

**Original Article**

## **The Association between Smoking and Health Risk Behaviours among University Students in Greece**

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### **Abstract**

**Background:** Youth smoking is an issue of great importance as it is responsible for premature death and serious related diseases. There are several determinants related to smoking, especially among young people, which should be recognized, as they may vary in different social backgrounds.

**Objectives:** The present paper aims to examine the association between smoking and key determinants, such as self-perceived health status, health risk behaviours and socio-economic factors as well among university students in Greece. Further, our study examines how smoking is affected by an additional variable measuring the applied knowledge of people on health issues, known as “health literacy”.

**Methodology:** The study is based on data derived from a survey which was carried out in 14 Higher Tertiary Public universities and Technological Educational Institutes in Greece receiving a random sample of 1,526 students, during the period 15–30 April 2013. Summary statistics, correlations and regressions were used to assess the association between smoking and estimators.

**Results:** Our results suggested a significantly negative association between smoking and perceived health status (coef; -0.004). Moreover, regular workout was found to be negatively correlated to smoking (coef; -0.168), while, respondents who consume alcohol seem to be related positively with tobacco use (coef; 0,245). With respect to demographic variables, our results demonstrated that lower income groups used to smoke less (coef; - 0.066). In contrast, the effect of health literacy on smoking is not significant. While our results are coherent with previous studies, several findings are worth further research.

**Conclusions:** Acknowledging the major factors associated with smoking can lead to more effective and targeted interventions, which promote healthy behaviour and self-efficacy; both playing a key role in providing the necessary confidence to an adolescent so as not to engage in unhealthy behaviours like smoking.

**Keywords:** Youth smoking; health risk behaviours; health status; health literacy

## Introduction

Smoking is indisputably the most preventable cause of premature death and serious related diseases (Tsalapati et al. 2014; World Health Organization, 2017). A significant body of literature has emerged the youth smoking as an issue of utmost importance worldwide with increasing prevalence rates since the early 1990's (Centers for Disease Control and Prevention, 2002). Investigating the most major factors effecting youth smoking may contribute to the development of more targeted and efficient tobacco control policies in order to curb the tobacco epidemic.

Prompted by this challenging issue, our paper aims to answer the following questions: Is there any relationship between several health factors, such as self-perceived health status, health habits and behaviours on smoking rates in Greece? Is smoking affected by an additional estimator measuring the applied knowledge of people on health issues, known as "health literacy" (Nielsen-Bohlman, Panzer & Kindig, 2004; Health Literacy Score (HLS)-EU Consortium, 2015).

Youth smoking in young population is sufficiently established in tobacco literature. According to the Eurobarometer survey on smoking attitudes of Europeans, nearly 7 out of 10 of smokers and ex-smokers in the European Union (EU) initiated smoking by the age of 18, while only 4% started after turning 25 (European Commission, 2012). The major risk lies on the fact that young people underestimate the addictive nature of tobacco products, while evidence indicates that tobacco experimentation is associated with future smoking (Hodder et. al., 2011). These findings explain why scientific evidence has concluded that tobacco prevention programs should focus on the 12-25 age group (American Lung Association, 2011; U.S. Department of Health and Human Services, 2012).

Tobacco Products Directive 2014/40/EU includes provisions for reduction in smoking rates among young people through regulation of tobacco product design, manufacture and marketing, which are broadly coherent with the principles of the WHO Framework Convention on Tobacco Control. Greece is an EU country that has not been left out of this addictive habit, presenting some of the most detrimental statistics in tobacco

use and prevalence. Recent epidemiological evidence has noted that 39% of Greek men and 26% of Greek women (15+ years old) smoke daily, while 27% of young adolescents (15 – 24 years old) smoke daily or occasionally (ELSTAT, 2014). Therefore, a better understanding of what relates to the consumption of tobacco products is crucial in the policymakers' efforts in order to control it (Alpert et al., 2014; Feliu et al., 2019) and decreases the burden that smoking causes (Harvard School of Public Health, 2011). Indeed, a relevant study (Agaku et al., 2015) in EU countries indicated significant associations between cigarette design, packaging features and other marketing strategies and aspects of initial smoking among younger smokers; a finding that calls for stronger implementation of the EU Tobacco Products Directive.

As regards the effect of health indicators on smoking, tobacco evidence is rather ambiguous. A study of Prokhorov (2003) suggests an optimism bias regarding the self-perceived health status; all of the smokers tended to overestimate their self-reported health status stating that their health was either not at all or only slightly affected by smoking. Further, almost half smokers thought that quitting would bring either no benefit or only minor benefit to their health. In the same lines, Pimenta, Leal & Maroco (2008) point out that ex-smokers perceive themselves as more competent to deal with their health in general than regular smokers.

The impact of physical activity on tobacco use is widely discussed in the relative tobacco literature. Poortinga (2007) shows that physical workout is associated to smoking, underlining, though, the need for further research in order to distinguish between different types of physical activity. Furthermore, a previous study of Blair, Jacobs & Powell (1985) reveal an inverse relationship between smoking and leisure-time activity and a positive relation with occupational physical activity.

Considering the impact of alcohol consumption on smoking, there is sparse and poorly established evidence, especially in Greece. Findings from a recent survey of Lynch et al. (2019) suggest that moderate drinking may be associated with short-term continued smoking and heavy drinking may

be associated with relapse in the short and long term. Similarly, evidence from US indicate a strong association between heavy smoking with ever drinking among current smokers as well as a significant link between smoking cessation and drinking cessation among ever drinkers who also were ever smokers (Leon et al., 2007).

In addition, health literacy is widely considered as an important determinant of health. Although it has been defined in several ways, the proposed definition for the purposes of this study is according to the Health Literacy Score (HLS)-EU Consortium as follows; the degree to which individuals are capable to obtain, process and conceive fundamental health information in order to make decisions about their health and life style (Sorensen et al., 2012). Despite the little evidence on this area, the available literature suggests that health literacy is associated to smoking behaviour, indicating actually that improving the level of health literacy can lead to change people's behaviour in relation to tobacco consumption (Atri et al., 2018). Specifically, a study of Stewart et al. (2013) reveal that lower health literacy is related to higher nicotine dependence, more positive and less negative smoking outcome expectancies as well as with less knowledge about smoking health risks.

In the present study, we analyze primary data derived from a survey, which was carried out using a random sample of 1,526 university students in Greece so as to assess the association between healthy behaviours and smoking incorporating a number of control variables, including demographic and socio-economic determinants, i.e. gender, family status and income. The evidence we provide is straightforward. All health estimators are related to smoking rates, whereas the effect of health literacy is not significant. The remainder of the paper is structured as follows: section 2 introduces the estimation methodology and presents the data; section 3 presents the results, section 4 discusses the findings and section 5 concludes.

## Methodology

This paper is based on primary data derived from a survey which was conducted during the period 15–30 April 2013 in 33 Departments of 14 Higher Tertiary Public universities and Technological Educational Institutes in Greece, located in six

major cities of the country and the results of the first data analysis can be found in the paper of Vozikis, Drivas K. & Milioris (2014). The sample consists of 1,526 students, aged 18–24 years and was chosen in a random way among trained postgraduate students. This paper uses and conducts new analysis of these collected data.

The data of interest was collected through questionnaires, including questions about demographic characteristics, such as age, sex, city of residence, occupational and marital status, income, perceived health status and various health behaviours, such as physical workout and alcohol consumption as well.

The additional variable “health literacy” was measured by a separate questionnaire. The procedure was followed with respect to the principles of personal data protection and security in order to assure the anonymity of the participants. Analyses were performed with Stata V.13.0.

The estimated model is specified as:

$$Y_i = f(\text{Health Status}_i, \text{Male}_i, \text{Income } [ < 1,100 ]_i, \text{Income } [ 1,100-2,000 ]_i, \text{Alcohol}_i, \text{Workout}_i, \text{Health Literacy}_i)$$

where the dependent variable  $Y_i$  is smoking (*Smoking*) and takes the value 1 if the student is a regular smoker and 0 if not. The variable *Health Status* ranges from 0 to 10. *Male* takes the value 1 if the respondent is a male and 0 if they are a female. *Income [ < 1,100 ]* takes the value 1 if the students' family income is less than 1,100 Euros and 0 otherwise. *Income [ 1,100-2,000 ]* takes the value 1 if the students' family income is between 1,100 and 2,200 Euros and 0 otherwise.

There is also a third income variable *Income [ > 2,000 ]* which takes the value 1 if the students' family income is more than 2,200 Euros and 0 otherwise; this variable is excluded to avoid the dummy variable trap. *Alcohol* takes the value 1 if respondents consume alcohol daily or almost daily and 0 otherwise. *Workout* takes the value 1 if a student works out more than once a week and 0 otherwise. Finally, the variable *Health Literacy* is a discrete variable, which ranges from 0 (minimum health literacy grade) to 4 (maximum health literacy grade). Given that the dependent variable is a dummy, we estimate the above model via logit.

## Results

Table 1 presents the summary statistics of the variables which are examined in our regression analysis. According to the table, people who smoke represent on average 38% of all participants. Respondents perceive their current health status at a relatively high level (77,2 out of 100), a not surprising score given that their age varies between 15 and 24 years. As regards the demographic characteristics, our sample concentrates more on the second income group [1100-2200€], although in general there is a uniform distribution between all three categories (around 30%). Our sample is divided almost in half among men and women with a slight dominance of women (55%). As far as health habits are concerned, 63,5% of postgraduates answered that they follow a systematic workout (twice a week), while daily consumers of alcohol represent 22% of our sample. As regards the health literacy grade, the average respondent scored 2,4, indicating a fair to high level of participants.

Table 2 shows the correlations across variables used in our regression analysis with their significance levels. Our results reveal that smoking is correlated strongly with all variables we examine, except for the income criterion. Among all variables, health habits seem to be more strongly related to smoking decision. More specifically, smoking is adversely correlated with working out (-0.204) at the 1% significance level, while there is a notable positive correlation with the alcohol consumption (0.240), which is statistically significant at the same level. Similarly, the health status of participants is negatively associated with the consumption of tobacco products (-0.174). Finally, the level of literacy on health issues is also proved to have a negative, albeit milder, relation to smoking. Regarding income, no statistical correlation is observed.

From the perspective of health status, the picture is different. The sex of the respondents does not appear to be associated with the health status of participants, whereas income seems to play an important role. Students who belong to the lowest income group are related to a lower health status (-0.081). Although middle income has no significant association with health status, respondents of the

highest income are correlated to the highest health status (0.055) at the 1% significance level, indicating that wealthier people are healthier. Moreover, health status has a positive association with working out (0.225) and this is significant at the 1% level. As also anticipated, respondents who consume alcohol regularly present lower levels of health status.

Finally, we tested for multicollinearity through further evaluation of associations across demographic and health habits variables. As presented in Table II, the correlations among three income groups are the highest. This makes sense because these variables are mutually exclusive. Except for income, there is no other strong association among independent variables indicating that our model does not suffer from multicollinearity.

Table 3 presents the results of logit regression analysis displaying how the variables are associated with the dependent variable, smoking; marginal effects are displayed. Column 2 shows the coefficients of independent variables. Health status seems to be significantly associated with smoking at the 1% level (coef; -0.004) and more specifically, students with a highly perceived health status smoke less than students with a lower perceived health status. According to Table III, all health habits are also associated at the 1% significance level. Especially, participants who work out at least once a week appear to avoid smoking more (coef; -0.168) than others who do not work out. In contrast, respondents who consume alcohol have a significantly positive correlation with smoking (coef; 0.245). As far as demographic variables are concerned, gender has insignificant relation to the consumption of tobacco products. In terms of income, though, there is a significant association between lower income groups and smoking. More specifically, a family income of less than 1,100 € is found to be, at the 5% level, significantly associated with smoking in a negative way (coef; -0.066). On the other hand, there is no effect of middle family income on smoking. It should also be noted that the impact of health literacy on smoking is not significant as well.

**Table I Summary statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Smoking	1.526	0.3761	0.4845	0	1
Health Status	1.526	77.2097	15.0409	15	100
Male	1.526	0.4567	0.4982	0	1
FamIncome[<1100]	1.526	0.2988	0.4578	0	1
FamIncome[1100-2200]	1.526	0.3597	0.48	0	1
FamIncome[>2200]	1.526	0.3414	0.4743	0	1
Workout	1.526	0.6349	0.4815	0	1
Alcohol	1.526	0.2162	0.4118	0	1
Health Literacy	1.526	2.3591	1.2994	0	4

Smoking factors study among university students, Greece, 2013.

**Table II Correlations across variables of interest.**

	Smoking	Health Status	Male	FamIncome [ [<1000]	FamIncome [1100-2200]	FamIncome me [ [>2200]	Workout	Alcohol	Health Literacy
Smoking	1								
Health Status	-0.174***	1							
Male	0.067***	0.005	1						
FamIncome [ [<1100]	-0.013	-0.081***	-0.058**	1					
FamIncome [1100-2200]	-0.027	0.023	-0.030	-0.489***	1				
FamIncome [ [>2200]	0.040	0.055**	0.086***	-0.470***	-0.540***	1			
Workout	-0.204***	0.225***	0.042	-0.040	-0.007	0.046*	1		
Alcohol	0.240***	-0.104***	0.154***	0.036	-0.042*	0.008	-0.098***	1	
Health Literacy	-0.046*	0.059**	-0.064**	-0.016	-0.058**	0.074* **	0.098***	-0.046*	1

Smoking factors study among university students, Greece, 2013. **Note:** Three stars (\*\*\*) indicate statistical significance at 1% level, two stars (\*\*) at 5% level, and one star (\*) at 10% level.



**Table 3: Factors associated with smoking through regression analysis.**

	dy/dx	Delta-method Std. Err.	z	95% Confidence Intervals
Health Status	- 0.004***	0.009	- 4.63	(-0.006 ; -0.002)
Male	0.039	0.027	1.50	(-0.012 ; 0.092)
FamIncome[<1100]	- 0.066**	0.033	- 2.01	(-0.131 ; -0.016)
FamIncome[1100-2200]	- 0.048	0.032	- 1.52	(-0.110 ; 0.014)
Workout	- 0.168***	0.027	- 6.15	(-0.222 ; -0.114)
Alcohol	0.245***	0.032	7.78	(0.183 ; 0.307)
Health Literacy	- 0.006	0.099	- 0.65	(-0.026 ; 0.013)

Smoking factors study among university students, Greece, 2013.

**Note:** Three stars (\*\*\*) indicate statistical significance at 1% level and two stars (\*\*) at 5% level.

### Discussion

This paper presents an analysis of data collected from a survey using a random sample of 1,526 university students in Greece, aged 18–24 years, in order to examine the effects of health behaviours and socio-economic factors on smoking rates in Greece.

To sum up, smoking prevalence of the sample is 38% and perceived health status is at a high level, as was expected since the respondents are very young. Among the variables we examined, smoking was found to be significantly associated with health status, lower family income and concerning health habits, smoking is correlated to systematic physical workout and the alcohol consumption as well. On the other hand, there was no significant correlation between smoking and health literacy.

While the results of the study are in line with previous work in this area, it is worth mentioning several findings. Our paper showed an inverse relationship between income and smoking prevalence, a finding which is not clearly demonstrated in the prevailing tobacco literature (Leinsalu, Kaposvári & Kunst, 2011; Farmer & Hanratty, 2012). Indeed, a study of Hosseinpoor et al. (2012) shows that smoking was disproportionately prevalent in poorer males in the

vast majority of countries. In many cases they were found to be more than 2.5 times more likely to be smokers than the richer men. On the other hand, a conflicting finding was suggested by Nikolaou's study (2009) advocating a positive relation between income and smoking, i.e. smoking is more frequent among higher income groups, in females but not in males in Italy, Spain, Portugal and Greece.

Recognizing the characteristics of smokers is an important tool for policymakers in designing well-targeted anti-smoking programs and consequently in assessing the effect of these prevention policies (Jha & Chaloupka, 2000; Joossens & Raw, 2011; 2014; 2017; World Health Organization, 2017). A relevant paper of Bosdriesz et al., (2016) found that smoking cessation mostly among higher socioeconomic groups is associated to tobacco-control policies, which include smoking restrictions in public places or public information campaigns. Similarly, recent evidence in Greece showed a statistically significant impact of antismoking campaigns on cigarette consumption (Tarantilis et al., 2015). The same study showed that cigarettes in Greece are regarded as a luxury good. This can be used as a great opportunity for decision makers to empower anti-smoking efforts in order to counter smoking, given that the implementation and effectiveness of tobacco

control policies in Greece are still at low levels (Economou et al., 2017; Feliu et al., 2019).

To conclude, some limitations need to be acknowledged. First, the variable describing the employment status of respondents was excluded from our analysis, as it might lead to biased results because of our sample composition. Second, our sample may not completely reflect the characteristics of university students in Greece as a whole, even though it comes from many universities of different geographical areas of the country.

### Conclusion

Given that smoking prevalence among college students has been poorly explored, the contribution of our paper lies on the research data provided. Although there is rich tobacco literature regarding the effects of socio-economic factors on the consumption of tobacco products, there is a need for further research of this issue in more focused age-groups throughout a country. This knowledge can lead to more effective programs and interventions, which promote healthy behaviour and self-efficacy; both playing a key role in providing the necessary confidence to an adolescent so as not to engage in unhealthy behaviours like smoking.

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