Protecting children from second-hand smoke

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Effects of smoke-free legislation on paediatric RTIs: more evidence that child health can be easily improved http://ow.ly/OPcWd

Since the 1970s, we have known that second-hand smoke (SHS) makes children sick, but we have only recently begun to quantify tobacco-related ill health, and to monitor the effects of public health interventions. In this issue of the *European Respiratory Journal*, Been *et al.* [1] quantify, for the first time, the effects of smoke-free legislation on hospitalisations for paediatric respiratory infections.

In 1974, two *Lancet* papers found that infants with smoking parents had higher hospital admission rates and higher risks of pneumonia and bronchitis [2, 3]. Since then, an accumulating body of evidence has confirmed a higher incidence of cough, wheeze, asthma, upper and lower respiratory tract infections (RTIs), preterm birth, and sudden infant death [4–6]. Globally, ~40% of children are exposed to SHS [7]. Oberg *et al.* [7] conservatively attributed 603 000 deaths (1% of all deaths) and 10.9 million disability-adjusted life years (DALYs) (0.7% of all DALYs) to SHS, based on area-specific prevalence of those exposed, and on disease-specific risk estimates for lower respiratory infections, otitis media, asthma, lung cancer and ischaemic heart disease. For this assessment, the authors considered only the listed outcomes with level "A" evidence; real numbers will be higher. Children accounted for 166 000 (28%) deaths and for 6.6 million (40%) DALYs caused by SHS; and within childhood disease, lower respiratory infections were most relevant. SHS is a group 1 carcinogen with no safe levels, and children with their immature immune system and developing lungs are particularly vulnerable [8].

Parents, who smoke at home or in the car, are responsible for children's exposure to SHS [9]. To improve child health, we therefore need interventions targeted at adults: preventing them from taking up smoking, or helping them quit. One approach is that of individual prevention, which attempts to change parents' attitudes and educate them through individual counselling, education or smoking cessation programmes. A second approach is structural, which depends on changing the environment and organisational structures by methods such as economic incentives, reducing the availability of cigarettes, tobacco-free advertising, or smoke-free public spaces [10].

Individual prevention remains important in clinical practice. Combining medication and counselling by a physician doubles the chance that individual smokers will quit, and is more cost-effective than other clinical interventions [10]. However, absolute rates of quitting remain low and smoking cessation programmes, including nicotine replacement therapy, electronic cigarettes and nicotine vaccines have small effects [11–13]. Even when patients are severely ill with COPD [14], or are offered financial rewards for successful quitting [15], quit rates hardly exceed 15%. Families of lower socioeconomic status (SES), who have a higher prevalence of smoking [16], tend to profit less from individual prevention [17].

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When a large proportion of the population is at risk and the target behaviour is common, structural prevention may be more effective, and there exist very effective structural interventions to reduce smoking. Price increases are by far the most effective measure [10, 18–20]. Campaigns designed to tarnish the image of smokers are also effective, and so are regulations that promote smoke-free public places [10]. Despite their effectiveness, these interventions are rarely implemented. To change this, the World Health Organization (WHO) developed the Framework Convention on Tobacco Control (FCTC), the first evidence-based treaty negotiated under its auspices [21]. The FCTC represents a paradigm shift in regulatory strategies to address addictive substances. In contrast with previous drug control treaties, the FCTC emphasises the importance not only of supply issues, but also of demand reduction strategies. The tobacco companies fiercely opposed the FCTC and employed a subtle strategy to defeat smoke-free policies and legislation [22–24], but the convention was adopted by the 56th World Health Assembly on May 21, 2003 and entered into force on February 27, 2005. The 180 countries party to the WHO FCTC recognise that there is no safe level of exposure to tobacco smoke, and recommend effective protection measures. Guidelines for implementing Article 8 specify that smoking and tobacco smoke should be eliminated from indoor work places, indoor public places and public transport. Yet, only 16% of the world's population is currently covered by comprehensive smoke-free laws [21, 25, 26].

For adults, the FCTC's passage in 2005 led to dramatic positive health effects. A meta-analysis from 2012, including 45 studies, showed that comprehensive smoke-free legislation was followed by lower rates of hospital admissions (or deaths) for four diagnostic groups: coronary events (relative risk 0.848); other heart disease (relative risk 0.610); cerebrovascular accidents (relative risk 0.840); and respiratory disease (relative risk 0.760) [27]. More comprehensive laws were associated with greater reduction of risk. Further evidence on effectiveness, particularly on respiratory admissions, was added by subsequent publications [28, 29].

Less research is available on children, who profit indirectly from the FCTC [30–33]. A recent review by Been *et al.* [34] showed that hospital attendances for asthma (−10.4%) and preterm births (−10.1%) decreased after the introduction of smoke-free legislation. However, data on childhood respiratory infections, which account for most SHS-attributable ill health, were lacking.

In this issue, Been *et al.* [1] present the first study on smoke-free law and hospitalisation for RTIs in children. They analysed hospital episode statistics to investigate the association between smoke-free legislation introduced in England on July 1, 2007, and hospitalisation trends for upper and lower RTIs from 2001 to 2012 in children <15 years of age. They carried out a careful analysis adjusted for confounders, seasonal variation, temporal autocorrelation, population size changes, and underlying incidence trends. A sensitivity analysis explored potential interference from the introduction of pneumococcal conjugate vaccine. They found that introduction of smoke-free legislation was followed by an immediate drop in RTI admissions (−3.5%), mainly attributable to lower RTIs (−13.8%). Reductions in admission for upper RTIs were lower and incremental. The study estimated that 11 000 fewer children were admitted to hospital every year, resulting in savings of roughly £17 million per year. The gradual decrease (but not the acute effect) varied by SES and was largest among children of lower SES.

The study demonstrates the far-reaching effects of a simple and cheap structural intervention: a smoking ban in workplaces and public places. Children are infrequently in workplaces and public places where smoking is common. The effect of the ban must, therefore, have been mediated *via* a reduction of SHS in their homes or cars, as parents might have stopped smoking and others refrained from smoking indoors. Several studies have shown that children's SHS exposure dropped after introduction of smoke-free legislation [32, 33]. For example, in the health survey for England, the proportion of smoke-free homes increased from 30% before the smoking ban to 48% afterwards. Likewise, the proportion of children with urine cotinine levels below the detection limit increased from 34% to 41% [32]. These effects are larger than what is usually attained by individual-based stop smoking programmes, and legislation is far cheaper. The effects could have been larger if smoking bans had included cars [35] and had been combined with higher tobacco prices [18–20].

More effective implementation of the WHO FCTC should be a central goal of political and health authorities in Europe. Political engagement of doctors and medical societies, supporting structural policies, will contribute more to reduce tobacco-related health problems in their country than clinical counselling alone (which of course keeps its value). The claim by Schroeder and Warner [36] that "at a time when all eyes are focused on health care reform, escalating medical costs, and childhood obesity, cigarette smoking remains by far the most common cause of preventable death and disability," is still true and also applies to Europe. Been *et al.* [1] give us even more evidence that child health can be improved easily, effectively and cheaply, if we want.

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References

1 Been JV, Millett C, Lee JT, *et al.* Smoke-free legislation and childhood hospitalisations for respiratory tract infections. *Eur Respir J* 2015; 46: 697–706.
2 Colley JR, Holland WW, Corkhill RT. Influence of passive smoking and parental phlegm on pneumonia and bronchitis in early childhood. *Lancet* 1974; 2: 1031–1034.
3 Harlap S, Davies AM. Infant admissions to hospital and maternal smoking. *Lancet* 1974; 1: 529–532.
4 Cook DG, Strachan DP. Health effects of passive smoking: Summary of effects of parental smoking on the respiratory health of children and implications for research. *Thorax* 1999; 54: 357–366.
5 Mitchell EA, Milerad J. Smoking and the sudden infant death syndrome. *Rev Environ Health* 2006; 21: 81–103.
6 Silvestri M, Franchi S, Pistorio A, *et al.* Smoke exposure, wheezing, and asthma development: a systematic review and meta-analysis in unselected birth cohorts. *Pediatr Pulmonol* 2015; 50: 353–362.
7 Oberg M, Jaakkola MS, Woodward A, *et al.* Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. *Lancet* 2011; 377: 139–146.
8 Centers for Disease Control and Prevention. Fourth National Report on Human Exposure to Environmental Chemicals. Atlanta, US, Department of Health and Human Services, 2009.
9 Kabir Z, Manning PJ, Holohan J, *et al.* Second-hand smoke exposure in cars and respiratory health effects in children. *Eur Respir J* 2009; 34: 629–633.
10 Frieden TR, Bloomberg MR. How to prevent 100 million deaths from tobacco. *Lancet* 2007; 369: 1758–1761.
11 Hartmann-Boyce J, Cahill K, Hatsukami D, *et al.* Nicotine vaccines for smoking cessation. *Cochrane Database Syst Rev* 2012; 8: CD007072.
12 McRobbie H, Bullen C, Hartmann-Boyce J, *et al.* Electronic cigarettes for smoking cessation and reduction. *Cochrane Database Syst Rev* 2014; 12: CD010216.
13 Stead LF, Perera R, Bullen C, *et al.* Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev* 2012; 11: CD000146.
14 Warnier MJ, van Riet EE, Rutten FH, *et al.* Smoking cessation strategies in patients with COPD. *Eur Respir J* 2013; 41: 727–734.
15 Halpern SD, French B, Small DS, *et al.* Randomized trial of four financial-incentive programs for smoking cessation. *N Engl J Med* 2015; 372: 2108–2117.
16 Moore GF, Currie D, Gilmore G, *et al.* Socioeconomic inequalities in childhood exposure to secondhand smoke before and after smoke-free legislation in three UK countries. *J Public Health (Oxf)* 2012; 34: 599–608.
17 Hiscock R, Murray S, Brose LS, *et al.* Behavioural therapy for smoking cessation: the effectiveness of different intervention types for disadvantaged and affluent smokers. *Addict Behav* 2013; 38: 2787–2796.
18 Kostova D, Ross H, Blecher E, *et al.* Is youth smoking responsive to cigarette prices? Evidence from low- and middle-income countries. *Tob Control* 2011; 20: 419–424.
19 Kostova D, Tesche J, Perucic AM, *et al.* Exploring the relationship between cigarette prices and smoking among adults: a cross-country study of low- and middle-income nations. *Nicotine Tob Res* 2014; 16: Suppl. 1, S10–S15.
20 Ross H, Blecher E, Yan L, *et al.* Do cigarette prices motivate smokers to quit? New evidence from the ITC survey. *Addiction* 2011; 106: 609–619.
21 World Health Organization. WHO Framework Convention on Tobacco Control. Geneva, WHO, 2003.
22 Grüning T, Weishaar H, Collin J, *et al.* Tobacco industry attempts to influence and use the German government to undermine the WHO Framework Convention on Tobacco Control. *Tob Control* 2012; 21: 30–38.
23 Diethelm PA, McKee M. Lifting the Smokescreen: Tobacco Industry Strategy to Defeat Smoke Free Policies and Legislation. European Respiratory Society and Institut National du Cancer, 2006; pp. 1–28.
24 Diethelm PA, Rielle JC, McKee M. The whole truth and nothing but the truth? The research that Philip Morris did not want you to see. *Lancet* 2005; 366: 86–92.
25 Frieden TR. Tobacco control progress and potential. *JAMA* 2014; 311: 133–134.
26 World Health Organization. Global progress report on implementation of the WHO Framework Convention on Tobacco Control. Geneva, WHO, 2012.
27 Tan CE, Glantz SA. Association between smoke-free legislation and hospitalizations for cardiac, cerebrovascular, and respiratory diseases: a meta-analysis. *Circulation* 2012; 126: 2177–2183.
28 Hahn EJ, Rayens MK, Adkins S, *et al.* Fewer hospitalizations for chronic obstructive pulmonary disease in communities with smoke-free public policies. *Am J Public Health* 2014; 104: 1059–1065.
29 Kent BD, Sulaiman I, Nicholson TT, *et al.* Acute pulmonary admissions following implementation of a national workplace smoking ban. *Chest* 2012; 142: 673–679.
30 Mackay D, Haw S, Ayres JG, *et al.* Smoke-free legislation and hospitalizations for childhood asthma. *N Engl J Med* 2010; 363: 1139–1145.
31 Millett C, Lee JT, Laverty AA, *et al.* Hospital admissions for childhood asthma after smoke-free legislation in England. *Pediatrics* 2013; 131: e495–e501.
32 Jarvis MJ, Sims M, Gilmore A, *et al.* Impact of smoke-free legislation on children's exposure to secondhand smoke: cotinine data from the Health Survey for England. *Tob Control* 2012; 21: 18–23.
33 Holliday JC, Moore GF, Moore LA. Changes in child exposure to secondhand smoke after implementation of smoke-free legislation in Wales: a repeated cross-sectional study. *BMC Public Health* 2009; 9: 430.
34 Been JV, Nurmatov UB, Cox B, *et al.* Effect of smoke-free legislation on perinatal and child health: a systematic review and meta-analysis. *Lancet* 2014; 383: 1549–1560.
35 Hitchman SC, Fong GT, Zanna MP, *et al.* Support and correlates of support for banning smoking in cars with children: findings from the ITC Four Country Survey. *Eur J Public Health* 2011; 21: 360–365.
36 Schroeder SA, Warner KE. Don't forget tobacco. *N Engl J Med* 2010; 363: 201–204.