

# Changing gears: bicycling as the panacea for physical inactivity?

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EDITOR'S CHOICE

For some, bicycling is a potential 'solution' to physical inactivity. Active commuting and recreational cycling can theoretically meet a population's need for health-enhancing physical activity.<sup>1</sup> The seductive appeal of cycling relates to its low cost and potentially high population reach. Cycling can be accessed by all ages and social groups, and infrastructure support for cycling is now being built into the new urban development frameworks that include 'active living'.<sup>2</sup>

This editorial summarises the health benefits and risks of cycling, and describes current controversies and evidence challenges for cycling policy and promotion. The bicycle is a means for individual health-promoting behaviour, is a clinical tool for rehabilitation and a societal tool for contributing to a healthier environment. Here we do not distinguish between the health effects of outdoor and indoor (stationary) cycling, as both can result in similar energy expenditures, but we do classify cycling by purpose into active transport (commuting and utility cycling) and recreational cycling. Physiologically, cycling has advantages over walking: typical commuting cycling intensity is higher (6–8 metabolic equivalents (MET) compared with walking (2.5–3.5 MET). This is important because higher intensity activity yields greater health benefits.<sup>3</sup>

## EVIDENCE IS ACCUMULATING: BENEFITS OUTWEIGH RISKS

Until recently there has been promising yet limited evidence on cycling-specific health benefits.<sup>4–5</sup> A new systematic review<sup>6</sup> identified 16 studies focusing on cycling-specific health outcomes. The studies identified a consistent positive relationship between cycling and cardiorespiratory

fitness and functional benefits in boys and girls. Furthermore, they demonstrated improvements in cardiorespiratory fitness and disease risk factor profiles. Several longitudinal epidemiological studies have shown a significant risk reduction for all-cause and cancer mortality and for cardiovascular disease, colon and breast cancer, and obesity morbidity in middle-aged and older men and women.

There are also cycling-associated risks, especially traumatic injuries (requiring acute clinical treatment) and non-traumatic injuries.<sup>7</sup> Next are the potential risks of exposure to poor air quality among cycle commuters.<sup>8</sup> However, a recent analysis has compared the risks and benefits,<sup>9</sup> and estimated that the life expectancy gained as a result of increased physical activity was many times larger (3–14 months gained) than the lost life expectancy due to increased air pollution (0.8–40 days lost) and increased traffic accidents (5–9 days lost), when shifting from a car to cycle commuting in urban settings.

## BARRIERS TO CYCLING

There are individual, social and environmental barriers to cycling. Lack of perceived fitness, costs and skills are often mentioned barriers for physical activity, but they are not serious barriers for cycling, as most people are able to and can afford to ride a bike. 'Lack of time' is also offered as a barrier for physical activity, but active commuting, or even indoor stationary cycling 'in front of the television', are time-neutral behaviours. Lack of modelling and social support<sup>10</sup> may be unconscious barriers. However, potentially modifiable barriers in the physical environment abound, with cyclists in many countries provided with limited infrastructure, few and disconnected bike lanes, paths or routes and road systems designed for cars.<sup>11</sup> The perceived safety concern is the dominant barrier to cycling, but this perception can be altered by the provision of cycling facilities.

## CONTROVERSIES: POLICIES AND INTERVENTIONS

There are many ongoing controversies regarding cycling interventions

and cycling-related policy. The limited expenditure on cycling infrastructure and cycling-promoting policies and environments remains an ongoing issue for cycling advocates. Competing with motorised transport remains a challenge, although more bicycles are sold than cars each year in many developed countries.<sup>1</sup> Mandatory bicycle helmet legislation remains a contentious issue. The premise that protective helmets should prevent head injuries is compelling. Cochrane reviews of interventions using mainly quasi-experimental designs report significant protective effects for helmet wearers.<sup>12</sup> However, the evidence for the effectiveness of helmet legislation in protecting populations remains contested.<sup>13,14</sup> In countries with a high prevalence of cycling (The Netherlands, Denmark), good bicycle infrastructure and low rates of helmet use, bicycle injury rates are much lower than among helmet-wearing Australians or Americans.<sup>11</sup> Furthermore, helmets may be a disincentive for people starting or maintaining cycling,<sup>15</sup> as one of a myriad of barriers to cycling initiation or maintenance.

The physical environment influences both recreational and commuter cyclists.<sup>16</sup> However, the evidence base on small changes to the cycling environment and population rates of cycling is not yet clear. A systematic review in 2010 suggested that individual-level cycling promotion can be effective.<sup>17</sup> Marketing bike trail use produces mixed results, with some studies showing no effect on cycling<sup>18</sup> and others showing small but significant effects.<sup>19</sup> The Cycling Towns project in England, combined substantial infrastructure development with behavioural programmes. The research from the first six towns indicates a 27% increase in population levels of cycling as well as total physical activity from large-scale municipal investment.<sup>20</sup> Improving the connectivity of bicycle routes in Delft, Holland, showed a small increase in local cycling trips over 3 years, compared with a control area.<sup>21</sup> Furthermore, building cycle infrastructure and safe routes to school can facilitate cycling among children and adolescents.<sup>22</sup>

More comprehensive approaches, such as the Dutch Bicycle Master Plan,<sup>23</sup> included promotion of the combined use of bicycle and public transport, the provision of bicycle parking as well as flexible bicycle rentals at train stations. Extending the rental idea, public bicycle loan programmes have been developed in downtown urban environments in

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many cities. Some bike loan schemes are successful, particularly where there is high population density, mixed zoning compact cities, lower vehicle speeds and some cycling infrastructure. Successful programmes include the London Barclays Cycle Hire programme, which reported 10–15% annual increases in users, with over half reporting they were new to cycling (Travel in London).<sup>24</sup>

The prevalence of cycling is highest in The Netherlands, Germany and the Nordic countries, where most of the adult population has a bicycle, and up to a third of all urban trips are made by bike.<sup>11</sup> This contrasts with Australia, Canada and the USA, where up to half the adult population have access to a bicycle, but only 1–2% of trips are made using this mode of transport,<sup>11</sup> and this rate has not changed over the past decade.<sup>25</sup> It seems that the potential for population change may rest more with active commuting than exercise-oriented recreational cycling.<sup>26</sup> A clear example of decreasing levels of physical activity through decreased active travel comes from the economic growth areas of the developing world; in countries such as Thailand, Vietnam and China, where a transition is occurring from bicycles to motorbikes and then to cars. This will pose increased risks of population inactivity, as active commuting is the largest contributor to population energy expenditure.

### TAKING UP THE RESEARCH CHALLENGES

Current research challenges are how to reverse these declines in cycling for transport in developing countries and, in developed countries, how to create the environments that increase cycling and the numbers of new cyclists. The next generation of research needs to move beyond cross-sectional correlational studies, and explore interventions that increase or preserve cycling rates in free-living communities.

Currently, cycling is not a panacea for physical inactivity. Furthermore, its 'potential' is already partly realised in northern Europe, is static and remains to be realised in North America and Australia,

and reductions in cycling need to be prevented from occurring in the developing world. Our efforts really need to step up a gear, if they aspire to freewheel to a successful public health conclusion.

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### REFERENCES

1. **Bauman A**, Rissel C, Garrard J, *et al*. Cycling: getting Australia moving – barriers, facilitators and interventions to get more Australians physically active through cycling. Melbourne: Cycling Promotion Fund, 2008. <http://www.cyclingpromotion.com.au/images/stories/downloads/CPFHthRpr08V3prf1.pdf> (accessed 14 Dec 2010).
2. **Schilling JM**, Giles-Corti B, Sallis JF. Connecting active living research and public policy: transdisciplinary research and policy interventions to increase physical activity. *J Public Health Policy* 2009;**30**(Suppl 1):S1–15.
3. US Department of Health and Human Services. 2008 Physical Activity Guidelines Advisory Committee Report. Washington, DC: USDHHS, 2008:**683**. <http://www.health.gov/paguidelines/> (accessed 2 Jun 2010).
4. **Bauman AE**, Rissel C. Cycling and health: an opportunity for positive change? *Med J Aust* 2009;**190**:347–8.
5. **Bassett DR Jr**, Pucher J, Buehler R, *et al*. Walking, cycling, and obesity rates in Europe, North America, and Australia. *J Phys Act Health* 2008;**5**:795–814.
6. **Oja P**, Titze S, Bauman A, *et al*. Health benefits of cycling; a systematic review. *Scand J Med Sci Sports* 2011; In press.
7. **Dettoni NJ**, Norvell DC. Non-traumatic bicycle injuries: a review of the literature. *Sports Med* 2006;**36**:7–18.
8. **Jacobs L**, Nawrot TS, de Geus B, *et al*. Subclinical responses in healthy cyclists briefly exposed to traffic-related air pollution: an intervention study. *Environ Health* 2010;**9**:64.
9. **Johan de Hartog J**, Boogaard H, Nijland H, *et al*. Do the health benefits of cycling outweigh the risks? *Environ Health Perspect* 2010;**118**:1109–16.
10. **Titze S**, Stronegger WJ, Janschitz S, *et al*. Association of built-environment, social-environment and personal factors with bicycling as a mode of transportation among Austrian city dwellers. *Prev Med* 2008;**47**:252–9.
11. **Pucher J**, Buehler R. Making cycling irresistible: lessons from The Netherlands, Denmark, and Germany. *Transport Rev* 2008;**28**:495–528.

12. **Macpherson A**, Spinks A. Bicycle helmet legislation for the uptake of helmet use and prevention of head injuries. *Cochrane Database Syst Rev* 2008;**3**:CD005401.
13. **Cummings P**, Rivara FP, Olson CM, *et al*. Changes in traffic crash mortality rates attributed to use of alcohol, or lack of a seat belt, air bag, motorcycle helmet, or bicycle helmet, United States, 1982–2001. *Inj Prev* 2006;**12**:148–54.
14. **Robinson DL**. No clear evidence from countries that have enforced the wearing of helmets. *BMJ* 2006;**332**:722–5.
15. **De Jong P**. The health impact of mandatory bicycle helmet laws. 2010. <http://ssrn.com/abstract=1368064> (accessed 12 Apr 2010).
16. National Institute for Health and Clinical Excellence. Physical activity and the environment. Guidance on the promotion and creation of physical environments that support increased levels of physical activity. London: NICE, Department of Health, 2008.
17. **Yang L**, Sahlqvist S, McMinn A, *et al*. Interventions to promote cycling: systematic review. *BMJ* 2010;**341**:c5293.
18. **Merom D**, Bauman A, Vita P, *et al*. An environmental intervention to promote walking and cycling – the impact of a newly constructed Rail Trail in Western Sydney. *Prev Med* 2003;**36**:235–42.
19. **Rissel CE**, New C, Wen LM, *et al*. The effectiveness of community-based cycling promotion: findings from the Cycling Connecting Communities project in Sydney, Australia. *Int J Behav Nutr Phys Act* 2010;**7**:8.
20. **Sloman L**, Cavill N, Cope A, *et al*. Analysis and synthesis of evidence on the effects of investment in six cycling demonstration towns. Department of Transport and Cycling England, 2009. Cycling England, PO Box 54810, London, England SW1P 4XX.
21. **Wilimink A**, Hartman J. Evaluation of the Delft Bicycle Network Plan: final summary report. Ministry of Transport and Public Works, 1987. [http://www.mobility-consultant.com/brm/indu/minitrans/toc/id\\_min1s.htm](http://www.mobility-consultant.com/brm/indu/minitrans/toc/id_min1s.htm) (accessed 14 Mar 2011).
22. **Boarnet MG**, Anderson CL, Day K, *et al*. Evaluation of the California Safe Routes to School legislation: urban form changes and children's active transportation to school. *Am J Prev Med* 2005;**28**:134–40.
23. Ministry for Transport, Public Works and Management. The Dutch Bicycle Master Plan. 1999. <http://www.fietsberaad.nl/library/repository/bestanden/The%20Dutch%20Bicycle%20Master%20Plan%201999.pdf> (accessed Jan 2011).
24. Transport for London. Travel in London: Report 3. 2010. <http://www.tfl.gov.uk/assets/downloads/corporate/travel-in-london-report-3.pdf> (accessed Dec 2010).
25. **Merom D**, van der Ploeg HP, Corpuz G, *et al*. Public health perspectives on household travel surveys active travel between 1997 and 2007. *Am J Prev Med* 2010;**39**:113–21.
26. **Dill J**. Bicycling for transportation and health: the role of infrastructure. *J Public Health Policy* 2009;**30**(Suppl 1):S95–110.