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)

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.
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
About the study


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

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\begin{align*}
\text{In}(\text{CycleKSI}(2010 - 12)) &= \alpha + \beta_1 \times \text{In}(\text{CycleCommuters}_{2011}) + \beta_2 \\
& \quad \times \text{In}(\text{MVVolume}_{2011})
\end{align*}
\]

\[
\begin{align*}
\text{In}(\Delta\text{CycleKSI}) &= \alpha + \beta_1 \times \text{In}(\Delta\text{CycleCommuters}) \\
& \quad + \beta_2 \times \text{In}(\Delta\text{MVVolume})
\end{align*}
\]

\[
\begin{align*}
\Delta\text{CycleKSI} &= \alpha \times (\Delta\text{CycleCommuters})^{\beta_1} \times (\Delta\text{MVVolume})^{\beta_2} \\
& \quad \times (\Delta\text{Population})^{\beta_3}
\end{align*}
\]

\[
\begin{align*}
\text{In}(\text{CycleKSI}) &= \alpha \times \beta_1 \times \text{In}(\Delta\text{CycleCommuters}) \\
& \quad + \beta_2 \times \text{In}(\Delta\text{MVVolume}) \\
& \quad + \beta_3 \times \text{In}(\Delta\text{Population})
\end{align*}
\]

Rachel Aldred¹, Rahul Goel², James Woodcock², Anna Goodman³

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)

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<td>Model A</td>
<td>Model B</td>
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<tr>
<td>Cycle commuters</td>
<td>0.48 (0.41 to 0.55)</td>
<td>0.42 (0.35 to 0.48)</td>
<td>0.68 (0.60 to 0.76)</td>
<td>0.52 (0.45 to 0.60)</td>
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<td>Motor vehicle kilometres</td>
<td>0.3 (0.20 to 0.40)</td>
<td>−0.13 (−0.27 to 0.01)</td>
<td>0.14 (0.05 to 0.23)</td>
<td>−0.32 (−0.46 to −0.19)</td>
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<td>Population</td>
<td>0.69 (0.51 to 0.86)</td>
<td>0.86 (0.67 to 1.05)</td>
<td>0.50 (0.29 to 0.71)</td>
<td>0.76 (0.62 to 0.91)</td>
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Model B additionally adjusts for the local authority population size.
Longitudinal models, with and without adjustment for population (n=202)

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<tr>
<td>Model A</td>
<td>Model B</td>
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<td>Relative change in cycle commuters</td>
<td>0.33 (0.10 to 0.56)</td>
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<td>Relative change in motor vehicle kilometres</td>
<td>-1.14 (-2.35 to 0.08)</td>
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<tr>
<td>Relative change in population</td>
<td>-0.13 (-0.75 to 0.50)</td>
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Model B additionally adjusts for the local authority population size.
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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