The potential influence of tobacco advertising on smoking association would have been even greater if there had not been a differential loss of smokers from the sample. Conclusion: The probability of being a smoker increased with the number of advertisements identified [OR 1.26 (95% CI: 1.09–1.46) after 6 months, OR 1.18 (95% CI: 1.03–1.35) after 12 months and 1.15 (95% CI: 1.02–1.30) after 18 months. It is possible the association would have been even greater if there had not been a differential loss of smokers from the sample. Conclusion: Increased awareness of cigarette advertising was associated with a higher smoking incidence and an increased risk of Spanish children becoming smokers. It is, therefore, imperative that cigarette advertising should be banned as a matter of urgency.

Keywords: adolescent behaviour, advertising smoking, smoking, smoking (prevention & control), social behaviour

The potential influence of tobacco advertising on smoking among adolescents has been widely debated during the past decade. The multinational tobacco companies use adolescent icons in their advertisements and messages that focus on rebelliousness, social protest, independence, freedom, peer acceptance etc. That the aim of these messages is to appeal specifically to young people is supported by internal documentation from the tobacco companies.1,2 Cross-sectional studies provide empirical support for associations between advertising and both adolescent smoking and the determinants of adolescent smoking,3–9 and recent longitudinal studies have identified a possible causal relationship between advertising and both smoking uptake and the continuation of smoking among adolescents.10–13 The independent variables in these studies were different cigarette promotion items and advertisements in magazines or on billboards. Government responses in both Europe and North America appear to have ignored the findings of these studies. For example, in 1994, the Report of the US Surgeon General16 recommended restrictions on all forms of tobacco advertising on the grounds that it appeared to increase the risk of young people smoking. In 1996, the FDA regulated access of young people to tobacco, but definitive control of tobacco promotion was said to clash with the First Amendment and constitutional rights.17 Such constitutional obstacles were also raised in Switzerland18 and Canada.1,19 In a series of recent cases, the Supreme Court has given businesses powerful new First Amendment rights to advertise hazardous products.20,21 Moreover, the Task Force, in its recent report on strategies for preventing tobacco consumption postponed recommending regulation of tobacco publicity on the grounds that ‘key findings are pending’.22 The European Directive 98/43 on advertising and promotion of tobacco products acknowledged, in Article 4, the role of advertising in promoting smoking to adolescents. It completely prohibited tobacco advertising in Europe by 2002 and all forms of tobacco promotion by 2006.23 However, such action was declared illegal in a judgement at a court in Luxembourg.24 A new directive has been approved recently25 but it does not prohibit advertising on billboards. However, a later, non-binding Recommendation of the Council26 asks member states to work towards the prohibition of panels, billboards and other interior and exterior advertising techniques. Restrictions on tobacco advertising are minimal in Asturias, a region in the north of Spain with a little more than a million inhabitants and its own autonomous government. Television is the only medium in which tobacco advertising is banned and there are no limitations on tobacco advertising in the press, including magazines, radio, Internet or on billboards. The Joe Camel advertising campaign, which was blamed for recruiting almost 3.5 million American children to smoking between 1988 and 1998,27 later seduced Spanish children. On the other hand, Spanish experts in prevention warn that tobacco advertising and promotion control is one of the actions with the greatest potential impact on consumption.28 As the situation continues to worsen, it was decided to carry out a study to investigate possible associations between tobacco advertising and smoking behaviour in adolescents in Asturias. The study is, as far as we know, unique in the following ways: it is a longitudinal study with four survey points which includes awareness of billboard advertising as an independent variable; it is carried out in a European country in the Mediterranean region. Risk factors for adolescent smoking other than advertising include age, gender, socio-economic status, family smoking and...
peer smoking. In addition there are a number of related psycho-social models which aim to explain adolescent smoking behaviour in terms of the Theory of Planned Behaviour and the related ASE Model (Attitudes / Social influences / Efficacy). These influences were taken into account in our study. Following the suggestions of previous investigators, a longitudinal study with four survey points was developed. We chose billboard advertising instead of other forms because it has been found, in some countries, to be the form of cigarette advertising to which young people are most exposed. In two studies, more than 90% of adolescents were found to be aware of billboard advertisements for tobacco. Moreover, it is known that the tobacco industry is carefully evaluating billboard advertising by exposing subjects to fleeting glimpses of advertisements using a tachistoscope, which is an instrument for displaying visual images for very brief intervals, usually a fraction of a second. Perhaps for this reason, many States in the USA, several European countries and some Spanish regions, like Cataluña, have decided on a partial or total ban on billboard tobacco advertising. Although these measures are a great step forward, Lantz et al. make the point that ‘partial bans on advertising have little effect because they afford cigarette companies the opportunities to switch advertising expenditures to other promotional media and methods’. The FDA established that ‘no outdoor advertising is permitted within 1,000 feet of a playground, elementary or secondary school’. However, a study conducted by Loyola University and The American Lung Association of Metropolitan Chicago demonstrated that this restriction was largely ignored, especially near schools in majority African American (29.3%) and Hispanic (24.5%) wards. No such limitations exist in most regions of Spain. We used schools located in municipalities having more than 50,000 inhabitants, which are the areas in which such billboards are usually placed. It is practically impossible to measure the total exposure of a person to tobacco publicity in a valid and reliable way. For that reason we used advertisement recognition with the brand name covered as one of the possible indicators of the said exposure. This indicator, among others, has already been used by several authors. Our aim was to investigate possible associations between billboard advertising for cigarettes and smoking behaviour in an autonomous region in northern Spain.

SUBJECTS AND METHODS

Subjects

The respondents were Spanish participants in the Octopus Programme for the Prevention of Smoking. This Programme involved more than 20,000 European children in Spain, The Netherlands and the United Kingdom. They attended 69 schools, located in municipalities of more than 50,000 inhabitants, in Asturias. The participation of each school was voluntary and approximately 40% of the eligible population took part. At baseline, 3,664 children aged 13 and 14 years completed the first survey. The participation rate at baseline was nearly 98% (practically all the children present in the classroom). At the three following survey points, there were 3,089, 2,395, and 2,356 respondents respectively. The attrition percentage at T3 was 35.7%.

Administration

The self-completion questionnaires (anonymous, but identifiable by means of a code) were administered to the children in groups and in class under the supervision of trained interviewers. The four surveys were at baseline (T0), at 6 months (T1), at 12 months (T2) and at 18 months (T3), and the code allowed the questionnaires of the same child to be matched over time. The children were guaranteed the confidentiality of their answers.

Survey questions

Self-validation completed questionnaires were used to collect the following data: smoking behaviour; its determinants in the ASE Model, which assesses attitude, social influence and self-efficacy as the main predictors of smoking intention and behaviour; number of brands of cigarette advertisements identified; age, gender and socio-economic status (SES). The questionnaire had been designed, tested and used with Dutch children, and piloted in Spain before being used in this study. A Cronbach α of 0.88 was obtained in the items that measured ‘attitude’ and the percentage of stability in the answers to questions that measured the same variable in two different ways was higher than 90% in all cases.

Measurements

■ Smoking behaviour

Two categories were used: ‘non-smoker’=0 (never smoked or smokes less than one per week or ex-smoker) and ‘smoker’=1 (smokes at least one cigarette per week). The accepted definition of a regular smoker in this age group is smoking at least one cigarette a week on a regular basis.

■ Advertisement awareness

Advertisement awareness was measured only at the baseline survey. The selection criteria for choosing the cigarette advertisements were: (a) to have been on billboards within a radius of 500 m of the schools at some time during the 3 months preceding the study; (b) to be focused on young people (the iconic message, the textural message or both). A group of experts selected by consensus the three advertisements whose message seemed most focused on young people, from among the five advertisements that satisfied the first selection criterion. The same three advertisements had been exhibited in the surroundings of all the participating schools. The slides of these three advertisements were shown, with the brand names covered. The respondents were asked to write the brand name if they recognized it. The range of responses was 0, 1, 2 or 3 brand names identified and children were assigned to a group according to their reply, and remained in that group until the end of the study. An advertisement was assumed to have been recognized when the brand in the advertisement was identified.

■ Determinants of smoking in the ASE model

Several blocks of questions measured ‘Attitude’, ‘Social influence’, ‘Self-efficacy’ and ‘Intention’ to smoke. In all cases the most negative score was given to the most favourable response to smoking behaviour, i.e. −3 in ‘attitude’ means the most favourable attitude to smoking and +3 the most negative attitude to smoking. The score ranges of the ASE determinants are set out in table 4.

■ Conditions

For purposes of the Octopus Program, the respondents had already been randomly divided into four groups called IN, OUT, IN–OUT and Control Group. Between T0 and T1, the IN group received an educational intervention in school aimed at preventing smoking; the OUT group received an intervention outside school; the IN/OUT group received both interventions; the Control Group had no preventive intervention. We controlled for the Octopus study group to which the respondents belonged in the multivariate analysis reported in this paper.

Follow-up

The dependent variable, namely regular smoking, was measured at baseline (T0), at 6 months (T1), at 12 months (T2) and at 18 months (T3).

Statistical analysis

Bivariate analysis was used to measure associations between the number of advertisements recognized at baseline and smoking...
status at each survey point. Pearson’s Chi² Test was used to test significance.
SES was calculated by means of a double factorial analysis and an index ranging from 0 to 10 was obtained (10 means the highest status).
Using version 10 of the SPSS, a multivariate analysis was carried out to control for the effect of confounders, apart from the ‘number of identified brands at baseline’ (NIBB, study variable), possibly associated with the outcome variable: the accumulated incidence of new regular smokers at T1, T2 and T3. A five-step logistic regression analysis was used. The covariates in each step are detailed in table 3 and were introduced in block using the method ‘enter’. In the fifth step, several interactions were introduced. Logically the NIBB was left in the model throughout.

The baseline answers of the 1,308 respondents who did not complete the study were also analysed by means of bivariate analysis and multivariate logistic regression analysis, and were compared with those of the respondents who completed the study, to detect which variables were associated with the drop-outs at T3.

RESULTS

Differences between respondents completing the study and those who were lost
Table 1 shows the baseline data for those respondents who completed the study compared with those who were lost at some stage. In the bivariate analysis, significant differences were found between these groups for age, smoking behaviour and NIBB. However, in the multivariate analysis, only age [OR=1.70 (95% CI: 1.58–1.83)] p < 0.001 and smoking behaviour [OR=1.9 (95% CI: 1.60–2.45)] p < 0.001, differed significantly: the lost respondents being older and more likely to be smokers.

Advertisement awareness and smoking behaviour
Table 2 shows the distribution of children and smokers at baseline and the drop-outs at T3 in the four groups defined according to the NIBB. Figure 1 shows the outcome of the bivariate analysis between NIBB and the prevalence of regular smoking at each of the four survey points. The greater the NIBB, the higher the percentage of smokers (p < 0.0001). However, there was no significant difference in smoking behaviour between those who recognized none or one of the brands.

The proportion of new (incident) smokers at the three survey points (figure 2) also shows significant differences (p < 0.05): at the end of the follow-up period there were 15.9% new smokers among those who did not recognize any brand of tobacco and 23.7% among those who recognized all three. If we exclude the incidence of those who recognized 0 advertisements at the beginning of the study, a dose–response relationship is observed in the rest of the cases (the more advertisements they recognize, the more they smoke).
Table 3 shows the findings of the logistic regression analysis controlling for other variables associated with smoking behaviour. The independent effect of the NIBB is observed in all the steps and survey points. Each intervention identified increased the probability of the child becoming a smoker, when all the main variables were controlled for, with a maximum OR of 1.26 at six months and 1.15 at 18 months. As might be expected, advertisement awareness having been measured only at baseline, there was a downward trend in this association throughout the four surveys, although even at T3 the association between number of advertisements identified and smoking was still very significant (p<0.0001), as it was in T0, T1 and T2. The fifth step of the regression analysis has not been included because the Chi² of the likelihood of improvement was not significant.

**DISCUSSION**

Our study corroborates the findings of many other research studies on the same topic, namely that there is an association between awareness of cigarette advertising and smoking behaviour.3,11,13,14,27,34,38 Some studies have also found a dose–response association,3,5,10 as our study did. Some others6,37 don’t find such association but they were cross-sectional or the environment situation of the study differed from the ours. The fact that the dose–response relationship is not detected in the group of those who say they do not recognize any advertisement could be owing to a classification bias because of lack of sincerity in the children. When most variables known to be associated with adolescent smoking were controlled for in the multivariate analysis, advertising awareness remained an independent factor 6, 12 and 18 months after, even in the adolescents who had received an intervention as part of the Octopus Program for Prevention of Smoking. However, the odds ratios decreased with time. Continuous measurement of awareness of current advertising at all stages of the study might have shown an even greater effect. The study has limitations, the most important of which is probably the loss of 57.1% (3,089) of the respondents between the baseline and T3. Respondents were lost for a variety of reasons not related to the study, including absence from school on a survey day, change of school, dropping out of studies at the end of a school year, etc. Smokers were more likely than non-smokers to be lost from the study, perhaps because they were unwilling to participate because of their behaviour but, on the basis of other research findings, probably because they were more likely to be absent from school.39,40 Being a smoker at baseline doubles the probability of dropping-out at T3. There is a greater proportion of drops-outs among the groups that identify the most advertisements. Whatever the reason for the greater loss of smokers, it could have introduced a bias to the findings, but in the direction of underestimation of the association between advertising awareness and smoking.

Drop-outs are greater among smokers and those who belong to the group with greater NIBB. This fact tends to diminish the accumulated incidences and could explain the apparent contradict between prevalence and incidence percentages of smokers in figures 1 and 2.

Other limitations include possible memory bias: being exposed to the advertisements, but not remembering the brand. There can also be differences in the ability to recall ads between smokers and non-smokers, which are impossible to control in our study. The association found could be partly attributed to the fact that the non-smoking youth, who is contemplating starting smoking, is more vulnerable to advertisements than one who is firmly against smoking. Some respondents may have lied about their smoking behaviour. It is also possible that some respondents said they did not recognize the cigarette brands advertised because they felt that to do so would somehow show that they were conversant with smoking issues. A bias of this kind would result in over-reporting in the ‘no advertisements recognized’ category and might help to explain why the observed dose–response relationship in the percentage of smokers at T0, T1 and T2, was not detected among those who recognized 0 and 1 ads at baseline, but was detected in the other groups.

Although cause and effect cannot be directly postulated, high levels of cigarette advertisement awareness has been specifically and consistently found in all longitudinal studies to be associated with increased risk of becoming or remaining a smoker. Our findings among Spanish children are consistent with those of other longitudinal studies involving young people’s exposure to cigarette advertising in a variety of forms in a wide range of locations, including California,12 Hong Kong9 and the United Kingdom.14 It is, therefore, reasonable to assume that the association is real. The evidence from these longitudinal studies should be sufficient to provide governments with a basis and motivation to introduce bans on tobacco advertising as part of their policies to prevent children from smoking.

Perhaps it is not the lack of evidence which is causing the clash between public health experts and policy-makers.32,42 The rejection of bans on tobacco advertising may not be due to lack of evidence or even to constitutional rights, but to economic interests.43,44 In our study, an association between cigarette advertising awareness and smoking among Spanish children has been shown, in spite of the limitations of the study; the main one being the higher number of losses over time in the groups that recognized a higher number of advertisements and among smokers at baseline. Without this limitation, the degree of association found between smoking advertising and smoking behaviour would be even higher. We hope the government and policy-makers of Spain or those of the autonomous government will override any economic interests and will ban tobacco advertising and promotion to protect the health of our children.

The authors gratefully acknowledge the collaboration of the students and teachers involved, and the funding from the European Commission – Directorate General V (98/CAN 32463).

**Table 3** Logistic regression to detect association between number of identified brands at baseline (NIBB) and accumulated incidence of regular smokers, controlling for other variables. 0 = No smoker; 1 = New Regular Smoker in the period

<table>
<thead>
<tr>
<th>Study factor and other associated variables</th>
<th>OR (95% CI) at T = 1 (6 months)</th>
<th>OR (95% CI) at T = 2 (12 months)</th>
<th>OR (95% CI) at T = 3 (18 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 NIBB (0 to 3)</td>
<td>1.36 (1.18–1.57)</td>
<td>1.32 (1.16–1.50)</td>
<td>1.25 (1.11–1.41)</td>
</tr>
<tr>
<td></td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>Step 2 NIBB + Study group</td>
<td>1.38 (1.19–1.59)</td>
<td>1.33 (1.17–1.52)</td>
<td>1.26 (1.12–1.42)</td>
</tr>
<tr>
<td></td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>Step 3 NIBB + Study Group + Age, gender and S.E.S.</td>
<td>1.36 (1.17–1.57)</td>
<td>1.30 (1.14–1.48)</td>
<td>1.25 (1.11–1.41)</td>
</tr>
<tr>
<td></td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>Step 4 NIBB + Study Group + Age, gender and S.E.S. + A.S.E. Model determinants</td>
<td>1.26 (1.09–1.46)</td>
<td>1.18 (1.03–1.35)</td>
<td>1.15 (1.02–1.30)</td>
</tr>
<tr>
<td></td>
<td>p=0.005</td>
<td>p=0.01</td>
<td>p=0.025</td>
</tr>
</tbody>
</table>
Some part of this study was presented orally at the XVII World Conference on Health Promotion and Health Education in Paris, July 2001.

REFERENCES


26 Recomendación del Consejo 2003/54/CE de 2.12.02. relativa a la prevención del tabaquismo. Diario Oficial de las Comunidades Europeas de 25.1.03. L223/1 - L223/34.

Received 14 November 2002, accepted 27 August 2003.