

Environmental tobacco smoke exposure among infants, children and young people: now is no time to relax

Juliana Pugmire, Helen Sweeting, Laurence Moore

The detrimental effects of environmental tobacco smoke (ETS—also referred to as passive or secondhand smoke) exposure begin in utero as the placenta offers no barrier to ETS exposure. Maternal smoking during pregnancy increases a child's risk for reduced lung function, wheezing and asthma even in the absence of postnatal ETS exposure. Of course, many children exposed to tobacco in utero are also exposed postnatally. Compared with children raised in smoke-free environments, ETS-exposed children have a higher risk of sudden infant death syndrome, respiratory infection, ear infection, asthma, meningitis and reduced lung growth. Adding to this body of evidence, the systematic review found that children exposed to ETS had increased risk of respiratory adverse events during the peri-anesthetic period of surgery.¹

The harms of ETS exposure follow a child into adulthood. Even when children do not adopt parental smoking habits and assume a smoke-free lifestyle in adulthood, they are still more likely to experience persistent respiratory symptoms into adulthood.² Beyond those risks, children with at least one smoking parent are about 60% more likely to take up smoking in adulthood themselves and the risk of uptake is much higher if both parents smoke³ compounding the risks of childhood ETS exposure with personal smoking in adulthood.

In 2016, the UK and the USA have smoking bans in most public indoor spaces. In the USA, smoking bans are increasingly extending outdoors, covering university campuses and around the entrances to office buildings, restaurants and hospitals. More recently, in the UK legislation has been enacted banning smoking in cars carrying children below 18 years with similar bans in parts of the USA, Australia and Canada. Also in the UK there is increasing support for

extending smoke-free legislation to public places visited by children and young people; on 30 August 2016, every playground in the city of Cardiff, Wales became officially smoke-free.

While many low-income and middle-income countries also have smoke-free legislation, there is less political will to enforce it. Thus, as high-income countries have continued to pass smoke-free legislation and limit advertising, tobacco companies have shifted their marketing and product to low-income and middle-income countries where, according to WHO, almost 80% of the world's 1 billion smokers live.

However, even in countries with strong and well-enforced smoke-free legislation, infants, children and young people continue to be exposed to ETS. ETS exposure varies widely by country and has a strong socioeconomic gradient, with lower socioeconomic status children having the highest ETS exposure.⁴ The primary source of ETS exposure in children is parental smoking in the home.³ Exposure to ETS in the home is estimated at about 2 million children in the UK and 40% of children worldwide.⁵ As a population, children appear to be most susceptible to tobacco smoke. Their lungs are not fully developed and relative to their body size, children have higher respiration and metabolism. Children are also more likely to stay in close proximity to smoking caregivers and spend more time indoors.

Opponents of smoking bans in public places predicted that it would displace smoking into the home. However, the opposite has been shown to be true. Smoke-free legislation is associated with an increase in smoke-free homes^{4 5} and children inarguably benefit, especially when they are strictly enforced. However, even when children live in a home with a strict household smoking ban, their exposure to toxins from ETS is still 5–10 times higher than children from non-smoking households.⁵ Exposure to residual tobacco—also known as thirdhand smoke—may in part explain the increased cotinine levels.

Residual tobacco sticks to walls, surfaces, upholstery or air vents and can remain in dust. Residual tobacco can also

be on the smoker himself/herself in hair, clothes and on hands. Unlike passive smoking with inhalation as a sole pathway for exposure, residual tobacco can be inhaled, ingested or absorbed dermally. This puts very small children at high risk of exposure because of hand-to-mouth behaviour and their regular proximity to the ground.

For these reasons, we propose the following steps to combat ETS exposure in children:

1. *Comprehensive tobacco control policies are needed internationally.* As advertising has become more restrictive and sales have decreased in high-income countries, tobacco companies have shifted their product to countries with poorly enforced antitobacco legislation. Children in low-income and middle-income countries are therefore at particular risk.
2. *Reduce the prevalence of smoking among pregnant women and parents.* Smoking prevalence remains relatively high among young adults and pregnant women, especially in low-income groups. Investment in effective smoking prevention, especially in more disadvantaged areas, continues to be required, as does the development of effective interventions to promote and maintain smoking cessation during the 'teachable moments' of pregnancy, child illness or surgery.¹
3. *Increase the number of homes that are smoke-free.* Encourage parents who smoke to instigate strict smoking bans in their homes, recognising that domestic living circumstances and relationships may make this more difficult for those in more disadvantaged areas. Banning smoking in detached homes (even when children reside there) is controversial; however, there is increasing support for smoking bans in multiunit and rented housing. In 2007, the city of Belmont, California banned smoking everywhere in the city except single-family detached homes and many cities in the state followed suit.
4. *Explore e-cigarettes as a harm reduction tool for parents.* E-cigarettes deliver nicotine in a vapour rather than in smoke. While recognising evidence of the impacts of nicotine on fetal and child brain and lung development,⁶ there is general agreement that e-cigarettes are significantly safer than tobacco products, for both active and passive smokers.⁷ Although there are concerns that the potential harms of e-cigarettes are not fully understood,⁷

MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, Glasgow, UK

Correspondence to Professor Laurence Moore, MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, Glasgow, G2 3QB UK; Laurence.Moore@glasgow.ac.uk

it has been suggested that they should be 'promoted' as a smoking cessation tool by the public health community.⁸ Whether or not the smoker achieves or maintains cessation, use of e-cigarettes could contribute to a reduction in children's exposure to ETS.

5. *Explore the risks posed to children by residual tobacco exposure.* Residual tobacco exposure is less understood and acknowledged than ETS, but there is a growing body of evidence that it is harmful. Legislation to reduce residual tobacco exposure in children could be modelled on previous environmental toxins like lead or asbestos.

Smoking prevalence and associated ETS risk have declined in many countries, due to comprehensive tobacco control measures taken to counter the global tobacco epidemic, including those set out in the 2003 WHO Framework Convention on Tobacco Control (FCTC) treaty.

Despite positive health outcomes experienced in many countries due to reductions in smoking prevalence and associated ETS exposure, many children still suffer the consequences of exposure

to ETS. Children in low-income and middle-income countries as well as those of lower socioeconomic status in high-income countries are at particular risk. While the steps outlined here would make a significant contribution towards combating ETS exposure in children, a bigger step would be for more countries to fully implement the WHO FCTC and adopt the tobacco endgame concept, with its vision of future tobacco-free generations.

Twitter Follow Laurence Moore @LMSphsu

Contributors JP wrote the first draft and all authors contributed further edits and approved the final manuscript.

Competing interests None declared.

Provenance and peer review Commissioned; internally peer reviewed.

To cite Pugmire J, Sweeting H, Moore L. *Arch Dis Child* 2017;**102**:117–118.

Received 20 September 2016

Accepted 26 October 2016

Published Online First 14 November 2016



► <http://dx.doi.org/10.1136/archdischild-2016-310687>

Arch Dis Child 2017;**102**:117–118.
doi:10.1136/archdischild-2016-311652

REFERENCES

- 1 Chiswell C, Akram Y. Impact of environmental tobacco smoke exposure on anaesthetic and surgical outcomes in children: a systematic review and meta-analysis. *Arch Dis Child* 2017;**102**:123–30.
- 2 Pugmire J, Vasquez MM, Zhou M, *et al.* Exposure to parental smoking in childhood is associated with persistence of respiratory symptoms into young adult life. *J Allergy Clin Immunol* 2014;**134**:962–5.e4.
- 3 Royal College of Physicians. Passive smoking and children. A report by the Tobacco Advisory Group. London: RCP, 2010.
- 4 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.
- 5 Shaw A, Ritchie D, Semple S, *et al.* *Reducing children's exposure to second hand smoke in the home, a literature review.* ASH Scotland, 2012.
- 6 England LJ, Bunnell RE, Pechacek TF, *et al.* Nicotine and the developing human: a neglected element in the electronic cigarette debate. *Am J Prev Med* 2015;**49**:286–93.
- 7 McNeill A, Brose LS, Calder R, *et al.* *E-cigarettes: an evidence update.* London: Public Health England, 2015.
- 8 Royal College of Physicians. Nicotine without smoke: Tobacco harm reduction. A report by the Tobacco Advisory Group. London: RCP, 2016.