RESEARCH PAPER

Is smoking a communicable disease? Effect of exposure to ever smokers in school tutor groups on the risk of incident smoking in the first year of secondary school

A Molyneux, S Lewis, M Antoniak, R Hubbard, A McNeill, C Godfrey, R Madeley, J Britton

Objective: To estimate the effect of joining a first year secondary school tutor group with a high prevalence of ever smoking on the risk of incident smoking in schoolchildren.

Design: Cross-sectional questionnaire survey.

Setting: 10 randomly selected secondary schools in Nottinghamshire, UK.

Participants: Pupils in years (grades) 7–11 (aged 11–16 years).

Main outcome measure: Incident smoking in the first year of secondary education, defined as pupils who reported smoking their first cigarette during year 7.

Results: Of 6522 pupils (75% of those eligible) who completed the questionnaire, 17% were current smokers and 49% had ever smoked, of whom 23% had started smoking in year 7. Incident smoking in year 7 was more common in girls, in children with parents or siblings who smoke, and in more deprived children, and was independently increased in relation to the proportion of ever smokers in the year 7 tutor group joined by the child (adjusted odds ratio of incident smoking for a child joining a year 7 tutor group in the highest relative to the lowest quartile of ever smoking prevalence 1.45, 95% confidence interval [CI] 1.11 to 1.89). Exposure to ever smokers in year 7 tutor groups also accounted for most of the increased risk of incident smoking associated with socioeconomic deprivation.

Conclusions: The risk of incident smoking in children entering secondary education is independently increased by exposure to other ever smokers in school tutor groups. Incident smoking in adolescents is thus to some extent a communicable disorder, and may be partly preventable by policies that reduce exposure to smoking at school.
those answering positively. Supervising teachers were asked to confirm that each pupil’s name and tutor group had been correctly completed, and that any absentees were asked to complete a questionnaire on a subsequent occasion.

This was a second cross-sectional survey carried out as part of a larger project to study adolescent smoking behaviour and develop smoking cessation interventions for adolescents. Data from this survey have been used as they contained more complete information than the previous survey on the school year in which most smokers smoked their first cigarette.

Regular and occasional smokers were categorised as current smokers. Parental smoking was categorised as neither parent smokes, one parent smokes, or both parents smoke, and sibling smoking was categorised as non-smoking sibling(s), smoking sibling(s), or no siblings (respondents answering no to the question "Do you have any brothers or sisters"). Social deprivation was estimated for each respondent from the Townsend Material Deprivation Index, an area measure based upon 1991 census data (the most recent available) on unemployment, overcrowding, car and house ownership, expressed as a standardised residual relative to the mean for England and Wales (negative values reflecting lesser and positive values greater degrees of deprivation), and available for each census enumeration district in England and Wales from Manchester Information and Associated Services (MIMAS), Manchester Computing, University of Manchester. Each respondent’s home postcode was converted to a census enumeration district post code using the PC2ED facility (based on the 1998 Central Postcode Directory, MIMAS, http://census.ac.uk/edu/Datasets/lookup_tables/postal/postcode Enumeration_District_Director.y.htm#3); this code was used to obtain the Townsend Index from the MIMAS database.

Statistical analysis

We used simple cross tabulation to calculate the prevalence of smoking in all respondents, and by school, sex, and school year. We used the school year in which pupils who had ever smoked reported that they had tried their first cigarette to estimate retrospectively the proportion of ever smokers in the tutor group at the beginning of year 7. Incident smoking in tutor groups at the start of year 7 was 14% (range 53–86%; only one school had a response rate of less than 70% as a result of the loss of a box of completed questionnaires before collection. Of a possible total of 316 tutor groups surveyed, questionnaires were returned from 303 (96%). The age range of respondents was 11–16 years (mean 13.5 years), and 52% were boys. The median Townsend Index of the pupils was −0.82 (range −6.51 to 9.31). Educational achievement in the study schools, measured as the average proportion of children gaining five or more grade A to C General Certificate of Secondary Education results in 2000 was 41% (range 18–74%), which was below the respective averages for Nottinghamshire and England of 44% and 49%.

Forty nine per cent of respondents had ever smoked a cigarette, and 17% were current smokers (12% regular, 5% occasional). Current smoking was more prevalent in girls (20%) than boys (14%), increased with school year from 3% in year 7 to 30% in year 11 (table 1), and with quartile of deprivation from 12% in the least deprived to 20% in the most deprived children. Current smoking prevalence varied between schools from 11–33%. The median prevalence of ever smoking in tutor groups at the start of year 7 was 14% (range 0–48%). Of children who had ever smoked, 23% started in year 7 and 32% had smoked their first cigarette before year 7. Forty nine per cent of children reported that at least one parent smoked, and 20% at least one sibling.

In univariate analysis, the relative odds of incident smoking during year 7 were significantly increased in relation to sex, parental smoking, sibling smoking, deprivation index, and the proportion of ever smokers in the tutor group at the beginning of year 7 (table 2). All of these univariate effects were confirmed as independent significant predictors of incident smoking in multivariate analysis, though the effect of social deprivation was much reduced, largely by adjustment for the effect of exposure to other ever smokers (table 2). The multivariate model presented used robust standard errors to adjust for clustering by school; adjustment of the model for clustering by class produced similar results. For a non-smoking child joining a tutor group in the highest relative to the lowest
for decades. Therefore, while the presence of some pairs of friends in disruptive friendship groups are usually deliberately separated, sometimes be kept together, this is not standard practice and in cases pairs of best friends from a primary school may be brought together. This is not standard practice and in certain cases pairs of best friends from a primary school may be brought together. This is not standard practice and in certain cases pairs of best friends from a primary school may be brought together.

The years that a child spends in secondary education represent a crucial period of risk of incident smoking. Of children joining secondary education in Notting-

**DISCUSSION**

The years that a child spends in secondary education represent a crucial period of risk of incident smoking. Of children joining secondary education in Britain at age 11, only 3% are regular or occasional smokers; by age 15 the figure is 31%. Addiction to nicotine is established in about half of young smokers within one year from starting to experiment with cigarettes, and in most cases results in continued smoking for decades. If smoking is to be prevented, it is essential to understand the major determinants of incident smoking during the early years in secondary school. Peer group and family influences are likely to be important in this respect. Our data were obtained using questions adapted from those used previously in national studies of smoking in UK adolescents, collected as part of a project designed to develop cessation services for teenage smokers in older school year groups. The socioeconomic status of our sample as measured by the Townsend Material Deprivation Index was slightly higher than the national average, which would lead us to expect a slightly lower than average prevalence of smoking; however, the overall educational achievement of children in the schools we studied was below average and children with low expectations of educational achievement are more likely to smoke. Our findings of a higher prevalence of smoking in girls, and with increasing age and social deprivation, are broadly similar to those reported nationally, and suggest that our findings are likely to reflect those of the national population of teenage smokers attending school in the UK. However, this inference needs to be cautioned by the fact that our

### Table 2 Unadjusted and adjusted risk factors for incident smoking in year 7

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Unadjusted OR</th>
<th>95% CI</th>
<th>p (χ² tests)</th>
<th>Adjusted OR</th>
<th>95% CI</th>
<th>p (likelihood ratio tests)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of questionnaire completion</td>
<td></td>
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<tr>
<td>7</td>
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<td></td>
<td></td>
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<tr>
<td>8</td>
<td>2.91</td>
<td>2.04 to 4.15</td>
<td>&lt;0.001</td>
<td>2.74</td>
<td>1.85 to 4.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>9</td>
<td>3.70</td>
<td>2.61 to 5.24</td>
<td>&lt;0.001</td>
<td>3.57</td>
<td>2.42 to 5.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>10</td>
<td>5.13</td>
<td>3.66 to 7.19</td>
<td>&lt;0.001</td>
<td>4.23</td>
<td>2.89 to 6.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>11</td>
<td>4.41</td>
<td>3.12 to 6.24</td>
<td>&lt;0.001</td>
<td>3.85</td>
<td>2.62 to 5.65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Boy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Girl</td>
<td>1.59</td>
<td>1.36 to 1.86</td>
<td>&lt;0.001</td>
<td>1.57</td>
<td>1.31 to 1.88</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Parental smoking</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Neither parent smokers</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only father or mother smokers</td>
<td>1.54</td>
<td>1.29 to 1.86</td>
<td>&lt;0.001</td>
<td>1.35</td>
<td>1.09 to 1.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Both parents smoke</td>
<td>2.45</td>
<td>2.00 to 3.00</td>
<td>&lt;0.001</td>
<td>2.01</td>
<td>1.59 to 2.56</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sibling smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smoking sibling(s)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking sibling(s)</td>
<td>3.22</td>
<td>2.69 to 3.85</td>
<td>&lt;0.001</td>
<td>2.27</td>
<td>1.85 to 2.78</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No siblings</td>
<td>0.94</td>
<td>0.67 to 1.33</td>
<td>&lt;0.001</td>
<td>0.88</td>
<td>0.60 to 1.29</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Peer smoking: quartiles of proportion of classmates who had smoked at the beginning of year 7 (range)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lowest (0–7.4%)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (7.5–12.0%)</td>
<td>1.36</td>
<td>1.08 to 1.73</td>
<td>&lt;0.001</td>
<td>1.20</td>
<td>0.92 to 1.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 (13.3–19.2%)</td>
<td>1.55</td>
<td>1.22 to 1.96</td>
<td>&lt;0.001</td>
<td>1.42</td>
<td>1.08 to 1.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest (20.0–48.0%)</td>
<td>1.48</td>
<td>1.17 to 1.87</td>
<td>&lt;0.001</td>
<td>1.45</td>
<td>1.11 to 1.89</td>
<td>0.023</td>
</tr>
<tr>
<td>Social deprivation: quartiles of Townsend Index (range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least deprived (−6.51 to −3.13)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (−3.12 to −0.84)</td>
<td>1.31</td>
<td>1.02 to 1.68</td>
<td>&lt;0.001</td>
<td>1.19</td>
<td>0.92 to 1.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 (−0.82 to 1.55)</td>
<td>1.40</td>
<td>1.10 to 1.80</td>
<td>&lt;0.001</td>
<td>1.11</td>
<td>0.86 to 1.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Most deprived (1.55 to 9.31)</td>
<td>1.77</td>
<td>1.39 to 2.55</td>
<td>&lt;0.001</td>
<td>1.23</td>
<td>0.94 to 1.59</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Mutually adjusted for all other variables in the table, using robust standard errors to adjust for clustering by school.
†Tests for linear trend.
CI, confidence interval; OR, odds ratio.
Trying smoking is important since many young people who try by not providing any discouragement from trying smoking. It is likely that during year 7 there would have some shifting smoking has been observed during school years, with cigarettes. Considerable movement into and out of smokers as well as some who may have only experimented who were ever smokers in year 7 include current and past reduce smoking prevalence.

Lescent smoking incidence is supported by evidence that to smoking in school could have an important impact on ado-preventative policies that focus on developing children's individual social skills in resisting peer pressure have to be encouraged and/or enforced much more to prevent this school (suggesting the need for policies in other places young smokers. A similar conclusion probably applies to poor health issues in relation to the direct adverse effects of smoking on individual health, but the effect on the educational or school health issue in relation to the direct adverse effects of smoking on individual health, but the effect on the social patterning of individual health behaviours: gambling, substance use, and the north of smoking. Adolescent smoking is thus a communicable disorder, and may be preventable by measures that reduce exposure to other smokers.

Our finding in relation to exposure of other ever smokers at school has important legal and health implications, since parents and pupils are entitled to expect that schools will not permit exposure of children to significant health hazards. Although some exposure may well have taken place out of school (suggesting the need for policies in other places young people frequent), it seems likely that at this age, school exposure may be of greater importance. To date, exposure to environmental tobacco smoke has been recognised as an occupational or school health issue in relation to the direct adverse effects of smoking on individual health, but the effect on the preventative measures are important for preventing a regular smoking habit. Our findings suggest that non-smoking policies in school need to be encouraged and/or enforced much more to prevent this school peer group exposure. A similar conclusion probably applies to teacher smoking, though we have not explored this influence in the present study. Our suggestion that preventing exposure to smoking in school could have an important impact on adolescent smoking incidence is supported by evidence that restriction of exposure to smokers in other locations can reduce smoking prevalence. Although schools based smoking prevention programmes that focus on developing children's individual social skills in resisting peer pressure have to date been of limited value, a recent study has shown that schools with strong, strictly enforced smoking policies tend to have a lower prevalence of smoking than schools with weak or poorly enforced smoking policies. Our findings suggest that a further benefit of effective non-smoking policies at school may be to reduce smoking not only in established smokers, but also to delay or possibly prevent incident smoking in young people.

ACKNOWLEDGEMENTS

The authors thank Paul Mein for his cooperation and support in organising the surveys in schools, the head teachers, staff, and pupils who participated, and the Wellcome Trust for funding the study.

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REFERENCES


What this paper adds

Most adult smokers start smoking during their early years in secondary education. The major influences on smoking behaviour during this period are not well understood. In particular, it is not clear whether peer group smoking, which is a recognised correlate of smoking in adolescence, arises from self selection of smoking peers or has a causal influence on smoking behaviour. This study shows that in addition to the established effects of female sex and parental and sibling smoking on individual smoking risk, incident smoking is more likely in children who join a new secondary school tutor group with a high prevalence of ever smoking. This effect is not caused by self selection of smoking peers, since tutor group membership is determined independently from smoking status, and is therefore likely to be causal. The effect of the prevalence of ever smoking in tutor groups accounts for one quarter of incident smoking in the first year of secondary school. Adolescent smoking is thus a communicable disorder, and may be preventable by measures that reduce exposure to other smokers.
The lighter side


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doi: 10.1136/tc.11.3.241

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