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Effect of smoke-free workplaces on smoking behaviour: systematic review

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Abstract

Objective To quantify the effects of smoke-free workplaces on smoking in employees and compare these effects to those achieved through tax increases.

Design Systematic review with a random effects meta-analysis.

Study selection 26 studies on the effects of smoke-free workplaces.

Setting Workplaces in the United States, Australia, Canada, and Germany.

Participants Employees in unrestricted and totally smoke-free workplaces.

Main outcome measures Daily cigarette consumption (per smoker and per employee) and smoking prevalence.

Results Totally smoke-free workplaces are associated with reductions in prevalence of smoking of 3.8% (95% confidence interval 2.8% to 4.7%) and 3.1 (2.4 to 3.8) fewer cigarettes smoked per day per continuing smoker. Combination of the effects of reduced prevalence and lower consumption per continuing smoker yields a mean reduction of 1.3 cigarettes per day per employee, which corresponds to a relative reduction of 29%. To achieve similar reductions the tax on a pack of cigarettes would have to increase from \$0.76 to \$3.05 (€0.78 to €3.14) in the United States and from £3.44 to £6.59 (€5.32 to €10.20) in the United Kingdom. If all workplaces became smoke-free, consumption per capita in the entire population would drop by 4.5% in the United States and 7.6% in the United Kingdom, costing the tobacco industry \$1.7 billion and £310 million annually in lost sales. To achieve similar reductions tax per pack would have to increase to \$1.11 and £4.26.

Conclusions Smoke-free workplaces not only protect non-smokers from the dangers of passive smoking, they also encourage smokers to quit or to reduce consumption.

Introduction

In the United States, passive smoking has been linked to the deaths of at least 53 000 non-smokers each year, about one non-smoker for each eight smokers that tobacco kills.^{1 2} Legislation enforced to protect the health of non-smokers also creates an environment that encourages smokers to cut back or quit. Since as early as the 1980s the tobacco industry has recognised that smoke-free workplaces have a major effect on cigarette consumption.³ In 1992 Phillip Morris Tobacco Company privately estimated that if all workplaces were smoke-free, total consumption would drop about 10%, through a combination of quitting and cutting down.⁴

We investigated the effects of smoke-free workplaces on cigarette consumption and compared these effects with those obtained by raising taxes.

Methods

Study selection

We located studies on the effects of totally smoke-free workplaces on prevalence of smoking and daily cigarette consumption through Medline, Science Citation Index, Social Sciences Citation Index, Current Contents, and PsychInfo; from reviews; and from references in the papers we located.

We included 26 studies reported in 24 papers. Worksite studies measured changes in smoking that accompanied regulations in individual workplaces assessed prospectively,⁵⁻¹² in sequential cross sections,^{6 13-18} or retrospectively.^{17 19-23} Population studies compared behaviour of smokers employed in workplaces with differing smoking policies and were cross sectional.²⁴⁻²⁸ See the long version of this paper on *bmj.com* for the details of the studies.

We excluded 16 studies because they evaluated policies that were not totally smoke-free and 11 because they did not report the desired outcomes. We excluded one study because the surveys carried out before and after the non-smoking policy were separated by eight years, so results could be contaminated by confounding factors.

Data analysis

We computed differences in consumption (per smoker and per employee) and prevalence before and after workplaces became smoke-free (in workplace studies) or between comparable samples with and without regulations (in population studies). We pooled all studies in a random effects meta-analysis. There was no evidence of publication bias as assessed with funnel plots (see *bmj.com*).

Results

Effects of smoke-free workplaces

Implementation of totally smoke-free workplace policies was associated with a reduction in absolute prevalence of 3.8% (95% confidence interval 2.8% to 4.7%) and a decrease in consumption of 3.1 (2.4 to 3.8) cigarettes per day per continuing smoker (see *bmj.com*). Combination of the effects of stopping smoking and the lower consumption per continuing smoker means that 1.3 (range 0.2-1.8) fewer cigarettes were smoked per day per employee (smokers and non-smokers), which corresponds to a 29% (11%-53%) relative reduction.

The time between implementation of the totally smoke-free workplace policies and the follow up survey ranged from 1 to 24 months (mean 10 months, median 9 months) in the 21 workplace studies. The correlation between length of follow up and effect was not significant. The effects of smoke-free workplaces after they were implemented remained stable over time.

Table 1 Price and tax changes necessary to obtain same effect as smoke-free workplaces

Location	Effect of smoke-free workplace on consumption	Equivalent price effect (per pack)			Equivalent tax effect (per pack)	
		Relative change*	Absolute change	Price/tax increase	Relative change	Absolute change
Within workplace (consumption/employee)						
US	-29%†	+73%	\$3.12‡ to \$5.41	\$2.29	+300%	\$0.76‡ to \$3.05
UK	-29%†	+73%	£4.30§ to £7.45	£3.15	+92%	£3.44§ to £6.59
In population (consumption/capita)						
US	-4.5%¶	+11%	\$3.12‡ to \$3.47	\$0.35	+47%	\$0.76‡ to \$1.11
UK	-7.6%¶	+19%	£4.30§ to £5.12	£0.82	+24%	£3.44§ to £4.26

Note: Numbers may not add up because of rounding. As of June 2002: £1=\$1.50=€1.55; \$1=£0.67=€1.03.

*Smoke-free workplace effect/price elasticity of cigarette consumption (-0.4²⁹) (see text).

†From table 1 in full version on *BMJ's* website (bmj.com).

‡Average price or tax in United States in 2000.³⁴

§Average price or tax for 20 Marlboros in United Kingdom in 2001 (Clive Bates, personal communication).

¶Effect on consumption per employee of smoke-free workplace (-29%)×proportion employed indoors (50%^{30 31})×proportion not yet smoke-free (31%³²) for US; for UK figures are -29%×50%^{30 31}×52%.³³

Comparison with tax increases

Increasing the price of cigarettes by 10% leads to a 4% reduction in consumption per capita (which reflects changes in both consumption per smoker and prevalence).²⁹ To obtain the 29% drop in employee consumption resulting from smoke-free workplaces would require an increase in the price of cigarettes of 73% (29%/0.4). Such an increase would require the average tax per pack to be increased from \$0.76 to \$3.05 in the United States and from £3.44 to £6.59 in the United Kingdom (table 1).

The effect of workplace policies on consumption in the general population will be equivalent to a smaller tax increase because making workplaces smoke-free affects only those employed indoors and outside the home (about half of the US adult population^{30 31}) and whose workplaces are not already smoke-free (31% in the United States³² and 52% in the United Kingdom³³), while tax increases will affect all tobacco buyers. The marginal effect on the entire population of making all workplaces smoke-free would be a reduction in per capita cigarette consumption of 4.5% in the United States and 7.6% in the United Kingdom. To achieve these reductions would require an increase in tax from \$0.76 to \$1.11 per pack in the United States and from £3.44 to £4.26 in the United Kingdom.

Totally smoke-free workplaces versus smoke-free areas

Totally smoke-free workplaces had about twice the effect on consumption and prevalence as policies that allowed smoking in some areas (table 2). Internal research at Phillip Morris reached similar conclusions in 1992: "Milder workplace restrictions, such as smoking only in designated areas, have much less impact on quitting rates [than totally smoke-free workplaces] and very little impact on consumption."⁴

Discussion

In this review we found that smoke-free workplaces are associated with a decrease in prevalence of tobacco consumption of nearly 4%, a decrease not due to underlying secular trends in prevalence.

Effect on tobacco company revenues

In the United States about 103 million people are employed indoors outside the home,^{30 31} 69% of whom are already in smoke-free workplaces.³² The marginal effect of the remaining workplaces becoming smoke-free would be 40 million fewer cigarettes smoked per day (103 million×31%×-1.3 cigarettes per day per employee). In the United States in 2000 the average pretax price for 20 cigarettes was \$2.36³⁴ so this reduced consumption would cost the tobacco industry \$1.7bn per year in lost sales. Likewise in the United Kingdom 29.9 million people are employed indoors,³⁵ with 48% already working in smoke-free workplaces. In 2001 the pretax price of 20 Marlboro cigarettes was £0.86 (Clive Bates, personal communication) so the marginal effect of all work sites becoming smoke-free would be 20 million fewer cigarettes smoked per day, worth £310m a year to the tobacco industry.

Effects of legislation

To protect the health of non-smokers US local and state governments have enforced legislation restricting smoking in public and in workplaces. Studies that characterised laws according to extensiveness of their coverage found decreases in consumption per capita or prevalence associated with more extensive laws compared with no laws ranging from 0.16 to 0.73 fewer cigarettes per day per capita and 3.7% to 4.5% reduction in absolute prevalence.^{36 37-39 40}

Local clean air laws are stronger and more comprehensive than state legislation.⁴¹ Strong local ordinances

Table 2 Comparison of the effects of totally smoke-free versus partially smoke-free workplaces*

Study	Setting	Consumption/smoker†		Prevalence (%)	
		Smoke-free v unrestricted	Partially smoke-free v unrestricted	Smoke-free v unrestricted	Partially smoke-free v unrestricted
Woodruff, 1993 ⁴⁶	1990 statewide survey of California	-3.3	-2.8	-6.3%	-3.5%
Glasgow, 1997 ⁴⁶	1993 study of 22 North American communities	-2.8	-1.2	NR	NR
Farely, 1999 ⁴⁵	1992-93 survey of US workers	-2.7	-1.5	-5.7%	-2.6%

NR: Not reported.

*Totally smoke-free workplaces allow no smoking inside buildings, partially smoke-free workplaces allow smoking in designated areas.

†Cigarettes per day.

in California in 1990-1 were associated with an absolute quit rate (over the previous six months) 7.6% higher than in areas with no workplace laws.³⁷ A Canadian study in 1990-1 found a 21% reduction in the odds of being a smoker in areas with high versus low coverage of smoking bylaws.⁴² A 1995 Finnish law that prohibited smoking in public areas in workplaces (with the option of creating separately ventilated smoking rooms) was associated with a 4.5% drop in prevalence of smoking and three fewer cigarettes smoked per day among continuing smokers.⁴³

Effects of smoke-free workplaces and clean air legislation on teenagers

Teenagers respond to smoke-free environments by decreasing smoking. Teenagers who worked in totally smoke-free work sites were 68% (95% confidence interval 51% to 90%) as likely to ever smoke than those who worked in less restricted work sites.⁴⁴ Studies that compared the effects of extensive versus no laws on smoking in young people found absolute reductions in prevalence of 2.3% to 46.0%,⁴⁵⁻⁴⁶ a relative reduction in prevalence of 17.2%,⁴⁷ and a relative reduction in per capita cigarette consumption of 50.4%.⁴⁰

Voluntary action to make homes smoke-free leads to lower rates of smoking among US high school students (odds ratio 0.79, 95% confidence interval 0.67 to 0.91, for 30 day prevalence).⁴⁷ Teenagers living in a smoke-free home were 74% (62% to 88%) as likely to ever smoke compared with those who lived in households with no smoking restrictions, after adjustment for demographics and smoking status of other household members.⁴⁴ Among young people aged 14 to 22 years old in the United States the only significant predictor of planning to stop smoking was the belief that passive smoking harms non-smokers; this belief more than doubled the chances of planning to stop or of having stopped already.⁴⁸ These effects, as well as the workplace effects, probably act by reinforcing the social unacceptability of smoking.

As interventions designed to restrict the purchase of cigarettes have no effect on the prevalence of smoking among teenagers,⁴⁹ clean indoor air is an effective strategy for reducing tobacco consumption among teenagers.

Weaknesses of study

We included studies with different methods carried out in different settings at different points in time. There were, however, no systematic differences in the results obtained in the workplace and population based studies, and the random effects model in the meta-analysis allows for any heterogeneity in study design.

We used changes in consumption per continuing smoker to measure the effect of the policies on consumption. Eight of the studies, however, reported consumption per current smoker (that is, including in the baseline measurement people who quit after the policy was implemented and in the follow up those who started after the policy). We used these data as consumption per continuing smoker. There is evidence that changes in consumption among current smokers are smaller on average than those among continuing smokers.⁵⁰⁻⁵¹ We may therefore be underestimating the effect on continuing smokers.

What is already known on this topic

Smoke-free workplaces are associated with lower cigarette consumption per continuing smoker

What this study adds

Smoke-free workplaces reduce prevalence of smoking as well as consumption

The combined effects of people stopping smoking and reducing consumption reduces total cigarette consumption by 29%

To achieve similar results through taxation would require cigarette taxes per pack to increase from \$0.76 to \$3.05 in the United States and from £3.44 to £6.59 in the United Kingdom

Interpretation of results

While producing benefits for non-smokers by eliminating passive smoking, smoke-free workplaces make it easier for smokers to reduce or stop smoking and substantially reduce tobacco industry sales. This loss in revenues explains why the industry fights so hard against legislation to ensure that workplaces become smoke-free.^{3-4, 52}

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- 1 National Cancer Institute. *Health effects of exposure to environmental tobacco smoke: the report of the California Environmental Protectional Agency*. Bethesda, MD: National Cancer Institute, 1999 (Smoking and Health Monograph 10).
- 2 Glantz SA, Parmley WW. Passive smoking and heart disease. *Epidemiology, physiology, and biochemistry*. *Circulation* 1991;83:1-12.
- 3 Chilcote S. Public smoking: the problem (SDC Introduction). Tobacco Institute, 1985. Bates Range TIMN0014552/4597 www.tobaccoinstitute.com/getimg.asp?pgno=0&start=0&if=avtdx&bool=0014598&docid=TIMN0014554/4565&docnum=2&summary=0&sel1= (accessed 27 Oct 2001).
- 4 Heironimus J. Impact of workplace restrictions on consumption an incidence (memo to Louis Suwana), Phillip Morris, 21 January, 1992: Bates Range 2045447779/7806 www.pmdocs.com/PDF/2045447779_7806.PDF (accessed 27 Oct 2001).
- 5 Borland R, Chapman S, Owen N, Hill D. Effects of workplace bans on cigarette consumption. *Am J Public Health* 1990;80:178-80.
- 6 Borland R, Owen N, Hocking B. Changes in smoking behaviour after a total workplace smoking ban. *Aust J Public Health* 1991;15:130-4.
- 7 Brigham J, Gross J, Sützer M, Felch L. Effects of a restricted work-site smoking policy on employees who smoke. *Am J Public Health* 1994;84:773-8.
- 8 Broder I, Pilger C, Corey P. Environment and well-being before and following smoking ban in office buildings. *Can J Public Health* 1993;84:254-8.
- 9 Gomel M, Oldenburg B, Lemon J, Owen N, Westbrook F. Pilot-study of the effects of a workplace smoking ban on indexes of smoking, cigarette craving, stress and other health behaviors. *Psychol Health* 1993;8:223-9.
- 10 Hudzinski LG, Frohlich ED. One-year longitudinal study of a no-smoking policy in a medical institution [see comments]. *Chest* 1990;97:1198-202.
- 11 Hudzinski LG, Sirois PA. Changes in smoking behavior and body weight after implementation of a no-smoking policy in the workplace. *South Med J* 1994;87:322-7.
- 12 Stillman FA, Becker DM, Swank RT, Hantula D, Moses H, Glantz S, et al. Ending smoking at the Johns Hopkins Medical Institutions. An evaluation of smoking prevalence and indoor air pollution. *JAMA* 1990;264:1565-9.
- 13 Becker D, Conner H, Waranch H, Stillman F, Pennington L, Lees P, et al. The impact of a total ban on smoking in the Johns Hopkins Children's Center. *JAMA* 1989;262:799-802.
- 14 Centers for Disease Control and Prevention. Evaluation of an employee smoking policy—Pueblo, Colorado. *MMWR Morb Mortal Wkly Rep* 1990;39:673-6.
- 15 Gottlieb NH, Eriksen MP, Lovatto CY, Weinstein RP, Green LW. Impact of a restrictive worksite smoking policy on smoking behavior, attitudes, and norms. *J Occup Med* 1990;32:16-23.
- 16 Mullooly JP, Schuman KL, Stevens VJ, Glasgow RE, Vogt TM. Smoking behavior and attitudes of employees of a large HMO before and after a work site ban on cigarette smoking. *Public Health Rep* 1990;105:623-8.
- 17 Offord KP, Hurt RD, Berge KG, Frusti DK, Schmidt L. Effects of the implementation of a smoking free policy in a medical center. *Chest* 1992;102:1531-6.

- 18 Tsushima WT, Shimizu AA. Effects of a no-smoking policy upon medical center employees. *Int J Addict* 1991;26:23-8.
- 19 Baile WF, Gilbertini M, Ulschak F, Snow-Antle S, Hann D. Impact of a hospital smoking ban: changes in tobacco use and employee attitudes. *Addict Behav* 1991;16:419-26.
- 20 Daughton DM, Andrews CE, Orona CP, Patil KD, Rennard SL. Total indoor smoking ban and smoker behavior. *Prev Med* 1992;21:670-6.
- 21 Olive KE, Ballard JA. Changes in employee smoking behavior after implementation of restrictive smoking policies. *South Med J* 1996;89:699-706.
- 22 Stave GM, Jackson GW. Effect of a total work-site smoking ban on employee smoking and attitudes. *J Occup Med* 1991;33:884-90.
- 23 Rosenstock IM, Stregachis A, Heany C. Evaluation of a smoking prohibition policy in a health maintenance organization. *Am J Public Health* 1986;76:1014-5.
- 24 Brenner H, Mielck A. Smoking prohibition in the workplace and smoking cessation in the Federal Republic of Germany. *Prev Med* 1992;21:252-61.
- 25 Farelly MC, Evans WN, Slekas AE. The impact of workplace smoking bans: results from a national survey. *Tob Control* 1999;8:272-7.
- 26 Glasgow RE, Cummings KM, Hyland A. Relationship of worksite smoking policies to changes in employee tobacco use: findings from COMMIT. *Tob Control* 1997;6(suppl 2):S44-8.
- 27 Kinne S, Kristal A, White E, Hunt J. Work-site smoking policies: their population impact in Washington State. *Am J Public Health* 1993;83:1031-3.
- 28 Woodruff TJ, Rosbrook B, Peirce J, Glantz SA. Lower levels of cigarette consumption found in smoke-free workplaces in California. *Arch Intern Med* 1993;153:1485-93.
- 29 US Department of Health and Human Services. *Reducing tobacco use: a report of the surgeon general*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health, 2000.
- 30 US Bureau of the Census. Resident population of the United States by age and sex. www.census.gov/population/estimates/nation/intfile2-1.txt (accessed 17 Aug 2001).
- 31 US Bureau of Labor Statistics. National employment and wage estimates. www.bls.gov/oes/1999/oes_n.htm (accessed 17 Aug 2001).
- 32 Shopland DR, Gerlach KK, Burns DM, Hartman AM, Gibson JT. State-specific trends in smoke-free workplace policy coverage. The current population survey tobacco use supplement 1993 to 1999. *J Occup Environ Med* 2001;43:680-6.
- 33 Lader D, Meltzer H. *Smoking related behaviour and attitudes, 1999*. London: Office for National Statistics, 2000.
- 34 Orzechowski W, Walker R. *The tax burden on tobacco*. Arlington, VA: Orzechowski and Walker, 2000.
- 35 Office for National Statistics. Mid-2000 UK population estimates. www.statistics.gov.uk/pdfdir/pop0801.pdf (accessed 21 August 2001).
- 36 Chaloupka F. Clean indoor air laws, addiction and cigarette smoking. *Appl Econ* 1992;24:193-205.
- 37 Moskowitz JM, Lin Z, Hudes ES. The impact of workplace smoking ordinances in California on smoking cessation. *Am J Public Health* 2000;90:757-61.
- 38 Emont S, Choi W, Novotny T, Giovina G. Clean indoor air legislation, taxation and smoking behavior in the United States: an ecological analysis. *Tob Control* 1992;2:13-7.
- 39 Yurekli AA, Zhang P. The impact of clean indoor air laws and cigarette smuggling on demand for cigarettes: an empirical model. *Health Econ* 2000;9:159-70.
- 40 Wasserman J, Manning WG, Newhouse JP, Winkler JD. The effects of excise taxes and regulations on cigarette smoking. *J Health Econ* 1991;10:43-64.
- 41 National Cancer Institute. *Major local tobacco control ordinances in the United States*. Bethesda, MD: USDHHS, 1993 (Smoking and Tobacco Control Monograph 3).
- 42 Stephens T, Pederson LL, Koval JJ, Kim C. The relationship of cigarette prices and no-smoking bylaws to the prevalence of smoking in Canada. *Am J Public Health* 1997;87:1519-21.
- 43 Heloma A, Jaakola M, Kahkonen E, Reijula K. The short-term impact of national smoke-free workplace legislation on passive smoking and tobacco use. *Am J Pub Health* 2001;91:1416-8.
- 44 Farkas AJ, Gilpin EA, White MM, Pierce JP. Association between household and workplace smoking restrictions and adolescent smoking. *JAMA* 2000;284:717-22.
- 45 Lewit E, Hyland A, Kerrebrock N, Cummings K. Price, public policy and smoking in young people. *Tob Control* 1997;6(suppl 2):S17-24.
- 46 Chaloupka FJ, Pacula RL. Sex and race differences in young people's responsiveness to price and tobacco control policies. *Tob Control* 1999;8:373-7.
- 47 Wakefield MA, Chaloupka FJ, Kaufman NT, Orleans CT, Barker DC, Ruel EE. Effect of restrictions at home, at school, and in public places on teenage smoking: cross sectional study. *BMJ* 2000;321:333-7.
- 48 Glantz SA, Jamieson P. Attitudes toward secondhand smoke, smoking, and quitting among young people. *Pediatrics* 2000;106:E82.
- 49 Fichtenberg CM, Glantz SA. Youth access interventions do not affect youth smoking. *Pediatrics* 2002;109:1088-92.
- 50 US Department of Health and Human Services. *Reducing the health consequences of smoking: 25 years of progress. A report of the surgeon general*. Rockville, MD: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health, 1989.
- 51 Hymowitz N, Cummings KM, Hyland A, Lynn WR, Pechacek TF, Hartwell TD. Predictors of smoking cessation in a cohort of adult smokers followed for five years. *Tob Control* 1997;6(suppl 2):S57-62.
- 52 Glantz S, Balbach E. *Tobacco war: inside the California battles*. Berkeley, CA: University of California Press, 2000.

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Alcohol consumption and mortality: modelling risks for men and women at different ages

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Abstract

Objective To estimate the relation between alcohol consumption and risk of death, the level of alcohol consumption at which risk is least, and how these vary with age and sex.

Design Analysis using published systematic reviews and population data.

Setting England and Wales in 1997.

Main outcome measures Death from any of the following causes: cancer of lip, oral cavity, pharynx, oesophagus, colon, rectum, liver, larynx, and breast, essential hypertension, coronary heart disease, stroke, cirrhosis, non-cirrhotic chronic liver disease, chronic pancreatitis, and injuries.

Results A direct dose-response relation exists between alcohol consumption and risk of death in women aged 16-54 and in men aged 16-34. At older ages the relation is U shaped. The level at which the risk is lowest increases with age, reaching 3 units a

week in women aged over 65 and 8 units a week in men aged over 65. The level at which the risk is increased by 5% above this minimum is 8 units a week in women aged 16-24 and 5 units a week in men aged 16-24, increasing to 20 and 34 units a week in women and men aged over 65, respectively.

Conclusions Substantially increased risks of all cause mortality can occur even in people drinking lower than recommended limits, and especially among younger people.

Introduction

Alcohol consumption increases the risk of various cancers, hypertension, liver disease, unintentional injuries, and violence.¹⁻³ Definitions of light and moderate alcohol consumption vary, but these levels of consumption are generally found to decrease the risk of ischaemic heart disease.²⁻⁶ For all cause mortality the relation is typically U shaped, with non-drinkers and heavier



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