

## **Smoking uptake in UK children: analysis of the UK Millennium Cohort Study**

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*Contributors: AAL had full access to all of the data and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design was by AAL and NSH. All authors were involved in the interpretation of data, drafting of the manuscript and revising it for critical intellectual content*

*Funding: There was no specific funding for this work but CM and AL are funded by the NIHR (NIHR RP 014-04-032) and the Public Health Policy Evaluation Unit at Imperial College London is grateful for the support of the NIHR School of Public Health Research. AB receives funding from the NIHR as a senior investigator as well as the Asthma UK Centre for applied research*

*Competing interests: The authors declare that they have no competing interests*

*Word count 1,141*

## **ABSTRACT**

Using data from 11,577 children in the UK Millennium Cohort Study, collected at approximately 14 years of age (“early teens”), we assessed characteristics associated with smoking and generated regional estimates of numbers of smokers. 13.8% of UK early-teens studied had ever smoked; 1.9% were current smokers. This corresponds to 228,136 and 39,653 (13-14 year olds) in the UK respectively. Ever smoking risk increased if caregivers (26.0% vs. 10.9%) or friends smoked (6.0% vs. <0.1%), with a dose response association evident for friends’ smoking. Caregiver and peer-group smoking remain important drivers of child smoking uptake and thus important targets for intervention.

## **INTRODUCTION**

For the majority of smokers, their habit derives from an addiction starting in childhood, which is the time of most experimentation and uptake of smoking [1]. The achievement of a “smoke free generation” will require substantial efforts to reduce the number of children taking up smoking, informed by an understanding of the factors that drive this phenomenon [2]. Previous research has identified characteristics linked to smoking uptake, which have included both individual level and environmental factors [3]. While there are cross-sectional data collections such as the Smoking, Drinking and Drug Use Survey in England the Scottish Schools Adolescent and Lifestyle Substance Use Survey, there is a lack of prospectively collected data with allow analysis of the impact of exposures in early life on smoking behaviour. To address this we used the nationally representative Millennium Cohort Study (MCS), to: (1) estimate the number of ever and current smokers among early-teens in the UK, and (2) assess risk factors for early-teens being an ever, current or continuing current smoker, including maternal smoking in pregnancy, and exposure to caregiver and peer smoking.

## **METHODS**

Data come from the MCS, which is a birth cohort study in the UK of children born between September 2000 and January 2002, and alive at 9 months [4]. We use data collected in “wave six” when children were aged approximately 14 years old, referred to here as “early-teens”. 11,872 early teens took part and after excluding individuals with missing data we had an analytic sample of 11,577.

The outcome in this study was early-teen smoking, classified as ever smoking, current smoking, (at least one cigarette per week) and continuing current smoking (being a current smoker at age 14 among those who reported being an ever smoker at age 11) We also used potentially relevant socio-demographic data: age, sex, country equivalised household income, ethnicity, caregiver current smoking and friends' smoking. We used two measures of early-life exposure to smoking: exposure to smoking in the same room and maternal smoking during pregnancy. We produce estimates of national and regional numbers of smoking using data on population from the Office for National Statistics (ONS).

Further methodological details are outlined in the **Appendix**

## RESULTS

A description of the sample can be found in **Appendix Table 1**.

After adjustment for survey weighting 16.0% (95% Confidence Interval 14.7; 17.3) of 13 and 14 year olds in the UK were ever smokers by the time they were early-teens (**Table 1**). Applying these estimates to national population data suggests that 228,136 (209,980; 246,293) early teens had ever smoked. 2.8% (2.0; 3.6) of early-teens were current smokers, equating to 39,653 (28,634; 50,672) early-teens.

Children who reported caregiver smoking were more than twice as likely to have ever smoked tobacco (26.0% vs. 10.9%, Adjusted Odds Ratio (AOR) 1.69, 1.38; 2.06) (**Table 2**). Among children who reported at least some of their friends smoked 35.1% had tried tobacco, compared with 4.0% of those reporting no tobacco use among their friends (AOR 10.35, 8.35; 12.81). Current smoking was also more common among children whose caregivers smoked (4.9% vs. 1.2%, AOR 1.92 (1.16; 3.19). Both reporting that at least some of their friends smoke (AOR 22.29, 4.91; 101.21) and not answering this question were related to being a current smoker (AOR 9.21, 1.64; 51.78). There were also notable differences in smoking prevalence across family income groups.

Children exposed to smoking in the same room in at least one survey wave of the MCS were more likely to be ever smokers (20.3% vs. 10.3% for those never exposed to smoking in the same room, AOR 1.55, 1.21; 1.98) (**Figure 1**) (**Appendix Table 2**). 35.8% of those exposed to smoking in the same room in all survey waves aged 0 - 7 years were ever smokers compared with 10.3% of those never exposed to smoking in the same room (AOR 2.67, 1.51; 4.70). Children whose mother smoked during pregnancy were more likely to be both ever and current smokers. For example, 5.2% of children

whose mothers smoked during pregnancy were current smokers as early-teens compared with 0.9% of children whose mother never smoked during pregnancy (AOR 2.16, 1.42; 3.26).

Results of additional analyses are presented in **Appendix tables 3 and 4** and show that earlier age of first smoking was associated with continuing current smoking as well as evidence of a dose-response effect between friend smoking and child smoking.

## **Discussion**

The principle findings from this nationally representative UK prospective cohort study are that smoking among early-teens is associated with smoking by caregivers and peers and specifically with early life exposure to smoking. We also estimate that over 220,000 13 and 14 year olds in the UK have tried tobacco and almost 40,000 are current smokers. These data reinforce findings regarding the links between caregiver smoking and smoking uptake, adding prospective data to that from other large cross-sectional surveys, further adding to this research by allowing detailed consideration of early life exposures among the same children.

Our data highlight the “transmissible” nature of the tobacco epidemic to young people and support the need for further urgent and comprehensive action on smoking to protect children. In addition to reducing exposure to second hand smoke, the data on passive exposure to smoke in the same room suggest that the promotion of smoke free homes has the potential to reduce youth smoking. Caregivers and those with children should be further supported to quit [5]. These findings also reinforce the view that tackling smoking in pregnancy can reduce child smoking uptake, as well as highlighting well known links between these and adverse Socioeconomic circumstances during childhood [6]. School-based strategies such as the ASSIST programme which trains peer supporters in schools are also recommended by the National Institute for Health and Care Excellence (NICE) to reduce smoking uptake among children [7].

There are some limitations to this work. Our measures of smoking among both caregivers and children were based on self-report, although previous work has found these to be accurate [6]. Our measure of exposure to early life exposure is exposure in the same room rather than in the home in general which would potentially show stronger associations. Some previous research has found differences in associations of caregiver smoking by sex, but we were unable to examine this due to a low number of fathers identified as caregivers in the study [8]. We have not included analyses here

of any potential associations between the use of e-cigarettes and tobacco among this age group, although previous analyses has revealed that the majority of e-cigarette use in this age group was among children using tobacco [9][10].

Despite a decline in overall smoking prevalence, large numbers of children in the UK experiment with and continue to smoke. Associations with smoking during pregnancy and smoking among peers and caregivers suggest the need for further comprehensive action to target this avoidable driver of disease.

**Table 1: Estimated ever use and current (at least weekly) use of cigarettes among early-teens year olds by region**

Region	% ever smokers (95% CI)	% current smokers (95% CI)	Number of ever smokers (95% CI)	Number of current smokers (95% CI)
North east	22.5 (16.1 ; 28.9)	5.4 (1.8 ; 9.1)	12387 (8856 ; 15917)	2994 (988 ; 5000)
North west	17.6 (13.9 ; 21.4)	3.3 (1.5 ; 5.0)	27879 (21963 ; 33796)	5162 (2360 ; 7964)
Yorkshire and the Humber	16.6 (14.4 ; 18.7)	3.3 (1.5 ; 5.0)	19570 (17029 ; 22110)	3854 (1754 ; 5955)
East midlands	16.5 (12.4 ; 20.6)	1.5 (0.2 ; 2.8)	16913 (12699 ; 21126)	1487 (156 ; 2819)
West midlands	15.1 (10.9 ; 19.3)	2.2 (1.2 ; 3.2)	19918 (14326 ; 25509)	2920 (1571 ; 4270)
East of England	13.3 (9.2 ; 17.5)	2.5 (1.0 ; 3.9)	17986 (12380 ; 23592)	3326 (1331 ; 5320)
London	11.1 (7.9 ; 14.4)	1.0 (0.3 ; 1.6)	20321 (14364 ; 26277)	1817 (629 ; 3004)
South east	16.1 (12.1 ; 20.0)	2.7 (1.6 ; 3.8)	32399 (24343 ; 40456)	5480 (3271 ; 7689)
South west	15.2 (12.6 ; 17.9)	2.3 (1.1 ; 3.5)	17615 (14526 ; 20704)	2653 (1298 ; 4008)
Wales	15.3 (11.6 ; 19.0)	2.3 (0.6 ; 4)	10388 (7867 ; 12909)	1586 (432 ; 2740)
Scotland	22.0 (13.8 ; 30.2)	6.5 (<0.1 ; 14.0)	24481 (15367 ; 33596)	7258 (0 ; 15552)
Northern Ireland	14.5 (11.6 ; 17.3)	0.7 (0.3 ; 1.2)	6570 (5258 ; 7883)	339 (121 ; 557)
Overall	16.0 (14.7 ; 17.3)	2.8 (2.0 ; 3.6)	228136 (209980 ; 246293)	39653 (28634 ; 50672)

These percentages adjusted for survey weighting . CI = Confidence Interval

**Table 2: Fully adjusted associations with smoking among early-teens**

		Ever smoking N = 11,557		Current smoking N = 11,557		Continuing current smoking N = 1,598	
		%	AOR (CI)	%	AOR (CI)	%	AOR (CI)
Age (years)	13	10.5	ref	1.1	Ref	10.4	ref
	14 / 15	14.9	<b>1.31 (1.07 ; 1.60)</b>	2.2	1.46 (0.83 ; 2.56)	14.6	1.40 (0.78 ; 2.51)
Gender	Female	14.9	ref	2.4	Ref	16.2	ref
	Male	12.7	<b>0.81 (0.67 ; 0.97)</b>	1.4	<b>0.62 (0.40 ; 0.95)</b>	11.0	0.75 (0.49 ; 1.15)
Country	England	13.6	ref	2.0	Ref	14.4	ref
	Wales	15.8	0.97 (0.76 ; 1.24)	2.1	0.67 (0.40 ; 1.14)	13.4	0.64 (0.37 ; 1.10)
	Scotland	14.9	<b>1.55 (1.04 ; 2.30)</b>	2.2	2.45 (0.83 ; 7.22)	15.0	1.59 (0.55 ; 4.64)
	N. Ireland	11.5	1.00 (0.77 ; 1.29)	0.9	0.41 (0.16 ; 1.02)	8.2	0.39 (0.15 ; 1.04)
Family income group	1 (highest)	8.5	ref	0.3	Ref	3.4	ref
	2	11.0	<b>1.35 (1.06 ; 1.72)</b>	1.4	<b>5.63 (2.28 ; 13.95)</b>	12.8	<b>4.94 (1.99 ; 12.30)</b>
	3	13.4	<b>1.85 (1.42 ; 2.42)</b>	1.6	<b>6.29 (2.66 ; 14.87)</b>	12.2	<b>4.14 (1.75 ; 9.83)</b>
	4	20.7	<b>2.56 (1.87 ; 3.53)</b>	3.8	<b>16.03 (5.90 ; 43.57)</b>	18.1	<b>10.06 (3.92 ; 25.83)</b>
	5 (lowest)	20.0	<b>2.74 (2.00 ; 3.75)</b>	3.6	<b>13.58 (5.51 ; 33.47)</b>	18.3	<b>8.07 (3.24 ; 20.12)</b>
Ethnic group	White	15.0	Ref	2.1	Ref	14.2	ref
	Mixed	13.1	<b>0.45 (0.23 ; 0.89)</b>	4.0	0.79 (0.29 ; 2.11)	30.8	1.25 (0.28 ; 5.47)
	Indian	4.3	<b>0.39 (0.20 ; 0.75)</b>	0.7	0.46 (0.10 ; 2.05)	15.4	1.16 (0.22 ; 6.18)
	Pakistani and Bangladeshi	8.6	<b>0.53 (0.33 ; 0.85)</b>	0.5	<b>0.27 (0.09 ; 0.84)</b>	5.7	0.33 (0.09 ; 1.20)
	Black	7.9	0.56 (0.31 ; 1.00)	0.5	<b>0.21 (0.05 ; 0.94)</b>	6.5	0.28 (0.07 ; 1.10)
	Other Ethnic group	6.7	0.95 (0.43 ; 2.10)	0.5	0.86 (0.10 ; 7.20)	7.1	0.67 (0.07 ; 6.82)
Caregiver smoking	No	10.9	ref	1.2	Ref	10.8	ref
	Yes	26.0	<b>1.69 (1.38 ; 2.06)</b>	4.9	<b>1.92 (1.16 ; 3.19)</b>	18.8	1.49 (0.92 ; 2.41)
Peer smoking	No	4.0	ref	<0.1	Ref	1.1	ref
	Some/most/all	35.1	<b>10.35 (8.35 ; 12.81)</b>	6.0	<b>115.57 (26.03 ; 513.08)</b>	17.2	<b>22.29 (4.91 ; 101.21)</b>
	No answer	9.3	<b>1.96 (1.34 ; 2.88)</b>	7.1	<b>14.51 (2.58 ; 81.66)</b>	7.6	<b>9.21 (1.64 ; 51.78)</b>

AOR = Adjusted Odds Ratio, adjusted for all other covariates in table, CI = Confidence Intervals. Continuing current smoker refers to those reporting having ever smoked at age 11 who were current smokers. Bold represents  $p \leq 0.05$

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