Buses, bicycles and building for health: practice-based evidence from the UK

David Ogilvie
MRC Epidemiology Unit | University of Cambridge
Inactivity 'kills more than obesity'

By James Gallagher
Health editor, BBC News website
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A lack of exercise could be killing twice as many people as obesity in Europe, a 12-year study of more than 300,000 people suggests.

University of Cambridge researchers said about 676,000 deaths each year were down to inactivity, compared with 337,000 from carrying too much weight.

They concluded that getting everyone to do at least 20 minutes of brisk walking a day would have substantial benefits.
“In view of the prevalence, global reach, and health effect of physical inactivity, the issue should be appropriately described as pandemic, with far-reaching health, economic, environmental, and social consequences.”
For too long the focus has been on advising individuals to take an active approach to life.
The greatest potential to increase population-level physical activity might be through creation of supportive policies in other sectors.

Pratt et al., Lancet 2012
Promoting and creating built or natural environments that encourage and support physical activity
Aims: To elucidate the potential of population-level approaches to the promotion of active living by:

• Evaluating environmental and policy interventions
• Understanding patterns and mechanisms of behaviour change
Health impacts of the Cambridgeshire Guided Busway: the Commuting and Health in Cambridge study

Ogilvie et al., *BMC Public Health* 2010
Panter et al., *IJBNPA* 2011
Jones and Ogilvie, *IJBNPA* 2012
Panter et al., *PLoS ONE* 2012
Yang et al., *Prev Med* 2012
Yang et al., *BMC Public Health* 2012
Carse et al., *J Transport Geogr* 2013
Panter et al., *Prev Med* 2013a
Guell et al., *BMC Public Health* 2013
Dalton et al., *PLoS ONE* 2013
Humphreys et al., *Prev Med* 2013
Jones et al., *PLoS ONE* 2013
Panter et al., *Prev Med* 2013b
Kesten et al., *BMC Public Health* 2014
Tully et al., *PLoS ONE* 2014
Panter et al., *Prev Med* 2014
Panter et al., *IJBNPA* 2014
Guell and Ogilvie, *Qual Res* 2016
Kesten et al., *IJBNPA* 2015
Heinen et al., *J Transport Health* 2015
Dalton et al., *J Transport Health* 2015
Heinen et al., *IJBNPA* 2015
Costa et al., *Prev Med* 2015
Foley et al., *IJBNPA* 2015
Ogilvie et al., *Public Health Res* 2016
Heinen et al., *J Transport Health* in press
Predictors of using the busway

Cycling

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.99</td>
<td>(0.98, 1.01)</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>0.41</td>
<td>(0.24, 0.69)</td>
</tr>
<tr>
<td>Education (degree)</td>
<td>1.06</td>
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Adjusted odds ratios (95% confidence intervals). 412 ≤ N ≤ 432

Heinen et al., *J Transport Health* 2015
Predictors of using the busway

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<td>(0.99, 1.03)</td>
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<td>Gender (female)</td>
<td><strong>0.41</strong></td>
<td>0.81</td>
<td>1.39</td>
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<td>(0.76, 1.75)</td>
<td>(0.63, 1.46)</td>
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Adjusted odds ratios (95% confidence intervals). 412 ≤ N ≤ 432

Heinen et al., *J Transport Health* 2015
Summary of outcomes

Living closer to the busway:

- Active mode share
- Car mode share
- Time spent cycling
- No recreational physical activity
He said ‘I wanted to hate it’ because of all the bad publicity... But then when he tried it he really liked it... He wouldn’t use other public transport – it’s unreliable. He’s told his friends how good it is.

For people like me, who used to have a good bus service, it’s frustrating that now it’s slower and you can’t always get a seat.

Jones et al., PLoS ONE 2013
Cycling to work

Proportion of commuters

- England and Wales: 3%
- Cambridge: 29%
- Oxford: 17%

Office for National Statistics – based on 2011 Census
Impact of Constructing Non-motorised Networks and Evaluating Changes in Travel

Ogilvie et al., Am J Public Health 2011
Sahlqvist et al., BMC Med Res Methodol 2011
Powell et al., Built Environ 2011
Ogilvie et al., BMJ Open 2012
Goodman et al., Environ Health 2012
Sahlqvist et al., Prev Med 2012
Song et al., Environ Plann A 2013
Brand et al., Appl Energy 2013
Sahlqvist et al., Int J Behav Nutr Phys Act 2013

Bird et al., Health Psychol 2013
Adams et al., Int J Behav Nutr Phys Act 2013
Goodman et al.,Prev Med 2013
Brand et al., Appl Energy 2014
Goodman et al., Am J Public Health 2014
Adams et al., PLoS ONE 2014
Sahlqvist et al., IJBNPA 2015
Panter et al., BMJ Open 2015
Connect2 case study sites

Ogilvie et al., BMJ Open 2012
Cardiff

Kenilworth

Southampton
Use of Connect2

Goodman et al., *Prev Med* 2013

Percentage of users who reported each type of use at two-year follow-up

- Transport: 18%
- Recreation: 32%
- Walking: 39%
- Cycling: 85%
Effects of Connect2

Change (min·wk⁻¹, 95% CI)

Walking and cycling
Overall PA

One year
N=1796

Adjusted linear regression coefficients per kilometre of proximity
Effects of Connect2

Adjusted linear regression coefficients per kilometre of proximity

Goodman et al., Am J Public Health 2014
Effects of Connect2

Walking and cycling at baseline (min·wk$^{-1}$)
Effects of Connect2

Change (min·wk$^{-1}$, 95% CI)

p=0.007 for interaction

Proximity (km)

Car
No car

Goodman et al., *Am J Public Health* 2014
Past a certain threshold of energy consumption, the transportation industry dictates the configuration of social space.

Illich, *Energy and equity* 1974
Health impacts of a new urban motorway: the M74 study

Ogilvie et al., *Int J Behav Nutr Phys Act* 2008a
Ogilvie et al., *Int J Behav Nutr Phys Act* 2008b
Ogilvie et al., *Int J Behav Nutr Phys Act* 2010
Olsen et al., *J Epidemiol Community Health* 2016
I just wouldn't like to think that I would walk up there and this big motorway thundering over my head [...] With the thunder of that traffic, it's a bit scary.

All this traffic going on top of you [...] it's just big, cold, stark, concrete... it's just only built for cars. You know?

Local female residents quoted in Ogilvie et al., IJBNPA 2010
More likely to travel

Foley et al., under review
More likely to travel

More likely to use the car

Close

Far

Foley et al., under review
More likely to travel
More likely to use the car
Reduced mental wellbeing

Foley et al., under review
So what?
Tell us something we don't already know or do!

Allender et al., J Public Health Policy 2009
Tell us something we don't already know or do!

Good intentions and received wisdom are not enough.

Allender et al., *J Public Health Policy* 2009

Macintyre and Petticrew, *J Epidemiol Community Health* 2000
The Physical Activity and Public Health research programme is supported by the Medical Research Council, and the research described in this talk was carried out as part of the Centre for Diet and Activity Research (CEDAR), a UKCRC Public Health Research Centre of Excellence funded by the British Heart Foundation, Economic and Social Research Council, Medical Research Council, National Institute for Health Research (NIHR) and Wellcome Trust under the auspices of the UK Clinical Research Collaboration.

The iConnect study was funded by the Engineering and Physical Sciences Research Council. The Commuting and Health in Cambridge and M74 studies were funded by the NIHR Public Health Research programme (project numbers 09/3001/06 and 11/3005/07). Anna Goodman and Jenna Panter were supported by NIHR Postdoctoral Fellowships.

The views and opinions are those of the author and do not necessarily reflect those of the Public Health Research programme, NIHR, NHS or Department of Health.
Effects on cycling and walking time
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Adjusted relative risk ratios (95% confidence intervals) for an increase in weekly duration of the given behaviour per unit of proximity (square root of distance) to busway. N=469

4 km

1 km
## Effects on cycling and walking time

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Adjusted for age, sex, education, car ownership, home ownership, children, health condition, body mass index, urban-rural classification, distance to work, car parking provision at work, baseline level of active commuting and home or work relocation

Active travel and physical activity

Adjusted linear regression coefficients

Recreational PA

Overall PA

Active travel increased

Change (min·wk⁻¹, 95% CI)
Active travel and physical activity

Active travel increased

Active travel decreased

Recreational PA

Overall PA

Recreational PA

Overall PA

Change (min·wk⁻¹, 95% CI)

Adjusted linear regression coefficients. N=1628

Sahlqvist et al., IJBNPA 2013
### Predictors of increases in walking for transport

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<tr>
<th>Predictor</th>
<th>Short-lived increase (from some)</th>
<th>Sustained increase (from some)</th>
<th>Uptake* (from none)</th>
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<tr>
<td>Lower car ownership</td>
<td>4.77 (0.81, 2.40)</td>
<td>5.35 (2.58, 11.08)</td>
<td>1.24 (0.54, 2.85)</td>
</tr>
<tr>
<td>(none vs. any)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower education</td>
<td>3.21 (1.48, 6.94)</td>
<td>1.36 (0.54, 3.44)</td>
<td>0.76 (0.45, 1.29)</td>
</tr>
<tr>
<td>(&lt;2° vs. 3°)</td>
<td></td>
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</tr>
<tr>
<td>Lower income</td>
<td>3.79 (1.55, 9.26)</td>
<td>3.43 (1.26, 9.33)</td>
<td>0.74 (0.42, 1.31)</td>
</tr>
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<td>(&lt;£20K vs. &gt;£40K)</td>
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Adjusted relative risk (*odds) ratios (95% confidence intervals). N=1105 (*N=394).

Panter and Ogilvie, under review
## Predictors of increases in walking for recreation

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<tr>
<td><strong>Lower car ownership</strong> (none vs. any)</td>
<td>1.18 (0.51, 2.72)</td>
<td>0.51 (0.15, 1.70)</td>
<td>0.68 (0.37, 1.25)</td>
</tr>
<tr>
<td><strong>Lower education</strong> (&lt;2° vs. 3°)</td>
<td>1.55 (0.73, 3.28)</td>
<td>0.59 (0.26, 1.31)</td>
<td>0.34 (0.20, 0.60)</td>
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<tr>
<td><strong>Lower income</strong> (&lt;£20K vs. &gt;£40K)</td>
<td>0.58 (0.25, 1.33)</td>
<td>0.63 (0.29, 1.40)</td>
<td>0.49 (0.28, 0.85)</td>
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Adjusted relative risk (*odds) ratios (95% confidence intervals). N=1115 (*N=383).

Panter and Ogilvie, under review