

## **APPENDIX B**

### **Literature Review on the Impact of Smoke-free Policies on Children**

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**November 30, 2018**

Prepared for the Bill and Melinda Gates Foundation



## **Acknowledgements**

This report was prepared for the Bill and Melinda Gates Foundation by a team of collaborators at the University of Waterloo: Dr. Janet Chung-Hall (lead author), Lorraine Craig (editing and review), and Dr. Geoffrey T. Fong (editing and review).

## Literature Review: Impact of Smoke-free Policies on Children

### Summary

1. Children are especially vulnerable to the harmful effects of SHS exposure because they cannot control smoking in their environments, and their bodies are smaller and still developing.
2. The main sources of SHS exposure for children are smoking in the home and cars by their parents or caregivers.
3. Evidence from high-income countries shows that comprehensive smoke-free laws can significantly reduce children's exposure to SHS when they are strongly enforced. Studies from high-income countries also show that strong smoke-free-laws can dramatically lower hospital admissions for childhood asthma, and decrease smoking rates among adolescents.
4. Smoke-free laws do not lead to more smoking in the home. In fact, studies from a number of high-income countries show that smokers are more likely to adopt home smoking bans following the implementation of complete bans on smoking in public places and workplaces.
5. A growing number of jurisdictions around the world have implemented bans on smoking in cars carrying children. However, only two middle-income countries (Mauritius and South Africa) and no low-income countries have implemented such bans.
6. Public support for bans on smoking in cars with children is very high, even among current smokers.
7. Children from low SES groups have higher exposure to SHS compared to those from high SES groups. Strong smoke-free laws are effective in reducing SHS exposure among children in all income levels.
8. There is no research on whether smoke-free laws in LMICs have been effective in reducing children's exposure to SHS, improving children's health outcomes, and helping young smokers to cut down on or to quit smoking.

### Background

There is no safe level of exposure to secondhand smoke (SHS), which contains more than 4,000 chemicals, including up to 70 that are known to cause cancer [1,2]. Scientific research over the last two decades has confirmed that the inhalation of SHS leads to a wide range of adverse health effects in both smokers and non-smokers, including different forms of cancer, and cardiovascular and respiratory diseases [1,3,4].

Children are especially vulnerable to the effects of SHS. On average, children have more exposure to SHS than non-smoking adults. Data from 192 countries shows that as many as 40% of children are exposed to SHS, with more than 50% of children exposed in countries in the European, Western Pacific, and Southeast Asian regions. The largest disease burden due to SHS exposure is accounted for by lower respiratory infections in children under the age of 5 years, and 28% of 603,000 premature deaths caused by SHS exposure in 2004 occurred in children [5].

Exposure to SHS among children is likely to be even greater in low-and middle-income countries (LMICs), where comprehensive smoking bans have not been implemented or are poorly enforced when they do exist. For example, results of a 2016 study based on data from 68

LMICs found that 55.9% of adolescents aged 12 to 15 years reported exposure to SHS during the past 7 days, with exposure ranging from 16.4% in Tajikstan up to 85.4% in Indonesia [7].

While there is evidence that comprehensive smoke-free laws can lead to significant reductions in children's SHS exposure, improve children's health outcomes, and decrease smoking prevalence among youth in many high-income countries [8,9], there is a lack of data on the effectiveness of smoke-free policies in LMICs.

### **Harms of SHS Exposure on Children**

Children are particularly susceptible to the harmful effects of SHS exposure because they cannot control adult smoking in their environments, and their lungs and immune system are still in the early stages of development.

SHS exposure increases the likelihood that children will experience [6,10,11]:

- Acute lower respiratory infections such as bronchitis and pneumonia
- Onset of asthma and worsening of symptoms
- Upper respiratory symptoms such as coughing, wheezing, and breathlessness
- Middle ear infections
- Respiratory effects such as emphysema, and persistent wheezing and coughing in adulthood

### **Smoke-free Policies Improve the Health of Children**

Smoke-free laws are critical to protect children from the adverse health effects of SHS. There is strong evidence that smoke-free laws have immediate and long-term benefits to child health, and in particular, marked improvements in respiratory outcomes.

- A 2017 review found that smoke-free policies are associated with a 9.8% reduction in children's hospital admissions for asthma, and an 18.5% reduction in hospital admissions for lower respiratory tract infections [8].
- A US study found that smoking bans in workplaces, restaurants, or bars at the county or state level were associated with significantly lower odds of asthmatic symptoms among non-smoking youth (aged 3 to 15 years) [12].
- Following the implementation of a comprehensive ban on smoking in public places and workplaces in Scotland, there was a significant reduction in hospital admissions for asthma among children younger than 15 years [13].
- Prior to the implementation of smoke-free legislation in England, hospital admissions for childhood asthma were increasing by 2.2% each year. After smoke-free legislation came into effect, there was an immediate 8.9% reduction in admission rates, and an annual 3.4% decrease, which translates to a reduction of >6802 admissions in the first 3 years after policy implementation [14].

### **Smoke-free laws Can Decrease Smoking Prevalence among Adolescents**

A few studies show a decrease in smoking prevalence among children after the implementation of smoke-free policies.

- In the first year after a 2002 smoking ban in schools came into effect in the Madrid region, there was significant decrease in smoking among adolescents (aged 15 to 16 years) from 39.6% to 20.4%, and this decline was maintained in 2005 [15].
- The implementation of comprehensive state-level restaurant smoking bans in US states from 1999 to 2013 was associated with a reduction in overall smoking rates and smoking frequency among adolescents aged 14 to 18 years [16].
- Implementation of smoke-free laws in US states from 2002 to 2008 was associated with decreased smoking susceptibility, current smoking, and established smoking among youth aged 12 to 17 years [17].

### **Smoke-free laws Encourage Smokers to Adopt Smoke-free Homes**

Children are most likely to be exposed to SHS in the home, largely due to smoking by their parents [18–20]. For example, data from England show that compared to children whose parents are non-smokers, SHS exposure is approximately 3 times higher in children if the father smokes, more than 6 times higher if the mother smokes, and nearly 9 times higher if both parents smoke [11].

Opponents of smoking bans in public places and workplaces argue that smoke-free policies could lead to the displacement of smoking into private homes, and thus have the unintended consequence of increasing children’s SHS exposure. During government consultations on the implementation of smoke-free legislation in England, the Secretary of State for Health at the time, Rt. Hon. John Reid, appeared before the House of Commons in 2005 and argued against a comprehensive ban on smoking, stating that: *“I came to the conclusion that [a comprehensive ban] was not a good thing on health grounds, apart from anything else, because you get the displacement of smoking from some public areas to the home.”* [21] Yet, there is no scientific evidence to support this claim, as indicated in a Parliamentary response from England’s Public Health Minister on this issue [22]. Apart from two studies from Hong Kong [23] and the US [24] that found increased smoking in the home after the implementation of smoking bans, research from a number of high-income countries consistently shows that smoking bans in public places and workplaces do not lead to more smoking in the home, and that such bans may encourage parents who smoke to make their homes smoke-free.

- No evidence for increased smoking in the home after smoke-free legislation was introduced in Scotland and Wales [25], England [26], and the US [27].
- One year after smoke-free legislation was introduced in Scotland, children (aged 11 years) were more likely to report a complete ban on smoking in their homes (71% vs. 79%) relative to partial bans (25% vs. 18%) or no bans (3.8% vs. 2.4%) on home smoking [28].
- After Ireland’s smoke-free law came into force, there was a significant decrease in the proportion of adult smokers who said they allowed smoking in their homes from 85% to 80% [29].
- In New Zealand, there was an increase in the proportion of smoke-free homes (where at least one smoker and at least one child lived) after the implementation of smoke-free legislation – from 64% pre-policy to 70% post-policy [30].
- After England implemented smoke-free legislation in 2007, there was an increase in the percentage of children with smoking parents who lived in smoke-free homes from 35.5% in 2006 to 48.1% in 2008 [31].

- A US study found that comprehensive state-level bans on smoking in workplaces, restaurants or bars were significantly associated with increases in voluntary home smoking bans, with the largest increases in homes with smokers [27].
- A US study found that state-level smoke-free legislation did not change parental household smoking [32].
- A US study found no association between state-level smoke-free laws and exposure to SHS in the home among youth who lived in a household with smokers [33].
- Following the implementation of national smoke-free legislation, the percentage of smokers who reported complete bans on smoking in the home increased by 25% in Ireland, 17% in France, 38% in Germany, and 28% in the Netherlands [34].
- After the implementation of a national smoke-free law in Uruguay, there was an increase in the percentage of smokers who reported having complete smoking bans inside their homes from 21% to 37% [35].

Overall, research from high-income countries demonstrates that comprehensive smoke-free policies can effectively reduce SHS exposure in the home. This in turn, may reduce the likelihood that children will take up smoking and continue to smoke as adults [22].

There is limited data on the association between comprehensive smoking bans and the adoption of smoke-free homes in LMICs.

- A 2014 study found that adults in 15 LMICs who were employed in a smoke-free workplace were 60% more likely to live in a smoke-free home, compared to adults who worked in settings where smoking was permitted [36].
- Data from the ITC Brazil Survey found no changes in the overall percentage of smokers who reported complete bans on smoking in the home following the implementation of comprehensive smoke-free laws across three major cities (Porto Alegre, São Paulo, and Rio de Janeiro). In Rio de Janeiro, the percentage of smokers who reported having complete bans on smoking in the home increased from 36% to 55% after the municipal smoke-free law came into effect. On the other hand, in São Paulo, there was a decrease in the percentage of smokers (72% pre-ban vs. 50% post-ban) and non-smokers (75% pre-ban vs. 41% post-ban) who reported having plans to make their homes smoke-free within the next year [37].

### **Social Inequalities in the Impact of Smoke-free Policies on Children**

Even in countries with strong smoke-free laws, children of lower socioeconomic status (SES) are more likely to be exposed to SHS, particularly in their home environments [38]. Studies from countries with smoke-free legislation also suggest that existing inequalities in children's SHS exposure may increase after policies are implemented. For example:

- After smoke-free legislation was introduced in Scotland, average SHS exposure decreased among children of all SES backgrounds. However, social inequalities in SHS exposure were still apparent, with highest level of SHS exposure among children in the lowest family SES group [39].
- There was a significant reduction in SHS exposure in the home following smoke-free legislation in Wales among children from higher SES households (who already had lower levels of pre-policy exposure). In contrast, children from lower SES households continued to be exposed to SHS in cars and homes [40].

- In England, SHS exposure among children (aged 4 to 15 years) from the lowest SES group is nearly 4 times higher than it is compared to children from the highest SES group [11].
- A study in Scotland, Wales, and Northern Ireland found marked inequalities in SHS exposure, with 96.9% of children from the poorest families exposed to SHS post-ban vs. 38.2% of children from the most affluent families [41].

### **Smoke-free Laws are Effective When they are Strongly Enforced**

In order for smoke-free laws to be effective as a public health policy, strong enforcement is needed to ensure compliance among the public and business establishments. In the vast majority of countries around the world, smoke-free legislation is still weakly enforced. Data from the 2017 WHO Report on the Global Tobacco Epidemic show that of the 55 countries with comprehensive smoke-free legislation, only 22 have high compliance rates for enforcing these laws [42]. There is a lack of research on the enforcement of smoke-free laws.

- A study from Malaysia highlights that smoke-free laws do not work when they are not strongly enforced. Results showed that adolescents (13 to 14 years) in Melaka (state with comprehensive smoke-free law) had a higher prevalence of respiratory symptoms, and exposure to SHS in restaurants, shopping complexes, and public transport, compared to adolescents in Kedah (state with partial smoke-free law) [43].

### **Smoke-free Laws Reduce Children’s Exposure to SHS in Public Places**

Although homes are the main setting where children are exposed to SHS, public places are another source of exposure. Data from the Global Youth Tobacco Survey (GYTS) shows that a substantial proportion of non-smoking adolescents aged 13 to 15 years reported exposure to SHS in public places at least once in the last 7 days — 54% across 131 countries from 1999 to 2005 [44], and 44% across 163 countries from 1999 to 2008 [45].

There is evidence that smoke-free policies are effective for reducing children’s exposure to SHS in different public venues.

- After smoke-free legislation was introduced in Wales in 2007, there was a significant reduction in exposure to SHS in cafés or restaurants, buses and trains, and indoor leisure facilities among children (aged 10 to 11 years). While children were still primarily exposed to SHS in the home, there was no evidence that smoke-free legislation was associated with the displacement of parental smoking into the home [25].
- A US study found that among youth (aged 3 to 19 years) who were not exposed to SHS in the home, those who lived in counties with smoke-free laws had lower exposure to SHS compared to youth who lived in counties with no smoke-free laws [33].

### **Expansion of Smoke-free Legislation to Ban Smoking in Cars with Children**

Over the last decade, a growing number of countries have banned smoking in all indoor public places and workplaces [42], which have led to substantial declines in SHS exposure in these venues [29,46–51]. However, this legislation does not always extend to private cars, where children are likely to be exposed to dangerously high levels of SHS [52].

Research shows that after just half a cigarette has been smoked in a car, the air quality reaches levels 10 times higher than what the United States Environmental Protection Agency deems as

hazardous [53], and that the levels of toxins created by smoking in cars are up to 11 times higher than that found in a pubs where smoking is allowed [54]. Exposure to SHS in cars increases the likelihood of respiratory, allergic, and nicotine dependence symptoms in children [55,56]. The only way to fully protect children against these health harms is to ban smoking in cars. Currently, national or subnational legislation that prohibits smoking in cars when children are passengers has been implemented in seven high-income countries (Australia, Canada, Cyprus, England, the United Arab Emirates, the UK, and the US), and in two middle-income countries (Mauritius and South Africa) [57–59].

There is limited research on the impact of the smoking bans in private cars, with no studies from LMICs. Two published studies from Canada show that bans on smoking in cars are effective in reducing children’s exposure to SHS.

- There was a significant decline in children’s exposure to SHS in cars after the introduction of provincial bans on smoking in cars with children, relative to other provinces without such bans [60].
- A study of the impact of bans on smoking in cars with children in 7 Canadian provinces found a decline in exposure to SHS among youth (aged 11 to 14 years) in cars in all provinces from 26% in 2004 to 18% in 2012. In addition, there was a significant immediate and long-term decline in exposure among youth in Ontario compared to youth in provinces that did not have such bans in place - from 20.4% (3 years before ban) to 12.1% (1 year after ban), and 11.6% (3 years after ban). In British Columbia, there was significant decline in exposure from 21.2% (3 years before ban) to 9.6% (3 years after ban). However, there was no change in exposure to smoking in cars after bans were implemented in all other provinces relative to those provinces with no bans [61].

Unpublished data from the 2016 Smoke-free Great Britain Survey conducted by Action on Smoking and Health (ASH) show that the percentage of children (aged 11 to 18 years) who reported no exposure to smoking in cars increased one year after a ban on smoking in cars with children came into effect (83% pre-ban vs. 86% post-ban) [62].

### **Widespread Support for Bans on Smoking in Cars with Children**

Studies from several high-income countries demonstrate that public support for bans on smoking in cars is strong among smokers and non-smokers, especially as a measure to specifically protect children.

- A 2009 literature review found that 6% to 23% of adult smokers support smoke-free cars in New Zealand and the US. In contrast, support for legislation that specifically bans smoking in cars with children was much higher — at least 77% of adult smokers surveyed in five jurisdictions in Australia, the US, and New Zealand since 2005 support smoke-free cars with children [63].
- A 2011 study based on ITC data found that a majority of adult smokers support banning smoking in cars with children in Australia (83%), the UK (75%), Canada (74%), and the US (74%) [64].
- 2016 survey data from Germany show strong public support for a smoking ban in cars when children are present (72%), even among current smokers (67%) [65].
- In Spain, 62% of adults support a ban on smoking in cars, while 90% of adults support a ban on smoking in cars carrying minors [66].

- A study from Italy found strong support for a forthcoming smoking ban in private vehicles in the presence of minors or pregnant women among both non-smokers (92%) and current smokers (87%) [67].

Consistent with findings from high-income countries, data from the ITC Mauritius Survey shows that a majority of smokers support banning smoking in cars.

- In 2009, Mauritius became the first country to ban on smoking in cars carrying any passengers. ITC Mauritius Survey data show strong support for the ban immediately after it came into effect, which continued to rise over time. Two to three months after the car smoking ban came into force, 90% of smokers supported a ban on smoking in cars, with further increases in support to 95% (18 to 19 months post-ban) and 97% (28 months post-ban) [68].

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