

BMJ Open Prevalence and determinants of current and secondhand smoking in Greece: results from the Global Adult Tobacco Survey (GATS) study

George Rachiotis,¹ Anastasia Barbouni,² Antonis Katsioulis,¹ Eleni Antoniadou,² Konstantinos Kostikas,¹ Kyriakoula Merakou,² Kallirrhoe Kourea,¹ Rula N Khoury,³ Agis Tsouros,³ Jenny Kremastinou,² Christos Hadjichristodoulou¹

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GR and AB contributed equally as first authors.

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For numbered affiliations see end of article.

Correspondence to
Dr Christos Hadjichristodoulou;
xhatz@med.uth.gr

ABSTRACT

Objectives: Greece is one of the leading tobacco-producing countries in European Union, and every year over 19 000 Greeks die from tobacco-attributable diseases. The aim of the present study was to provide nationally representative estimates on current and secondhand smoking prevalence in Greece and their determinants.

Design: Cross-sectional.

Setting: Greece.

Participants: A total of 4359 individuals participated in the Global Adult Tobacco Survey (GATS), a household survey of adults ≥ 15 years old (overall response rate 69%). They were selected through a multistage geographically clustered sampling design with face-to-face interview.

Primary and secondary outcome measures: In 2013, we investigated the prevalence of current and secondhand smoking and their determinants.

Univariate and logistic regression analysis was used in order to identify possible risk factors associated with the prevalence of current and secondhand smoking.

Results: The prevalence of current smoking was 38.2% (95% CI 35.7% to 40.8%), and the mean number of cigarettes smoked per day was 19.8. Multivariate analysis confirmed that male gender (OR=3.24; 95% CI 2.62 to 4.00), age groups (25–39, OR=4.49; 95% CI 3.09 to 8.46 and 40–54, OR=3.51; 95% CI 1.88 to 5.87) and high school education (OR=1.97; 95% CI 1.41 to 2.74) were independently associated with the current smoking. Remarkably, responders with primary or less education had the lowest prevalence of current smoking ($p < 0.001$). The prevalence of exposure to secondhand smoke at work, home and restaurants, was 52.3%, 65.7% and 72.2%. In total, 90.0% (95% CI 87.8% to 91.9%) of Greek population is exposed to tobacco smoke (current smoking and secondhand smoke).

Conclusions: Our results revealed an extremely high prevalence of current smoking and exposure to secondhand smoke among the adult population and a positive gradient between education and current smoking. These findings are alarming and implementation of comprehensive tobacco control and

Strengths and limitations of this study

- Nationwide, representative sample of Greek adult population.
- Global WHO standardised methodology to ensure comparability across countries: standardised questionnaire and sampling framework.
- The questionnaires were collected through interviews resulting in satisfactory response rate and limited missing values.
- The main limitation of our study is related to the self-reported nature of the data selected.

prevention strategies could be impactful in fighting the tobacco epidemic in Greece.

INTRODUCTION

Tobacco use is a major contributor to mortality and an estimated 9% of the global deaths are attributable to exposure to tobacco while in high income about 18% of deaths are attributable to tobacco.^{1 2} Projected estimates from low-income and middle-income countries suggest that tobacco exposure will cause 1000 billion premature deaths during 21st century.² Greece is a leading tobacco producing country in the context of the European Union.³ It has been estimated that every year in Greece more than 19 000 Greeks die from tobacco-attributable diseases (cancers, cardiovascular and diseases of the respiratory system). Moreover, in 2011, tobacco exposure accounted for almost 9% of the national total of hospital admissions. Moreover, it has been estimated that smoking is associated with 284 498 years of potential life lost per year among adults (all sexes) 35–65 years old.⁴ There is some evidence that Greece

presents a high prevalence of smoking among adults.⁵ In addition, previous cross-sectional studies (general population or workplace based) demonstrated a high prevalence of smoking and high prevalence of the use of smoking across several socioeconomic and demographic groups.^{6–11} A set of six strategies (MPOWER) has been recommended by the WHO: Monitoring tobacco use and Prevention policies; Protecting people from tobacco smoke; Offering help to quit tobacco use; Warning about the dangers of tobacco; Enforcing bans on tobacco advertising, promotion and sponsorship; and Raising taxes on tobacco.¹² Monitoring of the tobacco epidemic is key to effectively managing it. Many countries conduct surveys aiming to monitor adult tobacco use, but no one standard global survey for adults has tracked tobacco use, exposure to secondhand tobacco smoke and tobacco control measures. The Global Adult Tobacco Survey (GATS) fills the need for standardised survey of tobacco use. In particular, GATS is a nationally representative survey that uses a standardised protocol, to ensure comparability across countries, to track tobacco use and evaluate tobacco control policies.^{13 14} GATS has been implemented worldwide since 2008. The aims of this study are to examine the prevalence and determinants of current smoking and exposure to secondhand smoke among Greek adults.

METHODS

We used data from the 2013 Greece GATS, a household survey of adults (≥ 15 years old) aiming to produce nationally representative data, a multicentre cluster sample design is used in all countries.

The household and individual questionnaires were based on the GATS Core Questionnaire with optional questions, which were designed for use in countries implementing GATS. The individual questionnaire used included seven sections: background information, tobacco smoking, mode of tobacco use in any way other than smoking, cessation, secondhand smoke, economics, media, knowledge, attitudes and practices. The use of household questionnaire aimed to collect information on all adult residents—based on sampling strategy—in the household in order to randomly select an eligible respondent to complete the individual questionnaire. These questionnaires (household and individual) were adapted and modified to reflect issues relevant and applicable to the situation in Greece. Additional questions were included in the questionnaire on the use of electronic cigarette and the support of the law prohibiting smoking in public places. The questionnaire was first developed in English then translated into Greek and later was also back translated from Greek into English and was finalised in June 2013.¹⁵ Current smokers were considered persons who currently smoke tobacco. Current use includes both daily and occasional use. Secondhand smoking referred to smoking exposure at home and (during the past 30 days) in public places

(the work place, government buildings/offices, health-care facilities, restaurants, bars/night clubs, cafes/cafe-terias, public transportation, schools, colleges/universities and private workplaces). In Greece, GATS was conducted by the National School of Public Health, the Department of Hygiene and Epidemiology of the University of Thessaly, and the MRB Hellas, Market Research Company. The survey had the support of the Regional Office for Europe of the WHO and the Centers for Disease Control and Prevention (CDC) provided technical assistance in the design and implementation of the study.

Greece GATS sampling methodology

The sampling frame used for the GATS survey in Greece was created on the basis of the 2001 and 2011 Greek population census given that 2011 census provided only total figures. Data on gender, age and urban population allocation have been projected taking into account the 2001 census given the absence of availability of complete sampling frames at household level, stratified probability proportional to size (PPS) with replacement sampling has been applied in four stages. The strata apply to four major divisions of the Greek territory (Attica, Northern Greece, Central Greece, Crete and Aegean Islands). The principal sampling unit (PSU) was the Kapodistrian municipality ($n=1034$). At the first stage of the sampling design, 76 discrete PSUs have been selected, whereas some of them more than once resulting in overall 100 PSU selections (due to the replacement approach). At the second stage, two segments (census sectors) have been selected for each PSU, while for those PSUs selected K times, the number of selected segments was equal to $2 \times K$. In particular, for urban areas, the census sectors consist of nearby blocks of buildings, created in such way to account for 500 households each. For the rural areas, the census sectors were groups of nearby villages. As the census sectors size in terms of household number varies significantly, they have been selected with systematic PPS. For those PSU consisting of urban/rural census sectors the sampling method selected was the stratified systematic PPS where we defined the urbanicity of the PSU. Overall, 200 census sectors were selected. Following the standard protocol and recommendations outlined in the GATS Sample Design Manual, the initial target was a representative sample of 4000 households, subject to applicable non-response and eligibility rates.^{14 15} After accounting for possible non-response and illegibility, an average of 33 households per selected census sector were randomly selected, resulting in a total sample size of 6600 households.^{16 17} A total of 4359 individuals participated in the study (overall response rate 69.0%).

Statistical analysis

Complex survey data analysis was performed to obtain population estimates and their 95% CIs. Sample weights were developed for each respondent following the

standard procedures established in the GATS Sample Design and Sample Weights manuals.^{14 15} The final weights were used in all analyses to produce population estimates and their CIs. In univariate analysis, Pearson's χ^2 test was used to analyse associations between sociodemographic factors and current and secondhand smoking. Relative risk and the corresponding 95% CIs were also calculated. In multivariate analysis, logistic regression analysis was performed to identify independent risk factors for the current and secondhand smoking. ORs and 95% CIs were calculated. p Values were considered statistically significant if $p < 0.05$. All weighting computations and all computations of estimates and their CIs were performed using the complex sample module of SPSS V.19.

RESULTS

Overall, 38.2% of the respondents were current tobacco smokers and among them, 36.6% were daily smokers (table 1). The mean number of cigarettes among daily smokers per day was 19.8. The percentage of former smokers was estimated at 14.8%. The current smoking and daily smoking prevalence for men and women were 51.2%, 49.7%, and 25.7% and 23.9%, respectively.

Regarding the age at daily smoking initiation among ever daily smokers was 20–34 years and it is remarkable that 52.2% of the ever daily smokers reported start smoking at age 17–19 years (results not shown). In addition, 25.5% of ever daily smokers reported smoking initiation at age 15–16 years. Finally, 4.8% of ever daily smokers 20–34 years old reported smoking initiation at age <15 years.

Table 2 presents information on the prevalence of exposure to secondhand smoke. The prevalence of exposure to secondhand smoke at work, home and restaurants was 52.3%, 65.7% and 72.2%, respectively. Exposure to secondhand smoke was high at bars/night clubs (95.8%) and coffee shops (85.0%). In addition, 43.6% of the persons who visited universities during the past 30 days were exposed to secondhand smoke.

Table 2 Prevalence of exposure to secondhand smoke at work, home and various public places

Secondhand exposure	Overall (%)	Non-smokers (%)
At work	52.3	40.0
At home	65.7	51.1
At public places		
Restaurants	72.2	67.1
Cafes, coffee shops, tea houses	85.0	81.9
Bars, night clubs	95.8	94.3
Governmental buildings	18.2	15.2
Private workplaces	55.6	45.7
Universities	43.6	41.3
Schools	9.2	8.1
Public transportation	6.9	5.6
In favour of banning smoking in workplace		
Yes	73.9	90.9
In favour of banning smoking in public places		
Yes	61.4	84.1

Overall, over 60.0% of participants supported banning smoking in workplaces and public places, and among non-smokers the support was over 80.0%.

In total, 90.0% (95% CI 87.8% to 91.9%) of the Greek population is exposed to tobacco smoke (current smoking and secondhand smoke).

Univariate and multivariate analysis of risk factors for current smoking

Univariate analysis shows (table 3) that the sex ratio (man/woman) for smoking is 1.99 ($p < 0.001$). The age-specific pattern of current smoking indicates an increased prevalence of smoking during young adulthood and declined after the age of 40 years ($p < 0.001$). With respect to educational status participants with primary or less education had the lowest prevalence of current smoking. There were no significant differences in smoking in terms of residential status (rural/urban).

Multivariate analysis (table 4) indicated that gender, age and education were independently associated with

Table 1 Percentage of adults (≥ 15 years old), by detailed smoking status and gender—GATS Greece, 2013

Smoking status	Overall Percentage (95% CI)	Male	Female
Current tobacco smoker	38.2 (35.7 to 40.8)	51.2 (47.9 to 54.4)	25.7 (22.7 to 28.9)
Daily smoker	36.6 (34.1 to 39.1)	49.7 (46.4 to 53.0)	23.9 (21.2 to 26.9)
Occasional smoker	1.6 (1.0 to 2.6)	1.5 (0.7 to 2.9)	1.8 (1.1 to 2.9)
Occasional smoker, formerly daily	0.6 (0.3 to 1.2)	0.8 (0.4 to 1.6)	0.4 (0.2 to 1.0)
Non-current smoker	61.8 (59.2 to 64.3)	48.8 (45.6 to 52.1)	74.3 (71.1 to 77.3)
Former smoker	14.8 (12.9 to 16.9)	18.1 (15.9 to 20.6)	11.5 (9.1 to 14.5)
Former daily smoker	11.8 (10.4 to 13.3)	16.4 (14.3 to 18.7)	7.3 (5.9 to 9.0)
Never daily smoker	50.0 (46.9 to 53.1)	32.5 (29.0 to 36.2)	67.0 (63.3 to 70.6)
Former occasional smoker	3.0 (2.1 to 4.3)	1.8 (1.1 to 2.8)	4.2 (2.7 to 6.4)

Current use includes both daily and occasional (less than daily) use.
GATS, Global Adult Tobacco Survey.

Table 3 Univariate analysis of smoking prevalence and SHS (GATS, Greece, 2013)

Variable	Current smoking					SHS for non-smokers				
	Absolute numbers	Weighted (%)	RR	95% CI	p Value	Absolute numbers	Weighted (%)	RR	95% CI	p Value
Total	1667/4359	38.2				2115/2692	83.9			
Gender										
Male	1064	51.2	1.99	1.76 to 2.26	<0.001	903	89.5	1.11	1.07 to 1.16	<0.001
Female	603	25.7	ref			1212	80.4	ref		
Age										
15–24	126	30.0	1.96	1.50 to 2.57	<0.001	245	96.3	1.41	1.31 to 1.53	<0.001
25–39	599	52.4	3.42	2.87 to 4.09	<0.001	476	90.2	1.33	1.23 to 1.43	<0.001
40–54	513	46.7	3.05	2.49 to 3.74	<0.001	479	86.8	1.27	1.18 to 1.38	<0.001
55–64	242	38.6	2.52	2.06 to 3.09	<0.001	296	84.3	1.24	1.14 to 1.35	<0.001
65+	187	15.3	ref			619	68.1	ref		
Residence										
Rural	506	38.7	1.02	0.92 to 1.14	0.716	666	85.6	1.03	0.96 to 1.10	0.447
Urban	1161	38.0	ref			1449	83.3	ref		
Education level*,†										
College or above	429	48.2	3.03	2.45 to 3.75	<0.001	375	86.8	1.23	1.13 to 1.34	<0.001
High school	655	47.8	3.00	2.47 to 3.66	<0.001	605	85.9	1.22	1.12 to 1.32	<0.001
Secondary	288	41.7	2.62	2.08 to 3.30	<0.001	328	83.6	1.18	1.09 to 1.29	<0.001
Primary or less	169	15.9	ref			561	70.6	ref		

*Primary or less includes 'no formal schooling', 'less than primary school completed' and 'primary school completed'; secondary includes 'less than secondary school completed', 'secondary school completed' and 'less than high school completed'; high school includes 'high school completed'; college or above includes 'college/university completed or technological educational institute' and 'postgraduate degree completed'.

†Education level is reported only among respondents 25+ years old.

GATS, Global Adult Tobacco Survey; RR, relative risk; SHS, secondhand smoke.

the current smoking. In particular, men were 3.24 times (OR=3.24; 95% CI 2.62 to 4.00) more likely to report current smoking compared with women. Current smoking declined with increasing age. Multivariate analysis showed a complex smoking pattern for educational group, with participants completing high school education more likely to report current smoking (OR=1.97; 95% CI 1.41 to 2.74). Stratified analysis by gender confirmed a declining prevalence of current smoking by age group for men and women (results not shown). Rural residence was a significant predictor of current smoking only for men (OR=1.41; 95% CI 1.03 to 1.92). The prevalence of current smoking increased with level of education; however, this trend was stronger among women (results not shown). The χ^2 test for trend has shown significant differences of current smoking prevalence across the age and education subgroups ($p<0.001$; results not shown).

Univariate and multivariate analysis of risk factors for secondhand smoking

Univariate analysis of secondhand smoking (table 3) indicated that male sex, age group (exposure to secondhand smoke declined with increasing age) and education level were significantly associated with secondhand smoke. Multivariate analysis confirmed male gender and age group were independent determinants of secondhand smoking (table 4).

DISCUSSION

The 2013 Greece GATS study enabled us to provide for the first time valuable and valid information about tobacco smoking patterns in Greece and its determinants. Our results found a high prevalence (38.2%) of current smoking among adults in Greece, while previous nationwide studies found that the prevalence of smoking was estimated at 42.6%, 41% and 38.1% in 2008, 2010 and 2011, respectively.^{6 7} However, there are considerable differences between these studies and the GATS in terms of methodology and overall response rate. A slightly higher (39.3%) smoking prevalence has been found in the Russian Federation (GATS 2009).^{18 19} Among the European Union countries that released GATS results, Poland (30.5%) and Romania (26.7%) had considerably lower smoking rates compared with Greece.^{18–20} In addition, results from GATS from two South Eastern Mediterranean Region countries, Egypt (19.7%) and Turkey (GATS 2012; 27.1%),^{18–20} also showed lower smoking rates. Regarding determinants of current smoking, our results showed that sex was a strong independent determinant of current smoking. In particular, men had a higher adjusted OR than women. This result is higher in comparison to Poland's GATS results (2.4) but lower in comparison to GATS results from Egypt (162.2), Ukraine (13.1), Russian Federation (8.3) and Turkey (8.0). However, the prevalence of current smoking in Greece among women (25.7%) is by

Table 4 Multivariate analysis of current smoking and SHS (GATS, Greece, 2013)

Variable	Current smoking			SHS for non-smokers		
	OR	95% CI	p Value	OR	95% CI	p Value
Gender						
Male	3.24	2.62 to 4.00	<0.001	2.12	1.45 to 3.10	<0.001
Female	ref			ref		
Age						
25–39	4.49	3.19 to 6.30	<0.001	5.11	3.09 to 8.46	<0.001
40–54	3.51	2.50 to 4.92	<0.001	3.32	1.88 to 5.87	<0.001
55–64	2.75	2.02 to 3.76	<0.001	2.46	1.57 to 3.87	<0.001
65+	ref			ref		
Residence						
Rural	1.13	0.94 to 1.36	0.200	1.61	0.98 to 2.64	0.060
Urban	ref			ref		
Education level*,†						
College or above	1.67	1.10 to 2.51	0.016	0.92	0.53 to 1.60	0.773
High school	1.97	1.41 to 2.74	<0.001	1.04	0.64 to 1.67	0.876
Secondary	1.76	1.21 to 2.58	0.004	1.20	0.78 to 1.84	0.403
Primary or less	ref			ref		

*Primary or less includes 'no formal schooling', 'less than primary school completed' and 'primary school completed'; secondary includes 'less than secondary school completed', 'secondary school completed' and 'less than high school completed'; high school includes 'high school completed'; college or above includes 'college/university completed or technological educational institute' and 'postgraduate degree completed'.

†Education level is reported only among respondents 25+ years old.

GATS, Global Adult Tobacco Survey; SHS, secondhand smoke.

far the highest in comparison to European countries (Poland 24.4%, Romania 16.7%, Russian Federation 21.7%, Ukraine 11.2%) and countries of South Eastern Mediterranean Region (Egypt 0.6%, Turkey 13.1%). Age was found to be a significant determinant of current smoking among adults in Greece. The prevalence of current smoking was considerably high (30.0%) in the lowest age group. Taking into account the GATS data from the previous GATS study it is of note that only the Russian Federation (43.1%) and Ukraine (30.5%) recorded higher current smoking prevalence at the 15–24 years old age group in comparison to Greece. Further, the prevalence of current smoking remained high in the age groups 25–34 (52.4%) and 45–65 (43%), while it decreased relatively steeply among participants of age >65 years. This age-related pattern of current smoking is similar to that observed (GATS data) in Poland, Romania, Russian Federation, Ukraine and Turkey. An interesting finding in the present study is the considerably high prevalence (43%) of current smoking in the participants aged 45–64 years which is in line with the findings of the first GATS study conducted among 14 countries. This finding is of importance given that the health hazards of tobacco use begin to appear when adults reach middle age. On the basis of the above targeting cessation in these age groups is of crucial importance. Regarding the place of residence, we found similar prevalence of current smoking between urban and rural areas. The first GATS study revealed heterogeneous results across various countries. In particular, significantly higher prevalence of current smoking in urban areas in comparison to rural areas has been

observed in eight countries: Egypt, Mexico, Poland, Russian Federation, Ukraine, Uruguay and Vietnam. On the contrary in two countries (India and Thailand) a statistically significantly increased prevalence of current smoking has been found in rural areas in comparison to the urban place of residence.²¹ Regarding residence status, we found no association between residence and current or secondhand smoking.

An interesting finding of our study was the positive association of education with current smoking prevalence. This finding indicates a pattern of smoking in Greece which is in contrast to the patterns of smoking in the West. It is well known that in the Western social context smoking is more prevalent among individuals with lower education.²² In Western countries individuals with higher education level may have better knowledge about the health hazards of smoking. In addition, persons with increasing education are getting more benefits from their participation in health promotion activities than persons with less education.²³ The high prevalence of smoking and the positive association between educational level and current smoking reflect the low level of antismoking campaign in Greece. If a systematic antismoking health promotion campaign were to be implemented in Greece, we would expect a lower overall prevalence of current smoking, especially in the higher educational classes. Remarkably, the implementation of a systematic antismoking campaign in Greece in 1978 resulted in a substantial decrease in overall smoking rates. When the campaign stopped the smoking rate increased steadily to precampaign levels.^{23 24} Finally, the finding that almost 78% of ever

daily smokers initiated daily smoking at the age 15–19 years underlines the need for tailored antismoking interventions targeting these age groups or even in younger age.

In 2010, a comprehensive smoke-free law was adopted by the Greek Parliament (in line with the Council Recommendation 2009/C 296/02 and with Article 8 of WHO Framework Convention on Tobacco Control) mandating a complete ban in all closed private and public places (Law 3868/2010). Nevertheless, our study indicates that the existing smoking bans for workplaces and other public places have not been satisfactorily implemented and enforced. Moreover, the fact that 90% of the Greek population is exposed to tobacco smoke (current smoking and secondhand smoke) suggests that smoking is a poorly controlled hazard despite the fact that since 2009 a considerable number of national tobacco control legislations have been enacted.²⁵

Our study has some strengths and limitations. It is an advantage of our study that we used a representative sample of the adult Greek population and sampling and completion of the study were based on a standardised protocol to ensure international comparability across countries. In addition, the satisfactory response rate (69%) is a strength of our study indicating a good representativeness of the general population, and a similar rate has been observed in other GATS studies.²⁶ Further, the data have been collected by trained interviewers and this could have reduced the inter-reviewer error. The limitations of our study are mainly related to the self-reported nature of the data collected. Self-reported data may lead to underestimation of smoking prevalence.¹⁸ Another limitation is related to the cross-sectional design of the GATS.^{26–27} In addition, we were not able to obtain data from the non-responders. However, these limitations are counterbalanced by the methodological advantages previously mentioned.

In conclusion, the first GATS study in Greece revealed a high prevalence of current smoking and exposure to secondhand smoke among the adult population and also a positive social gradient between education and current smoking. Smoking is an uncontrolled hazard in Greece. These findings are alarming and implementation of comprehensive tobacco control and prevention strategies could be impactful in fighting the tobacco epidemic in Greece.

Author affiliations

¹Faculty of Medicine, Department of Hygiene and Epidemiology, University of Thessaly, Larissa, Greece

²Department of Public and Administrative Health, National School of Public Health, Athens, Greece

³Regional Office for Europe, World Health Organization, Copenhagen, Denmark

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Contributors GR participated in study design, drafted and revised the manuscript. AB participated in study design, supervised the study implementation, drafted and revised the manuscript. AK participated in study design and statistical analysis. EA, KK and KM participated in study design and revised the manuscript. KKour participated in data collection and revision of the manuscript. JM, AT and JK participated in study design and revised the manuscript for important intellectual content. RNK participated in study design. CH supervised study design and the implementation of the study, 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 Obtained.

Ethics approval Approval of the study protocol was received by the Institutional Review Board of National School of Public Health (NSPH), Athens, Greece.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The data for Greece GATS 2013 are available from CDC (<http://nccd.cdc.gov/GTSSData/Ancillary/DataReports.aspx?CAID=2>).

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