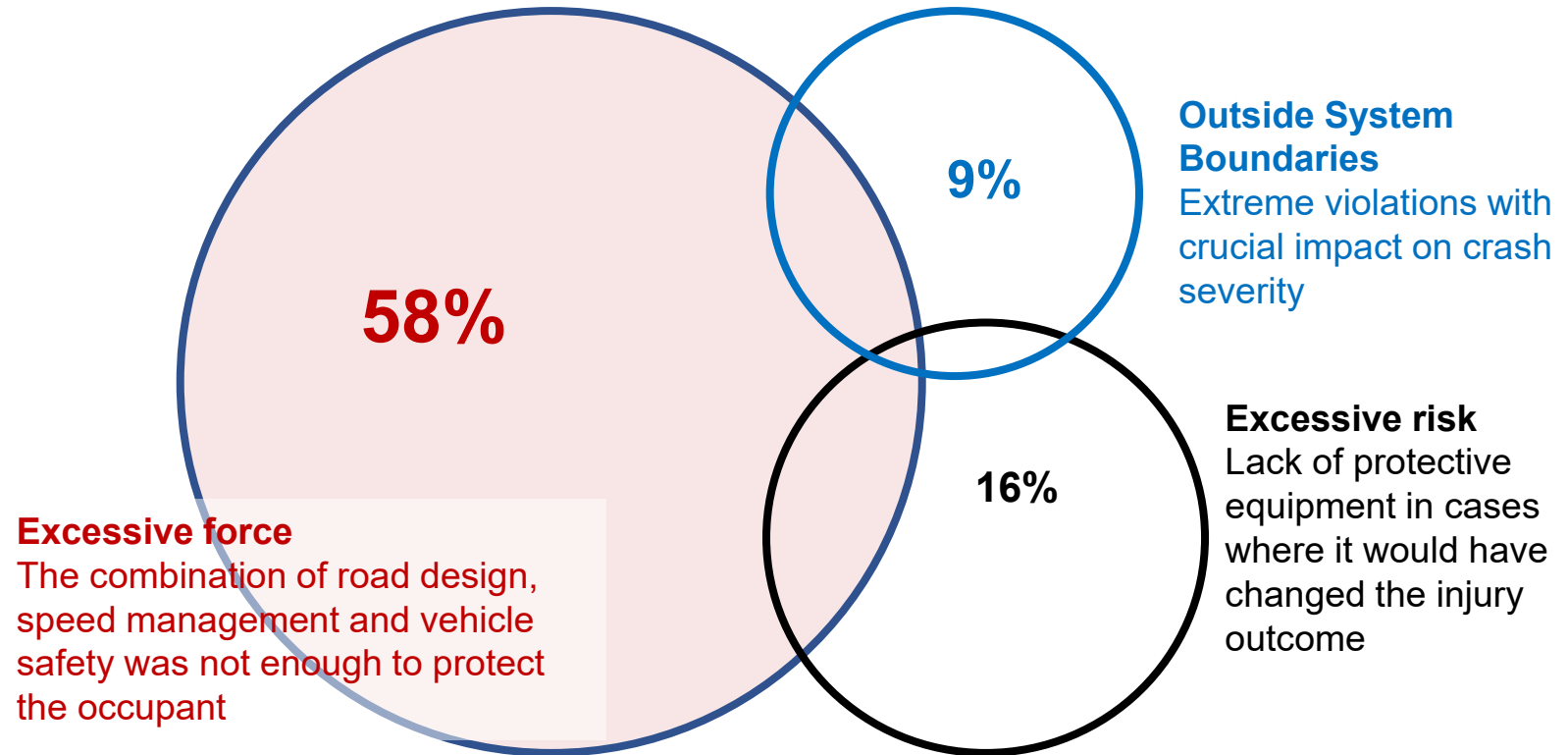
Why are people killed in road transport?

Classification of all fatal crashes in Sweden 2016-2018 (n = 840)

Traditional







Safe System



Strandroth Inc.

Safe System boundary conditions

Severe and fatal injuries

Crash Type		Impact speed
	head on	50 km/h
	side-impact	50 km/h
	side impact with tree	30 km/h
	pedestrian	20 km/h

**What analytical tools
can guide us on how
to get there from
where we are now?**

Strandroth Inc.

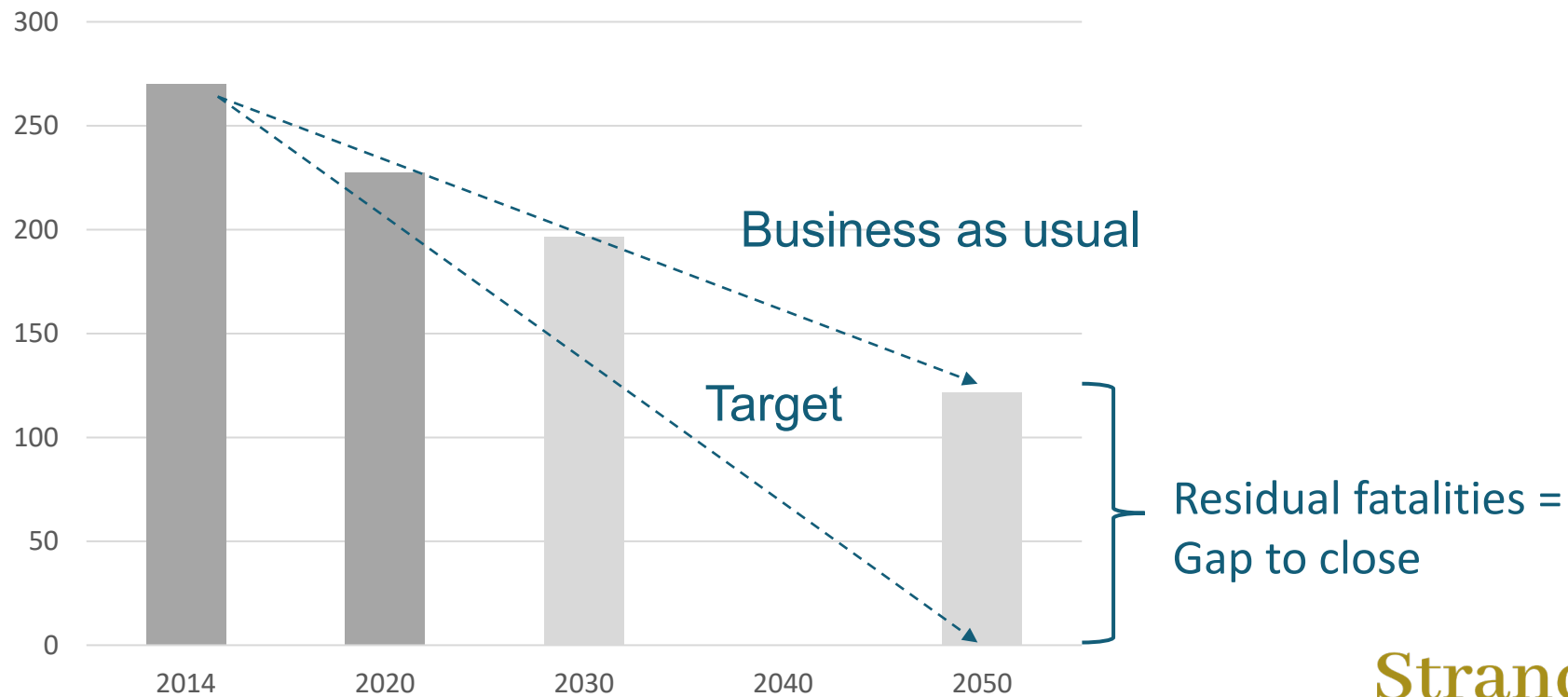
Road Safety Advice, Research and Strategy

Baseline analysis

Where do we want to be?

Where are we going in a business as usual scenario?

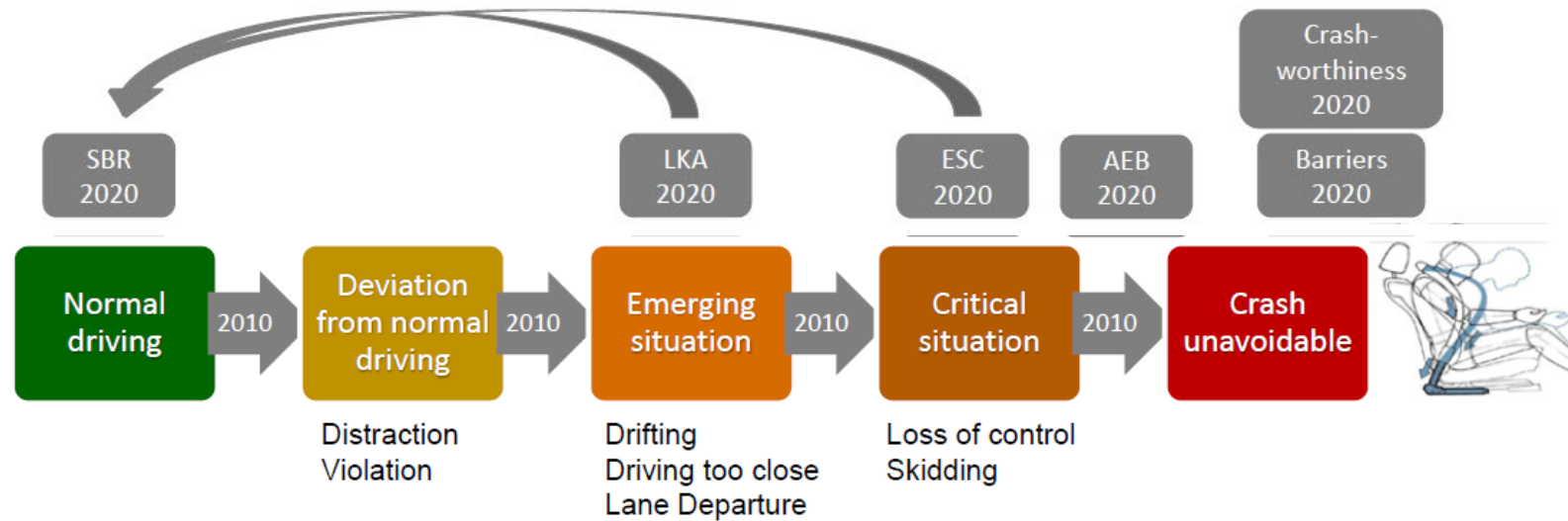
And where do we start?



Strandroth Inc.

Road Safety Advice, Research and Strategy

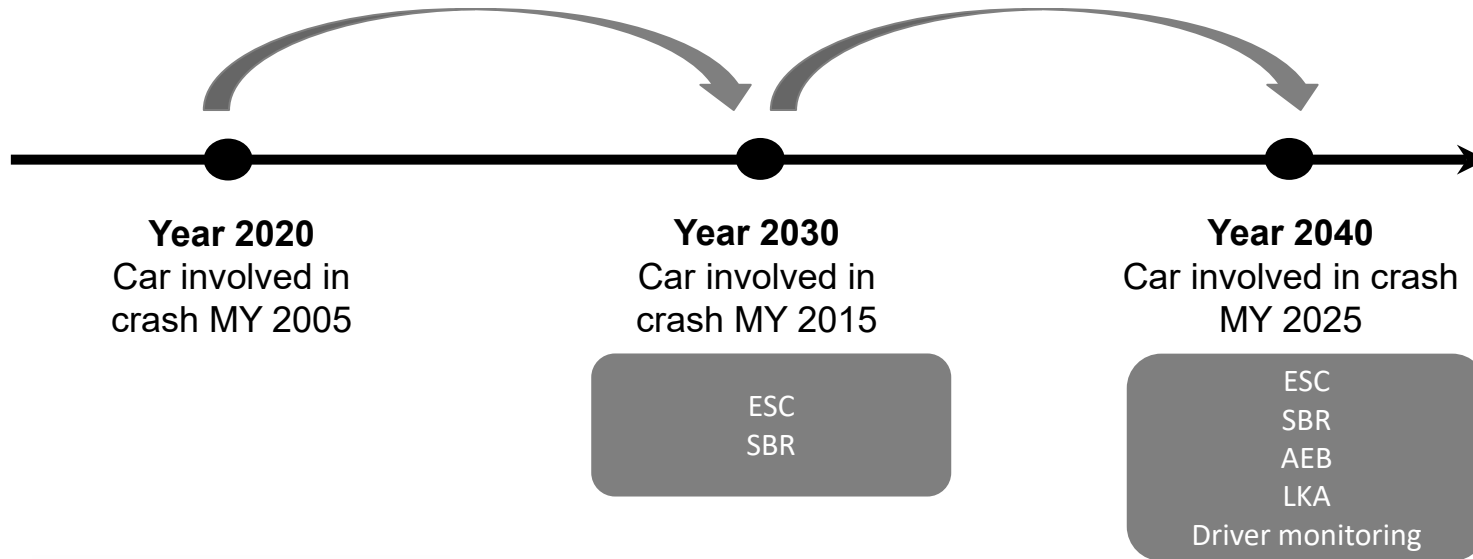
Chain of event analysis



Strandroth Inc.

Road Safety Advice, Research and Strategy

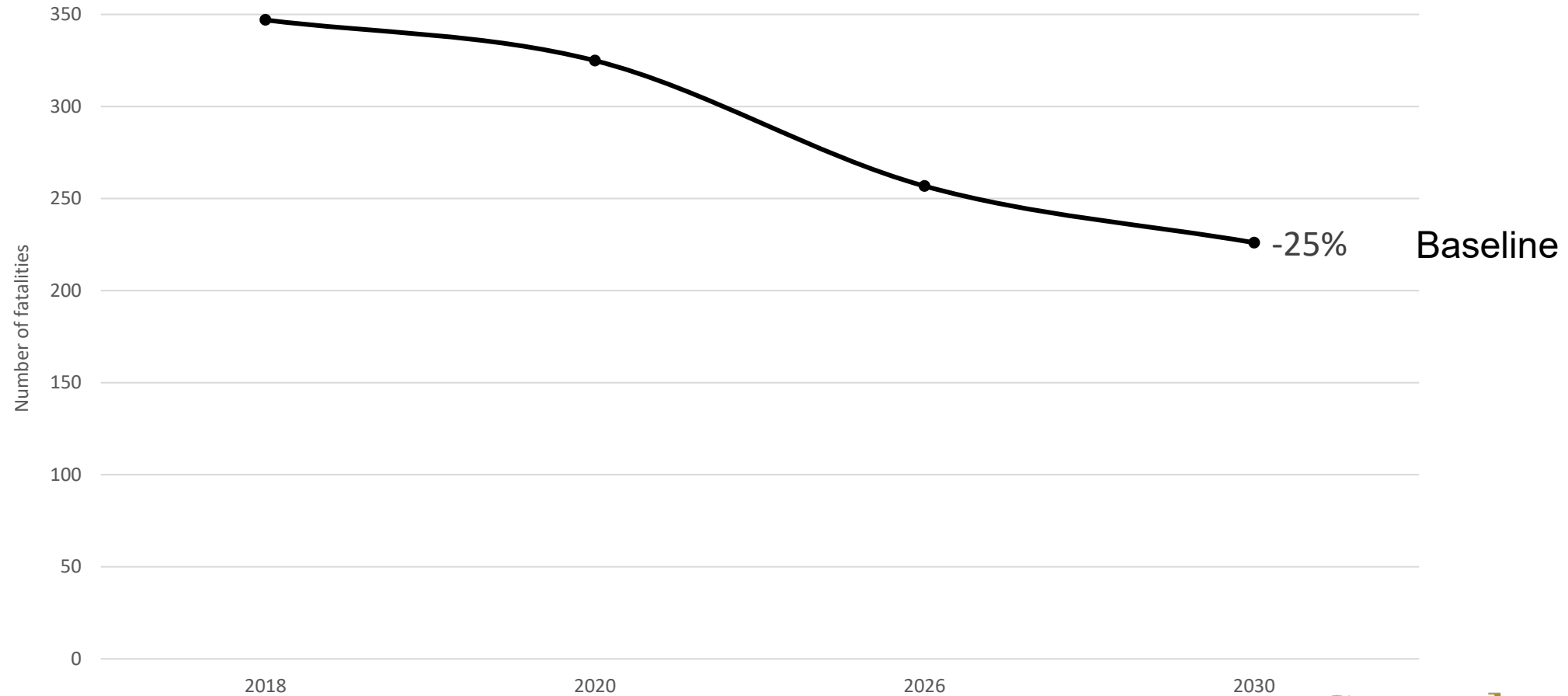
Chain-of-event analysis



Strandroth Inc.

Road Safety Advice, Research and Strategy

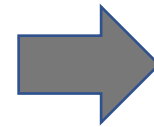
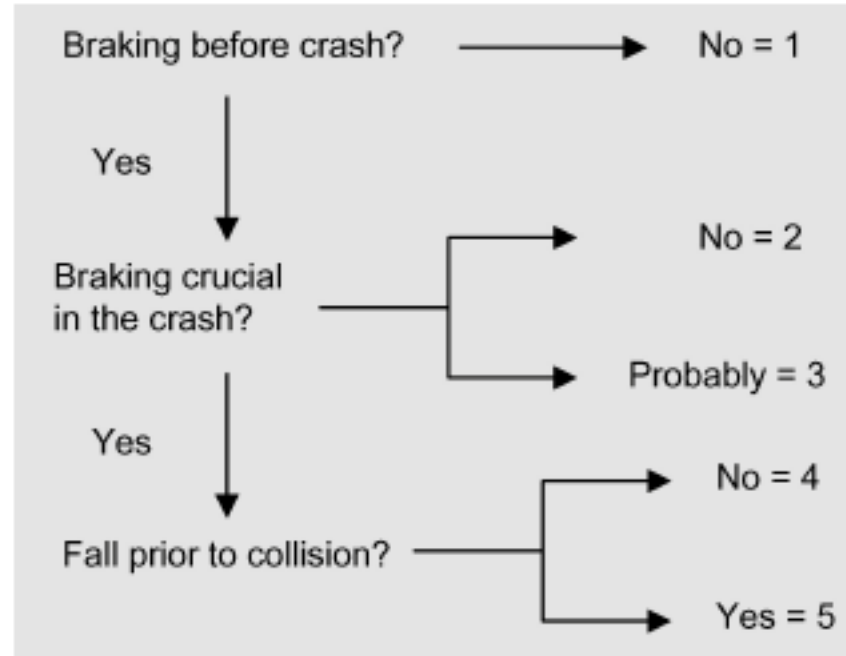
Baseline scenario



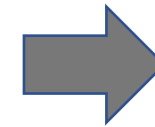
Strandroth Inc.

Road Safety Advice, Research and Strategy

Counterfactual analysis using chain-of-event analysis



In-depth analysis:
2/3 fatal crashes with motorcycles involve braking where ABS could have made a difference



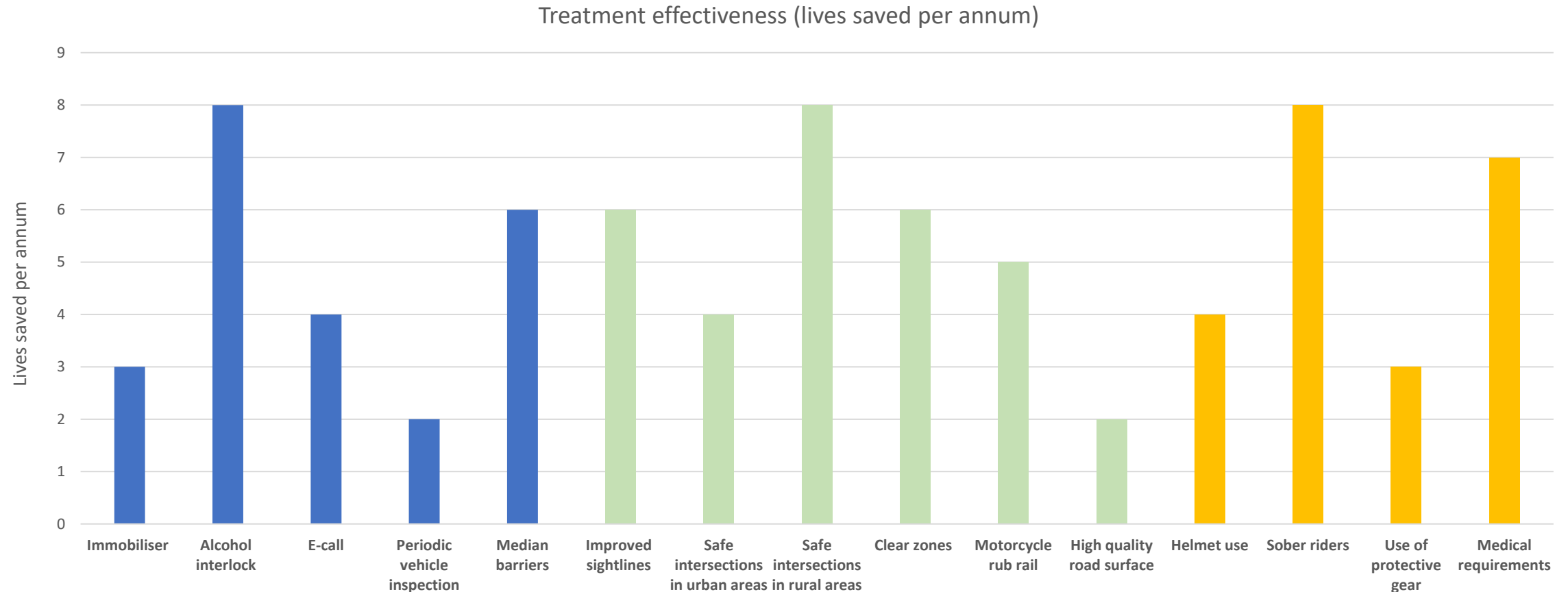
Statistical study: The overall effectiveness of ABS in Sweden was 48 percent on severe and fatal crashes.

Strandroth Inc.

Road Safety Advice, Research and Strategy

Counterfactual analysis using in-depth crash investigations

Potential benefits of motorcycle safety measures in Sweden



Strandroth Inc.

Road Safety Advice, Research and Strategy

Combined system benefits

~ 95 % injury reduction



Speed management

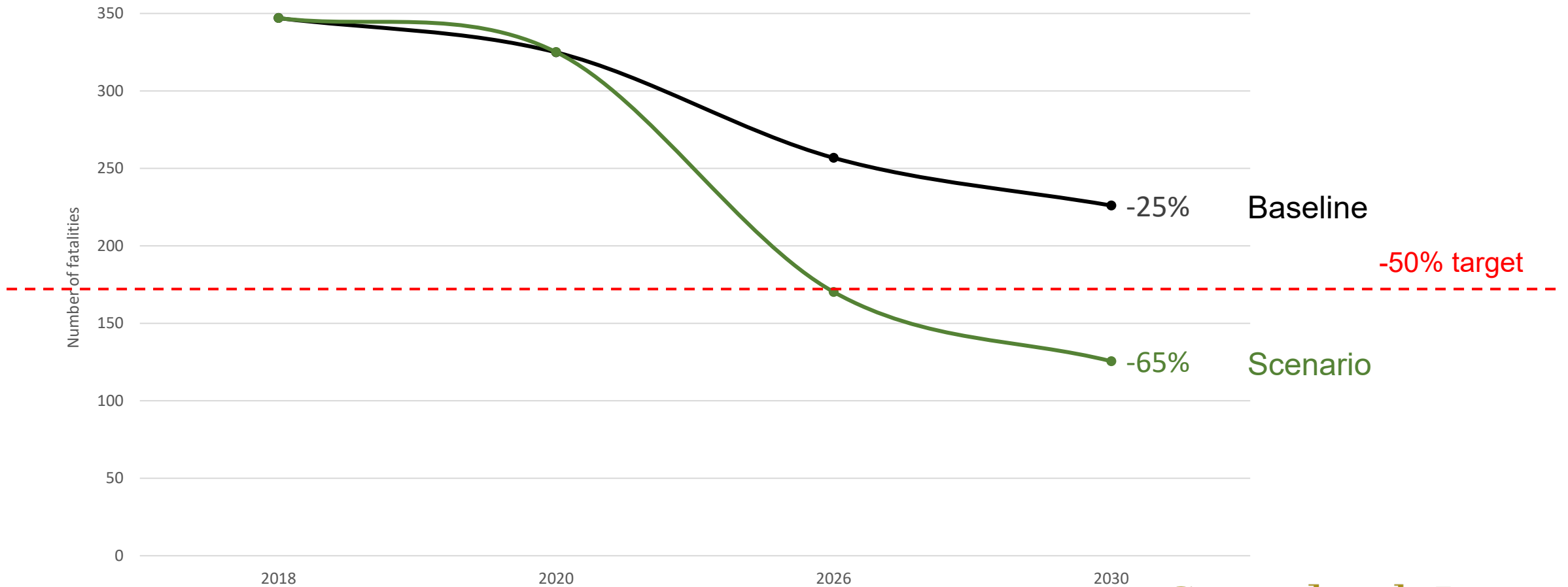


Autonomous Emergency Braking
and pedestrian protection



Protective clothing

Combined benefits for 2030 scenario



Strandroth Inc.

Road Safety Advice, Research and Strategy

Counterfactual analysis using in-depth crash investigations

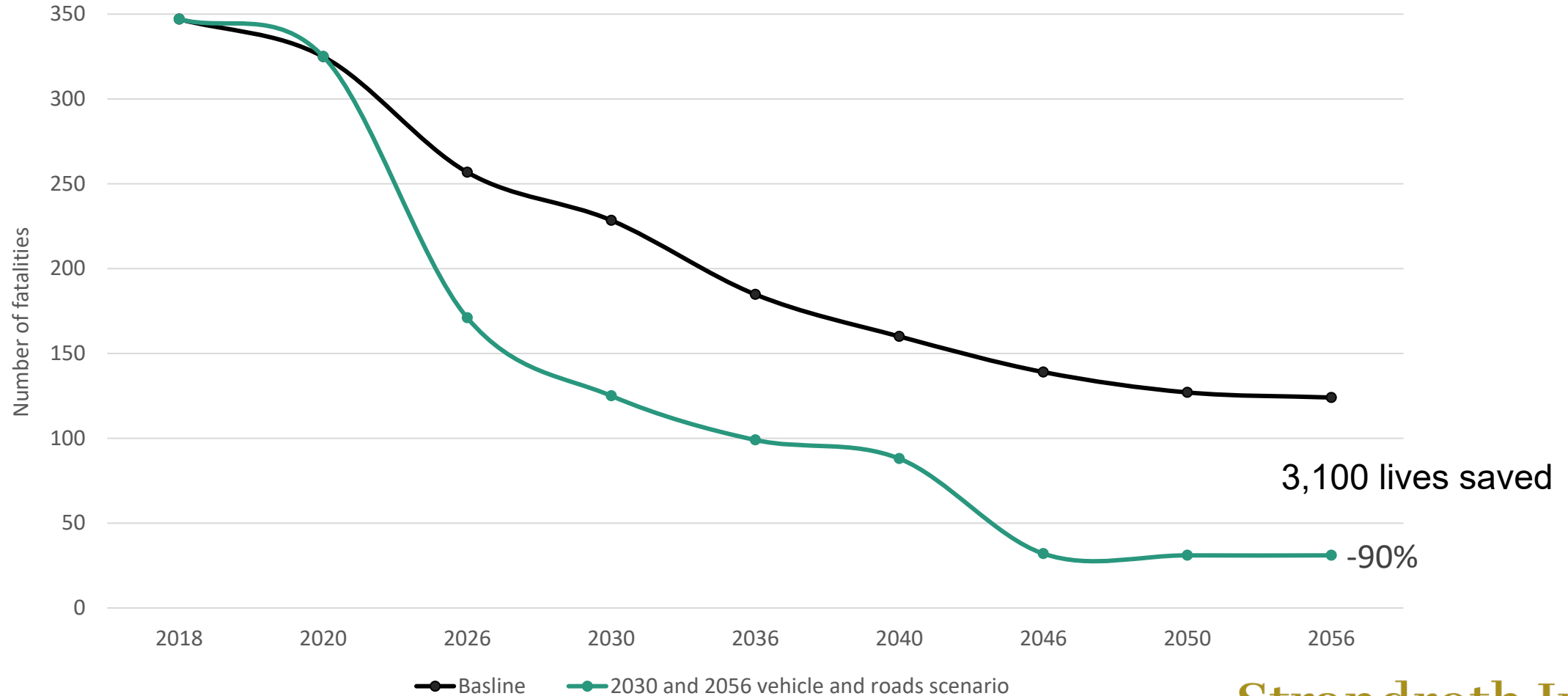
Performance Indicators to achieve interim targets

Performance Indicators	Lives saved at 100%	Current	Target	Effect
Share of new motorcycles sold with ABS	21	30%	98%	15
Motorcyclists speed compliance on arterial roads	11	?	80%	6
Motorcyclists speed compliance on municipality roads	4	?	80%	2,5
Share of safe intersections on the arterial road network	4	?	50%	2
Share of motorcycle friendly barriers on the arterial road network	5	0%	50%	2,5
Share of guard rails in curves fitted with motorcycle run rail	2	0%	50%	1
Total (number of lives saved)	47			29
Corrected for double counting	28			17
Target 50% reduction				26

Strandroth Inc.

Road Safety Advice, Research and Strategy

A Vision Zero scenario



Strandroth Inc.

Road Safety Advice, Research and Strategy

Residual fatalities



31 residual fatalities 2050

- 7 bicycle single, helmet no effect, average age 75 years
- 4 head-on, 80 km/h, HGV, overtaking
- 3 pedestrians, back-over
- 2 ATV single
- 4 pedestrians at highways
- 2 single MC against guardrails
- 2 pedestrians run over by their own car
- 2 elderly car occupants, side collisions
- 2 fatalities with agriculture vehicles
- 3 others

Strandroth Inc.

Road Safety Advice, Research and Strategy

Recommendation

- Apply in-depth chain-of-event analysis to:
 - Classify fatal and severe injury outcomes to guide decision makers on how to improve the road transport system
 - Investigate the individual and combined effect of road safety interventions
 - Guide the development of evidence based road safety strategy and action plans to achieve ambitious targets