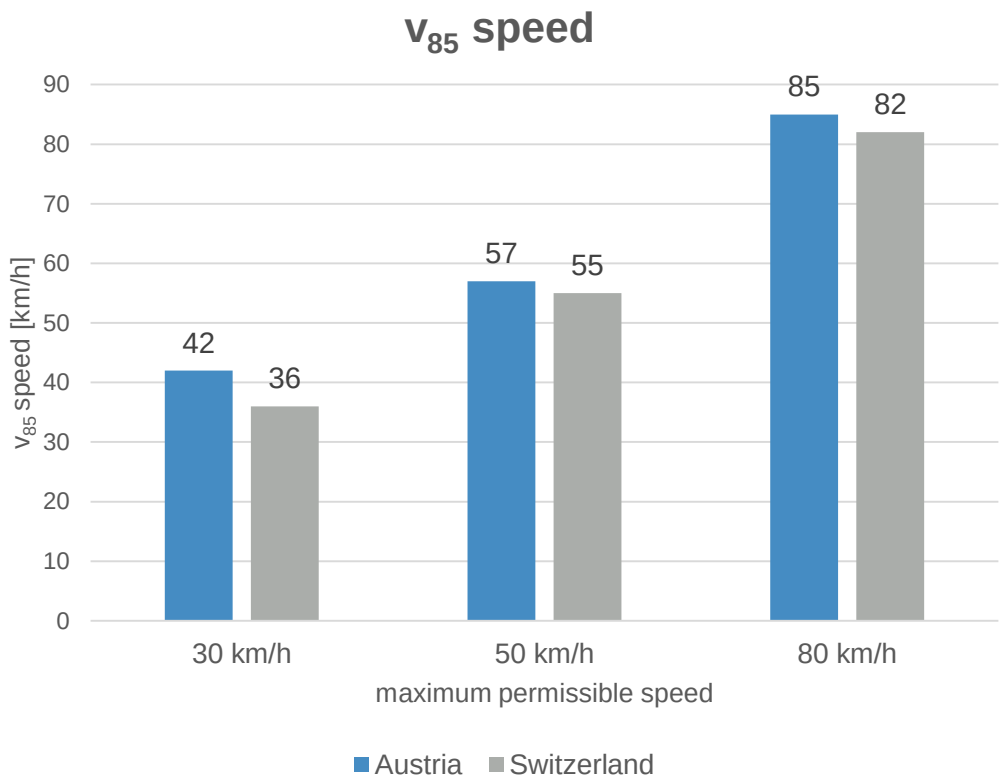
Simulation of the Effects of Different Speeds on Road Safety and Car Journey Times in Austria

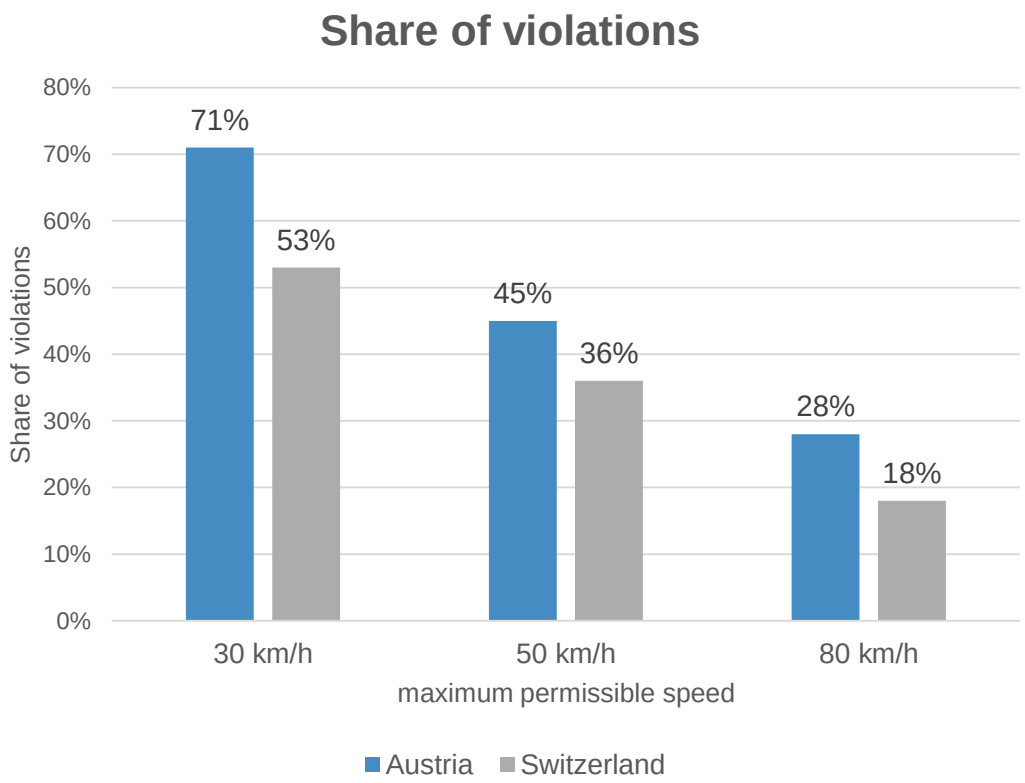
Road Safety and Simulation Conference

Michael Sülflow | 10 June 2022 | Athens

Background

Speed profiles (v_{85}) and share of violations, in Austria and Switzerland at different speed limits





Sources: A: Kuratorium für Verkehrssicherheit, 2020. Geschwindigkeiten im Straßenverkehr 2018-2020, Geschwindigkeiten und Verkehrsstärken des motorisierten Verkehrs in Österreich, Standarderhebungen des KFV, Wien. CH: Niemann, S., 2020. Geschwindigkeit auf Schweizer Straßen, Pilotprojekt zur Erhebung des Geschwindigkeitsverhaltens von Motorfahrzeuglenkenden, Bern: Beratungsstelle für Unfallverhütung BFU.

Methodology

Scenarios and framework conditions with regard to speeding

Scenarios	Maximum permissible speed			Tolerances	Penalty levels	Driving licence suspension times	Speed violations
		Urban roads	Rural roads				
S1A – 50/100: situation in Austria (status quo)	No change in maximum permissible speed	50 km/h	100 km/h	No change			
S1B – 50/100: fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)				Lower	Higher	Sooner and longer	Share of violations as in Switzerland
S1C – 50/100: no speed limit violations				No change			No violations
S2A – 30/80: situation in Austria	Reduced maximum permissible speed	30 km/h	80 km/h	No change			
S2B – 30/80: fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)				Lower	Higher	Sooner and longer	Share of violations as in Switzerland
S2C – 30/80: no speed limit violations				No change			No violations

Speed assumptions per scenario

Urban roads			Speed (km/h)		
			v_{50}	v_{85}	v_{95}
S1A		situation in Austria (status quo)	49	57	62
S1B		fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	48	55	59
S1C		no speed limit violations	49	50	50
S2A		situation in Austria	35	42	46
S2B		fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	31	36	41
S2C		no speed limit violations	30	30	30
Rural roads			**Speed (km/h)**		
			v_{50}	v_{85}	v_{95}
S1A		situation in Austria (status quo)	87	99	107
S1B		fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	81	93	100
S1C		no speed limit violations	87	99	100
S2A		situation in Austria	74	85	92
S2B		fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	72	82	88
S2C		no speed limit violations	74	80	80

Microscopic traffic flow simulation

- On 4 **representative sample routes** in Austria
- Aim: embody a “typical traffic situation” in urban and non-urban areas
- Sample routes were selected based on number of accidents, speed measurements and parameters like curviness or number of intersections
- Using PTV Vissim traffic simulation software

Route number	Federal State	Area	Name	km from	km to	~ADTw [veh./24h]	~length[km]	Number of accidents 2013-2019
1	Lower Austria	Urban area	Daniel-Gran-Straße	Praterstraße/ Goldeggerstraße	Eybner-straße	13,000	1.0	47 (on road section and intersection areas)
2	Lower Austria	Outside urban area	L35	24.5	27.2	1,800	2.7	7
3	Burgenland	Outside urban area	B50	55	63.4	8,000	8.4	39
4	Styria	Outside urban area/ urban area	B54	92.5	107.8	13,000	15.3	135

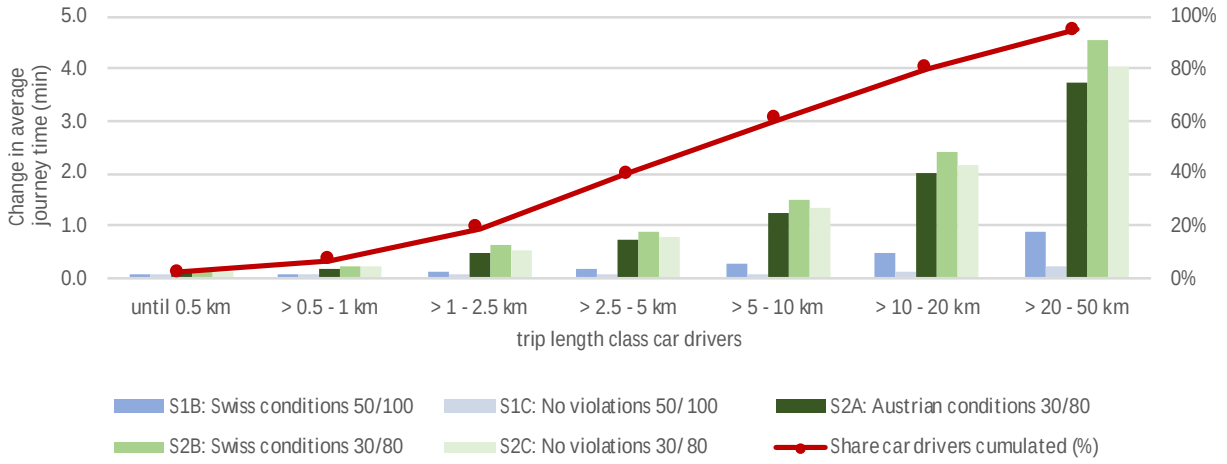
Accident and collision avoidance analyses

- Based on **reconstruction of real accidents** and **collision avoidance analyses** (using accidents contained in the IGLAD accident database)
- Using the accident reconstruction software PC Crash

- Accidents were reconstructed twice:
  - “baseline” based on evidence at the scene of the accident and the injuries sustained by the persons involved. The initial speed and collision speed were calculated.
  - The initial speed was subsequently adjusted to the respective scenarios, and collision avoidance analyses performed in a forward simulation (“treatment”).
- Number of avoided collisions was determined in a pre-post evaluation of baseline and treatment

Results

Journey time changes



- Overall, a maximum increase in journey time of **between 12 seconds** (S1C) **and 4.5 minutes** (S2B) per journey can be assumed **for 95% of all car journeys** (up to 50 km) in Austria.

- Increase in journey time is significantly **less than 1 minute** per journey for all scenarios, and especially **for short trips of up to 5 kilometers** (which corresponds to 40% of all car journeys in Austria)

- The potential change in journey time in relation to the **average car journey length** of 15.7 kilometers in Austria is **between 5 seconds** (S1B) **and 1.90 minutes** (S2B).

Potential reduction in injuries and fatalities per year and corresponding (annual) accidents costs in Austria

Szenario			Car occupants (non-urban areas)				Pedestrians (urban areas)			
			Minor injuries	Severe injuries	Fatal injuries	Accident costs	Minor injuries	Severe injuries	Fatal injuries	Accident costs
S1B		50/100: fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	- 15,6% (-706)	- 6% (-51)	- 7,7% (-9)	- 75,82 Mio. €	- 2,1% (-29)	- 6,9% (-30)	- 8,7% (-2)	- 21,05 Mio. €
S1C		50/100: no speed limit violations	- 14,1% (-635)	- 4,5% (-39)	- 7,7% (-9)	- 67,59 Mio. €	- 4,7% (-65)	- 6,9% (-30)	- 11,9% (-3)	- 24,72 Mio. €
S2A		30/80: situation in Austria	- 17,2% (-776)	- 9% (-77)	- 11,5% (-13)	- 104,39 Mio. €	- 10,8% (-149)	- 14,6% (-63)	- 11,9% (-3)	- 42,83 Mio. €
S2B		30/80: fewer speed limit violations, e.g., through heavier penalties (as in Switzerland)	- 18,8% (-847)	- 11,9% (-102)	- 15,4% (-17)	- 132,97 Mio. €	- 16,1% (-221)	- 17,2% (-74)	- 15,2% (-4)	- 52,79 Mio. €
S2C		30/80: no speed limit violations	- 18,8% (-847)	- 11,9% (-102)	- 19,2% (-21)	- 147,43 Mio. €	- 26,6% (- 365)	- 22,4% (-96)	- 15,2% (-4)	- 67,77 Mio. €

Discussion and Conclusions

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- The traffic simulations and accident reconstructions performed in this study using the different scenarios are clearly **only approximations of reality**, but
- the **results** regarding the effects on road safety **are in line with previous (non-simulation) before-and-after studies** on the road safety effects of speed limit reductions

- The **reduction in speeds** can make a **key contribution** to reducing the numbers of fatalities and injuries (fatalities for car occupants of up to -19%, for pedestrians up to -15%)
- **No**ne of the scenarios investigated are expected to have a **significant and noticeable impact on travel time**s for the majority of Austrian car drivers in everyday life.

➢ **Results contradict common subjective beliefs of car drivers in Austria:**
  - subjective feeling of losing time due to a lower speed limit is mostly unfounded, the perceived loss in time is higher than the actual loss of time determined in the simulations
  - results contradict the common subjective belief of car drivers that reducing the speed limit or introducing measures to combat speeding only has marginal effects on road safety

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