Strandroth Inc.

Road Safety Advice, Research and Strategy

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



www.strandroth.com

Dr Johan Strandroth

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



Rizzi M. (2016) Towards a Safe System Approach to Prevent Health Loss among Motorcyclists - The Importance of Motorcycle Stability as a Condition for Integrated Safety

First principle crash avoidance and injury mitigation Classification of all fatal motorcycle crashes in Sweden 2016-2018 (n = 163)



Adapted from Kimber (2003)

Source: Swedish Transport Administration

First principle crash avoidance and injury mitigation Human biomechanical tolerance



'Acceptable' impact speed for motorcyclists: Max 30 km/h (MAIS3+) to 50 km/h (fatalities)

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Adapted from: Lubbe, N., Wu, Y., & Jeppsson, H. (2022). Safe speeds: fatality and injury risks of pedestrians, cyclists, motorcyclists, and car drivers impacting the front of another passenger car as a function of closing speed and age. *Traffic Safety Research*, 2, 000006-000006.

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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Rizzi, Matteo, Strandroth, Johan and Tingvall, Claes(2009)'The Effectiveness of Antilock Brake Systems on Motorcycles in Reducing Real-Life Crashes and Injuries', Traffic Injury Prevention, 10:5,479 — 487

Counterfactual analysis using in-depth crash investigations

Potential benefits of motorcycle safety measures in Sweden

Treatment effectiveness (lives saved per annum)



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

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A conseptual Safe System for motorcycles



Safe System end state validation in Sweden:

5 motorcycle fatalities per annum \rightarrow 90% reduction

Baseline: 40 fatalities per annum

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A conceptual Safe System for motorcycles





Safe System end state validation in Sweden:

5 motorcycle fatalities per annum \rightarrow 90% reduction

Baseline: 40 fatalities per annum

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Context sensitive implementation



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

Puthan Pisharam, P., Lübbe, N., Shaikh, J. et al (2021). Defining crash configurations for Powered Two-Wheelers: Comparing ISO 13232 to recent in-depth crash data from Germany, India and China. Accident Analysis and Prevention, 151. http://dx.doi.org/10.1016/j.aap.2020.105957

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Context sensitive implementation



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

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Puthan Pisharam, P., Lübbe, N., Shaikh, J. et al (2021). Defining crash configurations for Powered Two-Wheelers: Comparing ISO 13232 to recent in-depth crash data from Germany, India and China. Accident Analysis and Prevention, 151. http://dx.doi.org/10.1016/j.aap.2020.105957

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

