

# Strandroth Inc.

Road Safety Advice, Research and Strategy

## Human Impact: What In-Depth Analysis of Crashes Tells Us

Dr Johan Strandroth

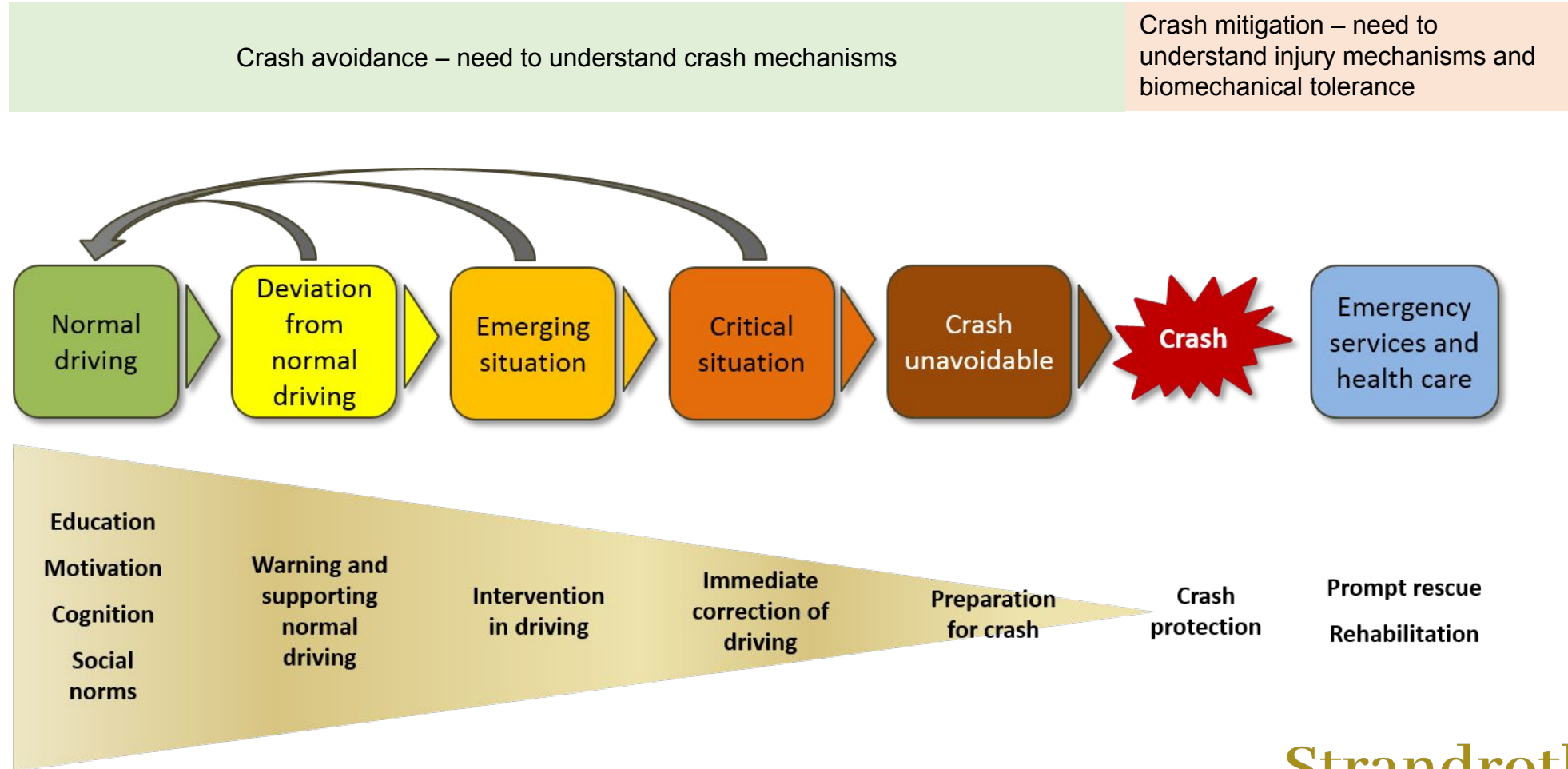
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# Content

- First principle crash avoidance and injury mitigation
- Counterfactual analysis
- Local validation of Safe System boundaries and end states

# First principle crash avoidance and injury mitigation



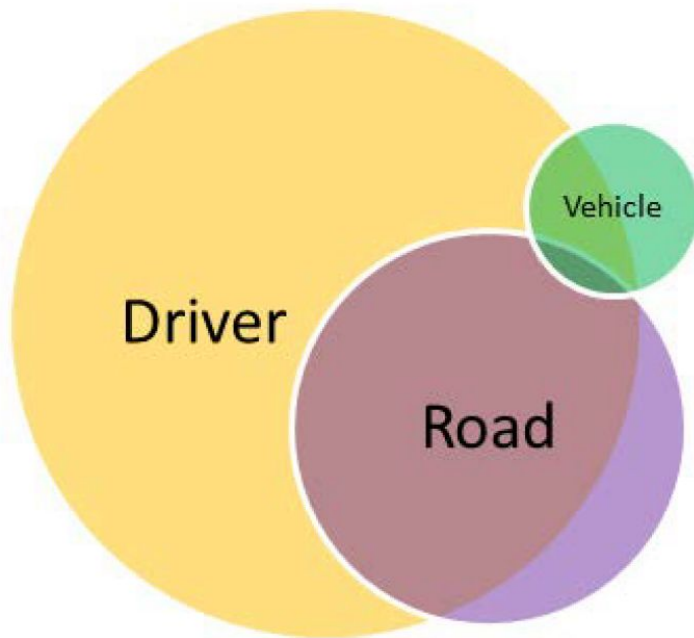
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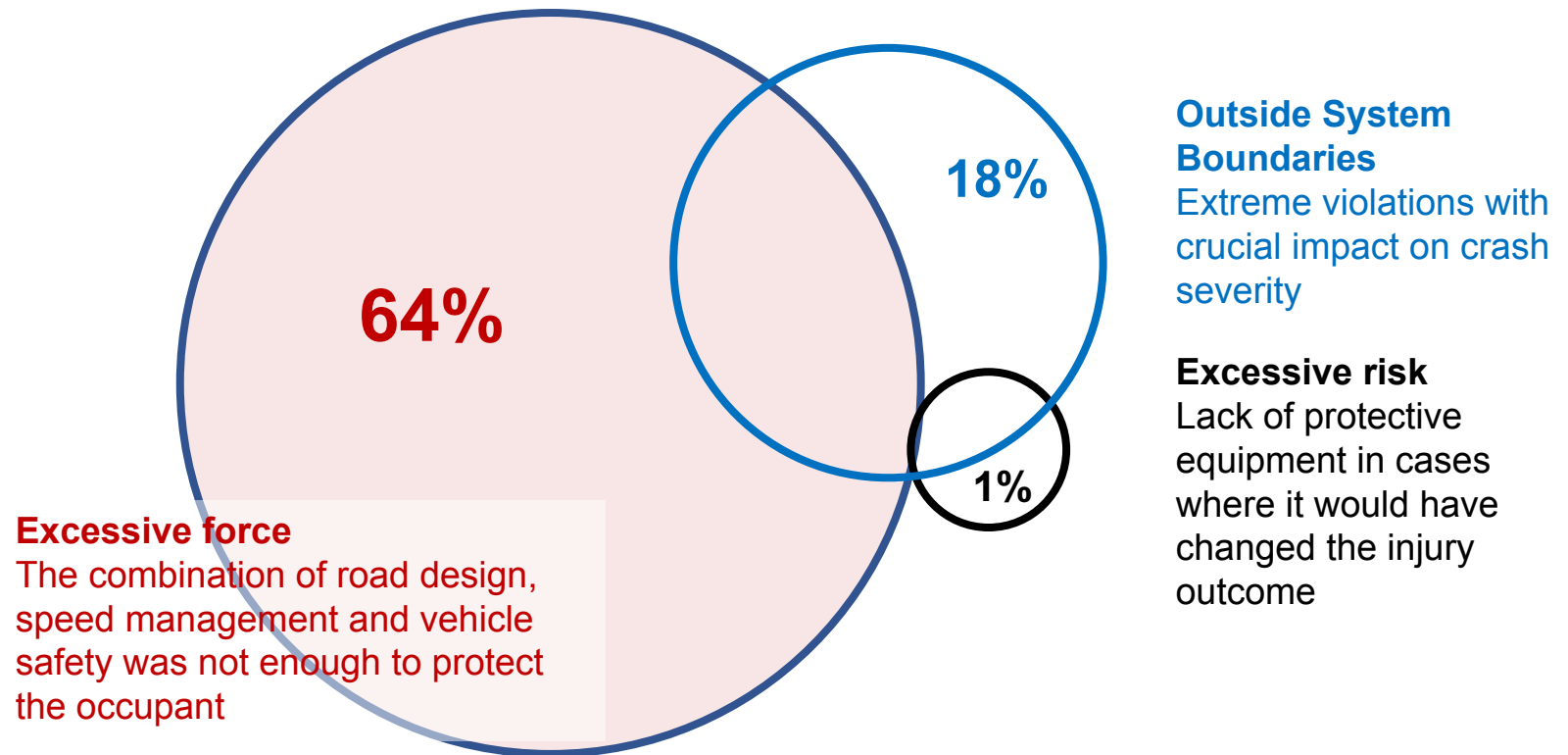
# First principle crash avoidance and injury mitigation

Classification of all fatal motorcycle crashes in Sweden 2016-2018 (n = 163)

Traditional

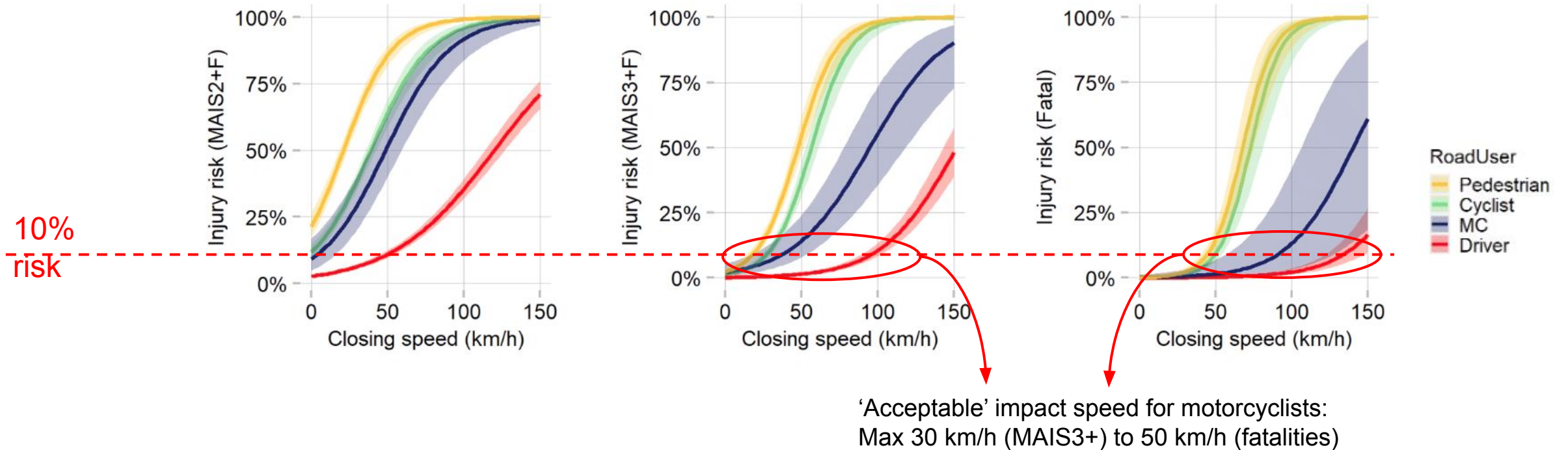


Safe System



# First principle crash avoidance and injury mitigation

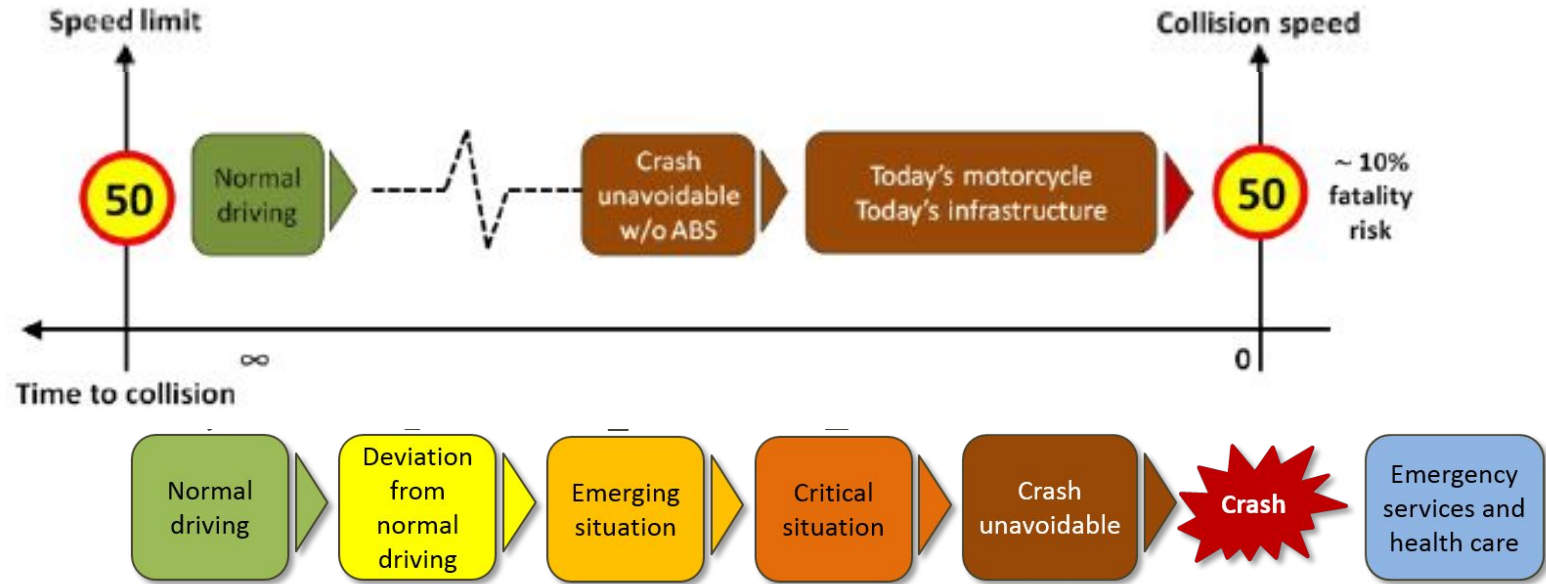
## Human biomechanical tolerance



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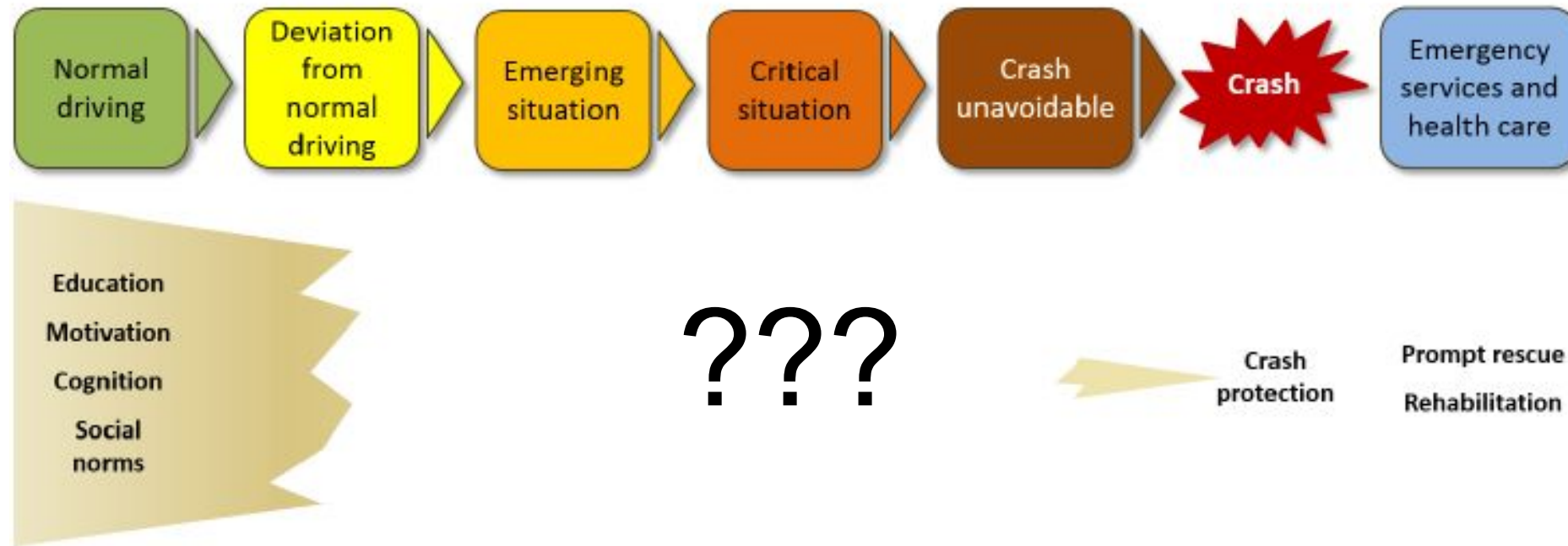
# First principle crash avoidance and injury mitigation



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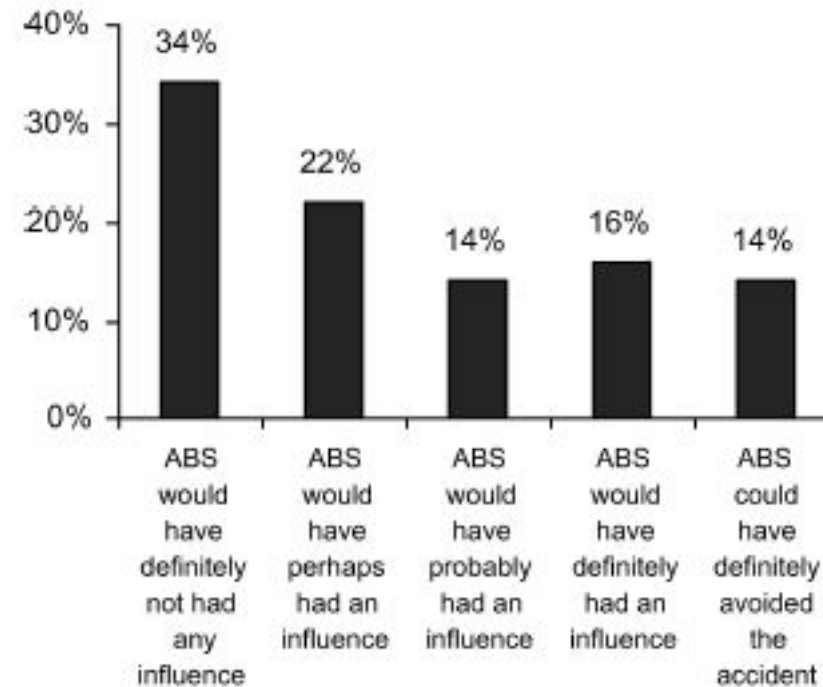
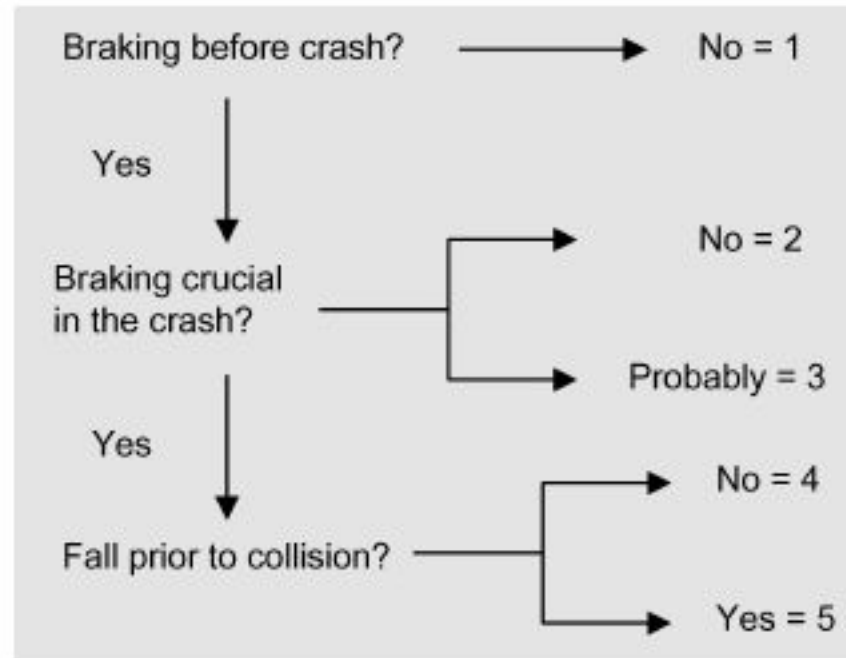
# First principle crash avoidance and injury mitigation



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# Counterfactual analysis using in-depth crash investigations



**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.

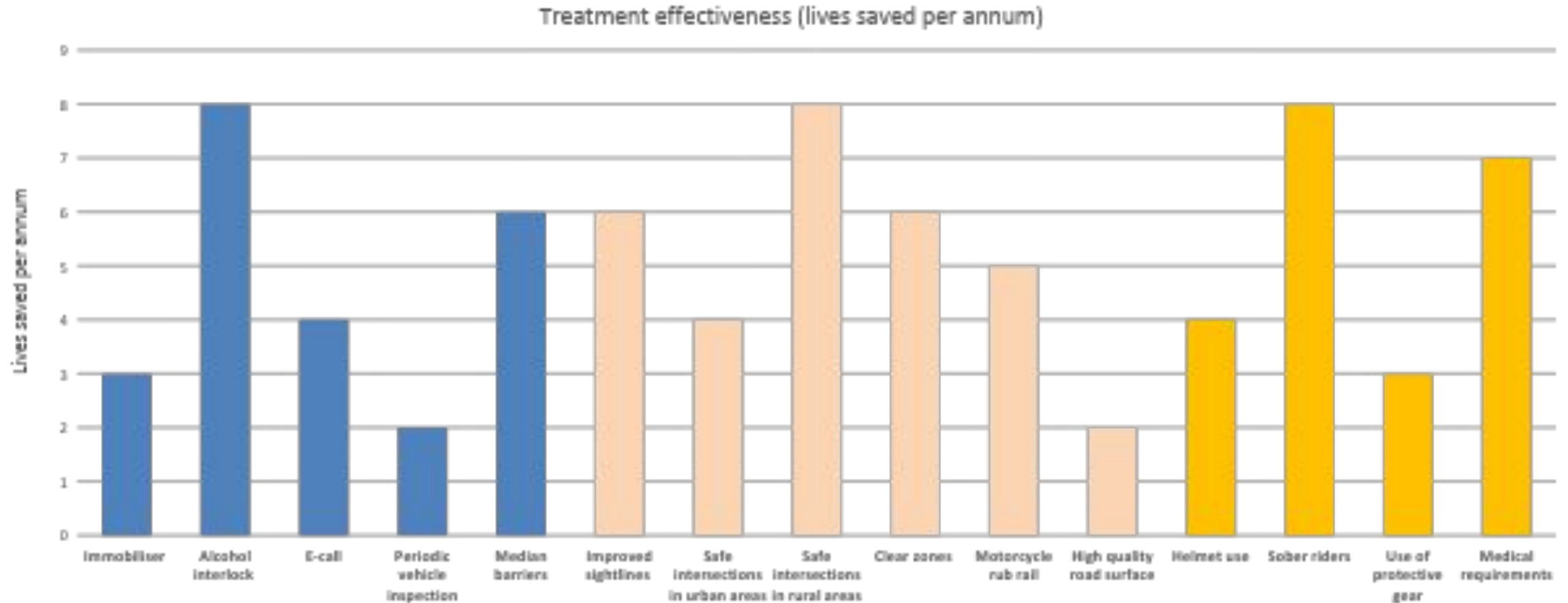
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# Counterfactual analysis using in-depth crash investigations

Potential benefits of motorcycle safety measures in Sweden



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# Counterfactual analysis using in-depth crash investigations

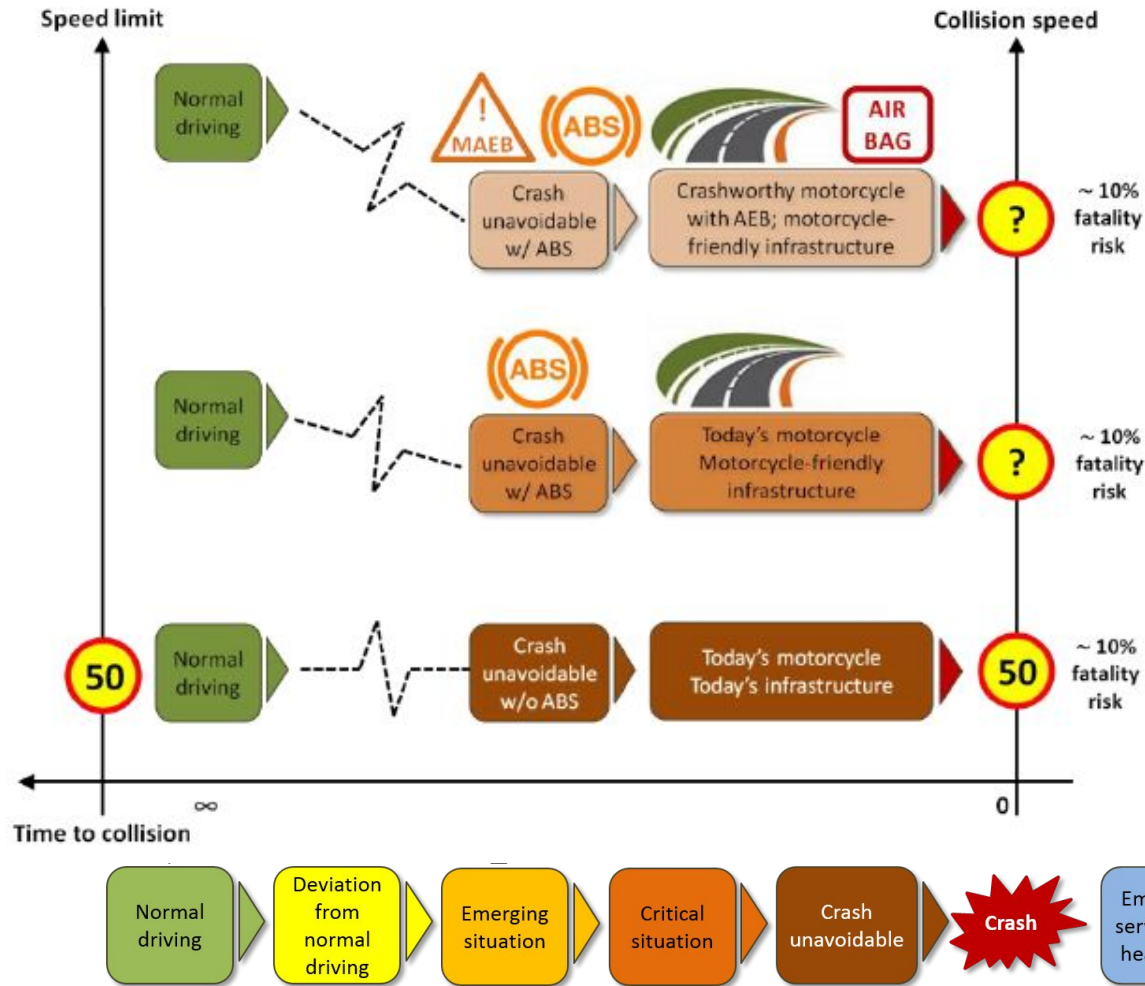
## Performance Indicators to achieve interim targets

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
<b>Total (number of lives saved)</b>	<b>47</b>			<b>29</b>
<b>Corrected for double counting</b>	<b>28</b>			<b>17</b>
<b>Target 50% reduction</b>				<b>26</b>

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# A conceptual Safe System for motorcycles



Safe System end state validation in Sweden:

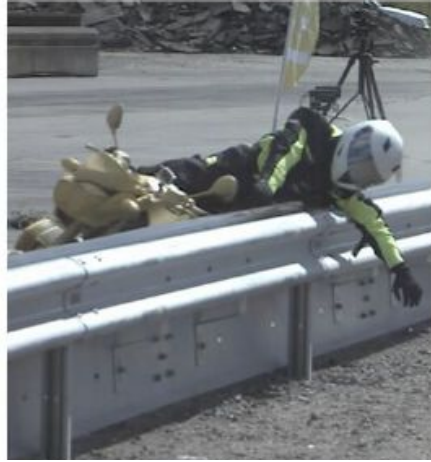
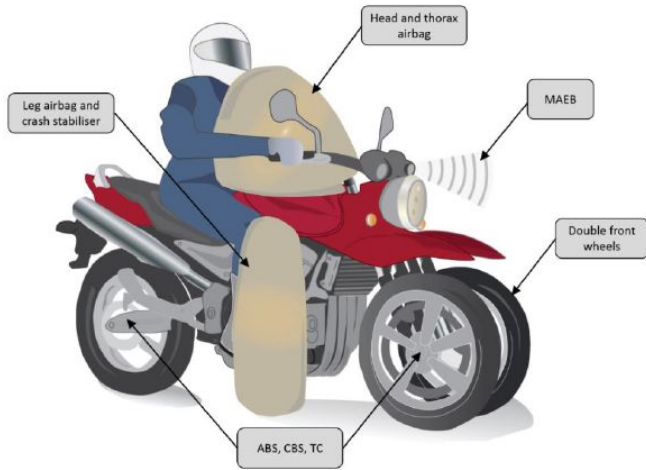
5 motorcycle fatalities per annum  
→ 90% reduction

Baseline: 40 fatalities per annum

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# A conceptual Safe System for motorcycles



Safe System end state validation in Sweden:

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# Context sensitive implementation

## Types of PTW



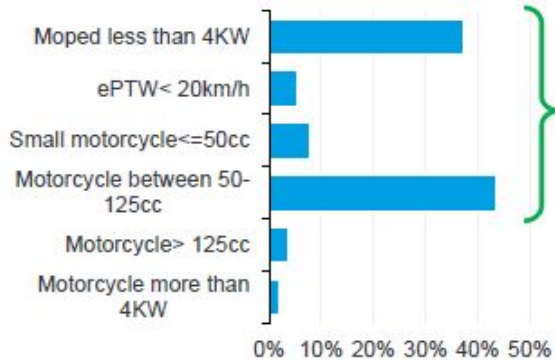
CIDAS



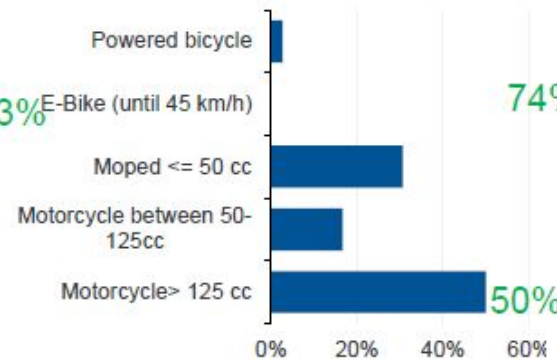
GIDAS



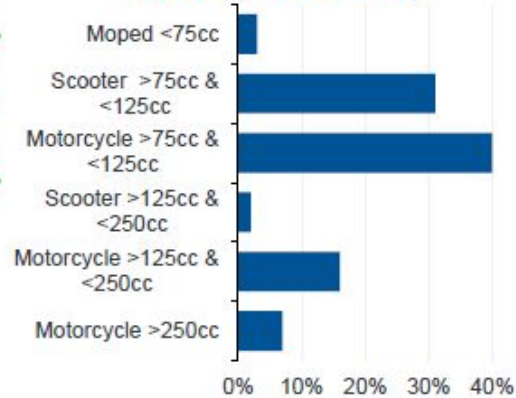
RASSI (n=2575879)



93%



74%



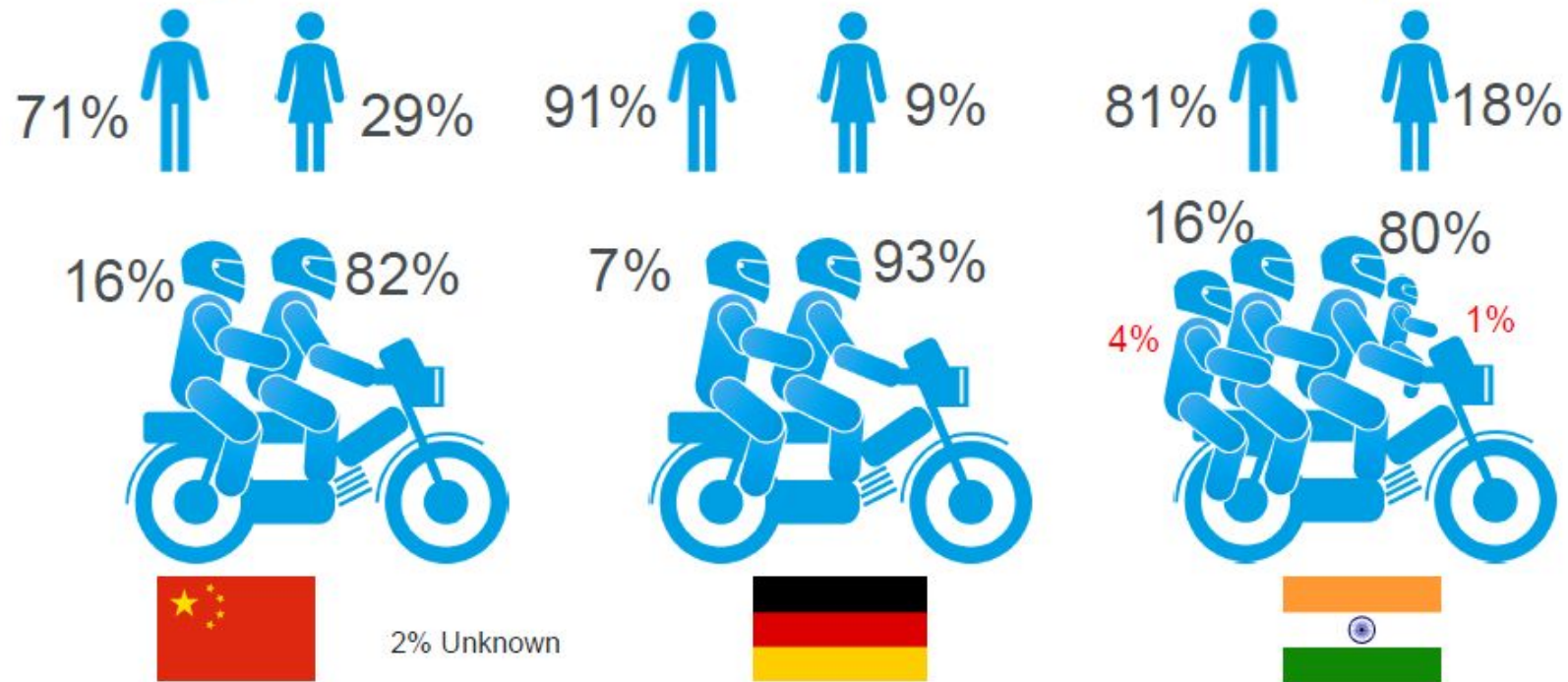
- India & China → Less powered PTW → Daily commute for transport/daily needs
- Germany → More of high powered PTW → Recreational use

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# Context sensitive implementation

## Seating Position & Gender distribution – PTW occupants



Mostly males as riders, In India, often try to accommodate full family (not necessarily helmeted!!)

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# Recommendations

- Develop an evidence based Safe System end state for motorcycles that takes regional mobility needs into account
- Validate the Safe System end state for local conditions using in-depth analysis of fatal and serious motorcycle crashes