



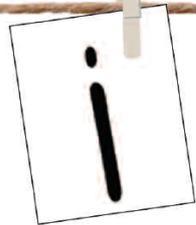
Protecting our children from second-hand smoke





Protecting *our* children from second-hand smoke

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“Today’s children, tomorrow’s world” is a five-year cancer prevention campaign initiated by the International Union Against Cancer (UICC) and focused on children and prevention.

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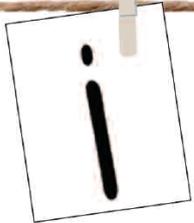
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FOREWORD

Isabel Mortara

Protecting our children against second-hand smoke is published by the International Union Against Cancer (UICC) for World Cancer Day, 4 February 2008.

Three years ago, UICC initiated the World Cancer Campaign to scale up awareness of the fight against cancer, which in many countries still takes a back seat to other public health priorities.

World Cancer Day 2007 began a second phase in this campaign, focused on children and cancer prevention. “Today’s children, tomorrow’s world” targets parents, health professionals and decision-makers with four key messages:

- give children a smoke-free environment
- encourage an energy-balanced lifestyle based on healthy diet and physical activity
- learn about vaccines against viruses that cause liver and cervical cancer
- teach children to avoid over-exposure to ultraviolet radiation by being “sun-smart”

On World Cancer Day 2008, UICC launches the “I love my smoke-free childhood” campaign, highlighting the first of these four messages, aimed at helping children grow up smoke-free.

Around 700 million children – almost half of the world’s children – breathe air polluted by tobacco smoke.

The message is clear: “Second-hand smoke is a health hazard. There is no safe level of exposure to second-hand smoke. Give our children a smoke-free childhood.”

This report explains why.

This report from UICC – the world’s leading non-governmental organization dedicated to fighting cancer – is an important resource for action by cancer organizations, tobacco control organizations, health professionals, community leaders and political decision-makers dedicated to the health of today’s children, the adults of tomorrow.

UICC is grateful to the expert authors who have contributed to the report, to the American Cancer Society and Johns Hopkins Bloomberg School of Public Health for lending us their expertise, and to Bloomberg Philanthropies for help in funding the writing.

We are also grateful to the donors whose generous support has made the “Today’s children, tomorrow’s world” campaign

possible: the Centres for Disease Control and Prevention, Glaxo-SmithKline, MDS, Merck, Pfizer and the Pfizer Foundation.

“Exposure to tobacco smoke causes death, disease and disability,” says the World Health Organization’s Framework Convention on Tobacco Control (FCTC) (1).^{*} At country level, and within the context of the FCTC, UICC and its member organizations are committed to catalysing change.

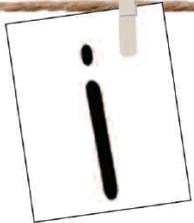
Countries that ratify the convention commit themselves to protect their citizens by legislating against exposure to second-hand smoke in workplaces and public places.

But legislation cannot protect children from exposure to tobacco smoke in all the places where they are vulnerable – above all, in their own homes.

Children depend on their parents and other adults to make sure their air is smoke-free.

This expert report sets out clearly what we need to do – all of us – if we are to protect our children from the damaging effects of environmental tobacco smoke.

^{*}For references, see p.35.





PREFACE

Witold Zatonski

Second-hand or environmental tobacco smoke is an important indoor air pollutant, containing mutagenic and carcinogenic compounds such as benzo[a]pyrene and other polycyclic aromatic hydrocarbons, formaldehyde, 4-aminobipheyl, benzene and nitrosoamines, as well as reproductive toxicants such as cadmium and carbon monoxide. In 1992, the US Environment Protection Agency labelled environmental tobacco smoke a “class A” carcinogen, to which there is no safe level of exposure.

The number of scientific reports presenting clear evidence on the health burden of second-hand smoke and a growing consensus on policy implications and recommendations rises yearly. The most recent knowledge is synthesized in the 2004 monograph of the International Agency Research on Cancer on tobacco smoke and involuntary smoking (8), the updated and revised report of the California Environment Protection Agency on environmental tobacco smoke as a toxic air contaminant (10), the US Surgeon General’s report in 2006 on the health effects of involuntary exposure to tobacco smoke (3) and the policy recommendations from the World Health Organization (WHO) in

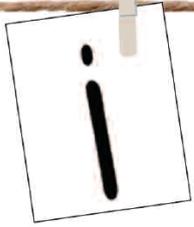
2007 on protection from exposure to second-hand tobacco smoke. (77). These publications are milestones on the road to a smoke-free society. Protection of non-smokers from tobacco smoke is one of the main goals of the WHO Framework Convention of Tobacco Control (1).

Fewer scientific syntheses and policy-oriented documents provide a rationale for protecting children’s health from tobacco smoke pollution. To be sure, these arguments cannot be separated from the justification for a more comprehensive smoke-free policy, but there is nonetheless a specific need to look at clear scientific evidence, solid conclusions, guidelines for intervention and policy recommendations that focus on children and their environment.

Approximately half of the world’s children are regularly exposed to second-hand smoke, according to the WHO’s estimate. Children are exposed to the toxic compounds in second-hand smoke more often, more intensively and longer than adults. There is a clear scientific consensus that second-hand smoke is a real and substantial threat to children’s health, not only in childhood but also in adult life. This has important implications for public health. There is an urgent

need to raise awareness of the danger that environmental tobacco smoke poses to our children among parents and other adults, health professionals, public health advocates and, crucially, policymakers.

This UICC report is one of the first attempts to review and synthesize scientific studies on exposure to second-hand smoke among children, relevant models for assessing exposure, the toxicity of second-hand smoke and related children-specific diseases, and the children’s health burden in global perspective. It also collects conclusions on effective intervention and policy measures in homes, private vehicles, schools and childcare facilities, and other public places. It will prove extremely useful in our efforts to clear the air of tobacco smoke and create safe and healthy environments for our children.





INTRODUCTION

The scientific consensus that second-hand smoke causes adverse health effects in non-smokers, including premature death, has prompted many countries to ban smoking in public places and workplaces in order to protect the health of non-smokers. Article 8 of the Framework Convention on Tobacco Control (FCTC), the World Health Organization's global treaty for tobacco control, calls for legislation to protect non-smokers from exposure to tobacco smoke, and requires the

ratifying countries, now 151, to implement smoking restrictions in public places. The treaty language specifies these restrictions must apply to "indoor workplaces, public transport, indoor public places, and, as appropriate, other public places" (1).

Second-hand smoke (SHS), also called environmental tobacco smoke (ETS), is a combination of two forms of smoke that come from burning tobacco products

- Sidestream smoke: the smoke that comes from the end of a lit tobacco product
- Mainstream smoke: the smoke that a smoker exhales

SHS is made up of particles and gases containing thousands of chemicals, including carcinogens and toxic chemicals

These regulatory measures aimed at protecting individuals from exposure to second-hand smoke, however, do not include homes and cars, primary locations where children spend time with parents and other adults who may be smokers. Initiatives such as the FCTC are a necessary but only partial step towards protecting non-smokers fully. Given that half of all children worldwide (about 700 million children) are exposed to second-hand smoke, there is a great need for increased action (2). The scientific evidence on the health risks associated with exposure is clear, credible, and indisputable (3). Second-hand smoke causes premature death and disease in adults and children who do not smoke. Children, infants and foetuses are particularly sus-



ceptible to the adverse effects of second-hand smoke. Because children breathe faster and are generally more physically active than adults, they inhale more of the toxic chemicals in smoke per unit body weight than adults do. Children also may be less able to process (metabolize and excrete) certain toxic components of second-hand smoke. As a result, these components may remain in the body for longer periods of time. In addition, younger children are less able than adults or older children to move away from smoky areas and may therefore have longer and more intense exposure to second-hand smoke.

Time-activity data collected on children in the US and Canada indicate that younger



children spend most of their time indoors at home (4;5). This time-activity pattern implies long hours of exposure to second-hand smoke for children living with parents who smoke inside the home. It should be noted that exposure can begin before birth. Foetuses in pregnant women who smoke are exposed to second-hand smoke as some toxic substances, including nicotine, carbon monoxide, and cyanide, are able to cross the placenta and reach the foetus.

Certain harmful health effects of second-hand smoke are specific to infants and children. Babies born to smoking mothers have on average lower birth

weight than those whose mothers do not smoke during pregnancy. Infants exposed to second-hand smoke are at increased risk for sudden infant death syndrome (SIDS), and both infants and older children exposed to second-hand smoke are at increased risk for respiratory infections, asthma, cough, wheeze, and middle-ear infections. The harmful health effects on children of exposure to second-hand smoke are discussed in detail in chapter 1.

Children are exposed involuntarily to second-hand smoke because adults smoke in the places where they live, work, and play. While more and more countries

are banning smoking in public places and workplaces, children remain unprotected from exposure in homes, cars, and other locations where they spend their time.

This report describes approaches for reducing exposure to second-hand smoke in children. We consider how children are exposed and then discuss the adverse health effects of this exposure. We review what we know about policies and interventions aimed at reducing exposure, and we end with recommendations on how to protect children further.



CHAPTER 1

Exposure to second-hand smoke

How are children exposed to second-hand smoke?

Tobacco smoke is a complex mixture of gas and particles that contains over 4,000 chemicals, 60 of which are known or suspected to cause cancer. Tobacco smoke contains small particles that can enter the lungs, as well as toxic chemicals such as nicotine, arsenic, carbon monoxide, cyanide, and countless other substances (6). Children are exposed to second-hand smoke when an individual smokes a tobacco product in their presence or smoke from elsewhere enters the air of the room

where they are present. The concentration of smoke depends on several factors, as discussed later in this chapter. Children can be exposed to second-hand smoke in the many different places where they spend time (7).

What makes up second-hand smoke?

SHS contains hundreds of toxic pollutants and dozens of cancer-causing chemicals

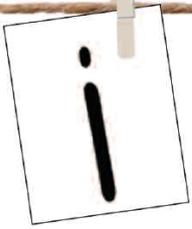
Hundreds of toxic or carcinogenic substances have been identified in second-hand smoke. *Table 1* lists some of these components.

Table 1: Selected toxic chemicals in second-hand smoke

Tobacco smoke contains	also found in
Acetone	Paint stripper
Arsenic	Ant poison
Butane	Lighter fuel
Cadmium	Batteries
Carbon monoxide	Car exhaust fumes
DDT	Insecticide
Formaldehyde	Embalming fluid
Hydrogen cyanide	Capital punishment by gas
Methanol	Rocket fuel
Nicotine	Cockroach poison
Phenol	Toilet bowl disinfectant
Propylene glycol	Antifreeze
Toluene	Industrial solvent
Vinyl chloride	Plastics

Reproduced from Mackay et al. (6)





Second-hand smoke contains both gases and small particles that can be inhaled and deposited deep in the lungs. These small particles are called respirable suspended particles (RSPs). The RSPs from second-hand smoke

in turn contain toxic compounds such as lead, arsenic, polonium, and NNK (a known tobacco-specific carcinogen) (8). The presence of these particles in the lung can trigger an inflammatory response that, over time, damages

the cells that line the lungs. The small particles may also affect the nerve cells which control breathing and may affect underlying lung diseases such as asthma and chronic obstructive pulmonary disease (COPD) (9).

How is exposure to second-hand smoke measured?

Exposure can be assessed by measuring various components of SHS in the air (markers of external exposure) or chemicals that are inhaled and absorbed into the body (biomarkers)

Exposure can be assessed by measuring markers of second-hand smoke in the air, administering questionnaires, or measuring components of second-hand smoke that are absorbed in the body (biomarkers).

Various components of second-hand smoke can be measured in air. The most commonly used markers of exposure are RSPs, nicotine, and carbon monoxide. These can be measured directly by placing personal monitors on individuals or indirectly by placing monitors in the various environments where people spend time. Air measurements provide objective evidence of the level of exposure and the settings in which exposure is highest.

The level of RSPs in indoor smoking areas varies, depending on the number of smokers present, the size of the room, and the ventilation rate in the room. In rooms where people are smoking, RSP concentrations in indoor air range from approximately 25 to more than 1900 $\mu\text{g}/\text{m}^3$. The aver-

age RSP concentration in a smoke room is about three times higher than in indoor non-smoking areas (3). A single cigarette smoked in a room with poor ventilation generates much higher concentrations of toxic substances in the air than encountered during normal, everyday activities in a city (10). For example, one study found that in a closed garage where three cigarettes were lit one after the other every 30 minutes, the level of RSPs was about 10 times higher than the level detected in the same garage with a diesel engine left running for 30 minutes (11). Particles are, however, a non-specific marker of tobacco smoke, since many sources other than tobacco smoking, such as cooking, can add small particles to indoor air.

Nicotine has become a widely used marker of exposure to second-hand smoke because it is easily measured and it is highly specific to tobacco smoke (3). The concentration of nicotine in the air inside smokers' homes ranges from 2 to 10 $\mu\text{g}/\text{m}^3$ (10). One

study found that the average air nicotine concentration in 33 smoking households was over 60 times higher than in six smoke-free households (6.3 $\mu\text{g}/\text{m}^3$ compared with 0.1 $\mu\text{g}/\text{m}^3$) (12).

Nicotine from second-hand smoke is also found deposited on household surfaces and dust. A recent study of 15 smoking households with infants found that 88% of surfaces in both living rooms and infant bedrooms were contaminated by nicotine. In comparison, no nicotine was detected on surfaces in living rooms and bedrooms of 17 non-smoking households. In smoking households, nicotine was detected in 55% of dust samples taken from living rooms and 70% of samples taken from infant bedrooms (13).

Even after dilution in room air, the indoor concentrations of pollutants from second-hand smoke often exceed federal limits on outdoor exposure to the same pollutants. On average, each cigarette smoked emits about 1.4 mg of nicotine, 13.3 mg of RSPs, and



58.5 mg of carbon monoxide into the air, based on results from three, five, and two studies respectively (8). In the US, this corresponds to emissions of about 647 tons per year of nicotine, 5,860 tons of RSPs, and 30,200 tons of carbon monoxide released each year from second-hand smoke (8).

Measurements of markers of second-hand smoke in the air, as described above, can be used to

validate and supplement self-reported information on exposure to second-hand smoke collected by questionnaires for epidemiological studies. Questionnaires typically ask about the number of smokers in the household, the number of cigarettes smoked in the home and the number of hours spent in the presence of smokers to gauge exposure level. Despite their limitations (3), questionnaires are the method most widely used to evaluate ex-

posure, because they are readily administered, relatively inexpensive and the only method available to assess second-hand smoke exposure that occurred in the past. Self-reported information on exposure to second-hand smoke can also be validated by measuring various biomarkers that reflect the uptake and/or excretion of specific contaminants in smoke, as described below.

Children exposed to SHS absorb numerous toxic and carcinogenic substances

Non-smokers who are exposed even briefly to a smoky environment take up and process (metabolize) some components of tobacco smoke. Biomarkers provide an estimate of the second-hand smoke components that entered the body and proof that exposure actually occurred. Currently, the main biomarkers for tobacco-smoke exposure are nicotine and its metabolite, cotinine (3;10;14;15). Nicotine from tobacco smoke is converted to cotinine when it enters the body. The amount of cotinine found in urine, blood, or saliva reflects the amount of second-hand smoke in the body, and provides a good measure of exposure. Cotinine is very specific, because it is not usually present in the body in the absence of exposure to tobacco smoke, and very sensitive, because it can be measured at very low concentrations.

Other biomarkers of interest used to measure the uptake of



second-hand smoke by children include the breakdown products of carcinogens that are specific to tobacco and of substances that bind to proteins or DNA. However, tobacco smoke is a complex mixture, and no single chemical accurately reflects exposure to all of the toxic and cancer-causing chemicals. Many studies conducted in countries around the world have measured these biomarkers to assess the exposure of newborns born to mothers who smoked while pregnant and of children exposed to second-hand smoke at home.

Exposure in utero occurs when a pregnant woman smokes and toxic substances are carried through the bloodstream to the developing foetus. There is a gene-damaging chemical found in tobacco smoke, 4-amino-biphenyl, that can cross the placenta and bind to foetal haemoglobin. Evidence of this exposure can be found in the



blood of newborns just after delivery (16). One study found that haemoglobin adduct levels (markers of exposure to chemicals found in cigarette smoke that bind to protein) were about seven times higher in newborns born to mothers who smoked during pregnancy than in newborns of non-smoking mothers (17). Products from a carcinogen specific to tobacco smoke, NNK, are able to cross the placenta as well. In one study, breakdown products from NNK were detected in the urine of newborns whose mothers smoked during pregnancy, but not in the urine of newborns whose mothers did not smoke (18).

Children who inhale second-hand smoke also absorb toxic and carcinogenic substances through their lungs. Infants aged 3 to 12 months who live with parents who smoke have higher concen-

trations of the carcinogen NNK in their urine than unexposed infants (19). Nicotine can be detected in the hair of children aged 3 to 27 months exposed to second-hand smoke, even when adults avoided smoking inside the house (20).

Evidence of exposure is seen in older children as well. One study measuring cotinine and the breakdown products of NNK among economically disadvantaged US schoolchildren found children who reported exposure to second-hand smoke had higher levels of these components than unexposed children. Even children reporting low exposure to second-hand smoke had elevated levels of cotinine and fragments of carcinogens attached to proteins in the body (19). A US cohort study of Hispanic and African-American preschool children found that levels of cotinine,

4-aminobiphenyl haemoglobin adducts, and PAH-albumin adducts were higher in children exposed to second-hand smoke than in unexposed children (21). Similarly, a study of 80 Moldovan children detected cotinine in the urine of 77 children (96%), but found that levels of both cotinine and NNK were higher in the 58 children who reported exposure to second-hand smoke at home than in those who did not (22). A study of Italian children aged 3 to 13 found that exposure was correlated with concentrations of both cotinine and N-(2-hydroxyethyl)valine, another compound that indicates absorption of carcinogens in tobacco products (23). Finally, a study in Germany found that children exposed to second-hand smoke at home had higher nicotine and cotinine urine concentrations than unexposed children (24).

The mass balance model: Implications for exposure reduction

Children's exposure to second-hand smoke can occur in the many different places where they spend time (7). The contribution of a particular environment to second-hand smoke exposure depends both on the concentration of second-hand smoke in the environment and the time spent in that environment (25). Concentration depends on several factors, including strength of the source, dilution by ventilation (the exchange of indoor air with outdoor air), and other processes that remove smoke from the air (cleaning) (3).

There is no practical level of ventilation that can effectively protect against SHS exposure

$$\text{Concentration} = \frac{\text{Source strength}}{\text{Ventilation} + \text{cleaning}}$$

The mass balance model shown above in a very simplified fashion illustrates how varying conditions affect the concentration of second-hand smoke. Concentration depends on the ratio between the rate at which second-hand smoke is produced to

the rate at which it is removed (26). The strength of the source depends both on the number of people smoking and how much they are smoking (3). The model shows that doubling the speed at which second-hand smoke is produced (source strength) doubles



concentration; however, doubling the speed at which second-hand smoke is removed (ventilation + cleaning) only halves the concentration level. An eight-fold increase in the effective ventilation reduces concentration to one-eighth, but no amount of ventilation can eliminate all second-

hand smoke. There is no practical level of ventilation that can protect effectively against second-hand smoke exposure, and air cleaners cannot remove second-hand smoke sufficiently from the air (3). For this reason, the American Society of Heating, Refrigerating, and Air Conditioning

Engineers (ASHRAE), which develops ventilation standards for buildings, has concluded that ventilation cannot provide healthy indoor air in the presence of smoking (27). Ventilation systems can also have the unintended consequence of spreading smoke to other parts of a building.

How common is second-hand smoke exposure in children?

About five of every 10 children worldwide are exposed to SHS; about eight of every 10 children in Eastern Europe are exposed

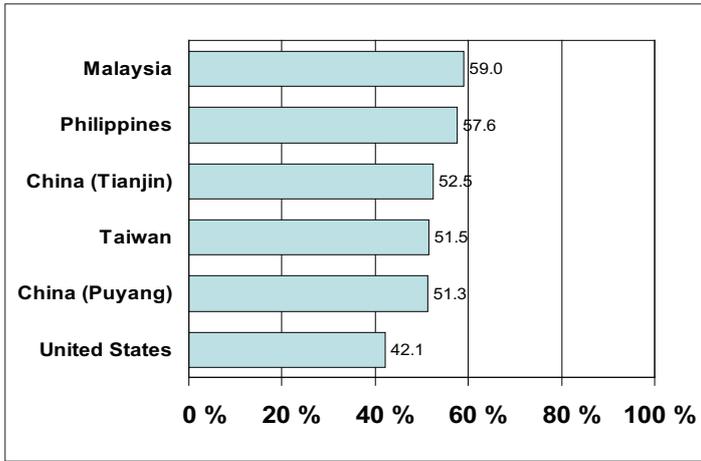
About five of every 10 school-children aged 13 to 15 worldwide are exposed to second-hand smoke at home, in public places, or both (28). Exposure is most common in Eastern Europe where seven of every 10 children report being exposed to second-hand smoke at home and eight of 10 children report being exposed outside the home (*Table 2*). The highest prevalence rates of second-hand smoke exposure among children were reported from Serbia, Bosnia and Herzegovina, Georgia, and Croatia, where nearly all children surveyed reported being exposed at home (47).

Children who live in countries of the Western Pacific have the next highest prevalence of second-hand smoke exposure. On average, almost six of every 10 children who live in Malaysia or the Philippines are exposed at home, and approximately four of every 10 children in Southeast Asia, the Americas, and the Eastern Mediterranean are exposed to

second-hand smoke. Although children in Africa are the least likely to be exposed, two of 10 African children report second-hand smoke exposure at home and four of 10 report exposure elsewhere (28). Countries in Western Europe did not participate in the Global Youth Tobacco Survey, but other surveys estimate that three to six children of every 10 are exposed to second-hand smoke at home (29). In the US, four of every 10 children aged 13 to 15 are exposed to second-hand smoke in the home and seven of 10 are exposed outside the home (*Figure 1*).

The exposure of younger children in the US has been measured using cotinine levels in blood. Based on measured cotinine, an estimated six of every 10 children aged 3 to 11 (that is, 22 million children) are exposed to second-hand smoke. Blood cotinine levels also indicate that 18 million children in the US aged 12 to 19 are exposed (3). Children

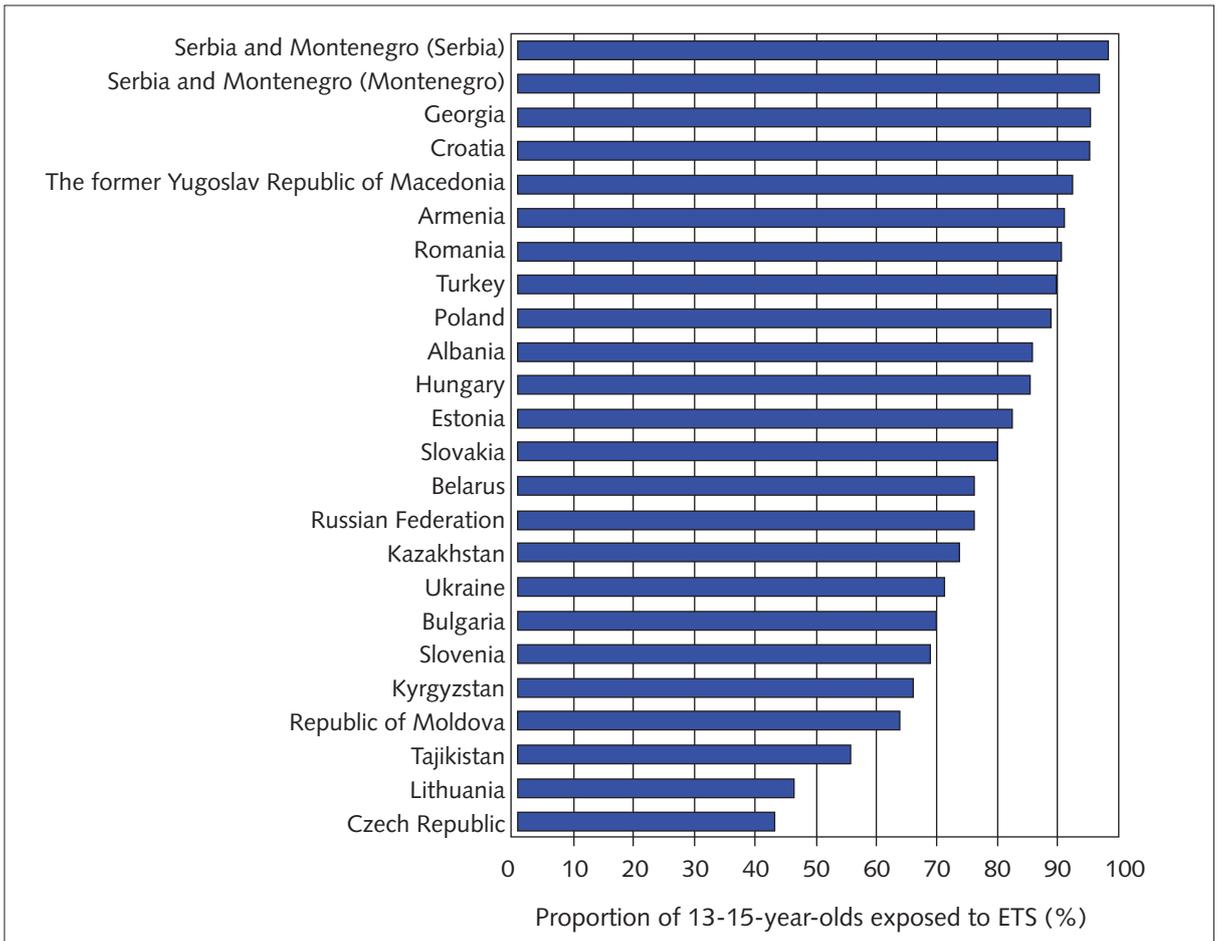




who are exposed to second-hand smoke experience not only the direct harmful effects on health, but are also more likely to start smoking. Data from the Global Youth Tobacco Survey indicate that children exposed to second-hand smoke at home are up to twice as likely to start smoking as children not exposed (28).

Figure 1: Percentage of students aged 13 to 15 reporting exposure to secondhand smoke at home in selected countries, Global Youth Tobacco Survey, 2000-2007 (28)

Figure 2: Percentage of 13-15 year olds exposed to second-hand smoke in their homes, Eastern Europe, 2002-2005



From ENHIS, Fact sheet No. 3.4, May 2007; Global Youth Tobacco Survey data



Table 2: Exposure to second-hand smoke at home and in places other than home among students aged 13 to 15, by World Health Organization (WHO) region

Region	Never smokers	
	Exposed to second-hand smoke at home	Exposed to second-hand smoke in places other than home
	% (95% CI)	% (95% CI)
Eastern Europe	71.5 (64.6 – 76.0)	79.4 (73.0 – 93.7)
Western Pacific	57.3 (48.5 – 65.3)	52.6 (49.2 – 56.1)
Southeast Asia	42.8 (35.2 – 49.7)	38.8 (35.9 – 41.7)
Americas	39.1 (31.6 – 47.2)	41.7 (36.9 – 46.6)
Eastern Mediterranean	37.0 (33.7 – 40.4)	42.9 (39.0 – 47.0)
Africa	22.6 (19.5 – 26.1)	38.2 (34.2 – 42.2)
Total	46.8 (39.9 – 52.5)	47.8 (44.1 – 51.3)

Global Youth Tobacco Survey, 2000-2007 (28)

What are the levels of second-hand smoke exposure in key environments?

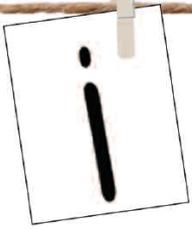
Home

The home is a key environment for exposure, because it is where children spend most of their time and a primary location where they are exposed to second-hand smoke, as demonstrated by the data above. The Canadian Human Activity Pattern Survey (CHAPS) found that children had the greatest contact with smokers at home, and similarly the California Activity Pattern Survey (CAPS) showed that homes were where children spent the longest average time with a smoker, versus other locations (7). The 2006 Surgeon General's Report concluded that the home has become the predominant location for exposure to second-hand smoke in children in the US (3).

Several studies have been conducted to measure second-hand smoke concentrations in the home (3). Studies measuring air nicotine concentrations in the

homes of smokers in the US found average nicotine concentrations between 1 and 3 micrograms of nicotine per cubic metre of air ($\mu\text{g}/\text{m}^3$), with ranges from $<01 \mu\text{g}/\text{m}^3$ to $8 \mu\text{g}/\text{m}^3$ (3). Another study in the US used personal monitoring to measure exposure in individuals throughout the week at their home, work, and other public places. This study found the average nicotine concentration of non-smokers married to smokers to be considerably higher than the average nicotine concentration of non-smokers married to non-smokers ($3.5 \mu\text{g}/\text{m}^3$ compared with $1.0 \mu\text{g}/\text{m}^3$) (30;31). The large percentages of children exposed to second-hand smoke at home and the concentrations of nicotine found in the homes of smokers demonstrate the need for smoke-free homes to protect child health.





Vehicle

A second key environment for exposure is the vehicle, particularly the private automobile. It is a key environment, not because of the duration of time spent in the vehicle, but because of the high concentrations of second-hand smoke produced in vehicles by smoking. Until recently, not many data had been collected on second-hand smoke concentrations in vehicles. Two recent studies measuring second-hand smoke concentrations in vehicles under normal driving conditions show that smoking in a vehicle increases second-hand smoke concentrations to harmful levels (32;33).

One study found significant increases in RSPs when a cigarette was smoked in the car. The

average level of RSPs with smoking taking place with the windows closed was $272 \mu\text{g}/\text{m}^3$ and with the windows open was $51 \mu\text{g}/\text{m}^3$ (32). Comparatively, the average RSP concentration with the windows closed exceeds the average respirable particle level found in a study of second-hand smoke in Massachusetts bars ($206 \mu\text{g}/\text{m}^3$) and is over half the average level found in bars in New York City ($412 \mu\text{g}/\text{m}^3$) (32). Carbon monoxide levels measured under the same conditions increase when the car windows are closed, but not when the windows remain open.

The second study measured RSPs in a variety of driving scenarios, involving different vehicle speeds, fan and air conditioning

settings, and window position. The maximum respirable particle levels ranged from $371 \mu\text{g}/\text{m}^3$ for a vehicle travelling 20 mph with windows open and the air conditioner off to $3,808 \mu\text{g}/\text{m}^3$ for a vehicle travelling 60 mph with windows closed and the air conditioner on maximum (33).

Children may only spend a small portion of their day in a vehicle, but smoking in their presence in a vehicle can put them at significant risk, particularly if they have asthma or some other condition leaving them particularly susceptible to second-hand smoke.

Childcare

A final key environment for second-hand smoke exposure is childcare facilities and schools. Not many data have been collected on second-hand smoke concentrations in childcare facilities, but a large percentage of children spend a significant amount of time indoors in

schools or childcare when they are not at their homes. In 2002, it was estimated that 63% of under fives in the US were in some form of regular childcare arrangement (36). A review of time-activity studies in the US found that school-age children on average spent around six hours a day in-

doors at school, and under fives spend 3.5 to 6.2 hours per day indoors at school (4). Smoke-free childcare facilities and schools are imperative because they should be a safe environment for children when they are away from their homes.



CHAPTER 2

Health consequences

What harmful effects does second-hand smoke have on children's health?

SHS increases a baby's risk of dying suddenly from unexplained causes

Exposure to second-hand smoke increases the risk of sudden infant death syndrome (SIDS), the unexplained death of an infant aged 12 months or younger. This increased risk has been shown in 10 epidemiological studies conducted in the US, the UK, Australia, New Zealand, and Scandinavia. All of these studies examined the relationship between exposure from maternal smoking and SIDS, and every study found that infants whose mothers smoked were more likely to die of SIDS. Smoking in the house by the father and other smokers was also shown to increase risk. The evidence that ex-

posure to second-hand smoke causes SIDS is both consistent and strong (3).

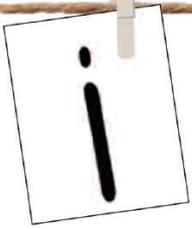
The increased risk of SIDS associated with exposure to second-hand smoke may be due to nicotine and other components of second-hand smoke that are neurotoxic. Such components may interfere with brain development and breathing regulation, which in turn may increase an infant's risk of SIDS. In addition, exposure also makes an infant more susceptible to respiratory infections and lung irritation, which may impair breathing and contribute to SIDS.

SHS causes low birth weight in newborns

Smoking by the mother during pregnancy increases risk of low birth weight (less than 5.5 lbs). Carbon monoxide and nicotine limit the flow of oxygen to the foetus and also decrease the flow of blood through the uterus into the umbilical cord, both of which can slow the development of the growing foetus. Newborns born to mothers exposed to second-hand smoke are approximately 20% more likely to have low birth

weight than infants of unexposed mothers. Numerous epidemiological studies in several countries show that even if the mother herself does not smoke during pregnancy, being around other people who smoke may have a similar, although smaller, effect on birth weight. Finally, infants born to women exposed to second-hand smoke are on average 30 grams lighter than infants born to mothers who were not exposed (3).





SHS causes more frequent ear infections

Ear infections, although common in childhood, are more frequent among children exposed to second-hand smoke. Ear infections typically affect the middle ear and can lead to temporary or permanent hearing loss if the infections are severe enough. Sec-

ond-hand smoke increases the risk of recurring middle ear infections, especially among children with a history of ear infection. On average, children whose mothers smoke have an almost 40% higher risk of build-up of fluid behind the eardrum and

ear infections than children whose mothers do not smoke. Of six studies conducted in six different countries, all but one showed greater risk of middle ear effusion when at least one parent smoked (3).

SHS harms lung development in children

Substantial evidence from cross-sectional and cohort studies exists on the harmful effects of second-hand smoke exposure on the structural and functional development of children's lungs. For over two decades there has been sufficient evidence to conclude that second-hand smoke exposure before and after birth is asso-

ciated with reduced lung function in children. The 1984 US Surgeon General's report concluded that children of smoking parents have reduced lung function compared with children of non-smoking parents (37), and the 1986 US Surgeon General's report concluded that second-hand smoke exposure reduces the

rate of lung function growth during childhood (38). Most recently, a pooled analysis of 26 studies published from 1979 to 2001 found that children exposed to second-hand smoke at home have significantly reduced lung function, on three out of four measures of function, compared with children not exposed (3).

SHS causes bronchitis and pneumonia in young children

Infants and young children exposed to second-hand smoke are at increased risk for respiratory infections and are more likely to be hospitalized for a serious respiratory infection than those who are unexposed. Parental smoking is consistently associated with an increased risk of lower respiratory illnesses such as bronchitis and pneumonia. This is particularly seen in children aged 2 or

younger (3). Of 34 studies based in several different countries and using a variety of study designs, all but one found an elevated risk of lower respiratory illness in young children whose parents smoked. On average, smoking by the mother was associated with a 60% increase in risk of a lower respiratory illness, and smoking by the father was associated with a 30% increase. Seventeen of 22 studies

found that each additional smoker in a household increased the risk of illness, as did smoking intensity (the number of cigarettes smoked in the household). In addition, young children who are exposed to second-hand smoke were more likely to be hospitalized for a serious respiratory illness (3).

SHS causes asthma, cough and wheeze among school-aged children

Out of 41 studies examining the risk of asthma in relation to second-hand smoke in school-aged children (aged 5 to 16), all

but three studies found increased asthma risk among children exposed to second-hand smoke. In pooled analyses of all studies, the

risk of asthma was 23% higher among exposed than unexposed children (3).



Among 58 studies that measured wheeze using different definitions, all but one showed increased risk associated with exposure to second-hand smoke. Risk of wheeze was 25% higher among school-aged children exposed to second-hand smoke in studies designed to control for other characteristics that might affect risk estimates (eg age, gender, socio-economic status). Out of 44 studies that examined chronic cough and second-hand smoke exposure, the risk of

chronic cough was 27% higher in school-aged children exposed to second-hand smoke in the studies designed to control for other risk factors (3).

The risks of asthma, wheeze, and cough are higher when both parents smoke than when only one parent smokes. The US Surgeon General has determined that exposure to second-hand smoke causes asthma, wheeze, and chronic cough during childhood (3).

Childhood exposure to SHS may cause health problems in adults

Being exposed to second-hand smoke as a child may lead to health problems later in life. Data from adults in 37 areas in western Europe showed that prenatal and/or childhood exposure to second-hand smoke was associated with decreased lung function and increased risk of respiratory problems in adulthood (39). Other recent studies suggest that childhood exposure leads to chronic cough and phlegm in adults (40), as well as asthma (41;42). Based on past studies, the

California Environmental Protection Agency has concluded that exposure to second-hand smoke during childhood causes adult asthma (8).

Exposure to second-hand smoke during childhood causes premature death and disease in adults and children who do not smoke. Second-hand smoke causes the following diseases and adverse health effects in infants and children (3).

- Sudden infant death syndrome (SIDS)
- Low birth weight
- Exacerbation of asthma
- Chronic respiratory illness
- Reduced lung function growth
- Middle ear disease
- Acute respiratory illness

Policies and interventions need to take into account the unique nature of second-hand smoke, as well as targeting the main sources of exposure.





CHAPTER 3

Policies and interventions

The adverse health effects of exposure to second-hand smoke provide a strong rationale for creating and enforcing smoke-free environments for children. Children can be fully protected against inhaling second-hand smoke. However, air cleaning and increased ventilation are not satisfactory approaches, since there is no practical level of ventilation that can effectively

protect against second-hand smoke exposure and air cleaners cannot remove second-hand smoke sufficiently from the air (3). The only effective way to fully protect children from the harmful effects of exposure to second-hand smoke is to create 100% smoke-free environments in the places they spend time: public places, homes, vehicles, and childcare settings and schools (3).

Public places

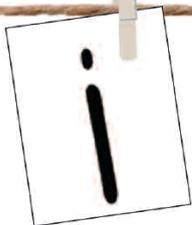
Smoke-free laws protect children from second-hand smoke

Since public places and workplaces are not beyond the reach of government regulation, many countries have begun to introduce policies that prohibit or restrict smoking in public places and workplaces. Implementing and enforcing these smoke-free policies is an effective way to protect children from exposure to second-hand smoke outside the home.

Smoke-free laws range in level of restriction. Some laws prohibit smoking in many or most public places but make exemptions for specific locations or allow smoking rooms. Other laws prohibit smoking in all enclosed public places with no exemptions. On

29 March 2004, Ireland became the first country to implement 100% smoke-free legislation that included all enclosed workplaces, including restaurants and bars. Since then additional countries have passed 100% smoke-free laws, including the UK, New Zealand, Uruguay, Bermuda, Bhutan, and Iran (43). In addition, many local or regional jurisdictions worldwide have enacted 100% smoke-free legislation, and many other countries and jurisdictions are making progress towards smoke-free legislation. Most jurisdictions, however, remain without legislation, leaving children vulnerable to exposure to second-hand smoke in public places.





Studies measuring cotinine levels among non-smokers have been conducted to assess the effectiveness of smoke-free legislation in reducing exposure to second-hand smoke. A study in Scotland measuring salivary cotinine levels in schoolchildren before and after the implementation of smoke-free legislation found that the overall average cotinine concentration decreased by 39% (from 0.36ng/mg to 0.22 ng/mg) after smoke-free legislation was put in place. This decrease, however, was only significant among children living in households with lower second-hand smoke exposure. Among children living in households with non-smoking

parents average cotinine concentrations dropped significantly by 51%. Similarly, among those where only the father smoked, concentrations dropped 44%. In contrast, among children living in a household where both parents smoked or only the mother smoked average cotinine concentration decreased by only 11%, and this decrease was not statistically significant (44).

Declines in cotinine levels over time can be seen even among children in countries where smoke-free laws are less restrictive. In the US, the Centres for Disease Control and Prevention (CDC) have measured cotinine in

the blood of participants in the National Health and Nutrition Examination Survey to assess exposure to second-hand smoke. Since the 1988 baseline, average cotinine levels in the blood of children aged 4 to 11 have dropped by about 65% as of 2002. Even larger decreases (74% for males and 72.1% for females) were observed in children aged 12 to 19. The declines in cotinine levels, however, have been greater in adults over 20 than in children aged 4 to 19, and currently the average blood cotinine levels in children remain significantly higher than adults (45).

People support bans on smoking in public places

Various surveys conducted worldwide have shown that support for smoking bans in public places is high among both adults and children. A survey of adult smokers in Ireland found that support for a total ban in workplaces increased from 40% before smoke-free legislation was imple-

mented to 65% afterwards (46). Similarly, the Global Youth Tobacco Survey found more than 70% of students' surveyed worldwide support a ban on smoking in public places (Table 3) (47).

These survey results show support among both smokers and

non-smokers for banning smoking in public places is high, which bodes well for future efforts to prohibit smoking in public places.

Regulations that prohibit smoking in public places are a necessary but not a sufficient step towards fully protecting children from second-hand smoke exposure, as these regulatory measures do not include homes and cars, which are the primary locations where children spend time with parents and other adults who may be smokers. However, implementing laws that restrict smoking outside the home does motivate some people to quit smoking (46;48;49) and encourage some families to introduce smoke-free home rules (50).

Table 3: Support for a ban on smoking in public places among students aged 13 to 15, by World Health Organization (WHO) region

Region	Support for a ban on smoking in public places (%)
Eastern Mediterranean	82.8
Eastern Europe	82.1
Americas	80.4
Southeast Asia	75.3
Western Pacific	72.9
Africa	60.2
Total	76.1

Global Youth Tobacco Survey, 1999-2005



Home

Creating 100% smoke-free homes is the only method to fully protect children and non-smokers from SHS exposure in the home

A private home is generally considered beyond the reach of government regulation, leaving children reliant on household members to voluntarily adopt home smoking restrictions to protect them from exposure to second-hand smoke at home. Home smoking restrictions vary in their level of strictness; some households ban smoking in all areas of the home at all times, while others restrict smoking to certain places or certain times (3;51). The only method, however, to protect children and non-smokers fully from second-hand smoke is to make the home completely smoke-free (3;52). A study in England of households with adult smokers and infants found a significant difference in the average urine cotinine levels of infants who lived in households with full smoking bans compared with households with no smoking bans. No significant difference was found in the average urine cotinine levels of infants living in households with less restrictive bans compared with no bans (53).

The increasing prevalence of voluntary smoke-free home rules is an indicator of changing public attitudes regarding the acceptability of smoking (3). The prevalence of smoke-free homes in the US has increased substantially in the past decade (3). According to the data



from the US Census Current Population Survey in 2003, a majority of US households reported having smoke-free home rules (72.2%), a percentage that has almost doubled since 1993 (43.2%) (28). But US data show households containing smokers – and therefore most in need of a household smoking restriction, – are least likely to have them. The 2001 Social Climate Survey of Tobacco Control, administered to US adults, found that smokers were considerably less likely to report a home smoking ban than non-smokers (30.2% and 86.3%, respectively) (54). Similarly, a study of survey data from adults in California found that smokers reported a lower prevalence of smoking bans in both the home and the car than non-smokers (55).

Limited data are available on the global prevalence of smoke-free homes. The International Tobacco Control Four Country Survey, a telephone survey of adult smokers, assessed the percentage of self-reported home smoking bans in the homes of smokers in two waves. In the first wave of data collection, conducted between October and December 2002, the prevalence of home smoking bans in the homes of smokers ranged from 15% in the UK to 34% in Australia. In the second wave, conducted seven months later, the percentage of home smoking bans among individuals who continued to smoke increased slightly to 19% in the UK and to 43.1% in Australia (49).



Table 4: Reported home smoking ban among homes of smokers

Country	Reported home smoking ban among homes of smokers	
	Wave 1	Wave 2 (among continued smokers)
Canada	27.3%	31.5%
USA	26.4%	27.9%
UK	15.3%	19.0%
Australia	34.1%	43.1%

International Tobacco Control Four Country Survey

A 2005 population survey in Scotland found that 42% of homes had a total smoking ban (56). A 2001 survey in Norway found that 85% of all households had some kind of rule in place to limit family members or others from smoking indoors (57).

studies that examine people’s attitudes towards home smoking restrictions. A study analysing survey data in Ontario, Canada, found that support for smoking bans in the home was high even among smokers. The data showed that the percentage of non-smok-

Smokers and non-smokers support smoking bans in the home

Even though the home is a major source of exposure to second-hand smoke, there are few

ers who agreed with the statement that “parents spending time with small children should... not

smoke at all inside the house” increased from 62.6% in 1992 to 78% in 1996, and the percentage of smokers who agreed with the statement increased from 51% in 1992 to 70% in 1996 (58). Similarly, a study of households in Norway with children aged 3 found that 95% of parents in households with smokers and 97% of households without smokers agreed with the statement that “children should have the right to live in a smoke-free home” (57).

Throughout the world, children continue to be exposed to second-hand smoke in their homes; efforts are needed to increase the prevalence of home smoking bans to ensure all children have a safe smoke-free environment in which to live and play.

Vehicle

Jurisdictions around the world are beginning to implement or explore the possibility of implementing bans on smoking in vehicles carrying children

Private vehicles, like homes, have traditionally been considered outside the realm of government regulation when it comes to smoking. Recently, however, jurisdictions have begun to introduce bans on smoking in vehicles carrying children. Three US states (Arkansas, Louisiana, and California), one US territory (Puerto Rico), and a few US cities have passed such laws. In addition, legislation has been proposed in a dozen other US states and cities. Worldwide, Cyprus, Nova Scotia

(Canada), South Australia and Tasmania (Australia) have introduced similar laws, legislation in South Africa is currently awaiting the signature of the president, and legislation is under discussion in Queensland and New South Wales in Australia.

The legislation in these jurisdictions varies by age cut-off, enforcement, and penalties. Worldwide, the age cut-off in the restrictions ranges from six to 19. In the US the penalties for violating

the legislation range from a 25-dollar fine in Arkansas to a 150-dollar fine in Louisiana. In Arkansas and Louisiana, smoking in a vehicle that is carrying a minor is a primary offence and a citation can be issued solely for violating the legislation. In California, however, a provision in the legislation prohibits a law enforcement officer from stopping a vehicle for the sole purpose of determining if the driver is in violation of the vehicle smoking ban.



Table 5: Jurisdictions that ban smoking in vehicles carrying children

Jurisdiction	Applicable age	Date
Arkansas	Under 6 or 60 pounds	Enacted April 2006
California	Under 17	In effect January 2008
Louisiana	Under 17	In effect August 2006
Puerto Rico	Under 13	In effect March 2007
Bangor, Maine	Under 18	In effect January 2007
Keyport, New Jersey	Under 18	Enacted April 2007
Rockland County, New York	Under 18	Enacted June 2007
West Long Branch, New Jersey	Under 18	Enacted June 2007
Cyprus	Under 16	Enacted 2002
Nova Scotia, Canada	Under age 19	In effect January 2008
South Australia	Under 16	Enacted May 2007
Tasmania, Australia	Under age 18	In effect January 1, 2008

On 9 April 2007 legislation to ban smoking while driving completely went into effect in New Delhi. The legislation was enacted

on road-safety grounds, because smoking while driving distracts the driver. Similarly, the UK enacted a new Highway Code on

28 September 2007 that classifies smoking while driving a “distraction” leaving drivers vulnerable to prosecution if they crash their car while smoking. These measures, although not enacted to protect children from exposure to second-hand smoke, create smoke-free vehicles and thereby protect children.

Jurisdictions around the world are beginning to explore the possibility of implementing legislation that bans smoking in vehicles with children. Most jurisdictions, however, remain without legislation, leaving children reliant on adults voluntarily to adopt vehicle smoking restrictions to protect them from exposure to second-hand smoke.

Surveys show both smokers and non-smokers support smoking bans in vehicles carrying children

Various surveys conducted in countries around the world have shown support for smoking bans in vehicles carrying children to be high even among smokers. The Ontario Tobacco Research Unit analysed data from an ongoing monthly survey of adults in Ontario and found that growing numbers of both smokers and non-smokers support a ban on smoking in vehicles carrying children. From 2002 to 2005 support increased from 50% to 66% among smokers and from 73% to 81% among non-smokers (59). Similarly, a 2006 survey in Victoria, British Columbia, Canada found that 88% of smokers, 90% of former smokers, and 94% of never-smokers believe that smok-

ing should not be allowed in vehicles carrying children (60). In 2000 in New South Wales, Australia, 56% of non-smokers and 45% of smokers supported legislation to ban smoking in vehicles carrying children (61). Finally in Perth, Australia, a survey of residents aged 25 to 54 showed 80% of smokers and 87% of non-smokers support banning smoking in vehicles carrying children under 18 (62).

These survey results show that there is growing support among both smokers and non-smokers to ban smoking in vehicles carrying children, indicating public support for such legislation.





Childcare

Unlike the private home or the vehicle, childcare facilities and schools are not beyond the reach of government regulation; in fact countries have already begun to implement policies that prohibit smoking in childcare and schools.

In the US, there are both federal and state laws to prohibit smoking in educational facilities. The Pro Children Act of 1994 prohibits smoking in schools that receive federal funding from the US department of education, including head start facilities, kindergarten, elementary, and secondary schools (3). In addition, all but four states in the US (Kentucky, Mississippi, North Carolina, and Wyoming) have state laws that restrict smoking in childcare centres. These laws range in their level of restriction; some states completely prohibit smoking in childcare facilities at all times, others prohibit smoking except in ventilated areas within the childcare facility, and still others restrict smoking to designated areas within the facility. Some of these laws explicitly state they

apply to both licensed childcare centres and home-based childcare centres while others do not (63).

In Ontario, Canada, the Ontario Tobacco Control Act requires all education institutions to be smoke-free, including licensed childcare. This law, however, does not cover home-based childcare provided in private homes, leaving children cared for under this arrangement unprotected from second-hand smoke exposure (64).

According to the European Public Health Alliance, several countries in Europe have legislation that specifically bans smoking in schools and educational facilities including: Austria, Denmark, the Czech Republic, Estonia, Finland, Hungary, Iceland, Latvia, Portugal, and Slovenia. Only two countries (Hungary and Iceland), however, specifically ban smoking in childcare facilities (65).

As countries begin to implement regulations to make public

places and workplaces smoke-free, childcare facilities and schools may fall under the workplace regulations. Children living in countries without laws to prohibit smoking in day-care facilities and schools or children attending home-based childcare centres not specifically covered by regulation remain, however, unprotected from exposure to second-hand smoke.

A survey of adults in the US showed that support for smoking bans in childcare facilities and schools is high even among smokers. The 2001 Social Climate Survey of Tobacco Control found that almost all smokers (97.9%) and non-smokers (98.9%) agreed that smoking should not be allowed in childcare centres (54). As childcare facilities and schools are not traditionally considered outside the realm of legislation and public support of smoking bans in these facilities is high, the environment is ideal to enact legislation to protect children currently unprotected from second-hand smoke exposure.

Interventions

Educating parents can motivate cessation or reduction in smoking in the home

Since the home and the vehicle are key environments for exposure to second-hand smoke in children but are generally considered outside the realm of government intervention, many public health and tobacco control organizations around the world

have begun to implement educational programmes to reduce children's second-hand smoke exposure in these locations. Recent campaigns in the US include the EPA's national smoke-free homes and cars programme and the American Legacy Foundation's

2005 "Don't Pass Gas" media campaign. Both are educational programmes aimed at encouraging individuals to make their homes and vehicles smoke-free (66;67). In 2001, the World Health Organization launched a community-based intervention



aimed at increasing the number of non-smoking pregnant women, smoke-free schools, and smoke-free homes. The intervention included educational materials targeted at parents and teachers, media campaigns, public events, and advocacy. The intervention was shown to be effective in reducing children's exposure to second-hand smoke when tested in two cities in Poland (68). In 2000, Ontario, Canada, launched a community-based education programme called Breathing Space: Community Partners for Smoke-free Homes to inform individuals of the dangers of second-hand smoke and encourage them to make their homes smoke-free (64). Since 1995, the Norwegian Cancer Society has led a public awareness campaign aimed at reducing children's exposure to second-hand smoke in the home and day care (57). Finally, in July 2007 in Salford, UK, a local organization launched a Smoke-free Homes promise campaign to raise awareness of the dangers of second-hand smoke and to encourage individuals to pledge to make their homes smoke-free; by October 1,000 homes had signed the smoke-free homes promise (69).

In addition to educational programmes, graphic health warnings on tobacco packaging have also been used to discourage smoking around children and encourage smoking cessation. Twelve countries have passed laws requiring pictorial warnings about smoking and/or exposure

of children to second-hand smoke, and many others are working towards this goal (70).

Although many countries have various programmes and interventions to reduce exposure to second-hand smoke in children, few have been thoroughly evaluated.

In 2003, Gehrman and Hovell reviewed 19 US interventions that were either physician-based or home-based, published between 1987 and 2002, and aimed at reducing second-hand smoke exposure among children (71). The physician-based interventions consisted of information on second-hand smoke and recommendations on methods to reduce exposure presented in a clinic. The home-based interventions were longer and consisted of intensive counselling from a nurse or research assistant during a home visit. The researchers found that 11 of the 19 interventions resulted in significant reductions in reported second-hand smoke exposure. Most of these studies used self-reported exposure as the outcome measure. Gehrman and Hovell (71) suggested that interventions can be effective in reducing children's exposure to second-hand smoke, and they concluded that home-based interventions and those based on a behaviour change theory appeared to be more effective than physician-based interventions or those not explicitly based on a behaviour change theory (71).

Similarly, Klerman (72) reviewed eight behavioural interventions in the US, published between 1990 and 2003, aimed at reducing exposure to second-hand smoke among infants and children, four of which were also included in the Gehrman and Hovell (71) review. The studies were grouped into two types of interventions, low-intensity interventions, in which a provider in a clinic gave information and educational material with little or no follow-up, and high-intensity interventions, in which individuals trained in smoking cessation provided extended counselling in the clinic or home. Most of the studies illustrated that both low intensity and high intensity intervention groups had a small but significant effect on maternal smoking and the amount of cigarettes smoked in the home. Based on the evidence





Klerman suggested that counselling interventions, even those that are low in intensity, can be effective in protecting children from second-hand smoke exposure (72). Both of these reviews are limited by the small number of studies available for review, and therefore the review conclusions are tentative (71).

Children with asthma are especially at risk when exposed to second-hand smoke. The EPA estimates each year in the US between 200,000 and 1,000,000 children with asthma have their condition worsened by exposure to second-hand smoke (66). Second-hand smoke is an asthma irritant and one of the leading triggers for an asthma episode. The Guidelines for the Diagnosis and Management of Asthma from the National Heart, Lung, and Blood Institute suggest at every

opportunity providers teach and reinforce avoiding exposures that worsen asthma such as tobacco smoke. In addition, the guidelines state individuals with asthma should not allow smoking in the home, in the car, or around themselves and ensure no one smokes at their child's day-care centre or school (73).

Several studies have evaluated interventions specifically aimed at reducing second-hand smoke exposure among children with asthma. Hovell and colleagues (74) examined the impact of a series of behavioural counselling sessions designed to decrease second-hand smoke exposure among asthmatic children and found a significantly greater reduction in self-reported exposure to second-hand smoke in the intervention group (79% reduction) than in the usual care group (34%

reduction). In 2001, Wilson and colleagues examined a behavioural-based intervention using nurses to administer counselling and feedback to reduce second-hand smoke exposure among children aged 3 to 12 with asthma (75). They found that children in the intervention group were 70% less likely than the control group to have more than one asthma-related medical visit in the follow-up year, but found no significant effect on urine cotinine levels. Finally, Hovell and colleagues (76) found coaching sessions to reduce second-hand smoke exposure among Latino children with asthma led to significant reductions in urinary cotinine levels and significant differences in self-reported exposures between the intervention and control groups (76).



CHAPTER 4

Challenges and recommendations

The tobacco industry is the biggest obstacle to smoke-free air

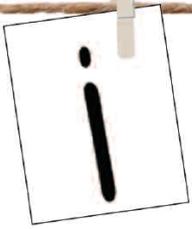
Second-hand smoke has been shown conclusively to harm the health of children. The main challenges to creating smoke-free environments where children live, work, and play appears to be a lack of public awareness about the hazards of exposure to second-hand smoke and well-financed opposition against smoke-free legislation from the tobacco industry. Tobacco companies have long denied the adverse health effects of second-hand smoke and have used industry-sponsored research to cast doubt on existing evidence. In addition, tobacco companies rely on false claims about the harmful economic effects of smoke-free legislation as they attempt to overturn existing smoke-free laws and prevent the passage of new smoke-free laws (3). The fastest rates of increase in adult and child smoking are now in developing countries, which may lack well-established tobacco control advocacy groups and resources to counter industry efforts. Several organ-

izations, however, such as the International Union Against Cancer (www.uicc.org), the Global Smoke-free Partnership (www.globalsmoke-freepartnership.org), and GLOBALink (www.globalink.org) now provide relevant materials and information on their websites to help counter industry efforts. Additionally, the more than 150 nations that have ratified the FCTC are now moving forward to implement its smoke-free provisions; the resulting actions, however, will leave the home environment,

the most critical location for children, uncovered.

As there is no safe level of second-hand smoke exposure and no practical level of ventilation that can effectively protect against second-hand smoke exposure, the only way to fully protect children from the adverse effects of second-hand smoke exposure is to create 100% smoke-free environments in the places they spend time: public places, homes, vehicles, childcare settings, and





schools (3). Organizations around the world recognize the importance of protecting children from second-hand smoke, and many have made recommendations on how to protect them from exposure. Some of these recommendations are outlined in the Appendix. Based on these, our own recommendations to protect

children from second-hand smoke exposure follow.

For areas clearly within the realm of government regulation – childcare settings and schools – smoke-free environments should be mandated by law, not voluntary policy. Voluntary policies do not provide adequate protection

because they are not mandatory, legally binding, or enforceable and carry weak or no penalties for violation (77). For areas outside the realm of government regulation like the home, educational strategies should encourage the creation of voluntary smoke-free policies (77).

Public places, vehicles, childcare, schools

- All governments should have laws that require all public places to be 100% smoke-free, completely banning smoking in public environments.
- All governments should have laws to ban smoking in vehicles carrying children.
- All governments should have laws that require all educational, school, and childcare facilities to be 100% smoke-free, completely banning smoking in these facilities. Legislation should explicitly state the bans apply to both licensed childcare centres and home-based childcare centres.
- Legislation should include methods for enforcement and penalties for violations (77).
- To increase compliance and change public attitudes, legislation should be accompanied by publicity and strong enforcement (52)
- Legislation enforcement and impact should be monitored and evaluated (1).

Homes

- Educational campaigns should be created to inform individuals about the dangers of second-hand smoke exposure in children, to inform individuals about the importance of the home as an environment of exposure, and to encourage them to make their homes smoke-free.
- Health warnings on tobacco packages describing the dangers of second-hand smoke exposure in children should be used to complement educational campaigns (77).
- Paediatric providers should inquire about tobacco use in the home, counsel and educate parents and guardians on the adverse health effects of second-hand smoke exposure and provide guidance on means of smoking cessation (78).
- To increase clinical counselling on cessation and second-hand smoke exposure, health-care providers should be trained on smoking cessation and reduction techniques as part of medical training or continuing education (2).

All children are entitled to a safe smoke-free environment in which to live and play; the governments and peoples of the world should take all steps necessary to ensure this right.



APPENDIX

Legislative and educational recommendations to reduce second-hand smoke exposure among children

Organization	Legislation	Education
American Academy of Paediatrics <i>Recommendations for paediatricians (78)</i>		Paediatricians should: <ul style="list-style-type: none"> • routinely screen children to identify household members who smoke • inform parents about the health hazards of second-hand smoke • advise parents to take steps to eliminate children's smoke exposure • provide information to help parents quit smoking
Centres for Disease Control and Prevention <i>Sabemos: toolkit to raise awareness about in-home protection from second-hand smoke (79)</i>		Education campaigns to convince the public to: <ul style="list-style-type: none"> • make homes and cars smoke-free • talk to children about dangers of second-hand smoke • teach children to avoid second-hand smoke • support local restaurants and businesses with smoke-free policies
Environmental Protection Agency <i>Smoke-Free Homes and Cars Programme (66)</i>		Education campaigns to convince the public to: <ul style="list-style-type: none"> • make homes and cars smoke-free • never allow family, friends, or visitors to smoke inside • if they smoke, smoke outside • ask their doctor for help in quitting smoking
Tobacco Free Japan <i>Recommendations for Tobacco Control Policy (80)</i>		<ul style="list-style-type: none"> • Education campaigns to create smoke-free environments in homes and private vehicles • Professional health organizations should educate members on the dangers of second-hand smoke, specifically among susceptible groups (eg children with asthma)
World Health Organization <i>Policy Recommendations on Protection from Exposure to Second-hand Tobacco Smoke (77)</i>	<ul style="list-style-type: none"> • Enact smoke-free workplace legislation to increase the likelihood individuals will implement voluntary smoke-free policies at home • Legislation should be clear and enforceable 	<ul style="list-style-type: none"> • Health warnings on cigarette packages to inform the public of the dangers of second-hand smoke. • Education campaigns to inform smokers of the impact of second-hand smoke exposure in the home and urge them to make homes smoke-free
World Health Organization/Tobacco Free Initiative <i>International consultation on environmental tobacco smoke (ETS) and child health (2)</i>	<ul style="list-style-type: none"> • Create legislation to ban smoking in places children frequent, schools, child-care, and health-care facilities • Impose workplace smoking restrictions to protect pregnant women 	<ul style="list-style-type: none"> • Health warnings on cigarette packages to inform smokers that tobacco smoke is injurious to children's and others' health • Education campaigns to inform smokers of the dangers of second-hand smoke: use mass media and base the campaign on communication science • Health-care workers should counsel children on avoiding tobacco smoke and adults on the importance of smoke-free air • Interventions to assist pregnant women in quitting smoking • Information on the health impact of second-hand smoke to be included in health professional training





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AFTERWORD

Sylviane Ratte

This UICC report provides timely and up-to-date scientific information on children and environmental tobacco smoke. Children, infants and foetuses are especially at risk from exposure to the hundreds of toxic and carcinogenic substances identified in second-hand smoke. Children inhale more of the toxic chemicals in smoke than adults; they also may be less able to process certain toxic components of second-hand smoke. Babies born to smoking mothers tend to have lower birth weight, and infants exposed to second-hand smoke are more at risk of sudden infant death syndrome (SIDS). All children have an increased risk of respiratory infections, bronchitis and pneumonia, asthma, cough, wheeze, and middle ear infection.

The international scientific consensus is clear and irrefutable: there is no safe level of exposure to tobacco smoke, and the only effective protection is 100% smoke-free environments. To date, 151 of the world's countries have committed to protect their peoples by ratifying the Framework Convention on Tobacco Control and adopting strict guidelines for implementing its article 8. The rapid and rigorous implementation of 100% smoke-free work-

places and public places according to international best practice will contribute greatly towards reducing overall exposure to second-hand smoke.

Much more is needed, however, to protect children where they are most exposed: at home but also in vehicles, childcare settings and schools. This report makes concrete recommendations on providing protection in these places. Where the state can regulate it should do so, avoiding the pitfalls of voluntary approaches. Where an environment is clearly outside the realm of state action, every step should be taken to educate and inform parents and the public, raise awareness of the dangers in children's exposure to second-hand smoke, change the social acceptability of second-hand smoke, involve key health professionals, and provide adequate cessation services to help smokers quit.

Encouraging smoke-free homes is of particular importance, not only to protect children from exposure but also to reduce tobacco consumption, help smokers quit and stay quit, and prevent young people from starting to smoke.

There is no doubt that the greatest challenge to protecting our children from second-hand smoke, everywhere but especially in developing countries, will be the tobacco industry.

This report, if widely disseminated, will help to counter the large-scale disinformation and unscrupulous delaying tactics by the tobacco industry worldwide and to guide effective policy and action.

First and foremost, however, the report is a plea to people everywhere to act responsibly – in their different roles as parent, educator, health professional, decision-maker, and citizen – to ensure our children's right to a safe, smoke-free environment in which they can grow into healthy adults.

As the authors poignantly remind us, children are exposed to risk because adults smoke in the places where they live, work, and play. Children are the most vulnerable and the least able to remove themselves from exposure. They depend on adults to protect them from the devastating impact of second-hand smoke.

They depend on all of us.



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ABOUT UICC

UICC is the leading international non-governmental organization dedicated exclusively to the global control of cancer. Its vision is of a world where cancer is eliminated as a major life-threatening disease for future generations.

UICC's mission is to build and lead the global cancer control community engaged in sharing and exchanging knowledge and competence, transferring scientific findings to clinical, patient and public settings, systematically re-

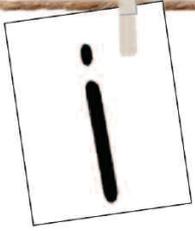
ducing and eliminating disparities in prevention, early detection and treatment, and delivering the best possible care to people living with cancer throughout the world.

UICC brings together a wide range of organizations, including voluntary cancer leagues and societies, research and treatment centres, public health authorities, patient support networks and advocacy groups and, in some countries, ministries of health. With 290 member organizations

in more than 90 countries, UICC is a resource for action and a voice for change.

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