Childhood exposure to tobacco smoke (CHETS) in Northern Ireland

Health Promotion Agency

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Foreword

On 30 April 2007 smoke-free legislation was introduced in Northern Ireland to prohibit smoking in all enclosed and partially enclosed public places and workplaces. This legislation endeavoured to help protect vulnerable groups such as non-smokers and children from the harmful substances found in second-hand smoke.

To assess the impact of this legislation, the Department of Health, Social Services and Public Safety (DHSSPS) launched a comprehensive monitoring and evaluation strategy. One key area of the strategy focused on the investigation of children's exposure to second-hand smoke. In order to contribute to the legislation review, the Health Promotion Agency for Northern Ireland (HPA) undertook research to assess children's exposure to second-hand smoke pre- and post-legislation.

This research details for the first time the extent to which children in Northern Ireland are exposed to second-hand smoke and the key factors that influence this exposure. In addition, these results have highlighted the need for a population-wide public health approach to help minimise second-hand smoke exposure among children.

The health and wellbeing of our children is of paramount importance. This research contributes to the growing body of worldwide evidence on children's exposure to second-hand smoke and will inform public health and education initiatives and programmes within Northern Ireland.

Dr Brian Gaffney
Chief Executive
Health Promotion Agency for Northern Ireland

Acknowledgements

We would like to thank all of the children, headteachers and staff of the schools who participated in the study. Their time and energy is greatly appreciated.

Thank you to staff in the Child and Adolescent Health Research Unit (CAHRU) who provided the original questionnaire and support and advice during the study, in particular Patricia Akhtar and Candace Currie. Special thanks to Dorothy Currie (CAHRU) who provided assistance with sample design and statistical support.

In addition, we would like to acknowledge the support from MVA Consultancy for managing the fieldwork and ABS Laboratories who carried out the salivary cotinine analysis.

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Introduction

The Northern Ireland *Five year tobacco action plan 2003–2008* acknowledges that individuals, especially non-smokers and children, are entitled to protection from second-hand smoke.[1]

Exposure to second-hand smoke is a major health concern because of its association with smoking-related illnesses such as lung cancer, heart disease and stroke. Second-hand smoke is also a threat to the health of children and babies due to demonstrated links between second-hand smoke and respiratory disease, cot death, middle ear disease and asthma.[2,3]

Willers *et al*., (1995) have shown that young children are especially vulnerable to second-hand smoke compared to adults. This is because children have a higher relative ventilation rate, which in turn leads to higher internal exposure to second-hand smoke.[4] Further evidence of the dangers of second-hand smoke to children has been provided by studies assessing cotinine levels, a biomarker of nicotine exposure, in which children demonstrated higher cotinine levels than adults, relative to their exposure.[5]

In addition, exposure to second-hand smoke has been shown to have an impact on the uptake of smoking and nicotine dependence symptoms in young people. Becklake *et al*., (2005) showed that the proportion of nicotine absorbed from that available in second-hand smoke during childhood was associated with subsequent smoking in adolescence. This association remained significant after adjusting for a number of factors such as sex, socio-economic group and number of adult smokers at home.[6] A further study by Bélanger *et al*., (2008) showed that young people who had never smoked but who had been exposed to increased levels of second-hand smoke were more likely to self-report nicotine dependence symptoms, a factor which may in turn lead to the uptake of smoking.[7]

Parental smoking is considered the main source of the majority of children's exposure to second-hand smoke. However, to the best of our knowledge, no published data is currently available on how many parents smoke in Northern Ireland or the extent of children's exposure to second-hand smoke in and outside the home environment.[8]

Studies in the United States have determined that 43% of children aged two months to 11 years lived in a home with at least one smoker.[5] Similarly, in Scotland over 40% of children in Year seven lived with a parent who smoked and 45% of children aged 11–15 years in England reported living in a smoking household.[9,10]

The World Health Organization (WHO) has reported the main location of children's exposure to second-hand smoke to be the home environment.[3] Children, especially younger children, may be particularly vulnerable to second-hand smoke in this environment as they often cannot remove themselves from the source of the exposure and may have limited or no influence on whether smoking occurs within the home or indeed in their presence.

In 2002, a British study reported the proportion of smokers' homes being smoke-free was related to the presence and age of the youngest child in the household. Only 12.5% of smokers' homes were smoke-free if no children were present. However, in homes with children, this proportion rose depending on the age of the youngest child. It increased to 16% when the youngest child was pre-teen and further increased to 28% when the youngest child was of pre-school age.[11]

Outside of the home environment, children may be exposed to second-hand smoke in a variety of public places. As a means of protecting non-smokers and children from exposure to second-hand smoke, on 30 April 2007 legislation was introduced in Northern Ireland to prohibit smoking in enclosed and substantially enclosed workplaces and public places.

Opponents of the smoke-free legislation have expressed concerns whether the adoption of smoke-free public places would lead to a displacement of smoking into private spaces, for example homes and cars, thereby enhancing the exposure of non-smokers and children. However these claims have not been upheld.[12,9] Indeed, a study by Borland *et al*., (2006) concluded that smoking prohibitions in the workplace facilitate rather than inhibit the introduction of smoke-free homes.[11]

This research aims to provide, for the first time, information about the levels of children's exposure to second-hand smoke in Northern Ireland and determine whether the implementation of legislation on smoking in public places has had any effect on children's exposure to second-hand smoke. To strengthen the study, this research has utilised a comparable methodology and questionnaire to that used in the Scottish study *Changes in child exposure to environmental tobacco smoke* (CHETS).[9]

This report will be of substantial benefit to those working in policy and programmes within the public health and education settings and will aid understanding of the extent and impact of children's exposure to second-hand smoke. It is anticipated that this report will help to highlight and focus the need for further education and intervention work with the general public, parents and smokers to minimise children's risk of exposure to second-hand smoke.

Aim

To assess Year seven children's exposure to second-hand smoke before and after the introduction of the smoke-free legislation to prevent smoking in enclosed public places and workplaces in Northern Ireland.

Objectives

In addition to the overall aim, the following objectives guided this research:

- to determine the smoking status of children's family and friends;
- to assess where children are exposed to second-hand smoke;
- to assess the frequency with which children are exposed to second-hand smoke;
- to determine children's awareness of the dangers of second-hand smoke;
- to examine the wider impact of children's exposure to second-hand smoke;
- to measure children's overall exposure to second-hand smoke via the use of salivary cotinine samples.

Methodology

Survey design

To address the objectives of this study, a repeat cross-sectional survey of Year seven children in primary schools was carried out pre- (February 2007–March 2007) and post-legislation (February 2008–March 2008).

The study consisted of two parts: a confidential self-completion questionnaire and the collection of saliva samples for cotinine assessment. The questionnaire used within this study had been adapted from the Scottish CHETS survey, carried out by the Child and Adolescent Health Research Unit (CAHRU) of the University of Edinburgh with Year seven children in Scotland.[9]

This year group of children was chosen for two reasons. Firstly, at this age (around 11 years) children are sufficiently mature to complete a questionnaire with minimal help, and secondly the percentage of children in this age bracket who are active smokers is very small. The latest figures suggest only 2% of children in Years five to seven currently smoke in Northern Ireland.[13]

Saliva samples were collected for analysis of cotinine, which has been established as a valid measure of exposure to second-hand smoke.[14] Cotinine concentrations in blood, urine and saliva correlate highly, but saliva offers the easiest method of collection, especially with young children.[15] Indeed, this method of obtaining cotinine samples is currently carried out with children as young as four years old as part of the Health Survey for England.[16]

Ethical approval for this study was obtained from the Office of Research Ethics in Northern Ireland.

Survey implementation

The recruitment and fieldwork processes were replicated pre- and post-legislation. In brief, schools were recruited with an initial letter to the principal introducing the study and requesting the school's participation. Each principal who gave informed consent for the study to take place in their school was asked to provide information on the number and size of Year seven classes, from which the HPA randomly selected one class within each school.

Schools were then provided with sufficient copies of parent letters and information leaflets containing opt-out consent forms for distribution to all parents in the participating class. Opt-out consent forms were returned to the HPA or directly to the school.

Trained fieldworkers (non-smokers) administered the survey and coordinated the collection of the saliva samples. This was conducted in the classroom with the class teacher present. Children were each given an envelope containing an information sheet, a questionnaire and a small plastic bag containing the salivette (for collection of saliva sample).

After reading the information sheet and being introduced to the study by the fieldworkers, children were asked to indicate if they did not wish to take part. Children could withdraw from the study at any point during the questionnaire, or could also refuse to take part in the saliva collection. Further details on the fieldwork procedure for collection of saliva samples are provided in the Appendix.

Survey sample

The sampling frame used for the study consisted of all primary schools in Northern Ireland (excluding special schools). The sample was stratified by school management type, Education and Library Board area, urban/rural area, proportion of free school meal entitlement, and school size. In total 128 of the 297 schools approached agreed to take part in the pre-legislation study (43% response rate). 122 of the 128 schools (95%) participated in the post-legislation in 2008. Comparison of the achieved school sample to all Northern Ireland schools is shown in the Appendix, Table 15.

Excluding those children absent on the survey day (2007, n=168; 2008, n=195), a final response rate of 91% (n=2176) was achieved pre- and 96% (n=2148) post-legislation. Several cases were excluded from the survey sample, including self-reported smokers, those who did not complete questions on gender and age and Year six children who were surveyed as part of a mixed Year six/ Year seven class. Details of exclusion criteria and excluded cases are detailed in the Appendix, Table 16. Final numbers in the survey sample where 2136 pre- and 2113 post-legislation.

Table 17 (Appendix) details the demographics of the sample pre- and post-legislation. No significant differences in the proportion of boys and girls (boys 51% pre-, 50% post-legislation), or in the proportion of children living in each family structure (living with two parents, step-parents or single parents) was evident.

For the purposes of this study, family structures were further reclassified into three groups of parental living arrangements. These included living with a mother and father figure, living with a mother figure only and living with a father figure only. In cases were children did not specify living with a mother, father or step-parent the main parent figure was taken as another relative living in the home. These parental living arrangements were used to further classify children as living with no parent, one parent (father only or mother only) or both parents who smoke.

Parental occupation was used as measure of socio-economic classification. Reported parental employment status and employment title were used to classify each parent into professional/managerial, skilled non-manual, skilled manual, partly skilled/unskilled, and not holding a job. From this information the highest occupational status was reported for each family. There was a significant difference between the pre- and post-legislation samples in terms of the highest occupational status of children's parents. Pre-legislation there was a higher proportion of professional/managerial and skilled manual households compared to post-legislation, where a higher proportion of children lived in skilled non-manual and partly skilled/unskilled households. However, no significant difference was evident overall between manual and non-manual groups.

Cotinine sample

Pre-legislation 98% (n=2124) of children (who completed a questionnaire) and post-legislation 99% of children (n=2125) provided a saliva sample for analysis. Ninety-one percent (n=1,985) pre- and 94% (n=2039) post-legislation of these samples were valid to be included in the analysis. Invalid saliva samples included those samples which had insufficient volume for analysis, were contaminated or had a cotinine value of 15ng/ml (see Appendix), the cut-off point for active smoking.

Thirty-eight percent of the samples (pre-legislation) and 42.5% (post-legislation) were below the limit of detection (<0.1ng/ml). Invalid saliva samples included those samples which had insufficient volume for analysis, were contaminated or had a cotinine value of 15ng/ml or above. This cut-off value of 15ng/ml and above has been used in a number of similar studies.[9, 10]

Statistical analysis and presentation of results

Cotinine values were positively skewed, therefore log transformed values were used in all analyses. Cotinine values are therefore presented as geometric means with the associated 95% confidence intervals (CI).

All results are presented as frequency values for survey data. Base numbers are provided on all tables and figures to illustrate the number of respondents on which percentages or means are based. As a result of rounding, some column or row percentages may not equal 100%.

Children's overall second-hand smoke exposure was firstly investigated by examination of cotinine levels. Exposure levels were then further qualified by investigation of children's sources (family and friends), frequency and location of second-hand smoke exposure.

Top line results were firstly statistically analysed by survey year (indicated throughout the report as pre- (for pre-legislation results) and post- (for post-legislation results). Results were further analysed at each individual time point (ie pre- and then post-legislation) based on a number of individual characteristics, including, if applicable, gender, parental smoking status (based on parents who live with the child), occupational status, household smoking rules, and mean cotinine levels. Significance levels for these results are referred to in tables as 'sign within year'.

Differences between the pre- and post-legislation measures were also examined within subgroups (based on individual characteristics), and significance levels in tables are referred to as 'sign between years'.

Statistical analysis was carried out using chi-square to determine whether there are any associations between groups (eg parental smoking status, occupational status etc). Analysis of Variance (ANOVA) and T-tests were used to test for mean differences between the pre- and post-legislation data, and also to explore differences between individual characteristics. Levels of significance are denoted in tables by asterisks – *$p<0.05$, **$p<0.01$, ***$p<0.001$. NS on tables denotes that results are not significant.

Children's overall cotinine concentrations

Assessment of salivary cotinine provides an estimate of a child's overall exposure to second-hand smoke. Following the introduction of smoke-free legislation in Northern Ireland, children's cotinine levels showed no significant change (0.174ng/ml pre-, 0.159ng/ml post-legislation, Table 1).

No variation in the mean cotinine levels was noted between boys and girls pre- or post-legislation, therefore further results on children's sources, frequency and location of exposure are not presented by gender.

Cotinine concentrations were shown to increase as occupational status decreased both pre- and post-legislation ($p<0.001$ pre- and post-legislation). Those children from professional/managerial households were more likely to have lower levels of exposure (0.081ng/ml pre-, 0.075ng/ml post-legislation) compared to those children from partly skilled/unskilled households (0.254ng/ml pre-, 0.233ng/ml post-legislation) groups or those children who reported their parent(s) did not currently hold a job (0.918ng/ml pre-, 0.634 ng/ml post-legislation).

Table 1: Geometric mean cotinine concentration by gender and parental occupational status

	Pre-			Post-			
	Mean ng/ml (95% CI)	**Base**	**Sign within year**	**Mean ng/ml** (95% CI)	**Base**	**Sign within year**	**Sign between years**
All	0.174 (0.160 to 0.190)	1985		0.159 (0.145 to 0.175)	2039		NS
Gender							
Male	0.178 (0.158 to 0.200)	1005	NS	0.161 (0.141 to 0.183)	1037	NS	NS
Female	0.171 (0.150 to 0.194)	980		0.158 (0.138 to 0.179)	1002		NS
Occupational status							
Professional/managerial	0.081 (0.069 to 0.094)	531	***	0.075 (0.063 to 0.088)	530	***	NS
Skilled non-manual	0.132 (0.105 to 0.165)	276		0.115 (0.091 to 0.142)	351		NS
Skilled manual	0.210 (0.178 to 0.248)	486		0.215 (0.177 to 0.261)	454		NS
Partly skilled/unskilled	0.254 (0.196 to 0.329)	204		0.233 (0.183 to 0.297)	287		NS
No job	0.918 (0.691 to 1.220)	146		0.634 (0.455 to 0.885)	132		NS

Cotinine levels will be further examined throughout this report to determine, validate or explain changes in children's self-reported sources, frequency and location of second-hand smoke exposure.

Children's reports on family and friends smoking

Children were provided with a list of potential family members and asked to state if any of the individuals (or groups of individuals) smoked either 'every day' or 'sometimes'. Children were also given response options of 'does not smoke', 'don't know' or 'do not know or see this person'. For the purposes of the current report those identified as smoking 'every day' or 'sometimes' were classified as a smoker.

Approximately one third of children reported their father to be a smoker (32% pre-, 34% post-legislation) and a similar proportion reported their mother to be a smoker (31% pre-, 32% post-legislation). Much greater percentages were noted for the percentage of aunts (52% pre- and post-legislation) and uncles (55% pre- and post-legislation) who smoked. The diverse number of aunts and uncles each child may have may explain the higher proportion of smokers identified in these two groups (see Appendix, Table 18).

Around 10% of Year seven children pre- and post-legislation reported any of their brothers smoked and 10% pre- and 9% post-legislation reported any of their sisters smoked.

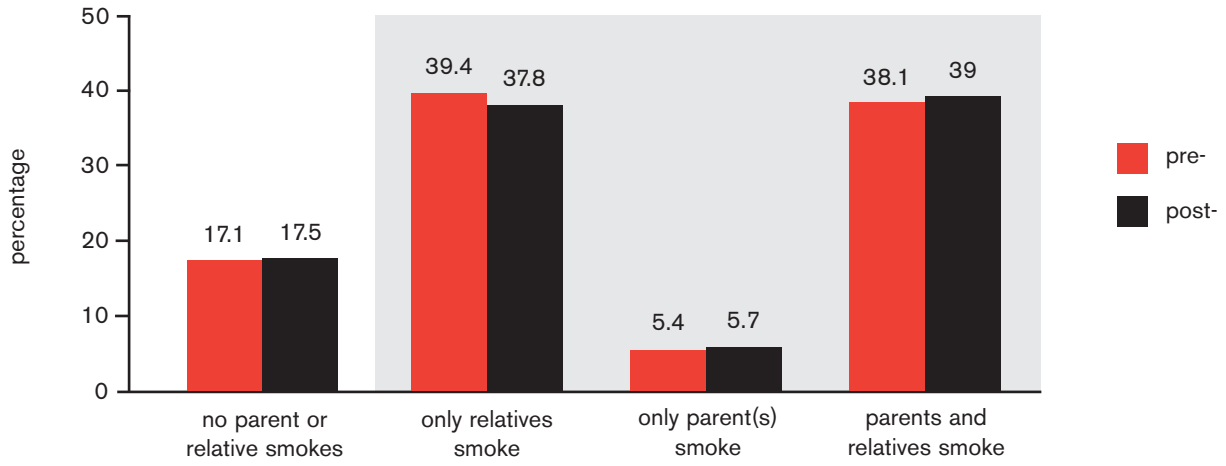
No changes in the proportion of any family member's smoking status were noted post-legislation.

Smoking in the extended family

From the information provided on the smoking status of each family member it was possible to investigate the extent of smoking within the child's extended family. To determine children's major sources of second-hand smoke exposure, results were analysed by the smoking status of parents and relatives. For the purposes of this study, parent(s) were classified as the main guardian(s) (parent, step-parent or other relative in the absence of a parent) who lived with the child all or most of the time. All other individuals were classified as a relative.

Overall 83% of children pre- and 82% post-legislation indicated they had at least one smoker in their extended family pre- and post-legislation (Figure 1). Over four in ten children (43% pre-, 45% post-legislation) reported living with a parent who smoked. In addition a further 39% of children pre- and 38% of children post-legislation were able to identify at least one other relative other than a parent who smoked. No statistically significant changes were noted post-legislation (Figure 1).

Figure 1: Smoking status of Year seven children's extended family



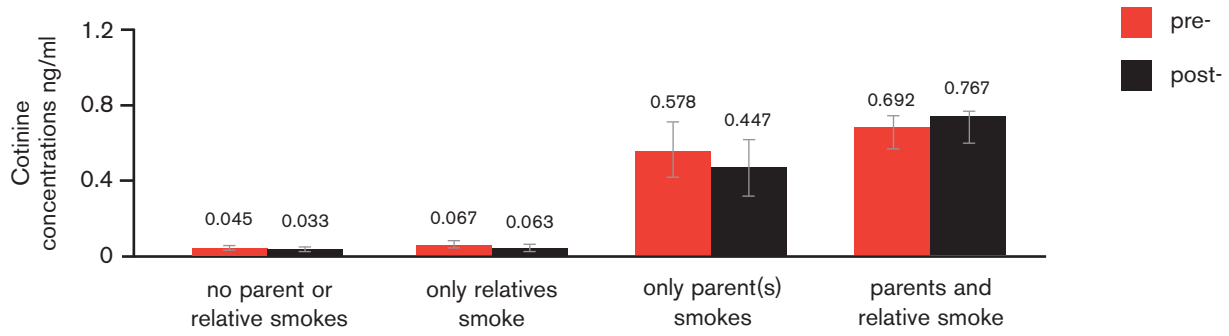
Base = 2112 pre-, 2089 post-, NS

Given that children were asked about individuals' (or groups of individuals) smoking status, it was not feasible to determine the actual number of relatives who smoke. However, to determine the contribution parents' and relatives' smoking makes to a child's exposure to second-hand smoke, mean cotinine concentration were investigated. Figure 2 (below) shows children who had either a parent or a parent and relative who smoke had the highest cotinine concentrations ($p<0.001$ pre- and post- legislation). Yet those children who had only a relative who smokes had substantially lower cotinine concentrations. This indicates that parents make the greatest contribution to children's cotinine concentrations.

Those children who reported having no parents or relatives that smoked demonstrated the lowest cotinine concentrations pre- and post-legislation (0.044ng/ml pre-, 0.033ng/ml post-legislation).

The only statistically significant change in cotinine concentrations was the decrease observed in children who reported they had no family relatives who smoked ($p<0.01$).

Figure 2: Geometric mean cotinine concentrations (ng/ml) by parent and relative smoking status



Base = 1967 pre-, 2013 post-, $p<0.001$ pre- and post-

Parental smoking

Having shown that children who live with smoking parents have the highest level of second-hand smoke exposure, further investigations were carried out looking specifically at the number and gender of these parents who smoked.

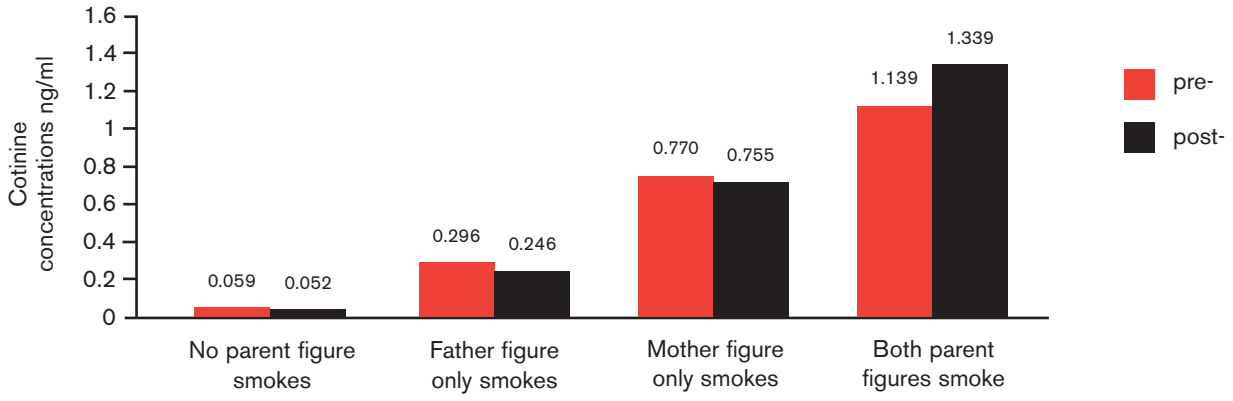
No significant changes were evident post-legislation in relation to the number or gender of parents that smoked. Similar numbers of children pre- and post-legislation reported both parent figures smoke (17% pre-, 14% post-legislation), mother figure only smokes (15% pre-, 17% post-legislation) or father figure only smokes (12% pre-, 14% post-legislation). Over half of children reported that no parent figure smokes (57% pre-, 55% post-legislation).

Table 2: Smoking status of parents of Year seven children

	No parent figure smokes	Father figure only smokes	Mother figure only smokes	Both parent figures smoke	Base	Sign
Pre-	56.5	12.4	15.1	16.9	2122	NS
Post-	55.3	13.8	16.6	14.3	2089	

Children's cotinine concentrations varied considerably based on the gender and number of parents who smokes. Cotinine concentrations were lowest for children who reported that no parent figure smokes (0.059ng/ml pre-, 0.052ng/ml post-legislation), with higher cotinine concentrations observed if a child reported only a father figure smokes (0.296ng/ml pre-, 0.246ng/ml post-legislation). The highest levels were observed if a mother figure only smoke (0.770ng/ml pre-, 0.755ng/ml post-legislation) or if both parents smoke (1.139ng/ml pre-, 1.339ng/ml post-legislation) (Figure 3).

Figure 3: Geometric mean cotinine concentrations (ng/ml) by parent smoking status



Base = 1971 pre-, 2016 post-, $p<0.001$ pre- and post-

Adult smoking has been shown to be strongly related to socio-economic group, with those from the manual groups exhibiting higher levels of smoking.[17] This relationship was also observed between parental smoking and parental occupational status (pre- and post-legislation $p<0.001$, Appendix, Table 19). Those living in professional/managerial households were least likely to report living with a parent that smoked (29% pre- and post-legislation) compared to those from partly skilled/unskilled households (52% pre-, 54% post-legislation) and those children in a household without current employment (70% pre-, 56% post-legislation).

Friends' smoking status

Another potential source of children's exposure to tobacco smoke is through their friends. The percentage of children who reported having friends who smoke was relatively low in comparison to the percentage of parents and relatives who smoke. Four percent of children pre-legislation (n=1854) and 5% post-legislation (n=1815) reported their best friend smoked.

Children were also asked how many of their other friends smoked (see Appendix, Table 20). Approximately three quarters of children in each phase reported that none of their other friends smoke (73% pre-, 72% post-legislation), 8% (pre- and post-legislation) reported some of their other friends smoke and only 1% at both phases reported that most of their other friends smoke. Seventeen percent of children pre-legislation and 19% post-legislation reported not knowing whether their friends smoke. This may indicate that friends did not commonly smoke around them and would therefore contribute little to a Year seven child's exposure to second-hand smoke. Indeed, an additional question asked post-legislation only determined 71% (n=2086) of children reported their friends do not smoke around them (results not shown).

There were no significant differences between genders at either phase for responses to this question. However, children from lower occupational groups were more likely to report having more friends who smoked (pre-, $p<0.001$ and post-legislation $p<0.01$, Appendix, Table 20). Pre-legislation 7% of children in a professional/managerial household reported some of their friends smoke compared to 14% of children in partly skilled/unskilled households. This suggests that children from the lower occupational status households are not only more likely to have parents that smoke, but are also more likely to associate with other children who smoke.

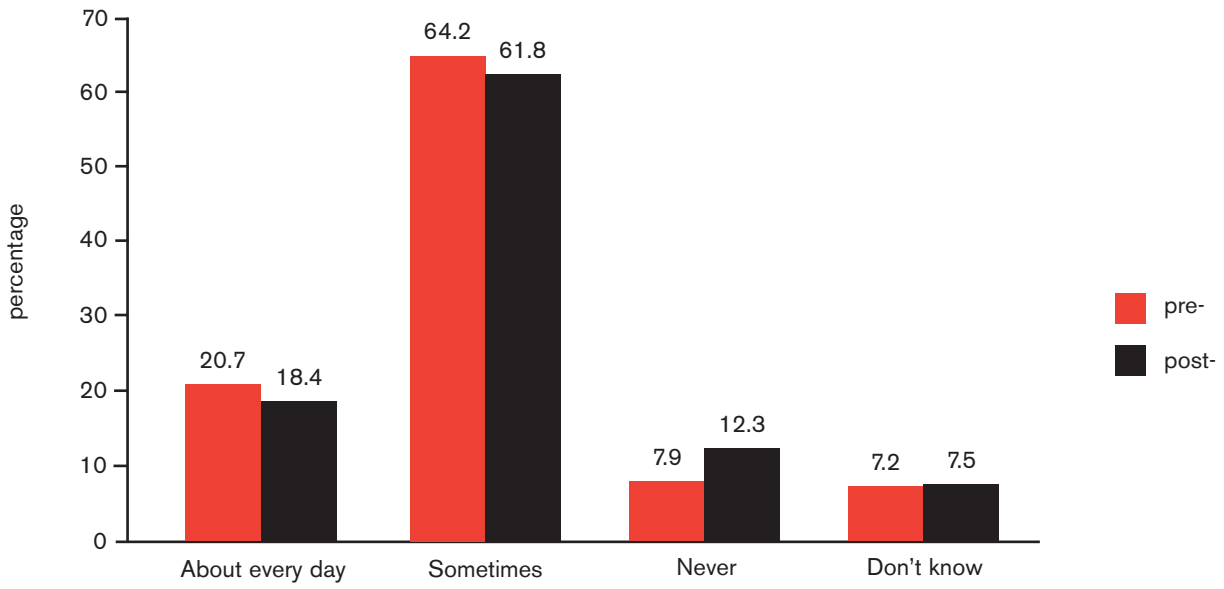
In addition, higher cotinine levels were associated with children who reported that some of their friends smoked ($p<0.001$ pre- and post- legislation). However, cotinine levels were not as high as those observed if a parent smokes (see Appendix, Table 20).

Children's frequency of exposure to second-hand smoke

To help determine the frequency children were exposed to second-hand smoke children were asked 'How often are you in a place where someone is smoking?'. Response options included 'about every day', 'sometimes', 'never' or 'don't know'. A large proportion of children (85% pre-, 80% post-legislation, $p<0.001$) were reported to be in a location where someone is smoking either 'about every day' or 'sometimes' (Figure 4).

Post-legislation, there was a significant increase in the percentage of children stating that they are 'never' in a location where someone is smoking (8% pre-, 12% post-legislation, $p<0.001$), accompanied by a small decline in those who reported they were in a location were someone is smoking 'about every day' (21% pre-, 18% post-legislation) or 'sometimes' (64% pre-, 62% post-legislation). However, following the introduction of the legislation there was still almost one fifth (18%) of children who reported that they were in a smoking location 'about every day'.

Figure 4: How often children report being in a location where someone else is smoking



Base = 2120 pre-, 2102 post-, $p<0.001$

Post-legislation, significantly more of those children who had parents and relatives who smoke ($p<0.001$) or only relatives who smoke ($p<0.05$) reported 'never' being in a smoking location compared to pre-legislation. Despite these changes children who had no parents or relatives that smoke were the most likely to report they were 'never' in a smoking location ($p<0.001$ pre- and post-legislation) (results not shown).

The significant impact of the increased frequency of children being in a smoking location on children's exposure to second-hand smoke was confirmed by cotinine analysis (Table 3). Those children who reported being exposed 'about every day' demonstrated the highest cotinine concentrations (0.914ng/ml pre-, 0.872ng/ml post-legislation) compared to those who reported they were 'sometimes' (0.124 ng/ml pre-, 0.129ng/ml post-legislation) or 'never' in a smoking location (0.058ng/ml pre-, 0.056ng/ml post-legislation).

Table 3: Geometric mean cotinine concentrations (ng/ml) by reported frequency of being in a smoking location

	Pre-			Post-			
	Mean (ng/ml) (95% CI)	Base	Sign within year	Mean (ng/ml) (95% CI)	Base	Sign within year	Sign between years
About every day	0.914 (0.781 to 1.070)	417	***	0.872 (0.737 to 1.033)	370	***	NS
Sometimes	0.124 (0.112 to 0.137)	1260		0.129 (0.115 to 0.145)	1260		NS
Never	0.058 (0.045 to 0.074)	151		0.056 (0.045 to 0.070)	247		NS
Don't know	0.099 (0.071 to 0.136)	141		0.076 (0.054 to 0.108)	154		NS

Despite reporting neither parent smoked, 6% of children pre- and post-legislation reported they were in a smoking location 'about every day' (Table 4). This figure was considerably lower than that reported by children who had a father figure who smokes (30% pre-, 28% post-legislation). However, children were most likely to report they were in a smoking location 'about every day' if either only a mother figure smokes (38% pre-, 36% post-legislation) or if both parents smoke (48% pre-, 38% post-legislation).

Conversely, children were more likely to report they were 'never' in a smoking location (12% pre- and 18% post-legislation) if no parent smokes compared to only 2% pre- and 3% post-legislation of children who reported both parents smoke.

Following the introduction of legislation, significant changes in the frequency of exposure occurred for those children who were least exposed initially. As can be seen in Table 4, more children reported they were 'never' in a smoking location if no parent (12% pre-, 18% post-legislation, $p<0.001$) or if only the father figure smoked (3% pre-, 9% post-legislation, $p<0.05$).

Table 4: Frequency of being in a smoking location, by parental smoking status

	About every day %	Sometimes %	Never %	Don't know %	Base	Sign within year	Sign between years
Pre-							
No parent figure smokes	6.1	72.8	12.2	8.9	1190	***	***
Father figure only smokes	30.4	61.2	2.7	5.8	260		*
Mother figure only smokes	38.1	54.7	1.9	5.3	320		NS
Both parent figures smoke	47.8	45.7	2.1	4.5	337		NS
Post-							
No parent figure smokes	5.9	66.6	17.6	9.9	1148	***	
Father figure only smokes	27.8	59.7	8.7	3.8	288		
Mother figure only smokes	35.7	55.4	4.6	4.3	345]		
Both parent figures smoke	38.0	53.9	3.4	4.7	297		

Parental occupational status was also shown to have a strong association with the frequency children were in a smoking location ($p<0.001$, pre- and post-legislation, see Table 5). Those in the professional/managerial group were least likely to state that they are in a smoking location 'about every day' (13% pre-, 10% post-legislation), compared to 40% pre- and 26% post-legislation of those children living in a home with no current parental employment.

Significant differences were evident within several of the occupational groups between the pre- and post-legislation surveys. For those in professional managerial and skilled non-manual households ($p<.01$) there was an increase in the percentage of children stating they were 'never' in a smoking location and a corresponding decrease in the percentage who reported 'sometimes' being in a smoking location.

There was also a significant change for those living in a home with no current parental employment ($p<.05$). Again the percentage reporting that they were 'never' in a smoking location increased (4% pre-, 9% post-legislation). However, in contrast to the aforementioned occupation group changes, this group reported lower levels of children being in a smoking location 'about every day' (40% pre-, 26% post-legislation). Despite these changes, a large proportion of children (from households with no parental employment) were still exposed to smoke 'about every day' (26%).

Table 5: Frequency of being in a smoking location, by household occupational status

	About every day %	Sometimes %	Never %	Don't know %	Base	Sign within year	Sign between years
Pre-							
Professional/ managerial	12.9	71.7	8.3	7.1	575	***	**
Skilled non-manual	17.3	66.4	7.3	9.0	301		**
Skilled manual	23.3	63.7	6.1	6.9	510		NS
Partly skilled/ unskilled	25.7	57.8	11.0	5.5	218		NS
No job	39.5	53.3	3.9	3.3	152		*
Post-							
Professional/ managerial	10.2	65.7	14.7	9.5	539	***	
Skilled non-manual	20.6	57.9	15.3	6.1	359		
Skilled manual	24.0	59.2	9.8	7.0	471		
Partly skilled/ unskilled	18.7	66.6	8.4	6.4	299		
No job	25.6	58.6	9.0	6.8	133		

Overall, these results suggest that those children who have a mother or both parents who smoke and those in the lower occupational groups are more likely to be exposed to second-hand smoke on a more frequent basis in comparison to those children who are in the higher occupational groups or report either only their father smokes or none of their parents smoke.

Locations where children are exposed to second-hand smoke

Children were asked a number of questions to determine their exposure to second-hand smoke in various locations on the day before the survey. They were first asked if they were in that location the day before followed by if there was anyone smoking there. Given the low numbers of children who reported being in a number of venues and the low exposure levels post-legislation, only top line figures are presented for the majority of venues.

Table 6 shows significant reductions in the percentage of children who reported someone was smoking in cafes or restaurants (27% pre-, 8% post-legislation, $p<0.001$) and in indoor leisure facilities (9% pre-, 6% post-legislation, $p<.05$) post-legislation. Results also showed an increase in the percentage of children reporting no-one was smoking in school (79% pre-, 82% post-legislation, $p<.05$).

These results indicate decreases in children's exposure to second-hand smoke in a range of public places following the introduction of smoke-free legislation, with the greatest reduction being in the proportion of children who reported someone was smoking to be in cafes and restaurants. This is unsurprising given that many schools and indoor leisure facilities in Northern Ireland may have previously adopted smoke-free policies prior to the introduction of the smoke-free legislation in comparison to cafes and restaurants.

No change was observed in the percentage of children who reported someone was smoking in the car or bus or train. Post-legislation 10% of children were still exposed to someone smoking in the car. Further analysis showed smoking in the car was related to parents' smoking status pre- and post-legislation. Only 2% of children with non-smoking parents (pre- and post-legislation) reported someone was smoking in the car yesterday compared to 34% pre- and 25% post-legislation of children who reported both parents smoked ($p<0.001$ pre- and post- legislation, results not shown).

No difference was noted in the proportion of children who reported someone was smoking in their own, or someone else's home.

Collectively, these results appear to reflect post-legislative changes in second-hand smoke exposure are limited to public places, with the results indicating no change in exposure within private places such as the car or home. Furthermore, post-legislation, the home environment (own and some else's home) remains the major location where children are exposed to second-hand smoke. Around one quarter of children stated that there was someone smoking in their own home (24% post-legislation) and in someone else's home (23% post-legislation) compared to between 1% and 10% of children who indicated smoking occurred in the other locations.

Table 6: Reported smoking in various locations

	There was no-one smoking there %	Yes, someone was smoking there %	Don't know %	Base#	Sign
Cafe or restaurant					
Pre-	34.0	27.1	38.9	262	***
Post-	57.4	8.4	34.2	237	
Indoor leisure facility					
Pre-	67.1	8.9	24.0	629	*
Post-	73.5	6.0	20.5	634	
School					
Pre-	78.8	1.4	19.8	1694	*
Post-	82.3	1.1	16.6	1802	
Car					
Pre-	84.5	12.0	3.5	1705	NS
Post-	86.0	10.0	4.0	1692	
Bus or train					
Pre-	80.9	2.3	16.8	351	NS
Post-	79.9	2.0	18.1	349	
Own home					
Pre-	66.5	26.1	7.4	2059	NS
Post-	67.2	23.7	9.1	2028	
Someone else's home					
Pre-	63.9	22.3	13.8	980	NS
Post-	62.8	23.2	14.0	949	

Those children who reported that they were in the designated location the day before the survey.

Smoking in the home

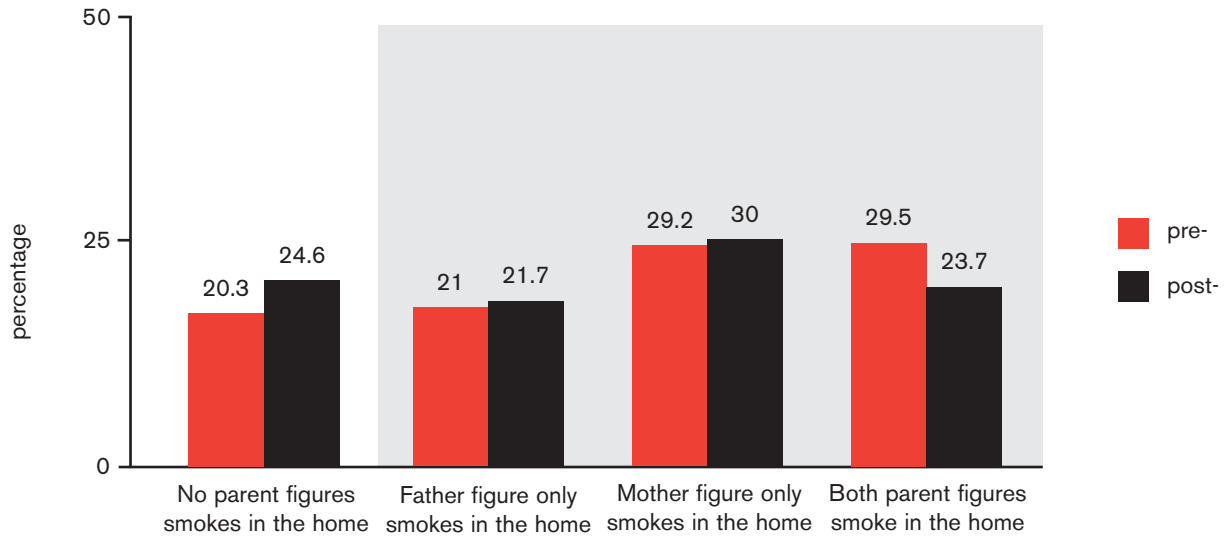
To gain a picture of the extent of smoking in the home, analysis was carried out to determine the degree that members of the family who smoke, smoke in the child's home. Children were therefore provided with a list of potential family members (see Appendix, Table 18 for list) and asked 'Do any of these individuals smoke in the home you live in all or most of the time?'

Of those children who had a member of the extended family who smokes, there was no difference, post-legislation, in the percentage of children who reported having a family member smoke in the child's home (n=1753 pre-, n=1720 post-legislation). 76% (pre-) and 72% (post-legislation) of children reported a member of the extended family, who smokes, does so in the child's home (results not shown). This equates to 64% pre- and 60% post-legislation of the overall sample having a member of the extended family who smokes in the home.

Given we have determined the majority of children's second-hand smoke exposure comes from parents who live with the child, parents' smoking habits in the home were investigated. Of those children who reported having a parent who smokes, a very high percentage of parents were shown to smoke in the home environment (Figure 5). Overall 80% (pre-) and 75% (post-legislation) of parents who smoke, smoke in the home. Although this represented a significant decrease in levels post-legislation, the proportion of parents who smoke in the home remains alarmingly high. These percentages equate to 36% (pre-) and 34% (post-legislation) of the overall Year seven sample having a parent who smokes in the home.

The significant decrease in parents smoking in the home was specifically related to a substantial decrease in the proportion of children who stated both parents smoked in the home (30% pre-, 24% post-legislation, $p<0.05$) and an increase in those children that reported no parents smoke in the home (20% pre- 25% post-legislation). No statistically significant changes were observed for smoking in the home among those children who reported only one parent smoked in the home.

Figure 5: Percentage of parents who smoke that smoke in the home of their child



Base =922 pre-, 927 post-, $p<0.05$

Significant relationships were observed between the number and gender of parents who smoked in the home in the subsample of children who have at least one parent that smokes. As before, an increase in cotinine concentrations was observed depending on the number and gender of parents who smoke (Table 7). Those who reported a father figure smokes in the home had mean cotinine concentrations of 0.446ng/ml pre- and 0.398ng/ml post-legislation. Cotinine concentrations increased substantially pre- and post-legislation when a mother figure smokes (0.953 ng/ml pre-, and 1.061 ng/ml post-legislation) and particularly when both parents smoke in the home (1.46 ng/ml pre-, and 1.73 ng/ml post-legislation).

In households where at least one parent smokes, those children who reported neither parent smokes in the home had the lowest mean cotinine concentrations (0.21ng/ml pre- and 0.201ng/ml post-legislation). However, these cotinine concentrations were still much higher than those among children who had previously reported neither parent smokes (0.059 ng/ml pre-, 0.052ng/ml post-legislation) (see Table 3 for comparison).

Table 7: Geometric mean cotinine concentration (ng/ml), by parental smoking in the home

	Pre-			Post-			
	Mean (ng/ml) (95% CI)	**Base**	**Sign within year**	**Mean (ng/ml)** (95% CI)	**Base**	**Sign within year**	**Sign between years**
No parent figure smokes in the home	0.210 (0.162 to 0.272)	178	***	0.201 (0.158 to 0.256)	216	***	NS
Father figure only smokes in the home	0.446 (0.362 to 0.550)	182		0.398 (0.319 to 0.497)	196		NS
Mother figure only smokes in the home	0.953 (0.801 to 1.133)	253		1.061 (0.891 to 1.264)	262		NS
Both parent figures smoke in the home	1.46 (1.244 to 1.716)	257		1.726 (1.459 to 2.044)	212		NS

There was a significant relationship between parents smoking in the home and parental occupational status pre-legislation ($p<0.001$ Appendix, Table 21). Those in the higher occupational groups were more likely to report that neither parental figure smokes in the home (28%) compared to, for example, those in the partly skilled/unskilled group (17%). Although a similar pattern was evident post-legislation, the differences were not statistically significant.

Rules on smoking in child's homes

Given the evidence that the majority of children's exposure to second-hand smoke occurs within the home environment, more detailed analysis of household smoking rules and smoking activity in the home was carried out.

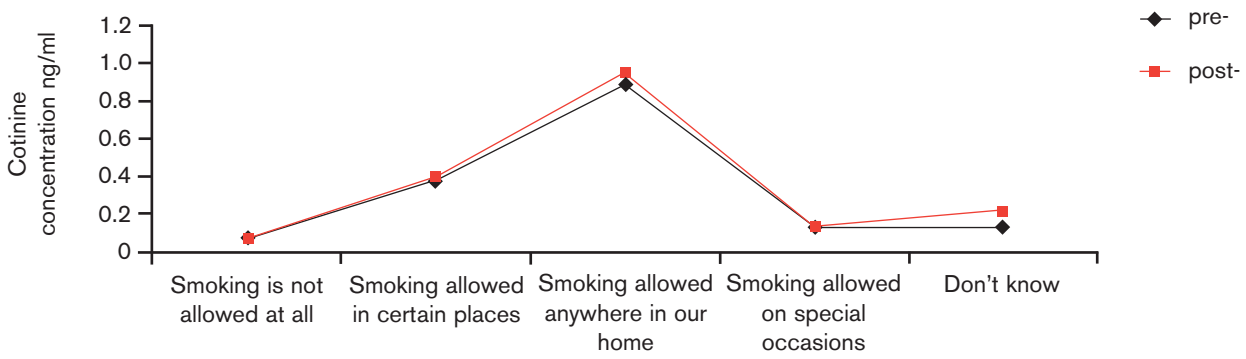
Children were asked 'Is smoking allowed inside your home?' Just under half of all children reported that smoking was not allowed at all (47% pre- and post-legislation, Table 8). However, the percentage of children reporting that smoking is 'only allowed in certain places' increased (24% pre-, 30% post-legislation) and the percentage of children reporting that 'smoking is allowed anywhere' decreased (15% pre-, 10% post-legislation) following the introduction of the legislation ($p<0.001$).

Table 8: Rules on smoking inside child's home

	Pre- %	Post- %	Sign
No, smoking is not allowed at all	47.2	47.4	***
Smoking is allowed in certain places	24.2	30.0	
Smoking is allowed anywhere in our home	14.6	10.4	
Smoking is allowed on special occasions in our home	4.3	4.7	
Don't know	9.6	7.6	
Base	2122	2086	

The impact of household smoking restrictions on a child's exposure to second-hand smoke can clearly be seen from Figure 6. Children from homes where smoking is allowed anywhere in the home had significantly higher mean cotinine concentrations (0.93ng/ml pre-, 0.97ng/ml post-legislation) than those where smoking is only allowed in certain places (0.39ng/ml pre-, 0.40ng/ml post-legislation) or those where smoking is not allowed at all (0.07 ng/ml pre- and 0.06 ng/ml post-legislation).

Figure 6: Impact of household smoking rules on children's cotinine levels pre- and post-legislation



A strong association was found between parental smoking status and rules on smoking in the home at both pre- and post-legislation ($p<0.001$ for both). Those children who reported that no parent smokes were the most likely to live in a home where smoking is 'not allowed at all' (67% pre-, 68% post-legislation) compared to those from homes where both parents smoke (12% pre-, 18% post-legislation) (see Table 9).

Interestingly, smoking was more likely to be 'not allowed at all' in the home if only a father figure smokes 34% (pre-) and 32% (post-legislation) compared to if only a mother figure smokes 20% (pre-) and 16% (post-legislation). Conversely, smoking was more likely to be 'allowed anywhere in the home' (ie no restrictions at all) if the mother figure only smokes (28% pre-, 25% post-legislation) compared to if the father figure only smokes (22% pre-, 12% post-legislation).

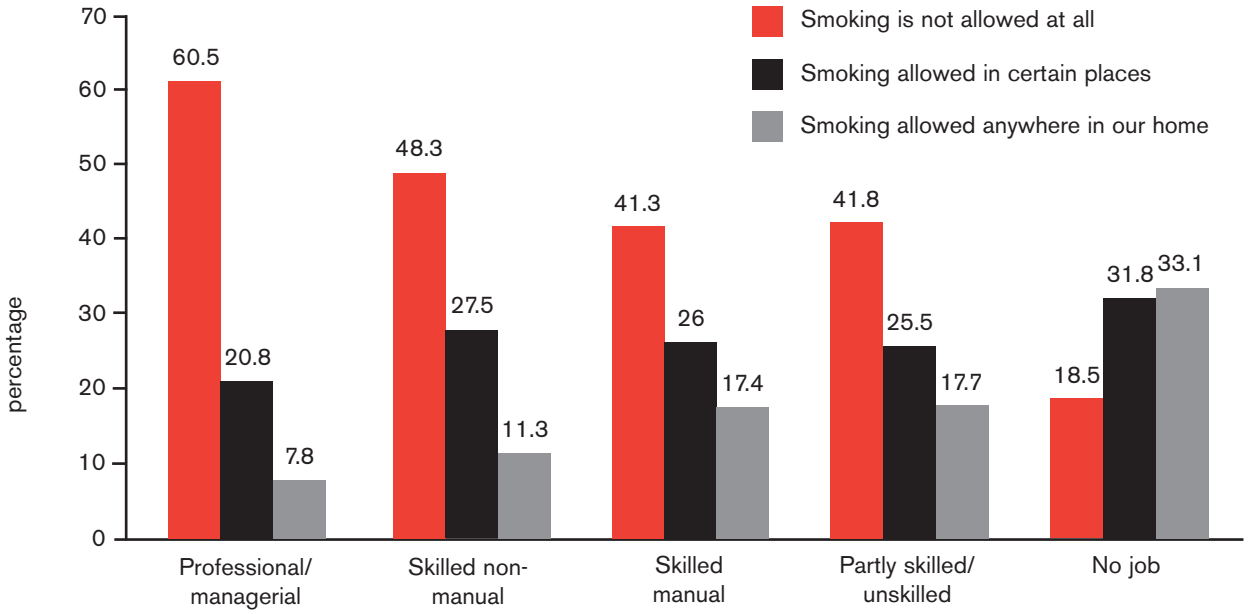
Post-legislation, there was a significant change in households' smoking rules among children who had a parent who smokes (father figure only smokes, $p<0.05$, mother figure only smokes, $p<0.01$, and both parents smoke, $p<0.01$). These changes involved an increase in the percentage of children reporting that smoking is 'allowed in certain places' post-legislation and a corresponding decrease in the percentage of children reporting that smoking is 'allowed anywhere in the home'. These results suggest that parents who smoke are beginning to introduce partial smoking restrictions in the home.

Table 9: Rules on smoking in the home, by parental smoking status

	Smoking is not allowed at all %	Smoking allowed in certain places %	Smoking allowed anywhere in our home %	Smoking allowed on special occasions %	Don't know %	Base	Sign within year	Sign between years
Pre-								
No parent figure smokes	67.3	13.7	4.2	4.8	10.0	1191	***	NS
Father figure only smokes	33.7	33.7	21.5	4.2	6.9	261		*
Mother figure only smokes	20.3	37.8	28.1	3.1	10.6	320		**
Both parent figures smoke	12.4	41.4	33.1	3.8	9.2	338		**
Post-								
No parent figure smokes	68.4	16.5	3.3	4.0	7.8	1138	***	
Father figure only smokes	31.6	43.2	11.6	5.3	8.4	285		
Mother figure only smokes	16.0	45.9	24.7	7.8	5.5	344		
Both parent figures smoke	17.6	51.2	20.0	3.1	8.1	295		

In addition, clear patterns of smoking behaviour were evident among occupational groups (pre- and post-legislation $p<0.001$, Appendix, Table 22). Pre-legislation results are illustrated in Figure 7 overleaf. Those from professional/managerial households were more likely to live in homes where smoking is 'not allowed at all' (61% pre-) compared to those from partly skilled/unskilled households (42% pre-) and those with no current employment (19%). In contrast, an opposing relationship was seen in households where smoking was allowed anywhere.

Figure 7: Household smoking rules, by parental occupational status



A similar pattern in household rules (to that above) emerged post-legislation. There was a change in household rules for those in skilled manual households, the percentage living in households where smoking is 'allowed anywhere' decreased (17% pre-, 14% post-legislation, $p<0.05$) and those who reported smoking was 'allowed in certain places' increased (26% pre-, 34% post-legislation, $p<0.05$).

There was also a change in rules for those from a household where the parents did not hold a job. There was a significant increase in the percentage of those households where smoking was 'not allowed at all' (19% pre-, 36% post-legislation, $p<0.01$), and a significant decrease for those reporting smoking was 'allowed anywhere in the home' (33% pre-, 17% post-legislation, $p<0.01$).

Locations where smoking is allowed

Within this research study it has been noted that 30% of all parents allow smoking in certain places. Table 10 shows the location where smoking was allowed. Pre-legislation the majority of pupils reported that smoking was allowed in the kitchen (40%) or the living areas (23%) of the home. Post-legislation significant declines were seen in smoking in the kitchen (32%) and the living areas (18%). However, the greatest shift in smoking venue was the increased number of children who stated smoking was allowed in outside areas only (3% pre-, 19% post-legislation, $p<0.001$).

Table 10: Locations children report smoking is allowed in the home

	Pre-	Post-	Sign
Kitchen, utility	40.4	32.0	***
Living area	22.6	17.5	*
Window/door/opening	8.5	9.9	NS
Bathroom	3.8	2.7	NS
Bedroom/spare room	3.3	1.1	***
Outside only	3.2	18.8	***
No children present	1.8	1.3	NS
Base	718	784	

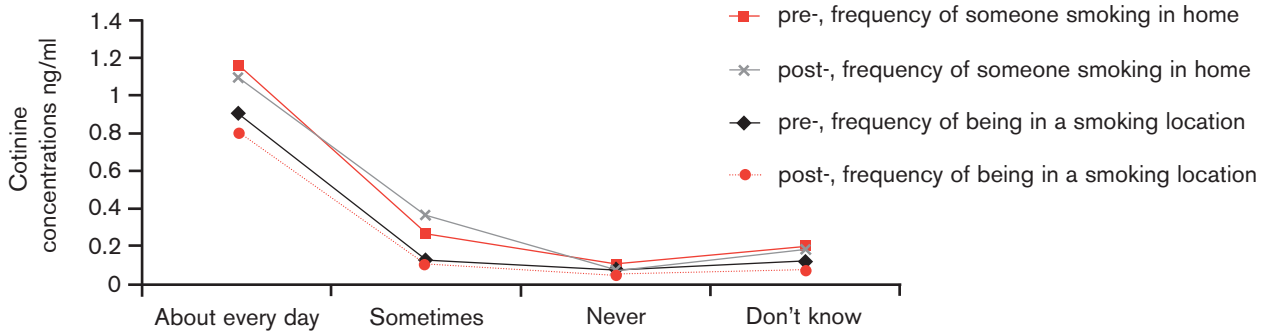
Frequency of exposure in the home

Children were asked to report how often someone was smoking in the home they live in all or most of the time. No change of proportions in the frequency of smoking in the home has been observed from pre- to post-legislation. Almost half of children reported that there was 'never' someone smoking in their home (47% pre-, 49% post-legislation), while about one in five children (22% pre-, 20% post-legislation) reported being exposed to someone smoking in their home 'about every day' (see Appendix, Table 23).

Children's cotinine concentrations were compared to how often a child reported someone smoked in their home (Figure 8). For reference purposes frequency of smoking in the home pre- and post-legislation was compared to the overall frequency children reported being in a smoking location (see Table 3). From the graph in can be seen children who reported someone smoked in the home either 'sometimes' or 'about every day' appear to have higher cotinine concentrations than those who reported being in a smoking location either 'about every day' or 'sometimes'. This gives some indication of the impact of second-hand smoke on children within a specific enclosed environment such as the home.

Those children who reported someone was smoking 'about every day' in the home had the highest cotinine levels pre- (1.156ng/ml) and post-legislation (1.115ng/ml) compared to those who were 'never' exposed in the home (0.056ng/ml pre-, 0.050ng/ml post-legislation) or those children who were 'sometimes' exposed in the home environment (0.251ng/ml pre-, 0.313ng/ml post-legislation) ($p<0.001$ pre- and post- legislation) No changes were evident among the groups between the pre- and post-legislation phases.

Figure 8: Cotinine concentrations (ng/ml) by frequency of exposure to someone smoking inside the home and overall frequency of being in a smoking location



Factors that impact on children's frequency of second-hand smoke exposure in the home

Increased frequency of exposure to second-hand smoke in the home was related to parental smoking status ($p<0.001$ pre- and post-legislation) and parental occupational status ($p<0.001$ pre- and post-legislation) (see Appendix, Table 23). Again, no changes were evident in the frequency of exposure between the pre- and post-legislation phases.

Regarding parental smoking status, those in the home least exposed to second-hand smoke were the children who reported no parent smoked in the home (2% both pre- and post-legislation). However, if a parent smoked the proportion of children who reported someone smoked in their home 'about every day' rose significantly to 35% (32% post-legislation) if only the father figure smoked, 49% (45% post-legislation) if only the child's mother figure smoked, and 57% (52% post-legislation) if both parents smoked.

Only 9% of children whose mother figure only smokes and 8% of children for whom both parents smoke report they are 'never' exposed to someone smoking in the home compared to 74% of children who do not have a parent who smokes.

Interestingly, even if no parent figure smokes, 20% pre- (19% post-) of children reported that there was someone smoking in their house either 'sometimes' or 'about every day'.

Analysis by occupational status showed those children in the professional and managerial group were least likely to report that people were smoking in their house 'about every day' (13% pre-, 11% post-legislation) compared to those living in a house with 'no parental employment' (41% pre-, 30% post-legislation). There was no change post-legislation within any of the occupational groups.

Rules preventing smoking in the home were shown to have a positive impact on reducing children's exposure to second-hand smoke. Table 11 shows significantly more children were exposed to smoking in the home 'about every day' (45% pre- and 40% post-legislation) if smoking was 'allowed at all' in the home, compared to only 3% pre- and post-legislation of children in homes were smoking was 'not allowed at all'. However, 3% and 14% pre- and 3% and 11% post-legislation of children respectively reported someone smoked in their home either 'about every day' or 'sometimes', even if smoking was not meant to be allowed in the home.

Post-legislation, the results showed significantly more children who said smoking was allowed in the home reported people 'never' smoked in their home (12% pre- and 16% post-legislation).

Table 11: Frequency of exposure in the home, by household smoking rules

	About every day %	Sometimes %	Never %	Don't know %	Base %	Sign within year	Sign between years
Pre-							
Smoking not allowed	3.2	13.9	79.6	3.3	999	***	NS
Smoking allowed in the home†	45.0	39.8	12.3	2.9	911		*
Post-							
Smoking not allowed	3.0	10.7	82.3	4.0	985	***	
Smoking allowed in the home†	39.7	40.8	16.2	3.2	936		

† Allowed anywhere, in certain places, or allowed on special occasions

The wider impacts of second-hand smoke exposure

Children's awareness of health risks of second-hand smoke

Both pre- and post-legislation, 66% of children strongly agreed that breathing in other people's cigarette smoke is bad for health; there was no change between phases (Appendix, Table 24). No variation in opinions of boys and girls were observed pre-legislation. However, there was a significant difference post-legislation ($p<0.001$), with girls being more likely to strongly agree (68% compared to 63% of boys).

When analysed by children's parental smoking status, there was a significant variation in responses at both phases (pre- $p<0.01$, post-legislation $p<0.001$). Those children who reported no parent figures smoked were most likely to strongly agree that other people's cigarette smoke is bad for heath (69% pre-, 70% post-legislation), while children who reported both parents smoked were least likely (64% pre-, 58% post-legislation) to strongly agree. There were no differences among individual parental smoking groups post-legislation.

When analysed by occupational group, there was a change between pre- and post-legislation for the partly skilled/unskilled group only ($p<.05$). Children were more likely to strongly agree at the pre- than post-legislation that breathing in other people's smoke is bad for health (72% pre-, 57% post-legislation). However pre- and post-legislation ($p<0.05$) children from the higher occupational groups were more likely to agree with this statement.

Estimating adults smoking prevalence

Children were asked 'How many adults smoke in Northern Ireland?' No changes were evident in the pattern of responses between pre- and post-legislation. Estimates were high, with 20% both pre- and post-legislation stating that it was 'nearly all of them'. Only 8% of children pre- and 9% of children post-legislation correctly reported around a quarter of adults smoke (see Table 12).[17]

There were differences in opinions of boys and girls to this question at both phases (pre- $p<0.05$, post-legislation $p=0.001$). Females were more likely than boys to report that they didn't know and less likely to correctly identify 'about a quarter'.

Table 12: Children's perception of the number of adults in Northern Ireland who smoke

		Nearly all of them %	About three quarters %	About half %	About a quarter %	Hardly any %	Don't know %	Base	Sign within year	Sign between years
Pre-	All	20.2	30.6	31.6	8.1	0.5	8.9	2124		NS
Post-	All	20.5	30.8	29.5	9.9	1.0	8.2	2099		
Pre-	Male	19.1	29.7	32.7	9.8	0.5	8.2	1067	*	NS
	Female	21.4	31.5	30.6	6.4	.5	9.6	1057		NS
Post-	Male	20.1	29.9	29.9	12.4	1.1	6.7	1051	***	
	Female	21.0	31.8	29.2	7.4	0.9	9.7	1048		

Parental smoking status and occupational status were also shown to influence children's perceptions of the number of smokers in Northern Ireland ($p<0.001$ for both, pre- and post-legislation, see Appendix, Table 25). Analysis by parental smoking status showed 12% of those children for whom no parent figures smoke reported that they thought that 'nearly all adults' smoke in Northern Ireland compared to 39% of children who reported both parents smoke. There was no change post-legislation among any of the groups. Children from households with lower occupational status (no parental employment) reported increased numbers of adults smoke (36% pre-, 33% post-legislation) compared with their counterparts from the higher professional/managerial group (13% pre-, 15% post-legislation). No changes in the pattern were noted from pre- to post-legislation.

Children's opinion of adults smoking around them

Children were asked 'How much do you agree or disagree that adults should be allowed to smoke in front of children?' Only 9% of children pre- and 10% post-legislation reported that they agree (or strongly agree) with this. There was a difference between boys and girls at both phases ($p<0.001$ for both), with boys being more likely to report that they don't mind (pre- 13% versus 7% and post-legislation 14% versus 9%, respectively). There was also a significant change for the girls between pre- and post-legislation ($p<0.05$). Post-legislation fewer girls tended to disagree, while more agreed (see Table 13).

Table 13: Children's opinion of adults being allowed to smoke around children

		Strongly agree %	Agree %	Don't mind %	Disagree %	Strongly disagree %	Base	Sign within year	Sign between years
Pre-	All	5.4	3.3	10.0	22.7	58.7	2119		*
Post-	All	6.9	3.4	11.4	24.6	53.8	2087		
Pre-	Male	5.1	4.2	12.7	21.7	56.4	1066	***	NS
	Female	5.7	2.3	7.2	23.8	61.0	1053		*
Post-	Male	6.3	3.7	14.2	22.4	53.4	1049	***	
	Female	7.5	3.0	8.5	26.9	54.1	1038		

Fewer children were likely to disagree that adults should be allowed to smoke around them if they had a parent who smokes ($p<0.001$ pre- and post-legislation). Twice as many children who had a parent who smoked reported they did not mind adults smoking around them compared to only 7% of children who had no parent who smokes (see Appendix, Table 26).

There was a significant difference pre- and post-legislation for children's opinions of adults being allowed to smoke in front of children in terms of parental occupational status (pre- $p<.05$, post-legislation $p<0.001$, Appendix 26). Pre- and post-legislation those children from a professional/managerial household were more likely to state that they strongly disagreed (64% pre-, 63% post-legislation) compared to those from a partly skilled/unskilled household (53% pre-, 49% post-legislation). There were no differences within each occupational group between the two phases.

Asking adults not to smoke

Post-legislation only, children were asked if they had ever asked adults not to smoke around them; 45% of children reported that they had done so (Table 14). Those who reported only a mother figure smoked (66%) were most likely to have asked an adult not to smoke around them compared to those who had reported both parents smoked (60%) or who reported only a father figure smoked (58%) ($p<0.001$). As expected, those for whom neither parent smoked were far less likely to have asked this (31%) as they were the most likely to report that adults don't smoke around them (33%).

Among children who had parents who smoke, children were more likely to ask an adult not to smoke in front of them if they smoked in the home (average 66%) compared to those children who reported their parents did not smoke in the home (47%) ($p<0.001$).

Table 14: Percentage of children who have asked an adult not to smoke around them by parental smoking status and parental smoking in the home

	Yes %	No %	Adults don't smoke around me %	Base	Sign
All	44.8	32.6	22.6	2095	
No parent figure smokes	31.4	36.1	32.6	1145	***
Father figure only smokes	57.8	32.1	10.1	287	
Mother figure only smokes	65.9	25.1	9.0	343	
Both parent figures smoke	59.5	29.4	11.1	296	
No parent figure smokes in the home	47.1	27.8	25.1	227	***
Father figure only smokes in the home	65.0	29.5	5.5	200	
Mother figure only smokes in the home	68.4	26.2	5.5	275	
Both parent figures smoke in the home	64.2	31.2	4.6	218	

Future smoking intentions

Children were asked to think about whether they will smoke in two years time. There was no difference between responses from pre- to post-legislation (see Appendix, Table 27). Just over four-fifths of children (84% pre-, 82% post-legislation) stated that they will definitely not smoke in two years time. There was no gender difference to responses to this question. However, there was a difference by household occupational status pre-legislation only ($p<0.001$). Those from a professional/managerial background were most likely to say 'definitely not' (82% pre-legislation, 86% post-legislation) and those from a household with no employment were least likely to report this (76% pre-, 74% post-legislation).

Children's predictions of their own future smoking were also related to the smoking status of their parents ($p<0.001$ pre- and post-legislation). Those who reported no parent figures smoke were more likely to state that they definitely will not smoke in two years time (pre- 88%, post-legislation 87%) compared to 77% (pre-) and 74% (post-legislation) of those children who reported both parents smoke.

Discussion

This study aimed to assess Year seven children's exposure to second-hand smoke before and after the introduction of smoke-free legislation to prevent smoking in enclosed public places and workplaces.

To achieve this aim a combination of methods have been utilised, including self-reported sources, location, and frequency of second-hand smoke exposure as well as assessment of a biological marker (cotinine). While these methods provide individual insights into exposure, used together, these measurements can contribute to a better understanding of children's exposure to second-hand smoke.

Indeed, our study has shown measurement of cotinine concentrations to corroborate Year seven children's self-reported second-hand smoke exposure. Cotinine concentrations were found to be consistently higher among children who reported having parent(s) or family members who smoke, who were in a smoking location more frequently and in children who reported smoking was allowed in the home environment. Cotinine concentrations were also higher in the lower occupation groups, thereby confirming the link found between lower occupational status and increased parental smoking prevalence.[18]

In addition, we have reported a number of key interrelated factors to be determinants of children's exposure to second-hand smoke. These include the increased frequency of children being around smokers, the relationship of the smoker to the child and the extent to which smoking is allowed in the home. The occupational status of parents lies at the core of these issues with children in manual and jobless households more likely to have parents who smoke, to be subjected to smoking in the home, and to be exposed to smoking on a daily basis.

Overall changes in exposure to second-hand smoke

Over the one year period, our study has shown no significant change in cotinine concentrations in the study population following the introduction of legislation, dispelling fears the legislation would adversely impact on children's exposure to second-hand smoke. Our study is also in line with the evaluation of the Scottish smoke-free legislation in that no detrimental impacts of second-hand smoke exposure have resulted since the legislation was implemented. Using the same methodology, the Scottish study demonstrated a significant decline in cotinine levels from 0.3ng/ml (pre-Scottish smoke-free legislation) to 0.2ng/ml (post-Scottish smoke-free legislation) in Year seven children, possibly due to the much higher initial cotinine concentrations than were observed in our current study.[9]

Our study has, however, demonstrated a reduction in (self-reported) second-hand smoke exposure in public places including cafes, restaurants, schools and indoor leisure centres following the introduction of smoke-free legislation. While smoking exposure was reported to not be completely eliminated in the majority of venues, this is most likely due to children witnessing smoking occurring in outside smoking areas. This reduction in smoking exposure in public places has consequently meant, more children have reported they are 'never' in a smoking location while a reduced proportion of children claimed to be in a smoking location either 'sometimes' or 'about every day'.

These changes were not evident in all population groups. Decreased frequency of exposure occurred in those children who were least exposed initially (those in the higher occupational groups, those who reported only a father figure smoked or those who reported no parent figures smoked). This indicates changes in children's exposure to second-hand smoke may be most predominant in those children who are least exposed.

Furthermore, reduced cotinine concentrations were not observed in the entire study population but limited to those children who reported they had no parents or relatives who smoke (and hence were least exposed to second-hand smoke). This reduction in second-hand smoke exposure implies that children with no smokers within their family have specifically benefited from the prohibition of smoking in public places. However, this research also suggests that changes in second-hand smoke exposure for children (who have a family member who smokes) may be limited due to their families smoking habits. Given our finding that over four in ten children live with a parent who smokes (43% pre- and 45% post-legislation) and nearly an additional four in ten children have another relative (other than a parent) who smokes, it seems that these children cannot avail of the potential positive impact of the smoke-free legislation to its full extent.

Parental smoking in the home

Our findings on the number of parents who smoke are similar to those noted in other studies and, like the Scottish smoke-free legislation, we have also been able to show the introduction of smoke-free legislation has had no direct impact on smoking prevalence among parents. [5,9,10]

Parents are a major source of smoking exposure, a fact that seems reiterated by the WHO report that children are most vulnerable to second-hand smoke exposure in the home environment.[3] Our study has shown that the impact of the legislation (in reducing second-hand smoke exposure) is somewhat limited in reducing exposure in the home environment. No changes in the frequency of exposure to second-hand smoke in private places including the home (own or others) or the car was observed in the current study. This is unsurprising given the major role of the legislation is to prohibit smoking in public places.

Nonetheless, we found some positive changes indicated through significant increases in household smoking restrictions. These changes included a decrease in the proportion of households where smoking was allowed anywhere and a concomitant increase in households were smoking was restricted to certain places (outside venues), or not allowed at all. This gives some indication that parents are trying to put in place additional smoking restrictions to protect children from second-hand smoke and concurs with evidence from Borland *et al*., that legislation preventing smoking in public places can positively impact on home smoking rules.[11]

Despite these changes in restrictions, we have found the group of children most vulnerable to second-hand smoke exposure in the home environment are children who have parents or relatives who smoke in the home. We have reported the majority of parents and relatives who smoke do so in the home environment and despite a small decline in the proportion of parents who smoke in the home, from 80% pre- to 75% post-legislation, it remains worryingly high. This is the equivalent of just over a third of all children in the sample pre- (36%) and post-legislation (34%).

The significant decline in smoking in the home was specifically observed among children who reported both parents smoked in the home. Post-legislation this corresponded with substantially more children (with both parents who smoke) reporting tighter restrictions on smoking in the home. These restrictions included more children reporting smoking was restricted to certain locations (outside) or simply not being allowed at all. These changes did not, however, correspond with any decrease in cotinine concentrations among this group, probably due to the fact that around one fifth of children among this group still reported smoking was allowed anywhere in the home.

No change in the extent of smoking in the home was noted if only one parent smoked in the home. The reasons for this are not clear. However, in households were two parents smoke it may be easier for those parents to support each other on a practical and motivational level to implement and maintain a smoke-free home as compared to households where only one parent smokes (especially if the smoker is the primary carer).

Maternal smoking

Our study has found that children who live with a mother figure who smokes (either a mother alone or both parents) have considerably higher cotinine concentrations than those children who have a father figure who smokes or non-smoking parents.[9,10] To substantiate this information, children with a smoking mother figure were also more likely to state they were in a smoking location more frequently, smoking was allowed anywhere in the home and smoking occurred in the home on a more frequent basis compared to if a father figure smoked. With mothers generally being the primary carer, it seems that their needs/responsibilities as carers are more likely to determine the rules on smoking in the home.

Indeed, a recent qualitative study reported mothers struggled with the message around not smoking in the home due to the difficulties involved in adaptation of their caring routine and behaviour. This was found to be considerably more difficult when young children, who need close proximity of care, were present. Mothers were aware they needed to protect their children from second-hand smoke, but they had difficultly juggling the addictive nature of their smoking habit alongside the need to either quit smoking or smoke in a separate location from their children.[19]

Smoke-free homes versus smoking restrictions

Overall 47% of the study population reported living in a smoke-free home. However, great variability in this figure was observed, with 67% of children who reported no parent figure smokes living in a smoke-free household compared to only 12% of children who had two parents who smoked, a situation described elsewhere.[11] In addition those from the higher occupational groups are more likely to live in a smoke-free home. This further reinforces the strong link between the higher rate of smoking (in the home) and lower occupational status.

A large proportion of parents allowed smoking in certain places within the home while over a fifth of children, who had a parent who smokes, stated smoking was allowed anywhere in the home. Our results have shown if smoking is allowed in certain places within the home, cotinine concentrations are lower than if smoking is allowed anywhere in the home. Yet cotinine concentrations are still substanially higher than if smoking is not allowed at all in the home. Further emphasis now needs to be placed on encouraging smoke-free homes. Currently little is known about the motivating factors that encourage parents to instigate smoking restrictions or indeed parents views on the effectiveness of such restrictions. Research has, however, shown the most effective means of protecting young children from exposure to second-hand smoke is by smoking outside the home.[20] A Swedish study, in particular, showed that smoking outside the home with the door closed was, although not totally effective, the most successful way to protect young children (aged two and a half to three years) from second-hand smoke exposure. Outdoor only smoking resulted in significantly lower cotinine concentrations than indoor smoking, but cotinine concentrations were still higher than among non-smoking controls.[21]

Our study was able to show similar results with Year seven children. Children of parents who smoke (but not in the home) had lower cotinine concentrations, compared to those who reported any parent smoked in the home. Yet, this group of children had higher levels than children who had non-smoking parents. Collectively these results illustrate the advantages of the smoke-free home in substantially reducing a child's exposure to second-hand smoke even when parents are still smokers.

Implementing a smoke-free home may be a difficult task for many individuals (especially for those who smoke) and clearly home smoking rules are not adhered to by everyone all the time. In homes where smoking was not allowed, around 3% and 14% pre-legislation, and 3% and 11% post-legislation of children report someone smokes in their home 'about every day' or 'sometimes', respectively.

In addition, even in homes were children report neither parent smokes, just under one fifth of children stated someone smokes 'about every day' or 'sometimes' in their home. Reasons for this are not clear but a variety of factors may play a role. It may be due to individuals not feeling confident enough to ask someone else to smoke outside their home, to be challenged by other family members who refuse to smoke outside, to be lacking in knowledge of the dangers of second-hand smoke exposure, or to simply not want to seem inhospitable to smokers.

To summarise, this information on smoking in the home indicates the need for further work to promote, empower and advise individuals, both non-smokers and smokers, to implement and maintain a smoke-free home. This work should prioritise the health of children but also target the social acceptability of the smoke-free home. In addition, we have found the majority of smoke-free homes to be among those households in the higher occupational groups therefore the smoke-free environment needs to be clearly targeted towards those in the lower occupational groups.

The wider impacts of children's second-hand smoke exposure

Children's knowledge of the health risks of breathing in other people's tobacco smoke were high. Nonetheless, those children in the current study who have a parent who smokes were more likely to perceive greater prevalence of smoking in adults, were less likely to disagree with adults smoking round them and were more likely to say they would take up smoking. Collectively, this shows some evidence that children who are more exposed to second-hand smoke may be more tolerant of adults smoking around them, more likely to view smoking as socially acceptable and may be less adverse to taking up the smoking habit. This develops a cyclical pattern whereby those children who have parents who smoke will be more likely to become smokers themselves, thereby continually reinforcing the health disparities between social classes.

A young person's immediate social environment, including the smoking behaviour and attitudes of family and peers, has an important influence on children's attitudes and behaviour in regard to tobacco. A study by Woods *et al*., (2005) showed that children's negative perceptions of smoking declined as children aged (from four to seven to seven to eight years old). The children became more accepting of smoking and rationalised their parents and others' smoking behaviour.[22] Further evidence has shown that smoking by parents, siblings, friends, and peers are important predictors of tobacco use. [23, 24, 25]

Conclusion

The introduction of smoke-free legislation has had some important impacts on children's exposure to second-hand smoke. We have observed decreased exposure to second-hand smoke in public places and greater restrictions on smoking within the home environment. Despite the positive connotations of these changes, following the introduction of legislation, just under one fifth of all children (18%) report being in a smoking location 'about every day'. It is therefore evident much work still has to be carried out on reducing second-hand smoke exposure within this vulnerable group.

Future public health initiatives to reduce children's exposure to second-hand smoke should therefore focus on reducing the prevalence of parental smoking and promoting smoke-free homes in the wider population.

The large proportion of parents that smoke and the impact of parental (especially maternal) smoking on children's cotinine concentrations reported in this study indicates a clear need for parents who smoke to become a priority target for smoking cessation intervention. *The Tobacco Action Plan 2003–2008* currently highlights three priority groups for targeted smoking cessation: young people, disadvantaged adults, and pregnant women.[1] However, the results from this study indicate a need for the inclusion of parents' as a further priority group within future tobacco action plans.

On a population level, the smoke-free home (and indeed car) now needs to promoted and fostered at all opportunities. Mass media campaigns offer the best opportunity for this within the wider population, while more direct and targeted intervention opportunities may arise within the primary care and education setting.

In 2004/2005 the HPA previously aired and evaluated a mass media campaign on the dangers of second-hand smoke.[26] Future campaigns need to build on this initiative. However, prior to this, further research is necessary to determine the public's understanding of the importance of a smoke-free home in comparison to restrictions on smoking in the home. In addition research needs to establish the public's knowledge of the short and long term consequences (health and non-health) of the dangers of second-hand smoke. In particular work needs to focus on parents' and the general public's awareness of the health implications of exposure to second-hand smoke and indeed the inadvertent messages they may be sending to children on the acceptability of smoking, either by smoking themselves or allowing smoking in the home environment.

Finally, children themselves should not be forgotten as a key target audience for public health intervention. Children can potentially play a key role in encouraging smoke-free homes and reducing parental smoking, although they may not have direct influence over these factors. Educating children on the health problems associated with second-hand smoke and informing children of the benefits of not having individuals smoke around them as well as having a smoke-free home may indirectly influence parents, other relatives or individuals who smoke to reconsider their smoking behaviour.

References

1. Department of Health Social Services and Public Safety. A five year tobacco action plan 2003–2008. Belfast: DHSSPS, 2003.
2. Department of Health. Scientific Committee on Tobacco and Health (SCOTH) Secondhand Smoke: Review of evidence since 1998: Update of evidence on health effects of secondhand smoke. London: Department of Health, 2004.
3. World Health Organisation. International Consultation on Environmental Tobacco Smoke (ETS) and Child Health. Geneva: World health Organisation, 1999.
4. Willers S, Skarping G, Dalene M, Skerfving S. Urinary cotinine in children and adults during and after semiexperimental exposure to environmental tobacco smoke. Archives of environmental health 1995; 50(2): 130-138.
5. Pirkle JL, Flegal KM, Bernert JT, Brody DJ, Etzel RA, Maurer KR. Exposure of the US population to environmental tobacco smoke: the Third National Health and Nutrition Examination Survey, 1988 to 1991. JAMA 1996; 275(16): 1233-40.
6. Becklake MR, Ghezzo H, Ernst P. Childhood predictors of smoking in adolescence: a follow-up study of Montreal schoolchildren. CMAJ 2005; 173(4): 377-9.
7. Bélanger M, O'Loughlin J, Okoli CTC, McGrath JJ, Setia M, Guyon L, et al. Nicotine dependence symptoms among young never-smokers exposed to secondhand tobacco smoke. Addictive Behaviors 2008; 33(12): 1557-63.
8. Jarvis MJ, Strachan DP, Feyerabend C. Determinants of passive smoking in children in Edinburgh, Scotland. In: American Journal of Public Health; 1992; 82(9):1225-9.
9. Akhtar PC, Currie DB, Currie CE, Haw SJ. Changes in child exposure to environmental tobacco smoke (CHETS) study after implementation of smoke-free legislation in Scotland: national cross sectional survey. BMJ 2007; 335(7619): 545-549.
10. Jarvis MJ, Goddard E, Higgins V, Feyerabend C, Bryant A, Cook DG. Children's exposure to passive smoking in England since the 1980s: cotinine evidence from population surveys. BMJ 2000; 321(7257): 343-5.
11. Borland R, Yong HH, Cummings KM, Hyland A, Anderson S, Fong GT. Determinants and consequences of smoke-free houses: findings from the International Tobacco Control (ITC) Four Country Survey. Tobacco Control 2006; 15: 42-50.
12. Haw SJ, Gruer L. Changes in exposure of adult non-smokers to secondhand smoke after implementation of smoke-free legislation in Scotland: national cross sectional survey. BMJ 2007: 335 (7619): 549-552.
13. Central Survey Unit. Knowledge & Use of Alcohol, Cigarettes and Drugs: Primary School Survey 2006. Belfast: NISRA, 2007.
14. Benowitz NL. Cotinine as a Biomarker of Environmental Tobacco Smoke Exposure. Epidemiologic Reviews 1996; 18(2): 188-204.
15. Jarvis MJ. Elimination of cotinine from body fluids: implications for noninvasive measurement of tobacco smoke exposure. In: American Journal of Public Health; 1988; 696-8.
16. Department of Health. Health Survey for England 2002. London: Department of Health, 2002.
17. Central Survey Unit. Prevalence of cigarette smoking by sex and socio-economic group, 1983 to 2007-08. Belfast: NISRA, 2008.

18. Delpisheh A, Kelly Y, Brabin BJ. Passive cigarette smoke exposure in primary school children in Liverpool. Journal of the royal institute of public health. 2006; 120; 65-69.

19. Robinson J, Kirkcaldy AJ. You think that I'm smoking and they're not': Why mothers still smoke in the home. Social Science & Medicine 2007; 65(4): 641-52.

20. G E Matt, P J E Quintana, M F Hovell, J T Bernert, S Song, N Novianti, T Juarez, J Floro, C Gehrman, M Garcia and S Larson. Households contaminated by environmental tobacco smoke: sources of infant exposures. Tobacco Control 2004; 13(1): 29-37.

21. Johansson A, Hermansson G, Ludvigsson J. How Should Parents Protect Their Children From Environmental Tobacco-Smoke Exposure in the Home? Pediatrics 2004; 113(4): 291-5.

22. Woods SE, Springett J, Porcellato L, Dugdill L. 'Stop it, it's bad for you and me': experiences of and views on passive smoking among primary-school children in Liverpool. Health Educ. Res. 2005; 20(6): 645-55.

23. Bricker JB, Peterson Jr AV, Leroux BG, Andersen MR, Rajan KB, Sarason IG. Prospective prediction of children's smoking transitions: role of parents and older siblings smoking. Addiction 2006; 101(1): 128-36.

24. Peterson JAV, Leroux BG, Bricker J, Kealey KA, Marek PM, Sarason IG, et al. Nine-year prediction of adolescent smoking by number of smoking parents. Addictive Behaviors 2006; 31(5): 788-801.

25. Farkas AJ, Gilpin EA, White MM, Pierce JP. Association Between Household and Workplace Smoking Restrictions and Adolescent Smoking. JAMA 2000; 284(6): 717-22.

26. Health Promotion Agency for Northern Ireland, Evaluation of 'Passive smoking – there's nothing passive about it' public information campaign 2005. In Research and evaluation review 2004–2005. Belfast: Health Promotion Agency, 2006.

Appendix

Procedure for collecting saliva samples for determination of cotinine levels

After completing the questionnaire, fieldworkers demonstrated how to obtain a saliva sample. To avoid contamination of samples, all study participants collected their own samples. The procedure involved children opening the salivette and carefully positioning the cotton wool roll between their teeth and cheek without touching it to prevent contamination. Children were instructed to keep the cotton wool roll in their mouths without chewing it or moving it around. After three minutes the cotton wool roll was removed from the mouth and placed back into the salivette and sealed, again without touching it. Salivettes were then placed in a small plastic bag.

Children were instructed that if they experienced discomfort or problems they could remove the cotton wool roll. These samples were marked as having possibly insufficient sample. Unused salivettes were also marked appropriately and were not sent to the laboratory for analysis.

After the saliva sample collection, each children was given a small cup of water to drink.

When collecting the samples and questionnaires, fieldworkers checked that the ID number on each salivette matched that of the children's questionnaire.

Fieldworkers were all non-smokers and saliva samples were stored in a non-smoking environment at 4˚C prior to analysis.

Measurement of cotinine from saliva

Cotinine is a metabolite of nicotine, it has a half-life of approximately 20 hours and is stable with temperature change. Analysis of the saliva samples was carried out by ABS (Advanced Bioanalytical Service) Laboratories Ltd. The measurement of cotinine is performed using capillary Gas Chromatography with a specific nitrogen/phosphorous detector from a 100 µl sample. The assay has a detection limit of 0.1ng/ml.

Table 15: Comparison of CHETS school sample with Northern Ireland school demographics

		Pre- (%)	Post- (%)	Northern Ireland 2005/06
Education and library board	Belfast	13	13	11
	Western	21	21	21
	North Eastern	23	23	24
	South Eastern	18	18	19
	Southern	26	25	26
School size	Small	32	31	45
	Medium	31	31	36
	Large	37	38	18
Free school meals	<28%	79	78	80
	>28%	21	22	20
Locality	Urban	52	54	43
	Rural	48	46	57
Management	Controlled	47	46	47
	Catholic maintained	49	50	46
	Controlled integrated	1.7	1.6	1.7
	Grant maintained integrated	1.6	1.6	2.4
	Voluntary	0.8	0.8	1.6
Gender	Single gender boys school	0.8	0.8	1.0
	Mixed gender school	98	98	98
	Single gender girls school	1.6	1.6	1.6

Exclusion criteria

A number of cases were excluded where there was missing information on gender (zero cases in 2007, two cases in 2008) and where children surveyed were in a Year six class contained within a mixed Year six/seven class (12 cases in 2007, 9 cases in 2008).

Cases were also excluded based on children's own smoking status. The sample had to contain only non-smoking children. Sixteen cases in 2007 and nine cases in 2008 were excluded based on children's own responses to a series of questions about their own smoking behaviour. In addition, 12 cases in 2007 and 15 cases in 2008 were excluded as these individuals had a cotinine concentration of over 15ng/ml, the accepted cut-off point for active smoking. The final sample contained 2136 cases in 2007 and 2113 cases in 2008.

Table 16: Description of total sample and excluded cases pre- and post-legislation

	Pre- (n)	Post- (n)
Total number surveyed	2176	2148
Gender missing	0	2
Year six	12	9
Self-reported smokers †	16	9
Cotinine >15ng/ml	12	15
Final sample number	2136	2113

† Children who stated that they were a current smoker but had a cotinine level of less than 15ng/ml or a missing cotinine level.

Table 17: Demographic characteristics of Year seven children, pre- and post-legislation

		Pre- %	Post- %	Sign
Gender	Male	50.5	50.3	NS
	Female	49.5	49.7	
	Base	2136	2113	
Age	Mean age (SD)	10.71	10.67	**
		(0.481)	(0.501)	
	Base	2124	2102	
Family structure	Live with mother and father	78.5	78.2	NS
	Live with mother only	12.2	13.4	
	Live with father only	1.3	1.7	
	Live in step family	6.8	5.7	
	Other living arrangements	1.2	1.1	
	Base	2129	2104	
Parental living arrangements	Live with mother and father figure	86.0	84.2	NS
	Live with mother figure only	12.6	13.9	
	Live with father figure only	1.4	1.9	
	Base	2127	2100	
Occupational status	Professional/managerial	32.7	29.9	***#
	Skilled non-manual	17.2	19.9	
	Skilled manual	29.1	26.2	
	Partly skilled/unskilled	6.1	8.4	
	No job †	8.6	7.5	
	Base~	1768	1810	

~ missing values include 'armed forces', not described or inadequate description and don't know

† no job category classified where children identified both parents did not have a job at the time of survey, or one parent had no job (at the time of survey) and the child did not have or see the other parent. No information was available on previous occupation.

no significant difference between manual and non-manual occupational groups

Table 18: Smoking status of Year seven children's individual relatives or groups of relatives

		Smoke %	Does not smoke %	Don't know %	Base	Sign between years
Father	Pre-	31.8	66.5	1.7	1939	NS
	Post-	33.9	63.9	2.2	1899	
Mother	Pre-	30.9	67.9	1.2	2024	NS
	Post-	32.3	66.5	1.3	1990	
Stepfather	Pre-	30.7	55.1	14.2	374	NS
	Post-	26.9	57.0	16.1	335	
Stepmother	Pre-	24.0	58.7	17.3	312	NS
	Post-	22.5	58.8	18.7	284	
Any of your aunts	Pre-	52.3	35.3	12.4	1919	NS
	Post-	52.3	34.4	13.3	1907	
Any of your uncles	Pre-	55.4	31.3	13.3	1944	NS
	Post-	54.7	30.2	15.1	1893	
Any of your brothers	Pre-	9.9	86.3	3.7	1421	NS
	Post-	9.6	86.2	4.2	1420	
Any of your sisters	Pre-	10.3	86.7	3.1	1442	NS
	Post-	8.7	87.7	3.6	1373	
Any of your grandfathers	Pre-	33.2	58.5	8.3	1610	NS
	Post-	32.9	57.6	9.5	1605	
Any of your grandmothers	Pre-	31.6	62.0	6.4	1786	NS
	Post-	32.4	60.7	6.9	1767	

Table 19: Parental smoking status, by occupational group

	No parent figure smokes %	Father figure only smokes %	Mother figure only smokes %	Both parent figure smokes %	Base	Sign within year	Sign between years
Pre-							
Professional/ managerial	70.6	10.1	10.6	8.7	574	***	NS
Skilled non manual	58.9	16.8	9.2	15.1	304		NS
Skilled manual	51.5	13.5	16.0	19.1	513		NS
Partly skilled/ unskilled	47.7	17.7	17.3	17.3	220		NS
No job	29.8	9.3	34.4	26.5	151		NS
Post-							
Professional/ managerial	71.1	10.8	8.8	9.3	537	***	
Skilled non manual	61.9	14.4	13.3	10.3	360		
Skilled manual	46.5	16.0	18.6	19.0	469		
Partly skilled/ unskilled	45.6	17.0	21.1	16.3	294		
No job	44.3	9.2	23.7	22.9	131		

Table 20: Number of children's other friends who smoke, by gender, occupational status and cotinine concentrations

		Most of them %	About half of them %	Some of them %	None of them %	Don't know %	Base	Sign within year	Sign between years
All	**Pre-**	1.1	0.7	8.2	73.2	16.8	1991		NS
	Post-	0.7	0.4	8.1	72.1	18.7	2060		
Gender	**Pre-**								
	Male	1.2	0.6	9.7	71.7	16.7	987	NS	NS
	Female	1.0	0.8	6.7	74.6	16.9	1004		NS
	Post-								
	Male	0.7	0.6	8.5	69.6	20.6	1030	NS	
	Female	0.7	0.3	7.6	74.7	16.8	1030		
Occupation status	**Pre-**								
	Professional/ managerial	0.2	0.4	6.6	79.1	13.7	546	***	NS
	Skilled non-manual	1.4	0.3	5.2	80.3	12.8	290		NS
	Skilled manual	0.8	0.4	9.2	72.7	16.9	479		NS
	Partly skilled/ unskilled	1.5	2.5	13.9	62.7	19.4	201		NS
	No job	2.9	0.7	10.1	64.7	21.6	139		NS
	Post-								
	Professional/ managerial	0.2	0.2	6.0	77.5	16.0	530	**	
	Skilled non-manual	0.6	0.0	6.0	77.5	16.0	351		
	Skilled manual	1.1	0.2	8.6	69.4	20.8	467		
	Partly skilled/ unskilled	0.7	1.4	10.6	68.6	18.8	293		
	No job	0.0	0.8	11.5	62.6	25.2	131		
Cotinine conc. (ng/ml)	**Pre-**								
	Cotinine	0.43325	0.86415	0.36172	0.14164	0.23392		***	
	Base	20	13	155	1353	310	1851		
	Cotinine	1.32789	0.35483	0.30505	0.13645	0.20210		***	
	Base	14	8	157	1439	370	1988		
	Sign between years	n/a~	n/a~	NS	NS				

~ between year differences not examined due to low sample numbers

Table 21: Parental smoking in the home, by occupational status

	No parent figure smokes in the home %	Father figure only smokes in the home %	Mother figure only smokes in the home %	Both parent figures smoke in the home %	Base#	Sign within year	Sign between years
Pre-							
Professional/ managerial	27.8	20.7	28.4	23.1	169	***	NS
Skilled non-manual	20.0	31.2	16.8	32.0	125		NS
Skilled manual	18.9	22.1	28.5	30.5	249		NS
Partly skilled/ unskilled	17.4	26.1	28.7	27.8	115		NS
No job	14.3	11.4	43.8	30.5	105		NS
Post-							
Professional/ managerial	30.3	26.5	24.5	18.7	155	NS	
Skilled non-manual	27.7	26.3	25.5	20.4	137		
Skilled manual	21.3	21.7	28.5	28.5	249		
Partly skilled/ unskilled	23.8	19.4	30.0	26.9	160		
No job	20.0	14.3	34.3	31.4	70		

Children who have at least one parental figure who smokes

Table 22: Rules on smoking in the home by occupational status

	No, smoking is not allowed at all %	Smoking is allowed in certain places %	Smoking is allowed anywhere in our home %	Smoking is allowed on special occasions %	Don't know %	Base	Sign within year	Sign between years
Pre-								
Professional/ managerial	60.5	20.8	7.8	2.9	8.0	577	***	NS
Skilled non-manual	48.3	27.5	11.3	5.3	7.6	302		NS
Skilled manual	41.3	26.0	17.4	5.9	9.4	511		*
Partly skilled/ unskilled	41.8	25.5	17.7	3.6	11.4	220		NS
No job	18.5	31.8	33.1	4.0	12.6	151		**
Post-								
Professional/ managerial	58.0	25.9	5.0	3.7	7.3	536	***	
Skilled non-manual	49.4	30.9	8.7	5.6	5.3	356		
Skilled manual	42.1	34.0	13.7	4.1	6.2	468		
Partly skilled/ unskilled	39.0	32.5	13.9	5.4	9.2	295		
No job	35.6	30.4	17.0	6.7	10.4	135		

Table 23: Frequency of people smoking in the child's home by parental smoking status, occupational status and cotinine concentrations

		About every day %	Some-times %	Never %	Don't know %	Base	Sign within year	Sign between years
All	**Pre-**	22.1	26.5	47.0	4.3	2122		NS
	Post-	20.3	26.6	48.9	4.2	2098		
Occupation status	**Pre-**							
	Professional/ managerial	12.5	21.0	61.4	5.0	575	***	NS
	Skilled non-manual	21.3	24.9	51.5	2.3	301		NS
	Skilled manual	24.0	30.9	40.4	4.7	512		NS
	Partly skilled/ unskilled	28.3	28.8	38.8	4.1	219		NS
	No job	41.3	35.3	20.7	2.7	150		NS
	Post-							
	Professional/ managerial	10.8	22.6	62.7	3.9	539	***	
	Skilled non-manual	19.6	22.9	54.5	3.1	358		
	Skilled manual	27.5	25.0	42.8	4.7	472		
	Partly skilled/ unskilled	23.1	34.7	37.4	4.8	294		
	No job	29.6	36.3	31.9	2.2	135		
Parental smoking status	**Pre-**							
	Neither parental figure smokes	2.0	18.2	74.3	5.5	1192	***	NS
	Father figure smokes	35.1	40.8	20.2	3.8	262		NS
	Mother figure smokes	48.6	39.8	9.1	2.5	319		NS
	Father and mother figure smoke	57.3	32.3	7.7	2.7	337		NS
	Post-							
	Neither parental figure smokes	1.9	17.0	76.0	5.1	1146	***	
	Father figure smokes	32.1	39.7	23.3	4.9	287		
	Mother figure smokes	44.8	41.3	11.6	2.3	346		
	Father and mother figure smoke	52.2	34.0	11.8	2.0	297		
Cotinine conc. (ng/ml)	**Pre-**	1.156	0.251	0.056	0.156		***	
	Base	443	531	911	86	1971		
	Post-	1.115	0.313	0.050	0.140		***	
	Base	407	539	998	83	2027		
	Sign between years	NS	NS	NS	NS			

Table 24: Children's reported opinions on breathing in other people's smoke being bad for health by gender, parental smoking status and occupational status

		Strongly agree %	Agree %	Don't mind %	Disagree %	Strongly disagree %	Base	Sign within years	Sign between years
All	**Pre-**	65.7	14.4	3.8	4.9	11.2	2115	NS	
	Post-	65.5	15.5	4.2	4.6	10.2	2089		
Gender	**Pre-**								
	Male	65.3	13.2	4.6	5.6	11.3	1062	NS	*
	Female	66.2	15.7	2.9	4.1	11.1	1053		NS
	Post-								
	Male	62.8	16.8	5.6	3.5	11.2	1051	***	
	Female	68.2	14.2	2.8	5.7	9.2	1038		
Parental smoking status	**Pre-**								
	No parent figure smokes	68.6	14.1	2.3	4.2	10.9	1188	*	NS
	Father figure only smokes	65.8	12.3	6.5	5.0	10.4	260		NS
	Mother figure only smokes	58.8	17.3	5.3	6.3	12.3	318		NS
	Both parent figures smoke	63.7	13.7	5.4	5.7	11.6	336		NS
	Post-								
	No parent figure smokes	70.2	14.1	2.8	3.2	9.7	1144	***	
	Father figure only smokes	60.4	17.5	4.2	7.4	10.5	285		
	Mother figure only smokes	62.2	15.0	6.2	6.2	10.6	341		
	Both parent figures smoke	57.6	18.6	6.8	5.4	11.5	295		
Occupational status	**Pre-**								
	Professional/ managerial	70.4	14.1	2.8	2.6	10.1	575	*	NS
	Skilled non-manual	70.9	11.9	3.3	2.3	11.6	302		NS
	Skilled manual	65.6	15.7	3.3	5.1	10.4	511		NS
	Partly skilled/ unskilled	71.6	11.9	2.8	4.1	9.6	218		*
	No job	57.3	11.3	6.7	8.0	16.7	150		NS
	Post-								
	Professional/ managerial	68.8	13.5	2.6	3.9	11.1	539	*	
	Skilled non-manual	70.2	16.4	2.8	3.3	7.2	359		
	Skilled manual	66.2	14.7	5.3	4.3	9.4	468		
	Partly skilled/ unskilled	56.9	19.0	4.4	7.5	12.2	295		
	No job	59.7	17.2	6.7	5.2	11.2	134		

Table 25: Children's estimates of the number of adults who smoke in Northern Ireland by gender, parental smoking status and occupational status

		Nearly all of them %	About three quarters %	About half %	About a quarter %	Hardly any %	Don't know %	Base	Sign within years	Sign between years
All	**Pre-**	20.2	30.6	31.6	8.1	0.5	8.9	2124		NS
	Post-	20.5	30.8	29.5	9.9	1.0	8.2	2099		
Gender	**Pre-**									
	Male	19.1	29.7	32.7	9.8	0.5	8.2	1067	*	NS
	Female	21.4	31.5	30.6	6.4	0.5	9.6	1057		NS
	Post-									
	Male	20.1	29.9	29.9	12.4	1.1	6.7	1051	***	
	Female	21.0	31.8	29.2	7.4	0.9	9.7	1048		
Parental smoking status	**Pre-**									
	No parent figure smokes	12.1	28.6	37.7	11.3	0.7	9.6	1194	***	NS
	Father figure only smokes	22.5	36.6	29.4	3.8	0.0	7.6	262		NS
	Mother figure only smokes	30.0	32.5	24.1	5.0	0.6	7.8	320		NS
	Both parent figures smoke	38.5	30.7	19.1	3.0	0.0	8.7	335		NS
	Post-									
	No parent figure smokes	11.8	31.2	35.1	12.9	1.1	7.9	1148	***	
	Father figure only smokes	27.7	29.4	29.1	5.9	1.0	6.9	289		
Occupational status	Mother figure only smokes	31.0	30.4	20.9	6.4	0.3	11.0	345		
	Both parent figures smoke	35.4	32.3	18.0	6.5	0.7	7.1	294		
	Pre-									
	Professional/ managerial	12.8	29.8	39.5	11.1	0.3	6.4	577	***	NS
	Skilled non-manual	16.9	32.2	34.9	8.0	0.3	7.6	301		NS
	Skilled manual	21.1	34.6	27.9	5.5	0.8	10.2	512		NS
	Partly skilled/ unskilled	24.8	29.8	28.0	7.8	0.9	8.7	218		NS
	No job	36.2	32.2	17.8	3.3	0.0	10.5	152		NS
	Post-									
	Professional/ managerial	14.6	34.3	32.2	13.0	1.1	4.8	540	***	
	Skilled non-manual	15.8	32.4	36.6	9.4	0.3	5.5	361		
	Skilled manual	22.5	32.7	25.9	7.4	1.3	10.2	471		
	Partly skilled/ unskilled	20.9	32.7	29.3	8.1	1.3	7.7	297		
	No job	33.3	22.7	22.7	5.3	0.0	15.9	132		

Table 26: Children's opinion of adults being allowed to smoke around children by parental smoking status and occupational status

		Strongly agree %	Agree %	Don't mind %	Disagree %	Strongly disagree %	Base	Sign within year	Sign between years
Parental smoking status	**Pre-**								
	No parent figure smokes	5.2	2.5	6.7	22.7	62.9	1191	***	NS
	Father figure only smokes	7.7	4.6	14.7	19.3	53.7	259		*
	Mother figure only smokes	4.1	5.3	13.1	25.9	51.6	320		NS
	Both parent figures smoke	5.7	3.0	13.7	23.2	54.5	336		NS
	Post-								
	No parent figure smokes	7.2	2.7	6.7	22.9	60.5	1140	***	
	Father figure only smokes	7.3	2.8	15.0	30.1	44.8	286		
	Mother figure only smokes	6.7	2.9	18.1	25.4	46.9	343		
	Both parent figures smoke	5.8	6.8	16.7	25.5	45.2	294		
Occupational status	**Pre-**								
	Professional/ managerial	4.7	2.8	8.7	19.4	64.4	576	*	NS
	Skilled non-manual	7.0	1.7	8.6	21.3	61.5	301		NS
	Skilled manual	4.5	2.7	7.8	26.9	58.0	510		NS
	Partly skilled/ unskilled	6.8	5.0	11.9	23.7	52.5	219		NS
	No job	8.6	4.6	12.5	17.8	56.6	152		NS
	Post-								
	Professional/ managerial	6.3	1.9	7.6	21.7	62.6	540	***	
	Skilled non-manual	9.0	2.5	9.0	23.5	56.0	357		
	Skilled manual	5.7	3.2	12.7	26.8	51.6	471		
	Partly skilled/ unskilled	7.2	2.7	14.1	26.8	49.1	291		
	No job	9.7	6.0	15.7	29.1	39.6	134		

Table 27: Children's self reported predictions of future smoking intentions by gender, parental smoking status and occupational status

		Definitely yes %	Probably yes %	Maybe, maybe not %	Probably not %	Definitely not %	Base	Sign within year	Sign between years
All	**Pre-**	0.2	.8	5.3	10.2	83.5	2124		NS
	Post-	0.2	1.3	5.1	11.8	81.7	2110		
Gender	**Pre-**								
	Male	0.2	0.9	5.8	11.4	81.7	1071	NS	NS
	Female	0.3	0.7	4.7	8.9	85.4	1053		NS
	Post-								
	Male	0.2	1.5	4.2	13.1	81.0	1060	NS	
	Female	0.2	1.0	6.1	10.4	82.3	1050		
Parental smoking status	**Pre-**								
	No parent figures smoke	0.2	0.5	3.9%	8.8	86.5	1342	***	NS
	Father figure only smokes	0.0	1.5	7.2%	14.9	76.4	195		NS
	Mother figure only smokes	0.0	1.8	7.7%	9.9	80.6	273		*
	Both parent figures smoke	0.7	0.7	8.8%	15.1	74.6	272		NS
	Post-								
	No parent figures smoke	0.1	0.9	3.5%	9.9	85.7	1358	***	
	Father figure only smokes	1.0	2.5	4.5%	13.4	78.6	201		
	Mother figure only smokes	0.4	1.4	11.6%	16.6	70.0	277		
	Both parent figures smoke	0.0	2.7	8.2%	15.5	73.5	219		

		Definitely yes %	Probably yes %	Maybe, maybe not %	Probably not %	Definitely not %	Base	Sign within year	Sign between years
Occupational status	**Pre-**								
	Professional/ managerial	0.0	0.5	3.5	8.3	87.7	576	***	NS
	Skilled non-manual	0.0	0.7	3.0	11.9	84.4	302		NS
	Skilled manual	0.2	0.4	5.7	11.4	82.4	511		NS
	Partly skilled/ unskilled	0.5	0.5	6.0	11.5	81.7	218		NS
	No job	2.0	2.0	10.5	9.2	76.3	152		NS
	Post-								
	Professional/ managerial	0.2	0.7	3.1	10.2	85.8	541	NS	
	Skilled non-manual	0.0	0.6	5.0	11.4	83.1	361		
	Skilled manual	0.4	2.1	5.9	12.3	79.3	473		
	Partly skilled/ unskilled	0.3	0.7	5.4	12.0	81.6	299		
	No job	0.0	2.2	7.5	16.4	73.9	134		

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02/09