

**To:** Transport & Health Policy Makers, & Practitioners  
**From:** Prof Adrian Davis, TRI, Edinburgh Napier University  
**Date:** 14<sup>th</sup> October 2020  
**Subject:** Essential Evidence 4 Scotland No. 30 Safety in numbers, danger in scarcity for cycle users

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Top Line: The risk profiles of cyclists will worsen if fewer people use a bicycle and more use a car.

The concept of 'safety in numbers' is well known in traffic safety, suggesting that a specific mode of travel may become safer if more people do it. Such a relationship was first reported in 1949 when Ruben Smeed, using data from 62 countries, showed that the fatality risk per vehicle was lower in countries with more vehicles per population.<sup>1</sup> The safety in numbers phenomenon applies also to vulnerable road users such as cyclists and pedestrians. This has important public health and road safety implications as active modes of travel provide substantial health, environmental and economic benefits. For instance, obesity rates are lower in countries where active travel is more common.

The earliest published studies were conducted in Sweden. Ekman compared numbers of cyclists, pedestrians and motorists against serious conflicts/crashes among them at 95 intersections in Malmö and found an inverse relationship between the number of conflicts per cyclists and the number of cyclists per hour.<sup>2</sup> Likewise, Leden examined bicycle flow counts and collisions between motorists and bicyclists before and after the construction of a new bicycle crossing at 45 non-signalised intersections in Gothenburg and reported that the number of collisions per bicyclists decreased with increasing bicycle flow.<sup>3</sup>

In a New Zealand study, researcher findings showed wide variation in the rate of traffic injuries to pedal cyclists and the amount of cycling and travelling as a driver or passenger in a car/van/SUV across New Zealand regions.<sup>4</sup> Cyclists were safer in regions with more bicycle use and less car use. Behaviour change by motorists is considered the most likely mechanism which underlies the "safety in numbers" effect. The risk of injuries to pedal cyclists and the time spent cycling relative to car use is consistent with a 'risk in scarcity' effect. The theory was formulated after researchers observed that motorists drive more slowly when they encounter more pedestrians and faster when there are few. Moreover, if more people cycle, drivers are more likely to be cyclists themselves and may give more consideration to other road users. Such a situation is likely to also result in greater political will to improve the traffic environment in favour of cyclists.

The vicious circle that would arise from an increasingly dangerous road environment encouraging greater car use poses a higher risk for those who continue cycling or walking and will have the greatest impact on those who lack access to a car, such as children, the elderly, and low-income families. Reversing the 'risk in scarcity' effect requires cooperative efforts to promote a modal shift (from using cars to active travel modes) and to improve the safety of vulnerable road users. Many European countries have succeeded in promoting cycling and walking through "coordinated implementation of multi-faceted, mutually reinforcing policies" such as providing better facilities for pedestrians and cyclists; extensive traffic calming of residential neighbourhoods; increased traffic regulation and enforcement; 'people oriented' urban design; integration of active travel with public transport; comprehensive traffic education and training; and restricted car ownership, use and parking.

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<sup>1</sup> Smeed, J. 1949. Some Statistical Aspects of Road Safety Research. *Journal of the Royal Statistical Society, Series A*. 112(1): 1-34.

<sup>2</sup> Ekman L. 1996. On the treatment of flow in traffic safety analysis – a non-parametric approach applied on vulnerable road users. Bulletin 136. Lund (SWE): Institute for Traffic Engineering; University of Lunds.

<sup>3</sup> Leden L, Gårder P, Pulkkinen U. 2000. An expert judgment model applied to estimating the safety effect of a bicycle facility. *Accident Analysis and Prevention*, 32(4): 589-99.

<sup>4</sup> Tin Tin, S. et al, 2011. Regional variations in pedal cyclist injuries in New Zealand: safety in numbers or risk in scarcity, *Australian and New Zealand Journal of Public Health*, 35: 357-363.