Contextualising Safety in Numbers

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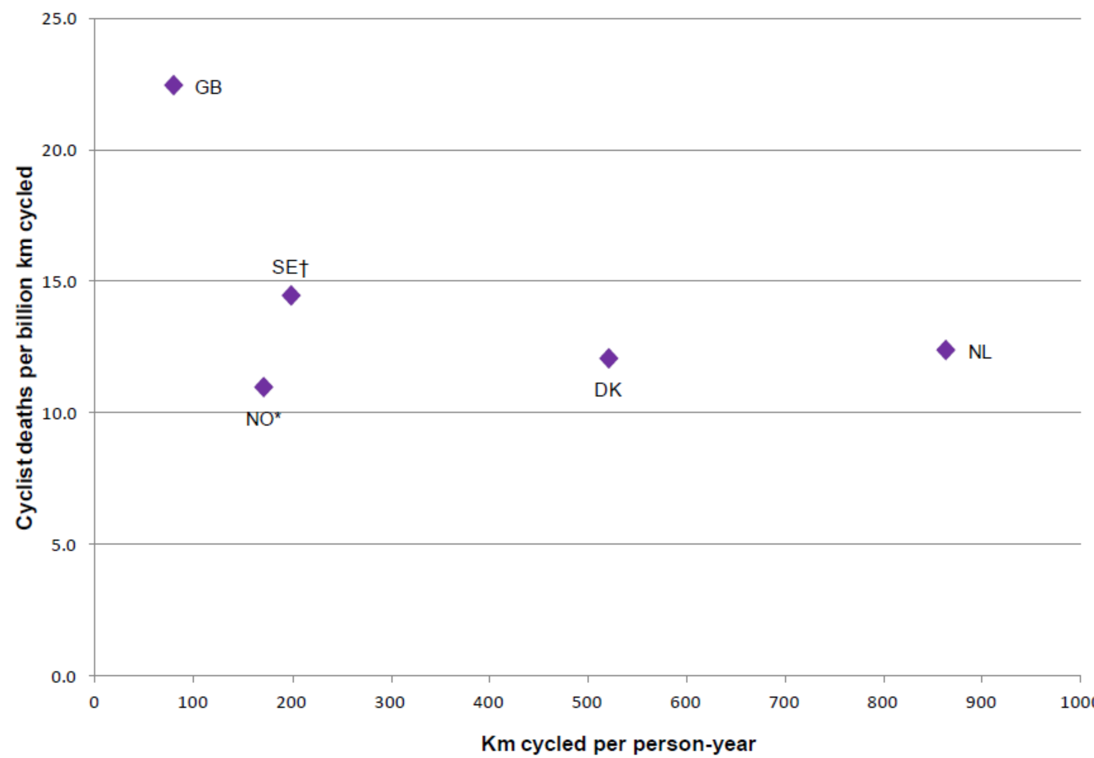
Safety in Numbers: a longitudinal as well as a cross-sectional phenomenon?

- More use of a mode is associated with lower injury risk per user
- Originally identified by Smeed as an inverse relationship between a country's level of motorisation and road deaths per motor vehicle

More cycling, fewer cyclist deaths per km (selected European countries)



Source: Lawton B, Fordham C. *Understanding the strengths and weaknesses of Britain's road safety performance, 2016. TRL Research Report, PPR796. Berkshire. P.34.*

Possible SiN mechanisms…

But are places where cycling is increasing also getting safer?

- Policy-makers hope that if contexts with low cycling and relatively high risks can increase cycling levels—for example, through improved infrastructure—this will be accompanied by a decrease in risk and hence a less than proportional increase in injuries.

- Most previous studies are cross-sectional, however, and one cannot assume that the effects found cross-sectionally will hold true longitudinally.

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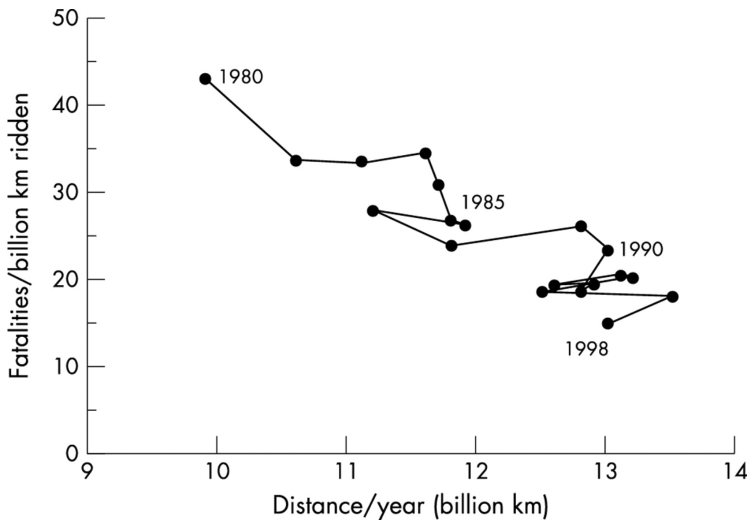
Also of interest…

- How do changes in cycling injury risk compare to changes in injury risk for people using other modes?



(As we normally see decline in injury risk over time)

Source: Safety in numbers: more walkers and bicyclists, safer walking and bicycling P L Jacobsen, Injury Prevention 9, 205-209

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About the study

Examines cross-sectional and longitudinal SiN effects in 202 local authority areas in Britain, via KSI statistics and Census commuting data from 1991, 2001, and 2011.

Cross-sectional & longitudinal log-linear injury prediction models built.

$$\mathrm{In}(\mathrm{CycleKSI}(2010-12)) = \alpha + \beta 1 \times \mathrm{In}(\mathrm{CycleCommuters\_2011}) + \beta 2 \times \mathrm{In}(\mathrm{MVVolume\_2011})$$

$$\mathrm{In}(\mathrm{CycleKSI}(2010-12)) = \alpha + \beta 1 \times \mathrm{In}(\mathrm{Cycle} \times \mathrm{Commuters\_2011}) + \beta 2 \times \mathrm{In}(\mathrm{MVVolume\_2011}) + \beta 3 \times \mathrm{In}(\mathrm{Population\_2011})$$

$$\Delta\mathrm{CycleKSI} = \alpha \times (\Delta\mathrm{CycleCommuters})^{\beta 1} \times (\Delta\mathrm{MVVolume})^{\beta 2}$$

$$\mathrm{In}(\Delta\mathrm{CycleKSI}) = \alpha + \beta 1 \times \mathrm{In}(\Delta\mathrm{CycleCommuters}) + \beta 2 \times \mathrm{In}(\Delta\mathrm{MVVolume})$$

$$\Delta\mathrm{CycleKSI} = \alpha \times (\Delta\mathrm{CycleCommuters})^{\beta 1} \times (\Delta\mathrm{MVVolume})^{\beta 2} \times (\Delta\mathrm{Population})^{\beta 3}$$

$$\mathrm{In}(\mathrm{CycleKSI}) = \alpha \times \beta 1 \times \mathrm{In}(\Delta\mathrm{CycleCommuters}) + \beta 2 \times \mathrm{In}(\Delta\mathrm{MVVolume}) + \beta 3 \times \mathrm{In}(\Delta\mathrm{Population})$$

Original article

PDF

Contextualising Safety in Numbers: a longitudinal investigation into change in cycling safety in Britain, 1991–2001 and 2001–2011

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Author affiliations +

Abstract

Introduction The 'Safety in Numbers' (SiN) phenomenon refers to a decline of injury risk per time or distance exposed as use of a mode increases. It has been demonstrated for cycling using cross-sectional data, but little evidence exists as to whether the effect applies longitudinally —that is, whether changes in cycling levels correlate with changes in per-cyclist injury risks.

Methods This paper examines cross-sectional and longitudinal SiN effects in 202 local authorities in Britain, using commuting data from 1991, 2001 and 2011 censuses plus police -recorded data on 'killed and seriously injured' (KSI) road traffic injuries. We modelled a log-linear relationship between number of injuries and number of cycle commuters. Second, we conducted longitudinal analysis to examine whether local authorities where commuter cycling increased became safer (and vice versa).

Cross-sectional models, with and without adjustment for population (n=202)

	Cross-sectional 1991		Cross-sectional 2001		Cross-sectional 2011		Repeated measures cross-sectional (1991, 2001, 2011)	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
Cycle commuters	0.48 (0.41 to 0.55)	0.42 (0.35 to 0.48)	0.68 (0.60 to 0.76)	0.52 (0.45 to 0.60)	0.75 (0.69 to 0.82)	0.62 (0.54 to 0.70)	0.61 (0.55 to 0.67)	0.47 (0.42 to 0.53)
Motor vehicle kilometres	0.3 (0.20 to 0.40)	−0.13 (−0.27 to 0.01)	0.14 (0.05 to 0.23)	−0.32 (−0.46 to – 0.19)	0.15 (0.07 to 0.22)	−0.10 (−0.22 to 0.02)	0.16 (0.08 to 0.24)	−0.24 (−0.34 to –0.14)
Population		0.69 (0.51 to 0.86)		0.86 (0.67 to 1.05)		0.50 (0.29 to 0.71)		0.76 (0.62 to 0.91)

Model B additionally adjusts for the local authority population size.

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Longitudinal models, with and without adjustment for population (n=202)

	Relative change in cycle KSI, 1991–2001		Relative change in cycle KSI, 2001–2011	
	Model A	Model B	Model A	Model B
Relative change in cycle commuters	0.33 (0.10 to 0.56)	0.34 (0.11 to 0.57)	0.79 (0.50 to 1.08)	0.75 (0.42 to 1.08)
Relative change in motor vehicle kilometres	−1.14 (−2.35 to 0.08)	−1.16 (−2.39 to 0.07)	2.15 (0.87 to 3.43)	2.19 (0.89 to 3.49)
Relative change in population		−0.13 (−0.75 to 0.50)		0.45 (−1.19 to 2.08)

Model B additionally adjusts for the local authority population size.

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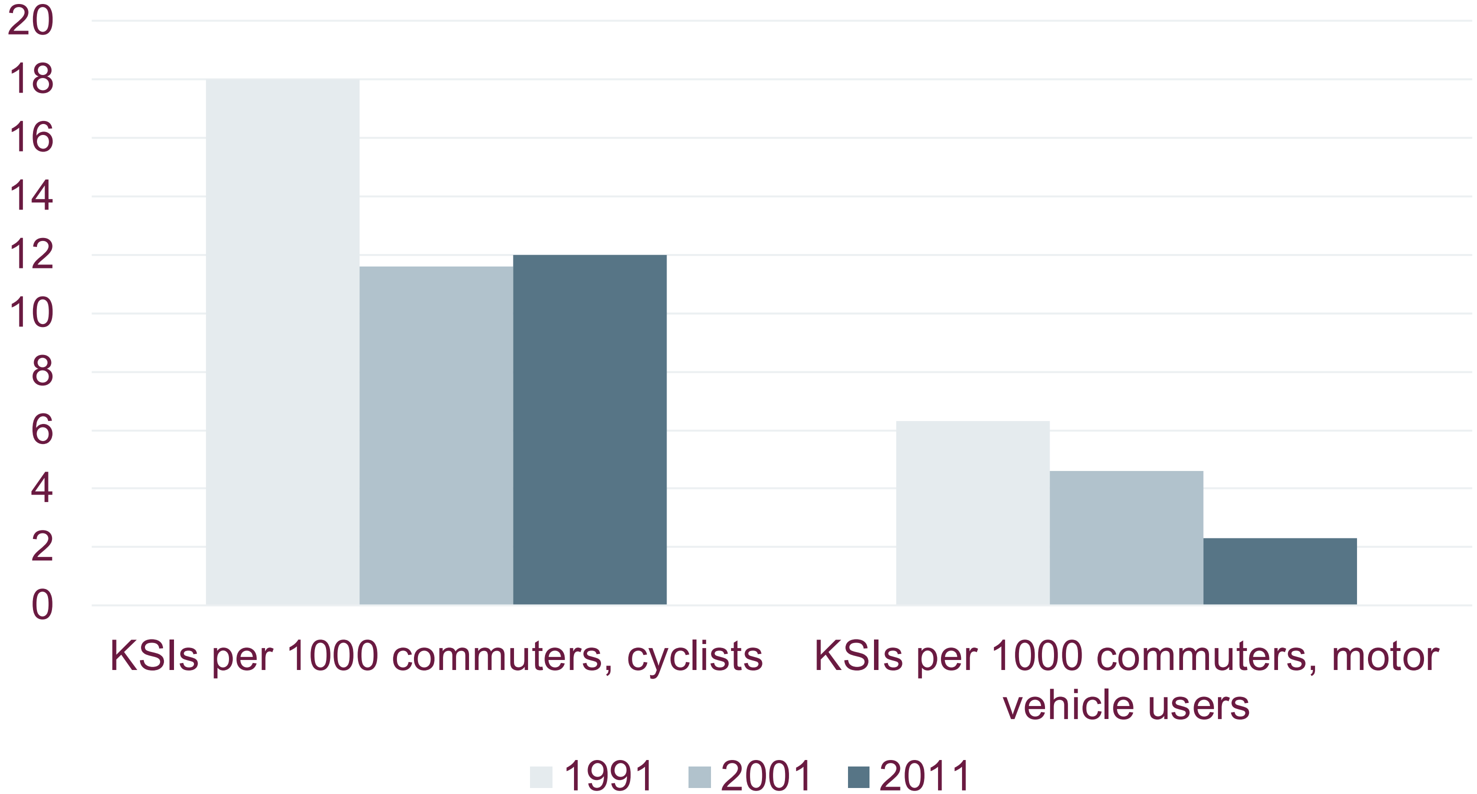
SiN Findings: summarised

– SiN found to exist cross-sectionally, although the effect seemed to weaken from 1991, to 2001, to 2011

– SiN also found longitudinally, although only statistically significant to $p<0.05$ between 1991-2001

The broader picture: despite SiN, cycling got no safer between 2001-11, and the gap with motor vehicle users grew substantially



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