Impact of cigarette advertising on smoking behaviour in Spanish adolescents as measured using recognition of billboard advertising

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Background: Cross-sectional studies provide empirical support for associations between advertising and adolescent smoking. The aim of this study was to investigate the relationship between Spanish adolescent smoking behaviour and prior awareness of cigarette advertisements on billboards, using a prospective design. Methods: 3,664 Spanish children aged 13 and 14 years filled in self-completion questionnaires at baseline, and 6, 12, and 18 months later (cohort study). Slides of three advertisements were projected at baseline. A multivariate logistic regression analysis was carried out to detect possible association between number of identified tobacco advertisements brands at baseline and smoking status along time, controlling ASE Model smoking determinants, smoking prevention interventions, age, gender and socio-economic status. Results: The more advertisements identified at baseline, the greater was the risk of being a smoker (p<0.0001). Final percentages of smokers were 15.8%, 16.3%, 19.3%, and 32.6%, respectively, for zero, one, two and three advertisements recognized. When confounders were controlled, 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
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, it is practically impossible to measure the total exposure of a used schools located in municipalities having more than 50,000 inhabitants. 

This indicator, among others, has already been used by several authors. 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 regular smoker in this age group is smoking at least one cigarette a week on a regular basis’.

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 advertisement 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 textual 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 covariables 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).
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. Some studies have also found a dose–response association as our study did. Some others don’t find such association but they were cross-sectional or the environmental 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 35.7% (1,308) 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. 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 contradiction 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, Hong Kong and the United Kingdom. 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. The rejection of bans on tobacco advertising may not be due to lack of evidence or even to constitutional rights, but to economic interests.

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.

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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>
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<tr>
<td></td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
<td>p&lt;0.0001</td>
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<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>
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<td></td>
<td>p=0.005</td>
<td>p=0.01</td>
<td>p=0.025</td>
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