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**Published paper**

Lazuras, L., Eiser, J.R. and Rodafinos, A. (2009) *Predicting smokers' non-compliance with smoking restrictions in public places*. *Tobacco Control*, 18 (2). pp. 127-131.

<http://dx.doi.org/10.1136/tc.2008.025841>

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Predicting smokers' non-compliance with smoking restrictions in public places

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Keywords: compliance, smoking restrictions, Greece, college students

Word count: 2745

**ABSTRACT**

**Objective:** The present study aimed to identify the predictors of non-compliance with smoking restrictions among Greek college student smokers. Differences in attitudes to smoking bans and tobacco control policies between current smokers and non-smokers were also examined.

**Methods:** Data were collected from college students ( $N = 229$ ,  $M_{age} = 21.27$ ,  $SD = 3.15$ ). Measures included tobacco dependence, attitudes to tobacco control policies, outcome expectancy and normative beliefs.

**Results:** The majority of current smokers reported non-compliance with existing restrictions. Logistic regression analysis showed that non-compliance was significantly predicted by (less) anticipated regret from tobacco-related health harm, tobacco dependence, and perceived prevalence and social acceptability of smoking. Analysis of variance indicated that current non-smokers held significantly more positive attitudes to smoking bans and tobacco control policies than current smokers.

**Conclusions:** Smoking was highly prevalent, and more than half of current smokers reported not complying with existing regulations in public places. Smokers' attitudes to smoking bans and tobacco control policies did not have an effect on compliance behaviour. Future policies to promote compliance with smoking restrictions in Greece should target health-related anticipated regret, and perceived social norms.

## **Predicting smokers' non-compliance with smoking restrictions in public places**

Tobacco use accounts for millions of deaths worldwide, and there is a causal link between passive exposure to environmental tobacco smoke (ETS) and adverse health problems, including lung cancer and heart disease. The World Health Organization (WHO) has introduced the Framework Convention on Tobacco Control (FCTC), the first treaty devoted to fighting the tobacco epidemic at a global level. The treaty has been signed and ratified by more than 120 countries, and requires the implementation of tobacco control policies to prevent tobacco use, and reduce exposure to ETS.<sup>1</sup>

The effectiveness of tobacco control policies is closely related to the public's support and acceptance of these policies. Past research has shown that policy support can be predicted by several psychosocial factors, including attitudes towards the policies, demographic characteristics, exposure to and annoyance from ETS, and beliefs about the hazards of passive smoking<sup>2-3</sup>. Also, several studies have shown that smokers are likely to accept, adjust, and comply with smoke-free policies in various settings, such as public places and the workplace<sup>3-5</sup>. Nevertheless, most of this research tends to be derived from countries with a long history in tobacco control and anti-smoking campaigns and where smoking is gradually becoming de-normalized (e.g., USA and Australia), thus making it hard to generalize the findings to countries with comparably weaker efforts to control the prevalence of tobacco use.

Greece presents a long history in tobacco cultivation and production, and is currently listed among the countries with the highest per capita consumption of tobacco products in the world. Around 40% of Greek adults are regular smokers, and more people initiate tobacco use each year.<sup>6-7</sup> Also, compared to other Europeans, Greeks are more likely to smoke in the presence of non-smokers and children,<sup>8-9</sup> and believe that smoking restrictions are against

free will and personal freedom.<sup>10</sup> In terms of tobacco control, an international report showed that Greece has actually moved backwards during the last two years by being ranked 28<sup>th</sup> among the 30 countries participating in the study.<sup>11</sup> Fiore et al.<sup>12</sup> examined the smoking habits of college students in 23 countries and found that Greeks had the highest smoking rates – 44% reported being regular smokers.

Tobacco use in Greece is extensive and thus presents an urgent problem, and very few studies have examined the support for tobacco control policies. It is important to explore Greek smokers' reported compliance with existing restrictions, and identify potential predictors of non-compliance behaviour – especially in light of evidence showing that Greeks largely disrespect smoking restrictions.<sup>9</sup>

The aim of the present study was to evaluate the relative contribution tobacco dependence, attitudinal, and normative beliefs on compliance with smoking restrictions among Greek student smokers. Specifically, given the strong pro-smoking climate in the country, it was expected that normative beliefs will retain a significant predictive effect, over and above the effects of non-normative variables. A further aim was to examine differences in attitudes to smoking bans and tobacco control policies between current smokers and non-smokers.

## **METHODS**

### **Participants and Procedure**

Participants were Greek undergraduate students attending university in northern Greece. Following Ethics Committee approval, 250 questionnaires were administered in classrooms during regular teaching hours, of which 229 were returned, yielding a high response rate (91.6%). Of these, nine were completed unsatisfactorily leaving 220 (88.0%) suitable for analysis. Participants' age ranged from 18 to 32 years ( $M = 21.27$ ,  $SD = 3.15$ ), and 43% were females ( $n = 95$ ).

## Measures

The questionnaire included measures relevant to smoking behaviour, outcome expectancy and normative beliefs, and supportiveness of smoking restrictions. The majority of items employed were adopted from the survey used in the International Tobacco Control (ITC) Policy Evaluation Project. The ITC project is an international collaboration of tobacco control researchers studying the impact of FCTC-related policies on psychosocial and behavioural outcomes in smokers. While initially focusing on the impact of policies in four countries (Australia, Canada, UK, and USA), the ITC has expanded considerably worldwide, to include data samples from other regions.<sup>13</sup>

### Smoking behaviour

The question “have you ever smoked” was used to assess *smoking status*. Responses were coded as never smokers, current non-smokers (have smoked a puff to fewer than five lifetime cigarettes, or no longer smoking), or current smokers (> 1 cigarette per week).

*Age of smoking onset* was measured with a single open-ended question: “How old were you when you first tried smoking, even if it were only a few puffs?” A single-item ordinal measure of *second time smoking* was also included, and response options ranged from 1 = the same day to 7 = never again. Higher scores in this measure indicated a longer interval between first and second use of cigarettes. *Frequency of subjective feelings of craving* was measured with a single item, and responses were recorded on a four-point scale (1 = never to 4 = very often). Higher scores on this measure corresponded with higher frequency of craving symptoms.

*First cigarette of the day* was measured with a single item asking participants to report the average time that elapses prior to their first cigarette after waking up. Responses were recorded on a four-point scale (from 1 = within five minutes to 4 = later than an hour). This measure, together with number of cigarettes smoked a day (indicated by the respective

measure on smoking status), made up the Heaviness of Smoking Index (HSI), a short form of Fagerstrom's tolerance questionnaire that is commonly used as an objective measure of tobacco dependence.<sup>14-16</sup> The HSI score can range from 0 to 6 and is calculated by summing the number of cigarettes smoked a day and the time to first cigarette after waking up. Specifically, less than 10 cigarettes a day correspond to a score of zero, whereas increasing number of cigarettes smoked a day correspond to a higher score (the highest being 3 points for more than 31 cigarettes smoked daily). Accordingly, time to first cigarette responses were coded from 0 = later than an hour to 3 = within five minutes. Higher HSI scores reflect greater tobacco use dependence. Specifically, HSI scores less than 2 indicate low dependence, scores between 2 and 4 medium dependence, and HSI scores greater than 4 indicate heavy dependence on smoking.<sup>14-16</sup>

#### Outcome expectancy beliefs and anticipated regret

*Health risk beliefs* were assessed with a three-item continuous scale, where respondents were asked to indicate the likelihood of tobacco-related health risk. One item reflected perceived health risk from one's own smoking, whereas the remaining two items were concerned with the health harm from passive smoking. Responses ranged from 1 = very unlikely to 4 = very likely. Higher scores corresponded to perceiving greater health-risk from tobacco use.

*Attitudes to smoking* were measured with a five-item interval scale. Each item described a specific outcome (e.g., smoking helps people deal better with hard times). Responses ranged from 1 = strongly disagree to 4 = strongly agree. Higher scores on this scale indicated more favourable views of smoking outcomes.

*Accessibility of negative smoking-related beliefs* was measured with five items. Each item described a smoking-related belief or outcome (e.g., harmful consequences of smoking to health, and money spent for the purchase of tobacco products), and respondents reported

how often they thought about each belief during the past 30 days. Responses were scored on five-point Likert scale from 1 = never to 5 = very often. Higher scores on this scale indicated higher frequency of thinking about the negative consequences of smoking.

Anticipated regret from smoking-related health harm was assessed with the mean of three items '*would you regret it if... you seriously damaged your own health through being a smoker; you seriously damaged someone else's health through being a smoker; smoke from other people's cigarettes seriously damaged your own health*'. Responses were recorded on a four-point scale ranging from 1 = definitely yes to 4 = definitely no. Higher scores reflected less anticipated regret.

### Normative beliefs

*Perceived approval of smoking (subjective norms)* was measured with the question: "what do these people think about you smoking?" Response options included mother or stepmother, father or stepfather, siblings, best friend and boyfriend or girlfriend, and were coded on a 3-point scale (1 = they believe I should smoke, 2 = they don't care whether I smoke or not, 3 = they believe I should not smoke). Higher scores reflected stronger perceived disapproval of smoking by important others. A separate response option "I don't have one or I do not have contact" was included for participants not having contact with the persons listed above. These responses were coded as missing values in subsequent statistical analyses.

*Perceived prevalence of smoking* in fellow students was measured with an open-ended question where students had to fill in their own estimate (out of 100%) of smokers (smoking at least one cigarette a day). Higher scores reflected greater perceived prevalence of smoking.

*Observed smoking in public places* was assessed by asking participants to rate how often they saw people smoking in each of four types of venues (cafeterias, bars/clubs, restaurants/taverns, and internet gaming stations) on a four-point scale (1 = never/almost

never, 2 = sometimes, 3 = often, 4 = always/almost always). If participants did not visit any of these public places, they were instructed to leave the respective item blank, in which case the responses were treated as missing values in subsequent statistical analyses.

*Observed compliance in public places* was measured by asking students to report whether they have ever seen someone being told off for smoking in a smoke-free area or sector in different public places. Responses were dichotomous with 1 = yes and 2 = no.

#### Supportiveness of smoking restrictions and tobacco control policies

*Attitudes to smoking bans* were measured with a 9-item four-point continuous scale. A stem proposition “smoking should be banned in...” was used, and each item corresponded to a different setting: all workplaces, schools, restaurants, train and bus stations. Responses ranged from 1 = strongly disagree to 4 = strongly agree. Higher scores on this scale indicated greater support for smoking bans in the respective settings.

*Attitudes to tobacco control policies* were measured with four items. Each item corresponded to a different policy issue (e.g., “the dangers of passive smoking should become known to the public” or “all cigarette advertisements should be banned”). Responses were scored on a four-point continuous scale ranging from 1 = strongly disagree to 4 = strongly agree. Higher scores indicated more favourable views towards anti-smoking policies.

*Compliance with smoking restrictions* was measured with a single item, which asked respondents to indicate whether they had ever smoked in a smoke-free sector in public settings. Responses were recorded on a three-point scale (1 = no, 2 = I don’t care whether I smoke in a smoke-free sector, and 3 = yes). Higher scores reflected personal violation of smoking restrictions. For purposes of subsequent statistical analysis two categories were generated (0 = compliance, 1 = non-compliance). Non-compliance included the responses

indicating policy violation and ignorance to the policy (i.e., don't care about any policy when smoking in public places).

## ANALYSIS

Reliability analysis (Cronbach's  $\alpha$ ) was used to assess the internal consistency of the multi-item measures used in the study. Logistic regression was employed to identify the predictors of non-compliance with smoking restrictions in public places. Finally, Analysis of Variance (ANOVA) was used to examine differences in attitudes towards smoking restriction and tobacco control policies.

## RESULTS

### Descriptive statistics

All the multi-item measures were internally consistent ( $\alpha > .70$ ). Where appropriate, certain items were removed in order to enhance internal consistency reliability scores.

Means, standard deviations, and reliability values are presented in Table 1.

Table 1.

*Means, SDs, and Internal Consistency Scores for the Measures Used in the Study*

	<i>N of items</i>	<i>M</i>	<i>SD</i>	Cronbach's $\alpha$
Smoking behaviour				
Age at initiation	1	14.9	2.69	-
Second time smoking	1	3.58	1.94	-
Frequency of craving feelings	1	2.21	1.06	-
HSI score	1	2.49	1.78	-
Outcome expectancy beliefs				
Health risk beliefs	3	3.31	0.76	0.85
Accessibility of negative beliefs	3 <sup>‡</sup>	2.99	1.16	0.78
Attitudes to smoking	5	1.71	0.53	0.71

Anticipated regret (health-related)	3	1.41	0.59	0.79
Normative beliefs				
Subjective norms	5	2.72	0.33	0.74
Observed smoking in public places	3 <sup>†</sup>	3.85	0.29	0.72
SPE (% fellow students)	1	69.5	19.0	-
Supportiveness of smoking restrictions				
Attitudes to smoking bans	9	2.50	0.63	0.87
Attitudes to tobacco control policies	3 <sup>†</sup>	3.21	0.65	0.70
Compliance with smoking restrictions	1	1.51	0.60	-

*Note.* <sup>†</sup>One item was removed to enhance the internal consistency reliability; <sup>‡</sup>two items were extracted to enhance the internal consistency reliability of the measure; HSI = Heaviness of Smoking Index; SPE = Smoking Prevalence Estimates.

### **Smoking behaviour, reported compliance with smoking restrictions in public places, and perceived prevalence of smoking**

Overall, 57.3% of the respondents were current smokers (see Table 2), and the mean age of smoking onset was 14.9 years ( $SD = 2.69$ ). Sixty four percent of current smokers smoked their second cigarette within 30 days post onset. The average (median score) daily consumption was 20 cigarettes – an average pack of cigarettes – and around half (50.8%) of current smokers reported frequent (often/very often) subjective feelings of cravings. The scores on the measure of tobacco dependence indicated moderate dependence on smoking (mean HSI = 2.49,  $SD = 1.78$ ). More than half (54.8%) of current smokers reported they had violated public smoking restrictions by having smoked in a smoke-free sector, and 4.8% reported that they don't care whether they smoke in a smoke-free sector. Finally, a one sample t-test analysis was conducted to compare the reported rates of current smoking status against the perceived prevalence of smoking. The results indicated that current smokers

significantly overestimated the prevalence of smoking among their fellow students ( $M = 68.63\%$ ;  $SD = 19.32$ ,  $t(124) = 6.55$ ,  $p < .001$ , *Cohen's d* = 0.58).

Table 2.

<i>Prevalence of Smoking (N = 220)</i>	<i>(%)</i>
Never smokers	17.3
Current non-smokers	
Only one puff	2.7
Only a few puffs	6.8
Smoked a few times but less than five cigarettes ever	6.8
Used to smoke but have given up	9.1
Current smokers	
Currently smoking at least one cigarette a week	5.9
Currently smoking at least one cigarette a day	1.9
Currently smoking >1 cigarette a day	49.5

### **Non-compliance with smoking restrictions**

A hierarchical logistic regression analysis was performed to identify the predictors of current smokers' non-compliance with smoking restrictions in public places. Predictors included normative beliefs (subjective norms, smoking prevalence estimates, and observed smoking in public places); tobacco dependence as measured by the HSI score; outcome expectancy (accessibility of negative beliefs, attitudes to smoking, health risk perceptions, and health-related anticipated regret); and supportiveness of smoking restrictions (attitudes towards smoking bans and tobacco control policies). The analyses was completed at three steps, and the model at the final step had good fit to the data (Omnibus  $\chi^2 = 32.1$ ,  $df = 11$ ,  $p < .001$ ; Hosmer and Lemeshow  $\chi^2 = 8.22$ ,  $df = 8$ ,  $p > .05$ ), predicting 39.3% of the variance

(Nagelkerke  $R^2$ ) in non-compliance behaviour (91.8% correct classification of non-compliers). Smokers were more likely to have smoked in a smoke-free sector when they had a higher HSI score, anticipated less regret from tobacco-related health risk, perceived greater prevalence of smoking among their peers, and more approval of their smoking behaviour by their family and close friends. Significant predictors of non-compliance at each step of the logistic regression analysis are presented in Table 3.

### **Perceived health risk and anticipated regret from smoking**

In light of the strong predictive effect of anticipated regret, paired samples t-tests were conducted in order to compare participants' responses to items reflecting harm to the self, and items reflecting harm to other people. The findings showed that significantly more regret was anticipated from harming oneself through being a smoker as compared to harming others through the smoke of one's own cigarettes ( $t(209) = -4.29, p = .001, \eta^2 = 0.08$ ), and through being harmed from the smoke of other people's cigarettes ( $t(209) = -3.16, p = .001, \eta^2 = 0.05$ ). Also, more regret was expected from being harmed from other people's cigarette smoke compared to regret from harming others through one's own smoking ( $t(209) = 2.19, p = .001, \eta^2 = 0.02$ ).

Accordingly, paired samples t-tests were conducted to compare smokers' perceptions of health risk to themselves through smoking and through being exposed to other people's smoke, as well as the risk posed by their own cigarette smoke to other people's health. The findings indicated that smokers perceived their smoking as more dangerous to their health, compared to being exposed to other people's cigarette smoke ( $t(211) = 8.89, p < .001, \eta^2 = 0.27$ ), and compared to the risk posed by their own cigarette smoke to other people's health ( $t(215) = 7.79, p < .001, \eta^2 = 0.22$ ). Also, there were no significant differences ( $p > .05$ ) between risk beliefs about harming oneself through being exposed to other people's smoke, and harming others by exposing them to own cigarette smoke.

### Attitudes to smoking restrictions and tobacco control policies

One-way ANOVA was used to examine differences in attitudes to smoking restrictions and tobacco control policies between current smokers ( $n = 126$ ) and non-smokers ( $n = 94$ ). As expected, current non-smokers reported significantly more positive attitudes to smoking restrictions ( $F(1, 213) = 61.09, p < .001, \eta^2 = 0.22$ ) and to tobacco control policies ( $F(1, 213) = 12.29, p = .001, \eta^2 = 0.05$ ).

Table 3.

#### *Predictors of Non-Compliance with Smoking Restrictions Among Current Smokers ( $n = 121$ )*

	Goodness of fit (Omnibus $\chi^2$ )	Nagelkerke $R^2$	Wald	OR	95% CI
Step 1	8.61*	.119			
SPE (fellow students)			5.19	1.03	1.01-1.05
Step 2	19.3*	.253			
SPE (fellow students)			5.09	1.03	1.01-1.05
HSI			9.42	1.54	1.16-2.02
Step 3	32.1*	.393			
SPE (fellow students)			4.66	1.03	1.00-1.06
Subjective norms			4.50	6.40	1.15-35.5
HSI			6.20	1.49	1.10-2.05
Anticipated regret (health)			6.70	4.82	1.46-15.8

*Note.* \* $p < .001$ ; all ORs were significant at .05 level; CI = confidence interval; HSI = Heaviness of Smoking

Index; SPE = Smoking Prevalence Estimates.

## DISCUSSION

The vast majority of respondents (82.7%) reported having tried smoking at least once in their lifetime, and more than half of them (57.3%) were current smokers. It appears that tobacco use among Greeks represents a behaviour that most people at least experiment with. Similar findings have been reported in previous studies on the smoking habits of Greek university students.<sup>12, 17</sup> Relevant to their profile characteristics, current smokers smoked on average 20 cigarettes a day and the HSI score indicated moderate levels of tobacco dependence, and half of them reported frequent subjective feelings of cravings. Age at initiation was around 14 years, and this confirms previous findings on the age of smoking onset among Greek smokers.<sup>7, 17</sup>

In predicting non-compliance behaviour, the hypothesis of the study was supported, as normative beliefs retained a significant effect over and above the effects of non-normative variables. Specifically, current smokers were more likely to report defiance of existing policies when they anticipated less regret from tobacco-related health harm. Further analysis, however, indicated that regret was higher for health risks to the self, than for risks to others. This suggests that compliance with smoking bans in public places may be motivated more strongly by a concern with being harmed oneself, rather than a concern with harming other people through exposure to passive smoking. Part of the reason for this may have been that current smokers were sceptical of the extent of harm caused by passive smoking. However, this cannot be the whole story. Although current smokers did not see themselves as more at risk from others' smoke than others were from their own smoking, they nonetheless expressed less regret at the thought of harming other people than being harmed by others themselves.

Non-compliance was also more common among smokers with high HSI scores. This finding is in line with previous studies<sup>18, 19</sup> reporting an inverse relationship between higher

nicotine dependence scores and support of smoking restrictions. Future efforts may increase compliance rates among Greek smokers by educating them about the risks of passive smoking and anticipated regret from harming their own health. Awareness should also be raised about harming other people's health, so that smokers become more sensitive over the issue of exposing others to ETS. The present findings also suggest that efforts to enhance compliance with smoking restrictions should be directed especially to smokers with higher dependence on nicotine.

Additionally, non-compliance was partly norm-driven whereas, attitudinal beliefs (e.g., health risk beliefs, and attitudes to smoking restrictions and tobacco control policies) did not have a significant effect. Smokers were more likely to report violation of smoking restrictions when they believed that smoking was more prevalent and socially accepted. This finding is important because it denotes smokers' attitudes to tobacco control policies, may be of lesser importance for future interventions, compared to normative beliefs. For instance, recent trends in norms-based campaigns indicate that desirable behaviours tend to increase when people are informed about the prevalence *and* the social acceptance of the target desirable behaviour.<sup>20</sup> In line with this, the present findings suggest that conveying messages on the true rates of smoking prevalence, which correct the misperception that smokers are the vast majority, and the social unacceptability of smoking at a micro-level (i.e., close friends and family members) might increase Greek smokers' compliance with smoking restrictions more effectively than would interventions targeting health risk and attitudinal beliefs. Therefore, subsequent policies to increase compliance with smoking restrictions in Greece might benefit by incorporating social norms-based campaigns.

Finally, in line with previous studies<sup>19, 21</sup>, students who smoked held significantly more negative attitudes to smoking bans and tobacco control policies as compared to non-smokers. This finding is unsurprising given that current smokers will be directly affected by the

enforcement of smoking restrictions. Therefore, they are less supportive of such restrictions as compared to non-smokers.

Caution is needed, however, in generalizing from this convenience sample to the population at large. Nonetheless, there was a very high response rate among those who were approached, so any bias would not have been due to a self-selection for agreeing to participate. Despite a relatively high rate of participation in higher education in Greece, university students may tend on average to come from somewhat higher socio-economic status families. However, in view of the general relationship between socio-economic status and smoking, any such bias should mean that our findings might even underestimate the prevalence of pro-smoking attitudes and behaviour in the population age-group as a whole. Our interest, though, was not primarily in the absolute rates of smokers, but in the relationships between various attitudinal, normative, and behavioural measures within the sample. There does not seem to be any obvious reason to suppose that these were vulnerable to any selection bias.

## **ACKNOWLEDGEMENTS**

This study was financially supported by a Cancer Research UK grant: C3841/A8924. We are grateful to the students who participated in our study.

## **WHAT THIS PAPER ADDS**

Greece has the highest smoking rates in EU, research on tobacco control and smoking behaviour is scarce, and the existing policies to restrict tobacco use and exposure to ETS are reported to be ineffective. The present study is among the first to provide an insight into the psychological processes underlying non-compliance to existing smoking restrictions in public places – a phenomenon that is unwanted by policy-makers, and seems to be largely

common in the Greek cultural context. The findings have implications for future policy-making at a national level, but, most importantly, provide the ground for future research on compliance with tobacco control policies in other countries where smoking is still regarded as normative and acceptable.

### **Competing interest statement**

The authors of this manuscript have no competing interests to declare.

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