


# BMJ Open Prevalence and determinants of current cigarette smoking and secondhand smoking among Greek adolescents: the Global Youth Tobacco Survey (GYTS) 2013 study

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## ABSTRACT

**Objectives** Smoking prevalence in Greece is considered high within the European Union and the collection of evidence on tobacco use among adolescents is of vital importance in order to develop effective smoking prevention and cessation programmes.

**Design** Cross-sectional.

**Setting** Greece.

**Primary and secondary outcome measures** Global Youth Tobacco Survey (GYTS) is a national representative, paper-and-pencil, cross-sectional, school-based study of students at ages 13–15 years. The survey employed a multistage cluster sample design with schools selected proportional to enrolment size. Finally, 4618/5127 students aged 13–15 years participated in the survey. The school response rate was 98.1%, the student response rate was 90.1% and the overall response rate was 88.4%.

**Results** The prevalence of current cigarette smoking was estimated at 10.1% (10.4% in GYTS 2005) and of exposure to secondhand smoking in public places at 67.4% (94.1% in GYTS 2005). The vast majority of the adolescents (82.1%) supported the banning of smoking inside enclosed public places. Most of the current smokers (90.8%) were not prevented/refused purchase because of their age according to existing law. Multivariate analysis showed that peer influence (OR=48.32; 95% CI 36.2 to 64.48), pocket money (OR=2.63; 95% CI 1.28 to 3.41), increasing age (OR=2.35; 95% CI 1.63 to 3.39) and low educational level of father (OR=2.82; 95% CI 1.7 to 4.68) were risk factors independently associated with current cigarette smoking.

**Conclusions** Despite the existence of strict laws related to tobacco control, exposure to secondhand smoking among Greek students remained high even when compared with GYTS in 2005. This is likely a result of weak enforcement, what is really missing is the enforcement of the related legislation.

## INTRODUCTION

Tobacco cigarette smoking is the dominant form of tobacco use and a major preventable

## Strengths and limitations of this study

- Nationwide, representative sample of Greek student population aged 13–15 years old.
- Standardised methodology to ensure comparability across countries.
- The questionnaires were collected through interviews resulting in satisfactory response rate.
- The main limitation of the study is related to the self-reported nature of the information collected.

hazard to human health. The WHO reported that more than 8 million deaths per year are attributed to tobacco smoking.<sup>1</sup> It is well known that the vast majority of current adult smokers initiated smoking before the age of 18 years.<sup>2</sup> In this context, cigarette smoking—the most prevalent form of tobacco use—has been described as a ‘pediatric epidemic’.<sup>3</sup> In addition, early initiation of smoking is associated with increased likelihood of chronic health conditions.<sup>4</sup> In May 2003, the WHO adopted the Framework Convention on Tobacco Control (FCTC). The Global Tobacco Surveillance System (GTSS) was established in 1998 in order to establish tobacco control surveillance and monitoring programmes.<sup>5</sup> Global Youth Tobacco Survey (GYTS) is a component of GTSS, and was developed in order to provide an international protocol for standardised monitoring and surveillance of tobacco use among adolescents. The GYTS is a joint project between WHO, US Centers for Disease Control and Prevention (CDC) and the Canadian Public Health Association. The first wave of GYTS was conducted in 140 countries and recently, the CDC analysed GYTS data from the second wave of GYTS with 61 participating countries

**Table 1** Point prevalence of selected variables in 2005 and 2013 (Global Youth Tobacco Survey, Greece)

Variable	2013	2005
	% (95% CI)	% (95% CI)
Current use of any tobacco product	16.0 (13.9 to 18.3)	16.2 (14.3 to 18.4)
Current cigarette smokers	10.1 (8.3 to 12.2)	10.4 (8.8 to 12.4)
Exposure to secondhand smoke		
At home	70.0 (67.7 to 72.2)	89.8 (88.3 to 91.1)
In public places	67.4 (65.2 to 69.6)	94.1 (93.2 to 94.9)
In favour of banning smoking inside enclosed public places	82.1 (79.7 to 84.2)	84.8 (82.7 to 86.6)
Percentage of current cigarette smokers who bought cigarettes and were not prevented/refused purchase because of their age*	90.8 (85.2 to 94.4)	95.0 (89.5 to 97.7)

\*From a store, shop, and so on.

across the six WHO regions for the period 2012–2015.<sup>6–8</sup> Greece is a major tobacco-producing country within the European Union and the collection of evidence on tobacco use among adolescents is of vital importance in order to develop effective smoking prevention and cessation programmes.<sup>9</sup> The first GYTS in Greece has been conducted in 2005. The results of this study showed that the prevalence of current tobacco use was 16.2% while the prevalence of exposure to secondhand smoke (SHS) varied from 88% at home to 93.4% in public places.<sup>10</sup> In addition, further analysis indicated that current and secondhand smoking were influenced by several variables related to individual/social context.<sup>11 12</sup> The aim of the present study which uses data from the 2013 Greece GYTS was to report on the prevalence and determinants of current and secondhand smoking among Greek adolescents and compare the results of the present study to those of the first GYTS study conducted in 2005. Lastly, we examined the level of exposure to secondhand smoking and sales of tobacco products to minors in relation to the articles 8 and 16 of FCTC.<sup>13</sup>

## METHODS

GYTS is a national representative, paper-and-pencil, cross-sectional, school-based study of students at ages 13–15 years. The study is based on a standardised methodology that facilitates cross-country comparisons. GYTS 2013 has been implemented by the National School of Public Health and the Department of Hygiene and Epidemiology, Medical Faculty, School of Health Sciences of the University of Thessaly.

## Questionnaire

The questionnaire used included the following sections: use of tobacco products, exposure to SHS, smoking cessation, advertisements in the media for and against smoking, availability and access to tobacco products and knowledge of the harmful effects of tobacco use. Current tobacco smoking was defined as answering  $\geq 1$  day to the question: ‘During the past 30 days, on how many days did you smoke cigarettes?’ We used three questions to assess secondhand exposure at home: (1) ‘During the past 7 days, on how many days of those has anyone smoked inside your home, in your presence?’ (2) ‘How often do you see your father (stepfather or mother’s partner) smoking in your home?’ (3) ‘How often do you see your mother (stepmother or father’s partner) smoking in your home?’ Participants who gave positive responses to at least one of the questions mentioned above were considered to have been exposed to SHS at home. We also used one question to assess secondhand exposure in public enclosed places: ‘During the past 7 days, on how many days has anyone smoked in your presence, inside any enclosed public place, other than your home (school, shops, restaurants, shopping malls, movie theaters)?’ Those who responded ‘0 days’ were considered to have not been exposed to SHS in public places. Participants who responded ‘1–7 days’ were considered to have been exposed to SHS in public places.

## Sampling

The survey employed a multistage (geographical) cluster sample design with schools selected proportional to enrolment size. The sampling technique included two geographical strata: the Attica region and the rest of Greece. The primary sampling units were 30 high schools from each stratum. The selection of classes within the schools was based on a simple random sampling method. The final sampling units consisted of all students in the selected classes. All students in the selected classes attending school on the day of the survey were eligible to participate in the study. Parents were notified by a letter and students gave verbal consent to participate in the study.

## Statistical analysis

A weighting factor was used in the analysis to reflect the likelihood of sampling each student and to reduce bias by compensating for differing patterns of non-response. The weight used for estimation is given by the following formula:

$$W = W1 * W2 * f1 * f2 * f3 * f4$$

where W1 is the inverse of the probability of selecting the school; W2 is the inverse of the probability of selecting the classroom within the school; f1 is a school-level non-response adjustment factor calculated by school size category (small, medium, large); f2 is a class-level non-response adjustment factor calculated for each school; f3 is a student-level non-response adjustment factor calculated by class; and f4 is a poststratification adjustment

**Table 2** Univariate analysis of current cigarette smoking, GYTS Greece 2013

Variable	Current cigarette smoking				
	Absolute numbers	Weighted percentage	RR	95% CI	P value*
Total	412/3988	10.1			
Gender					
Male	208/2005	10.3	1.04	0.90 to 1.21	0.544*
Female	204/1981	9.9	Ref		
Age group (years)					
15	196/1126	16.9	NA	NA	<0.001†
14	147/1368	10.5			
13	69/1494	4.7			
Father's education					
University or above	98/1322	7.3	NA	NA	<0.001†
Lyceum	148/1378	10.5			
High school	76/604	11.8			
Elementary or less	55/349	15.1			
Mother education					
University or above	124/1544	7.9	NA	NA	0.007†
Lyceum	161/1446	10.7			
High school	69/515	12.6			
Elementary or less	32/240	13.5			
Residence					
Athens	201/1773	11.1	1.19	0.99 to 1.73	0.354
Rest of country (ROC)	211/2215	9.6	Ref		
Pocket money					
€25+	47/205	22.7	3.65	2.6 to 5.0	<0.001†
€15–€24	99/598	15.4	2.6	1.9 to 3.4	
€5–€14	187/1915	9.3	1.5	1.2 to 2.0	
<€5	79/1258	6.6	Ref	NA	
See parents smoking at home					
Both parents	158/1025	14.9	NA	NA	<0.001*
Father	87/837	10.1			
Mother	58/563	10.1			
None	104/1381	7.6			
Accept a tobacco product offered by a best friend					
Yes	303/477	62.8	20.29	16.09 to 25.57	<0.001*
No	104/3472	3.1	Ref		

\*Pearson's  $\chi^2$  test.

† $\chi^2$  test for trend.

GYTS, Global Youth Tobacco Survey; NA, not applicable; RR, relative risk.

factor calculated by grade. In univariate analysis, Pearson's  $\chi^2$  test was used to analyse associations between sociodemographic factors and current and secondhand smoking. Relative risk with their corresponding 95% CIs was also calculated.  $\chi^2$  test for trend was used to determine whether the proportion of current smoking differed significantly across age, parents' education and

pocket money subgroups. In multivariate analysis, logistic regression analysis was employed to identify independent risk factors for the current and secondhand smoking. ORs and 95% CI were calculated. P values were considered statistically significant if  $p < 0.05$ . All analyses were performed using the complex sample module of SPSS V.19.0.

**Table 3** Multivariate analysis of current cigarette smoking, GYTS Greece 2013

Variable	Current cigarette smoking		
	OR	95% CI	P value
<b>Gender</b>			
Male	1.25	0.96 to 1.62	0.089
Female	Ref		
<b>Age group (years)</b>			
15	2.35	1.63 to 3.39	<0.001
14	1.73	1.20 to 2.48	0.004
13	Ref		
<b>Father's education</b>			
University or above	Ref		
Lyceum	1.45	1.03 to 2.05	0.034
High school	1.56	0.97 to 2.52	0.068
Elementary or less	2.82	1.7 to 4.68	<0.001
<b>Pocket money</b>			
€25+	2.63	1.28 to 5.41	0.010
€15–€24	1.84	1.18 to 2.86	0.009
€5–€14	1.54	0.94 to 2.50	0.082
<€5	Ref		
<b>Accept a tobacco product offered by a best friend</b>			
Yes	48.32	36.22 to 64.48	<0.001
No	Ref		

GYTS, Global Youth Tobacco Survey.

### Patient and public involvement

No patient and public were involved in this study.

### RESULTS

Finally, 4618/5127 students aged 13–15 years participated in the survey. The school response rate was 98.1%, the student response rate was 90.1% and the overall response rate was 88.4%.

Table 1 presents the evolution of the prevalence of a set of smoking-related variables in 2005 (first GYTS in Greece) and 2013 (second GYTS in Greece). The prevalence of current cigarette smoking was 10.1% compared with 10.4% in 2005. With respect to secondhand smoking at home the environmental tobacco smoke (ETS) exposure was reduced from 89.8% in 2005 to 56.7% in 2013. The prevalence of exposure to secondhand smoking in public places decreased from 94.1% in 2005 to 67.4% in 2013. With respect to the intensity of exposure to SHS in enclosed public places, 27.1% of the participants reported exposure to SHS for 1–2 days per week, 15% for 3–4 days/week, 7.3% for 5–6 days per week and 17.9% for 7 days per week. The vast majority of the adolescents supported the banning of smoking inside enclosed public places (84.8% in 2005 vs 82.1% in 2013). The percentage of current cigarette smokers who bought cigarettes and

were not prevented/refused purchase because of their age decreased from 95% in 2005 to 90.8% in 2013.

The results of the univariate analysis of current cigarette smoking appear in table 2. These results suggest a dose–response relationship between pocket money and current cigarette smoking. Multivariate analysis (table 3) showed that peer influence (OR=48.32; 95% CI 36.22 to 64.48), pocket money (OR=2.63; 95% CI 1.28 to 5.41), increasing age (OR=2.35; 95% CI 1.63 to 3.39) and low educational level of father (OR=2.82; 95% CI 1.70 to 4.68) for elementary or less compared with the university were risk factors independently associated with current cigarette smoking. Table 4 reports the results of univariate analysis of second-hand smoking exposure. Multivariate analysis indicated that female gender (OR=1.00 compared with 0.60 for males; 95% CI 0.51 to 0.71), increasing age (OR=1.78; 95% CI 1.44 to 2.19), pocket money (€15–€24 per week compared with <€5 per week; OR=2.36; 95% CI 1.78 to 3.12), parental (both parents) smoking at home (OR=2.86; 95% CI 2.28 to 3.58) and peer influence (OR=1.85; 95% CI 1.26 to 2.71) were independently associated with the likelihood of exposure to SHS (table 5).

### DISCUSSION

The results from the second wave of GYTS study in Greece raise several major points over the state of tobacco control among Greek adolescents aged 13–15 years. The prevalence of current cigarette smoking among adolescents was estimated at 10.1 in 2013% compared with 10.4% in 2005. A comparison of GYTS national prevalence survey results within the European Region of WHO indicates that Greece recorded lower current smoking prevalence compared with Italy (23.4%), Latvia (16.8%) and Lithuania (19.4%) but higher than Romania (9.4%), Moldova (7.2%) and Montenegro (6.9%).<sup>7</sup> With respect to current smoking determinants the Greece 2013 GYTS showed that peer influence, higher amount of pocket money, father's level of education and increasing age were independent determinants of current cigarette smoking. The strongest determinant of current smoking was peer influence. This finding is in line with previous research.<sup>11</sup> In particular, individuals tend to socially compare their own self-image with their prototype of the 'ideal' person (eg, close friend, parent) engaging in various hazardous behaviours.<sup>14</sup> Nevertheless, we would like to note that it is methodologically challenging to separate the impact of peer influence from selection effects given that students choose friends who have smoking behaviours similar to their own.

Availability of pocket money proved also to be a strong risk factor independently associated with the likelihood of current smoking. This finding is consistent with previous GYTS results from Cyprus<sup>15</sup> and Greece<sup>11</sup> and has important public health implications. In particular, parents who hand over pocket money to adolescents should take into consideration how that pocket money is used. Furthermore, the role of pocket money as a risk factor for current smoking should be considered in

**Table 4** Univariate analysis of secondhand smoking, GYTS Greece 2013

	Secondhand smoke in enclosed public places in the past 7 days				
	Absolute numbers	Weighted percentage	RR	95% CI	P value*
Total	2164/3333	64.6			
Gender					
Male	981/1644	59.3	0.85	0.80 to 0.90	<0.001
Female	1182/1687	69.9	Ref		
Age group (years)					
15	628/849	73.3	NA	NA	<0.001†
14	741/1129	65.8			
13	795/1355	58.2			
Father's education					
University or above	765/1155	66.5	NA	NA	0.137†
Lyceum	756/1135	66.1			
High school	312/496	62.2			
Elementary or less	164/273	59.2			
Mother's education					
University or above	899/1320	68.0	NA	NA	0.013†
Lyceum	788/1211	64.6			
High school	253/407	62.0			
Elementary or less	113/190	58.3			
Residence					
Athens—Attica	940/1437	65.3	1.02	0.94 to 1.10	0.662
Rest of country (ROC)	1224/1896	64.2	Ref		
Pocket money					
€25+	95/137	69.5	NA	NA	<0.001†
€15–€24	350/460	74.8			
€5–€14	1125/1615	69.6			
<€5	591/1111	52.1			
See parents smoking in the home					
Both parents	590/794	75.0	NA	NA	<0.001
Father	493/700	70.2			
Mother	363/476	76.5			
None	632/1205	51.0			
Banning smoking in public places					
Yes	1882/2868	65.1	1.05	0.98 to 1.12	0.122
No	270/439	61.9	Ref		
Accept a tobacco product offered by a best friend					
Yes	124/156	80.2	1.26	1.16 to 1.36	<0.001
No	2025/3150	63.9	Ref		

\* $\chi^2$  test for trend.

†Pearson's  $\chi^2$  test.

GYTS, Global Youth Tobacco Survey; NA, not applicable; RR, relative risk.

conjunction with adolescents' easy access to cigarettes in spite of existing law prohibiting the sale of cigarettes to minors. Greater enforcement of laws banning the retail sale of tobacco products to minors in other countries

such as the USA has yielded higher rates of adolescents reporting retailer refusals than observed among respondents here. Enforcement efforts that have worked elsewhere and may work in Greece include licensing tobacco



**Table 5** Multivariate analysis of secondhand smoking, GYTS Greece 2013

	Exposure to secondhand smoke in enclosed public places in the past 7 days		
	OR	95% CI	P value
<b>Gender</b>			
Male	0.60	0.51 to 0.71	<0.001
Female	Ref		
<b>Age (years)</b>			
15	1.78	1.44 to 2.19	<0.001
14	1.36	1.12 to 1.66	0.004
13	Ref		
<b>Pocket money</b>			
€25+	1.98	1.03 to 3.82	0.041
€15–€24	2.36	1.78 to 3.12	<0.001
€5–€14	1.93	1.58 to 2.36	<0.001
<€5	Ref		
<b>See parents smoking in the home</b>			
Both parents	2.86	2.28 to 3.58	<0.001
Father	2.33	1.77 to 3.08	<0.001
Mother	3.08	2.29 to 4.15	<0.001
None	Ref		
<b>Accept a tobacco product offered by a best friend</b>			
Yes	1.85	1.26 to 2.71	0.003
No	Ref		

GYTS, Global Youth Tobacco Survey.

retailers and cancelling their licence if undercover inspections reveal violations. An additional deterrent found effective in many countries would be the imposition of excise taxes on cigarettes. Given the evidence that substantial weekly pocket money facilitates tobacco use among youth, increasing the cost of cigarettes by imposing an excise tax on cigarettes would discourage their tobacco use. In addition, increased monitoring of sales outlets should be considered. We found no gender difference with regard to current smoking. This finding may reflect changes in the gender-related prevalence of current smoking during the period 2005–2013. Indeed, the prevalence of current smoking among females has been increased from 9% in 2005 to 9.9% in 2013. In addition the prevalence of current smoking among males has been decreased from 11.3% in 2005 to 10.3 in 2013. In contrast, we found that males were less likely to be exposed to ETS in enclosed public places compared with females. This result was in line with our previous findings from 2005.<sup>12</sup>

The exposure of Greek students to SHS remains extremely high and this is the case for both home (56.7%) and enclosed public places (67.4%). We have also noted a high intensity of exposure to SHS in public places. In particular, 40.3% of the adolescents reported exposure

to SHS 3–7 days per week. Especially for enclosed public places it is of note that we found a considerable decrease in exposure to SHS in comparison to the results of the first wave of GYTS in Greece in 2005. This finding is in line with the reported significant reduction of particulate matter levels following the complete ban of smoking in hospitality venues.<sup>16</sup> However, the existing levels of exposure to ETS are still high and not in compliance with article 8 of the WHO FCTC which highlights the importance of protection from exposure to tobacco smoke. It is also well known that ETS has been classified by the International Agency for Research on Cancer as a human carcinogen.<sup>17</sup> We believe that the high level of exposure to ETS reflects the absence of political will of subsequent Greek governments to impose the regulatory control of the smoking ban legislation. Moreover, it should be underlined that tobacco industry has claimed that enforcement of smoke-free laws caused hospitality revenues to decline considerably. However, accumulated, high-quality evidence indicates that these claims are unfounded.<sup>18</sup> In addition, it should be taken into account that the vast majority of students (82%) supported the smoking ban in enclosed public places.

Despite the existing legislation which prohibits the sale of tobacco to minors we found that the vast majority (90.8% vs 95% in 2005) of current smokers had access to cigarettes and were not prevented/refused purchase because of their age. Greece has ratified FCTC and the article 16 of this WHO Framework Convention recommends that signatories prohibit the sale of tobacco to minors. This recommendation has been made on the bases of scientific evidence suggesting that disruption of the commercial distribution of tobacco to youth results in reduction of smoking rates among adolescents. Our data clearly demonstrate that the implementation of the legislation related to the article 16 of the FCTC in Greece is not satisfactory.

Our results are subject to several limitations. First, data were based on self-reports, which might result in information bias related to misclassification of smoking use.<sup>19</sup> There is some evidence that the use of questionnaires for the evaluation of smoking use has low sensitivity and thus an underestimation of smoking use is expected.<sup>19</sup> Second, the data presented represent only youths who are enrolled in school, which might limit generalisability to all youths aged 13–15 years in Greece. However, the majority of Greek adolescents between the ages 13 and 15 usually attend the high school since it is obligatory according to the law. High student dropout is expected only for disadvantaged social groups (eg, Roma). Moreover, according to the European Commission, Greece has a low student dropout rate (<10%) in the European Union.<sup>20</sup> Third, we were not able to get data from non-responders and thus selection bias may have occurred. On the other hand, we believe that the sampling method employed reduced considerably the risk of selection bias. Moreover, the use of a standardised data collection protocol to collect the questionnaire-based data would have likely minimised the risk of information bias. We have already acknowledged limitation related to inverse causality with respect to the

impact of selection effects on peer influence given that student choose friends who have smoking behaviours similar to their own.<sup>21</sup> Last, our study has the advantage of the use of a standardised questionnaire that enables cross-country comparisons of smoking use.

In conclusion, the present study demonstrated that current smoking rates among Greek students aged 13–15 years old remained almost stable in comparison to the first wave of GYTS study in 2005. It is also of note that despite the laws that prohibit the access of minors to tobacco, our results indicate that smoking ban laws are not being upheld. Consequently, the exposure of youths to SHS in Greece can be considered as an uncontrolled hazard. Our policy recommendations include for the Greek government to ensure the urgent enforcement of the antismoking ban legislation in enclosed public places and also of the law which prohibits the sale of tobacco to minors.

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**Contributors** GR participated in study design, and drafted and revised the manuscript. AB participated in study design, supervised the study implementation and revised the manuscript. AB participated in collection of data and revision of the manuscript. AK participated in study design and statistical analysis. KK participated in study design and revision of the manuscript. VM interpreted the results and revised the manuscript. KM participated in study design and revised the manuscript. JK participated in study design and revised the manuscript for important intellectual content. CSH supervised the study design and the implementation of the study, and participated in statistical analysis, interpretation of results and revision of the manuscript. All authors have read and approved the final version of the manuscript.

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**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** The protocol of the study has been approved by the Ministry of National Education and Religions, Athens, Greece (ID: 41996/Γ2/6-4-2011 and 41996/Γ2/31-5-2012).

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**Data availability statement** Data are available in a public, open access repository ([https://extranet.who.int/ncdsmicrodata/index.php/catalog/539/data\\_dictionary](https://extranet.who.int/ncdsmicrodata/index.php/catalog/539/data_dictionary)).

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