Health effects of the London bicycle sharing system: health impact modelling study

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Paper: Deaths of cyclists in London 1985-92: the hazards of road traffic (*BMJ* 1994;308:1534)

STUDY QUESTION

What are the likely effects on health of the London bicycle sharing system?

SUMMARY ANSWER

Using the actual number of injuries observed to date among cycle hire users, the benefits clearly outweighed harms among both male and female users. However, using background injury risks in the cycle hire area, although benefits outweighed harms among men they were similar to harms among women.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Cycling is a physically active and environmentally sustainable form of transport that poses low harms to others, but cyclists may face an increased risk of injury and exposure to pollution. Our study suggests that the London bicycle sharing system has had a smaller per user benefit than that reported for the Barcelona system.

Design

We modelled the health impacts of the London bicycle sharing system by comparing the effects of the cycle hire scheme against a counterfactual scenario in which it did not exist. Health impacts were modelled through changes in physical activity and exposure to air pollution (using a comparative risk assessment approach) and in road traffic injuries (using a risk and travel time based approach). Road traffic injuries were initially estimated using observed injuries among cycle hire users and then, in a second set of analyses, using background injury risk in central London. We included stochastic uncertainty on key parameter estimates to produce 95% credible intervals. We also included deterministic sensitivity analyses, examining the sensitivity of our findings both to key aspects of the London context and to modelling methods.

Main results

Over the year examined, 578 607 users made 7.4 million cycle hire trips (estimated 71% of cycling time by men). These trips would mostly otherwise have been made on foot (31%) or by public transport (47%). There has been a trend towards fewer fatalities and injuries than expected on cycle hire bicycles. Using these observed injury rates, the benefits of cycle hire substantially outweighed harms. However, when we modelled cycle hire injury rates as being equal to the background injury rates for all cycling in central London, the benefits of cycle hire were smaller and evidence of a benefit among female users was lacking. This sex difference largely reflected higher road traffic fatality rates for female cyclists in London. At older ages the modelled benefits of cycling were much larger than the harms. Using background injury rates in the youngest age group (15-29 years), the medium term benefits and harms of cycling in central London were both comparatively small and potentially negative.

Health impact of cycle hire using DALYs modelled through specific diseases

Sex	All non-injury diseases (95% CrI)	Observed cycle hire injury rates: Injuries (95% CrI)	Observed cycle hire injury rates: Total (95% CrI)	Background cycling injury rates for cycle hire: Injuries (95% CrI)	Background cycling injury rates for cycle hire: Total (95% CrI)
Men	−83 (−120 to −56)	10 (4 to 20)	−72 (−110 to −43)	34 (21 to 51)	−49 (−88 to −17)
Women	−22 (−48 to −14)	6 (2 to 12)	−15 (−42 to −6)	21 (14 to 30)	−1 (−27 to 12)
Both sexes	−105 (−165 to −71)	17 (6 to 32)	−88 (−148 to −51)	55 (38 to 78)	−50 (−111 to −9)

DALYS=disability adjusted life years; CrI=credible interval; negative numbers represent a reduction in disease burden.

Data sources

Total population operational registration and usage data for the London cycle hire scheme (collected April 2011-March 2012), surveys of cycle hire users (collected 2011), and London data on travel, physical activity, road traffic collisions, and air pollution from particles ≤2.5 µm (PM2.5, collected 2005-12).

Results of sensitivity analysis

Results were particularly sensitive to assumptions on the age structure of the population (an older population would have larger benefits), the shape of the physical activity dose-response curve, and the relative risk used for physical activity and cardiovascular disease. If injury risks were reduced to those in the Netherlands, benefits would be considerably larger. We also found larger benefits when we modelled physical activity impacts using relatives risks applied directly to all cause mortality, rather than through individual diseases.

Limitations and important assumptions

One limitation is that we only modelled health benefits from short to medium term behaviour change, without time lags between exposure and outcome. A second limitation is that the London bicycle sharing system has not been operating long enough to allow cycle hire specific injury rates to be estimated with precision; hence our complementary use of background injury rates.

Study funding /potential competing interests

There was no explicit funding for this work. A full list of the funders is on bmj.com. JW and AG have received funding from the Greater London Authority to model transport scenarios for London.

Change in mental health after smoking cessation: systematic review and meta-analysis

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Smoking cessation treatment and risk of depression, suicide, and self harm in the Clinical Practice Research Datalink: prospective cohort study (*BMJ* 2013;347:f5704)

STUDY QUESTION

How does mental health change after smoking cessation compared with continuing to smoke in general and psychiatric populations?

SUMMARY ANSWER

Smoking cessation is associated with improvements in mental health compared with continuing to smoke. The effect sizes seem as large for those with psychiatric disorders as those without and are equal or larger to effect estimates of antidepressant treatment for mood and anxiety disorders.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Many smokers with and without mental illnesses want to stop but continue to smoke as they believe smoking offers mental health benefits. This paper provides consistent evidence to suggest that smoking cessation is associated with improvements in mental health, with no evidence of differences between the general population, populations with mental health disorders, and populations defined by other clinical characteristics.

Selection criteria for studies

We searched Web of Science, Cochrane Central Register of Controlled Trials, Medline, Embase, and PsycINFO for relevant studies from inception to April 2012. We hand searched reference lists of included studies and contacted authors when insufficient data were reported. Studies were in adult smokers in the general population or from populations defined by the presence of other clinical characteristics. Studies had to report data on people who had continued smoking and those who had quit smoking during the study period, and measure mental health immediately before quitting and at least six weeks after quitting. We included studies that provided sufficient data to calculate the standardised mean difference (SMD) and its variance in change in mental health score from baseline to follow-up between quitters and continuing smokers.

Primary outcome

Self report measures designed to assess anxiety, depression, mixed anxiety and depression, positive affect, and psychological quality of life.

Main results and role of chance

Follow-up mental health scores were measured between seven weeks and nine years after baseline. Anxiety, depression, mixed anxiety and depression, and stress significantly decreased between baseline and follow-up in quitters compared with continuing smokers: the standardised mean differences (95% confidence intervals) were −0.37 (−0.70 to −0.03) for anxiety; −0.25 (−0.37 to −0.12) for depression; −0.31(−0.47 to −0.14) for mixed anxiety and depression; and −0.27(−0.40 to −0.13) for stress. Both psychological quality of life and positive affect significantly increased between baseline and follow-up in quitters compared with continuing smokers (0.22 (0.09 to 0.36) and 0.40 (0.09 to 0.71), respectively).

Bias, confounding, and other reasons for caution

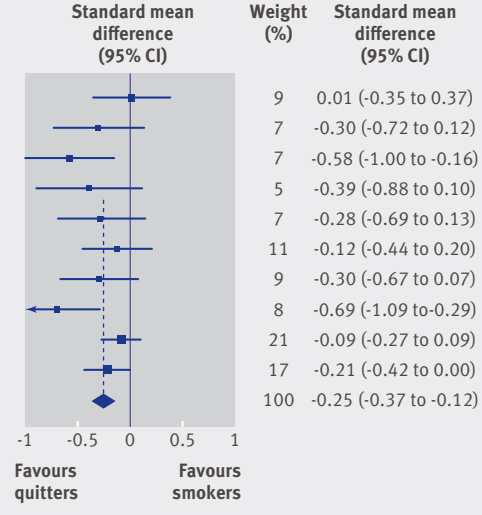
We conducted sensitivity and subgroup analyses to investigate within and between study heterogeneity. We found no evidence that methodological issues or population characteristics changed our results greatly. We found minimal evidence of selective reporting and small study bias. Observational data, however, cannot prove causality.

Some health professionals are reluctant to approach cessation in people with poor mental health for fear that cessation might worsen their state. However, studies show that regular smokers experience depression, anxiety, and irritability a few hours after not having smoked. The misattribution hypothesis states that smokers assume that because smoking abolishes these feelings, that smoking a cigarette has improved their mental health when in fact it was smoking that caused these problems.

Study funding/potential competing interests

This study was funded by a National Coordinating Centre for Research Capacity Development scholarship. Some of the authors have received travel allowance and hospitality from manufacturers of smoking cessation/harm reduction products and funding/grants from UK Centre for Tobacco and Alcohol Studies and National Prevention Research Initiative. AF sat on the professional development group for NICE guidance on stopping smoking in secondary care.

Difference in depression scores from baseline to follow-up in those who stopped or continued smoking



The potential effects of tobacco control in China: projections from the China SimSmoke simulation model

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- Observations: When will the tobacco industry apologise for its monstrous harms? (*BMJ* 2014;348:g437)
- Views and reviews: Communication is a determinant of public health: a media campaign for tobacco control in India (*BMJ* 2013;347:f6275)
- Observations: It is time to plan the tobacco endgame (*BMJ* 2014;348:g1453)

STUDY QUESTION

What is the potential effect of complete implementation of the World Health Organization's Framework Convention for Tobacco Control (FCTC) in China?

SUMMARY ANSWER

Complete implementation of WHO FCTC recommended policies would prevent almost 13 million smoking attributable deaths in China by 2050 and would alleviate a substantial portion of the tobacco related health burden that threatens to slow China's extraordinary gains in life expectancy and prosperity.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Studies have estimated the mortality burden attributable to smoking in China but have not estimated how much fully implementing FCTC measures might prevent tobacco related deaths. Complete implementation of recommended tobacco control measures in China would lead to a relative reduction of over 40% in smoking and prevent almost 13 million tobacco deaths by 2050.

Main results

Of the individual FCTC recommended tobacco control policies, increasing the tobacco excise tax to 75% of the retail price was projected to be the most effective, incrementally reducing current smoking relative to status quo by almost 13% by 2050. However, strict advertising restrictions, smoke-free air laws, health warnings, media campaigns, and cessation treatment policies would also play an important role. Complete and simultaneous implementation of all FCTC policies was projected to incrementally reduce smoking by about 40% relative to the 2050 status quo levels and to prevent approximately 12.8 million smoking attributable deaths and 154 million life years lost by 2050.

Prevalence of smoking, smoking attributable deaths averted, and life years gained, 2012-50, projected by China SimSmoke model

Variables	2010*	2015	2050	Deaths averted 2012-50*	Life years gained 2012-50*
Status quo prevalence of smoking in males	52.1	51.3	46.5	—	—
% change in male smoking prevalence from status quo from implementing new policies:					
Raise taxes to 75% of retail price	—	−10.0	−12.9	3 476 341	44 315 184
Comprehensive smoke-free air laws	—	-8.8	-10.3	2 465 027	30 179 085
Comprehensive marketing ban	—	−5.7	−7.5	2 149 873	27 138 822
High intensity tobacco control campaign	—	−2.6	−3.3	1 080 457	13 076 991
Strong health warnings	—	−1.3	−2.3	759 055	8 205 264
Strong access enforcement for youth	—	−0.5	−2.3	27 186	949 533
Cessation treatment policies	—	−2.7	−4.0	1 825 782	18 582 968
Combined policies	—	−31.3	−41.2	12 744 380	154 247 987

*For both males and females.

Design

The SimSmoke tobacco control policy simulation model was applied to China. SimSmoke is a Markov computer simulation model of tobacco smoking prevalence, smoking attributable deaths, and the impact of tobacco control policy. Into SimSmoke we entered China's adult population, current and former smoking prevalence, initiation and cessation rates, and past policy levels, and validated the model by comparing predicted smoking prevalence with smoking prevalence measured in tobacco surveys from 1996-2010.

Limitations

The effects of policy are subject to uncertainty, especially on how the effects of the interventions apply to a Chinese setting and the potential synergistic effects of simultaneously implementing multiple tobacco control policies. Tax increases are assumed to be passed along to consumers, but a recent tax increase in China was absorbed and resulted in no change in cigarette prices for consumers at the point of purchase. The direct impact of smoke-free air regulations and indirect impact of current smoking declines on secondhand smoking related deaths was not projected, leading to underestimation of the effects on deaths. Data on cessation rates and initiation rates were limited.

Study funding /potential competing interests

DL received funding from Bloomberg Philanthropies and from the Cancer Intervention and Surveillance Modeling Network of the Division of Cancer Control and Population Sciences, National Cancer Institute (grant UO1-CA97450-02) for general development of the SimSmoke model. T-WH was supported by the US Fogarty International Center of the National Institutes of Health and the National Cancer Institute of the National Institutes of Health (1R01TW009295-01). RLR-B was supported by a European Commission Erasmus Mundus masters program fellowship (Erasmus Mundus category A Europubhealth student scholarship, Framework Partnership Agreement 2006-0047). AEM was supported by a US National Heart, Lung, and Blood Institute Career Development Award (K08 HL089675-01A1). We have no competing interests.

Explaining trends in Scottish coronary heart disease mortality between 2000 and 2010 using IMPACT SEC model: retrospective analysis using routine data

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Research: Coronary heart disease mortality among young adults in Scotland in relation to social inequalities: time trend study (*BMJ* 2009;339:b2613)

STUDY QUESTION

To what extent has the recent decline in coronary heart disease (CHD) mortality in Scotland been driven by treatments or changes in cardiovascular risk factors, and have all socioeconomic groups benefited equally?

SUMMARY ANSWER

CHD mortality fell substantially, particularly in affluent areas; improved treatments accounted for approximately 43% of the fall, and benefits were very equitably distributed.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

CHD remains the largest cause of total and premature deaths in Scotland, generating strong and persistent socioeconomic inequalities. The single largest contribution to the 43% fall in CHD mortality between 2000 and 2010 came from population level falls in blood pressure, but increases in obesity and diabetes are already generating many additional deaths.

Participants and setting

We studied the Scottish population aged 25 years and over in 2000 and 2010.

Design

This was a retrospective analysis using data relating to the Scottish population, patient groups, and prevalence of risk factors from a variety of sources. We estimated net treatment benefits in nine mutually exclusive groups of patients by using the results of randomised controlled trials and meta-analyses. We estimated the mortality benefit of a change in each of six major cardiovascular risk factors by using regression coefficients and population attributable risk fractions from large meta-analyses. We then used the $IMPACT_{SEC}$ model to estimate the number of deaths prevented or postponed and compared this with the fewer deaths actually observed in 2010 compared with 2000.

Percentage reduction in deaths prevented or postponed between 2000 and 2010 among adults in Scotland aged 25 and over attributable to changes in treatments and risk factors

Treatments by patient groups/risk factors	Scotland	Most affluent fifth	Most deprived fifth
Total treatments	43.0	45.5	43.9
Total risk factors	38.8	35.9	43.5
Diabetes	−8.2	−5.3	−11.5
Systolic blood pressure, mm Hg	36.9	37.5	37.2
Total cholesterol, mmol/L	8.9	4.7	13.8
Body mass index	−4.1	−3.9	−4.3

Primary outcome

The main outcome was the number of deaths prevented or postponed owing to treatment uptake or changes in risk factors.

Main results and the role of chance

In all, 5770 fewer CHD deaths than expected occurred in 2010 (8042 rather than 13 813), representing a 43% decline since 2000. Approximately 43% (95% confidence interval 33% to 61%) of this decline was attributable to improved uptake of treatments, particularly statins (13%), secondary prevention (9%), and management of chronic stable CHD (7%). A further 39% (29% to 49%) of the fall in mortality was attributable to changes in risk factors, mainly a 2 mm Hg fall in population systolic blood pressure (37%). Mortality gains from decreases in smoking and physical inactivity were cancelled out by increases in obesity (−4%) and diabetes (−8%). The overall decline in CHD mortality was more pronounced in the most affluent fifth compared with the most deprived fifth (44% *v* 38%). Reductions in mortality attributable to treatments were spread very equitably across fifths. However, changes in risk factors accounted for a larger proportion of the decline in mortality in the most deprived fifth compared with the most affluent fifth (44% *v* 36%). Conversely, the increase in deaths due to diabetes was also higher in the most deprived fifth (−12%) than in the most affluent fifth (−5%).

Bias, confounding, and other reasons for caution

Our model could not explain 18% of the decline in CHD mortality, perhaps reflecting a lack of precision in estimates of risk factors or the omission of other psychosocial or dietary risk factors. We used an area based rather than individual measure of deprivation. Mortality rates for 2010 were calculated using 2001 population estimates rolled forward.

Generalisability to other populations

This was a population based study generally representative of the people of Scotland. Results were broadly in line with analyses of English data from 2000 to 2007.

Study funding/potential competing interests

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