The relationship between the socio-economic gradient and cigarette consumption in Spain

La relación entre el gradiente socioeconómico y el consumo de cigarrillos en España

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Abstract

The objective of the study was to analyze the relationship between individual socioeconomic characteristics and cigarette consumption in Spain. The sample consisted of 19,931 individuals aged 15 or older who completed the *European Health Interview Survey for Spain* (EHSS-2014). Variables: prevalence and intensity of cigarette consumption. Multivariate ordered logistic regression analysis was performed with the following socioeconomic variables: social classes, educational attainment, main activity, economic situation and, for the working population, the activity sector. Other control variables were sociodemographic variables and healthy lifestyle habits (physical exercise, diet and alcohol consumption). The factors that relate to greater prevalence are: lower social class, not having university studies, being unemployed, having worse economic situation and working in hospitality industry. On the other hand, the variables related to higher intensity of cigarette consumption of the smoking population are: lower social class, not having university studies, and being neither a student nor on a permanent contract. Regarding control variables, those regressors associated with a higher prevalence and intensity of cigarette consumption are: being male, being aged between 36 and 65, being divorced, having fewer children at home and having worse lifestyle habits.

Keywords: Smoking; cigarettes; socio-economic gradient; lifestyle habits; health; European Health Interview Survey.

Resumen

El objetivo del estudio fue analizar la relación entre las características socioeconómicas individuales y el consumo de cigarrillos en España. La muestra estaba formada por 19.931 individuos de 15 o más años de edad de la *Encuesta Europea de Salud en España* (EESE) de 2014. Variables: prevalencia y nivel de consumo. Se realizó análisis de regresión multivariante logística ordinal con las variables socioeconómicas clase social, nivel educativo, actividad principal, situación económica y sector de actividad (solo para población trabajadora). Otras variables de control incluidas fueron las características sociodemográficas y los hábitos de vida saludables (ejercicio físico, alimentación y consumo de alcohol). Los factores que se relacionan con mayor prevalencia en el consumo de cigarrillos son: inferior clase social, no tener estudios universitarios, ser desempleado, tener peor situación económica y trabajar en hostelería. Por su parte, las variables relacionadas con el nivel de consumo de la población fumadora son: inferior clase social, no tener estudios universitarios, y no ser estudiante ni trabajador indefinido. En cuanto a las variables de control, aquellos regresores asociados a mayor prevalencia y nivel de consumo son: sexo masculino, edad entre 36 y 65 años, ser divorciado, menor número de niños en el hogar y peores hábitos de vida.

Palabras clave: Tabaquismo; cigarrillos; gradiente socioeconómico; hábitos de vida saludables; salud; Encuesta Europea de Salud.

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Data from the latest *Spanish National Health Survey* (*Encuesta Nacional de Salud de España 2017*, ENSE-2017) show that the prevalence of daily tobacco use in the population aged 15 and above is 22.1%, a decrease in the smoking habit of over 4 percentage points over the last decade. In the previous surveys of 2011-12 and 2006 the figure stood at 23.9% and 26.4%, respectively.

Regarding the international context, Figure 1 shows the prevalence of smokers for all EU-28 countries based on data from the last two available Eurobarometers (numbers 429 and 458) on *Attitudes of Europeans towards tobacco and electronic cigarettes* for the periods 2014 and 2017 (European Commission, 2014, 2017).

As can be seen, smoking prevalence in the EU-28 has remained stable at around 26% for both periods, 2014 and 2017, although there are significant differences between countries. While important decreases in smoking prevalence are observed in countries such as Belgium (-6.2%), Denmark (-4.4%) or Sweden (-4.3%), there have been marked increases in countries such as Slovakia (+5.6%), Czech Republic (+4.5%) or France (+4.1%).

While Spain saw a decrease in smoking prevalence of around 2% between 2014 (29.5%) and 2017 (27.4%), this decline was preceded by an earlier fall of 3.5 points between 2012 (33%) and 2014 (29.5%), which took Spain from 4th place in the EU-27 ranking in 2012 in terms of smoking prevalence to 13th in the EU-28 in 2017 (European Commission, 2012, 2014, 2017).

The high cost of smoking in health and social terms, together with the fact that it is a risk factor susceptible to prevention, has made *reducing smoking prevalence* one of the priority objectives in the health policies of all socioeconomically similar countries. In the case of Spain, information and awareness campaigns on the effects of tobacco exist alongside (i) the prohibition of smoking in public places, collective means of transport and workplaces; (ii) regulation regarding not only the manufacture, presentation and sale of tobacco products but also advertising and sponsorship; and (iii) heavy taxes on tobacco production and use.

These interventions, together with the influence of the economic crisis on smoking (Martín-Álvarez, Golpe, Iglesias & Ingelmo, 2020), likely explain not only the decrease in the prevalence of cigarette smoking but also the changes in smoking behaviours towards the use of other (sometimes more affordable) tobacco products such as hand rolled cigarettes, cigars, cigarillos or pipe tobacco (López-Nicolás, Cobacho & Fernández, 2013). It is no less true, however, that such interventions rarely take into account that smoking, despite its presence in all social groups, does not affect the entire population equally (Almeida, Golpe, Iglesias & Martín-Álvarez, 2021).

Thus, according to the López, Collishaw and Piha (1994) model of the spread of the epidemic in developed countries, Spain is in *phase IV*, characterized by a smoking prevalence with a higher concentration among the most disadvantaged socioeconomic groups. This influence of the *socioeconomic gradient* on smoking has been sufficiently documented in the international academic literature, showing an association between smoking and factors such as unemployment, level of education, type of occupation and socioeconomic situation (Schaap, Van Agt & Kunst, 2008; White, Redner, Bunn & Higgins, 2016). The higher prevalence of unhealthy lifestyle habits in groups of lower socioeconomic level is one of the mechanisms linking this unfavourable socioeconomic situation with worse health (Macintyre, 1997). More specifically, smoking in groups with lower socioeconomic status is the most important cause of socioeconomic differences in mortality (Stringhini et al., 2010).

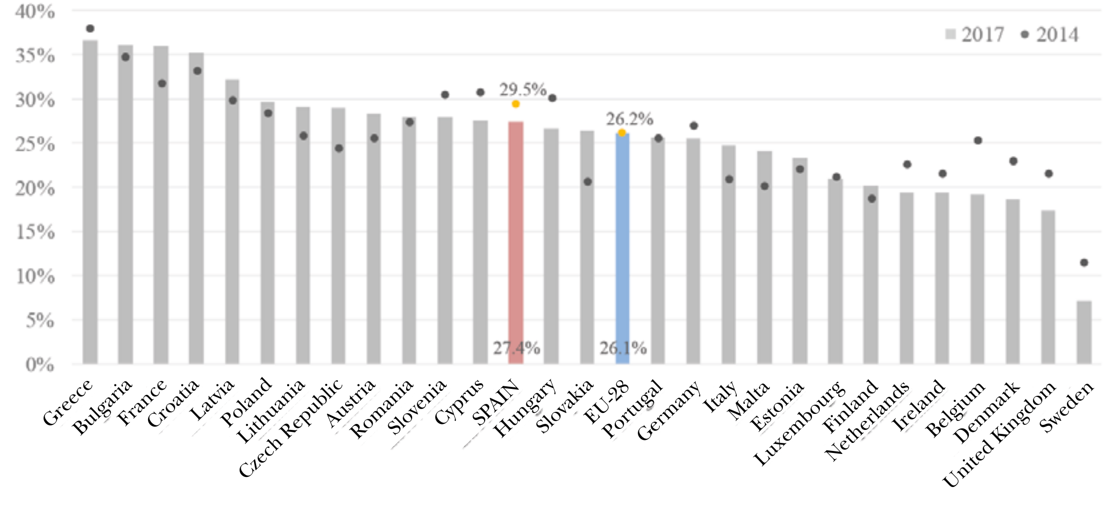

Figure 1. Prevalence of smokers (cigarettes, cigars, cigarillos or pipes) in the EU-28.
Source: Special Eurobarometers 429 (2014) and 458 (2017). European Commission

However, the generalizability of the effects of this gradient to different economies is not so clear and needs data-based support (Sarkar et al., 2017). Unfortunately, the studies analysing these associations at a national level are practically anecdotal and their results are sometimes not supported by multivariate regression models but only by bivariate descriptive analyses (the studies by Agudo et al., 2004 and Pinilla & Abásolo, 2017 are notable exceptions).

Therefore, correcting this gap in the literature by characterizing the smoking population in Spain from a socioeconomic perspective, thereby identifying the groups at highest risk of prevalence and use, becomes a priority objective from the perspective of health authorities aiming for a more effective design of smoking control policies, with more specific, focused and more easily evaluable goals.

With this objective in mind, using microdata from the 2014 *European Health Survey in Spain* (EHSS-2014), the present study analyses the *prevalence* and *intensity* of cigarette smoking using bivariate and multivariate analysis techniques. Using the EHSS-2014 made it possible to generate comparable information at a European level based on the most recent data available. It was decided to focus on cigarettes (including hand rolled) as a tobacco product, reflecting its still leading role in terms of total consumption, despite changes detected recently.

Methods

Study instrument

This study uses the records of participants in the 2014 European Health Survey in Spain (EHSS) (Ministerio de Sanidad, Servicios Sociales e Igualdad, 2015). The general aim of the EHSS, designed and coordinated by EUROSTAT, is to provide information on the health of the Spanish population in a harmonized and comparable way at the European level in order to plan and assess actions in health matters. It is a cross-sectional survey, carried out every five years by the Spanish National Statistics Institute (Instituto Nacional de Estadística, INE), in collaboration with the Spanish Ministry of Health, Social Services and Equality (Ministerio de Sanidad, Servicios Sociales e Igualdad). A three-stage sampling design is used, stratified by census tracts, households and people. The data are freely accessible to any researcher on the INE website in the form of an anonymized microdata file.

The EHSS-2014 is structured in two questionnaires: households and adults. The household questionnaire has only a *sociodemographic* module, while the adult questionnaire consists of four different modules: (i) *sociodemographic*, (ii) *health status*, (iii) *health care*, and (iv) *health determinants*. This study included the variables of both questionnaires and all modules.

The *health determinants* module provided information on the smoking (section V), diet (section U), physical activity (section T) and physical characteristics (section S) of participants. In particular, this module allows the construction of the following variables used in the analysis: *prevalence* of cigarette smoking, *intensity* of cigarette smoking, type of diet, leisure-time physical exercise, alcohol use and Body Mass Index (BMI).

The *health care* module offered information on participants' health insurance (section O), which was used to generate the health insurance modality variable.

The *health status* module provided information on the mental health of participants (section G), enabling the variable of mental health in the last 12 months to be generated.

Finally, the *sociodemographic* modules, both in the household and adult questionnaires, revealed the household composition (section A), demographic (section E) and economic activity characteristics (section F) of each participant. Specifically, the construction of the variables sex, age, marital status, number of children in the household, social class, educational level, main activity and activity sector (only for participants with paid work) is based on these modules.

Design and participants

The study was observational, epidemiological and descriptive. The object of study was the totality of the records of participants aged 15 years or older participating in the EHSS-2014, comprising a total of 22,842 records. Those participants who regularly smoke products other than cigarettes were excluded from the final sample. While hand-rolled cigarettes were therefore not excluded, cigars, pipe tobacco and other products were (barely 1% of the total records). Likewise, participants with missing values for variables relevant for performing this analysis were also excluded. The final sample thus comprised a total of 19,931 records.

Procedure

From the information available in the EHSS-2014, the *prevalence* and *level* of cigarette smoking were selected as the *dependent* variables of the study. To assess prevalence, three situations were considered: (1) never smoker, (2) ex-smoker and (3) smoker. To assess intensity, four levels were considered: (1) occasional smoker, (2) daily smoker of up to 10 cigarettes, (3) daily smoker of 11 to 20 cigarettes and (4) daily smoker of over 20 cigarettes.

The *main independent* variables selected for analysis were those related to the *socioeconomic gradient*, that is, social class (based on the occupation of the individual or the reference person), level of educational attainment, and economic/work-related variables such as main occupation, health insurance (only public health cover, excluding state mutuals vs. private insurance or mutuals) and activity sector, according to the National Classification of Economic Activities (NACE Rev.2) (only for participants with paid work).

Independent *control* variables were (i) *sociodemographic*: sex, age, marital status and number of children in the household; (ii) *health status*: BMI and mental health in the last 12 months; and (iii) *healthy lifestyle habits*: leisure-time physical exercise, type of diet and alcohol use.

Statistical analysis

Statistical analysis of the data was performed with the Stata/MP-16 program and consisted of a descriptive analysis by calculating number (n) and proportion (%) for qualitative variables and calculating means and standard deviations for quantitative variables. The proportions of categorical variables were also compared using chi-square tests for contingency tables. In order to measure prevalence and intensity of cigarette smoking, six ordinal multivariate logistic regression models were performed, for which the probability ratios or "odds ratio" (OR) were obtained with 95% CI. Selecting the *main independent* variables was done on the basis of previous knowledge of the relationship between the *socioeconomic gradient* and smoking. The inclusion of independent *control* variables also linked to smoking (as argued in the Discussion section) was based on a forward selection procedure, without this process significantly altering the coefficients associated with the *main independent* variables. All hypothesis tests were two-tailed and statistical significance was set at $p < 0.05$ (two tails).

Results

Bivariate analysis

Figure 2 shows the information regarding prevalence and intensity of cigarette smoking of the participants in the final sample.

Table 1 shows how these patterns of prevalence and intensity of consumption vary for different specific population subgroups based on the independent variables.

The most prevalent subgroups within the population of never smokers (48% of the final sample) were people with primary education (57%), people who mainly study (78%) or do housework (66.3%), retirees or early retirees (54.6%), workers in the education sector (52.6%), women (59.1%), people over 65 (61.1%), and widows/widowers (70.5%).

The population of *ex-smokers* (28% of the final sample) is dominated by people of social class I (31.3%), those with work disability (37.4%), retirees or early retirees (36.3%), business owners or professionals with employees (32.5%), civil servants (32.4%), men (36.6%), people between 51 and 65 years (36.3%), and married (33.8%).

Regarding *smokers* (24% of the final sample), the most prevalent groups are people from social class VI (27.3%), people with secondary education (31.5%) and vocational training (31.1%), unemployed (38.5%), workers with a temporary contract (33.7%), business owners without employees or the solo self-employed (32.9%), those with work disability (32.8%), workers in the hospitality sector (38.2%), manufacturing (35.6%) and construction industries (33.5%) among others, men (27.9%), people aged between 15 and 35 years (33.8%) and between 36 and 50 years (32.2%), divorced (37.7%), separated (35.5%), and single (33.8%).

Within the population of smokers, the group of *occasional smokers* (8.4% of the final sample of smokers) includes people from social class I (12.1%), people with a university education (11.4%), students (17.2%), business owners or professionals with employees (12.2%), workers in artistic, recreational and entertainment sectors (17.9%) and in professional, scientific and technical activities (17.5%), and people aged 15 to 35 years (12.1%).

Among *daily smokers of more than 20 cigarettes* (6.8% of the final sample of smokers), the largest groups are people with work disabilities (12.4%), business owners without salaried employees or the solo self-employed (9.9%), business owners or professionals with salaried employees (9.4%), workers in the construction (13.9%) and transport and storage sectors (10.5%), men (9.2%), people between 51 and 65 years (10.1%), separated (12.2%), and divorced (9.6%).

In relation to the *quantitative variables*, daily smokers of over 20 cigarettes (compared to daily smokers of 10 or fewer cigarettes and occasional smokers) present higher BMI, higher daily alcohol use, fewer weekly hours of physical ex-

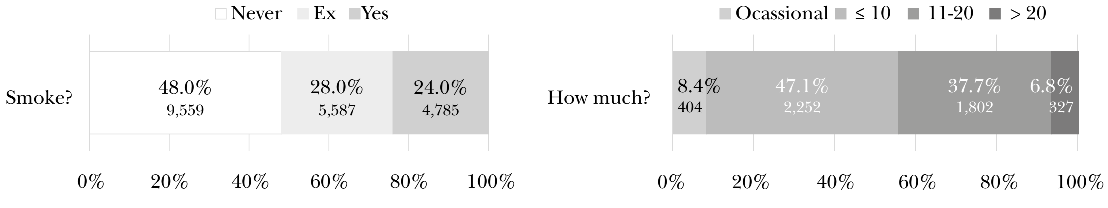

Figure 2. Prevalence (left panel) and intensity of cigarette smoking (right panel) in Spain in 2014.
Source: Own research with data from the EHSS-2014.

Table 1. *Prevalence and intensity of cigarette smoking in Spain in 2014 by different characteristics.*

	n (%)	Prevalence (%)			P	Intensity of smoking (%)				p
		Never	Ex	Smoker		Ocas-sional	Daily smoker			
							≤ 10	11-20	> 20	
Total	19,931 (100%)	48.0%	28.0%	24.0%		8.4%	47.1%	37.7%	6.8%	
Mean cigarettes smoked (1-80) [a, b]							6.93 (2.87)	17.5 (3.04)	33.0 (8.31)	
Main Independent Variables –Socioeconomic Gradient–										
Social class [c]					< 0.001					< 0.001
Class I (0-1)	2,316 (11.6%)	47.6%	31.3%	21.1%		12.1%	51.1%	30.5%	6.3%	
Class II (0-1)	1,173 (8.6%)	48.9%	29.4%	21.7%		9.2%	51.7%	33.7%	5.4%	
Class III (0-1)	3,882 (19.5%)	47.6%	28.7%	23.7%		8.9%	48.9%	36.5%	5.7%	
Class IV (0-1)	2,946 (14.8%)	47.0%	29.9%	23.1%		7.8%	45.4%	39.9%	6.9%	
Class V (0-1)	6,387 (32.0%)	47.6%	27.5%	24.9%		7.1%	46.9%	38.8%	7.2%	
Class VI (0-1)	2,687 (13.5%)	50.2%	22.5%	27.3%		8.6%	41.6%	41.2%	8.6%	
Educational attainment					< 0.001					< 0.001
Primary education (0-1)	6,436 (32.3%)	57.0%	27.6%	15.4%		6.4%	41.5%	43.2%	8.9%	
Secondary education (0-1)	6,598 (33.1%)	41.0%	27.5%	31.5%		8.2%	45.6%	39.1%	7.1%	
Vocational training (0-1)	2,934 (14.7%)	41.1%	27.8%	31.1%		8.7%	49.2%	36.7%	5.4%	
University education (0-1)	3,963 (19.9%)	49.9%	29.8%	20.3%		11.4%	55.2%	28.1%	5.3%	
Economic/work-related variables										
Main activity					< 0.001					< 0.001
Business owner or professional with employees (0-1)	532 (2.7%)	39.7%	32.5%	27.8%		12.2%	35.8%	42.6%	9.4%	
Business owner without employees or solo self-employed (0-1)	1,138 (5.7%)	37.7%	29.4%	32.9%		7.7%	39.6%	42.8%	9.9%	
Civil servant (0-1)	1,129 (5.6%)	46.0%	32.4%	21.6%		9.0%	46.7%	39.0%	5.3%	
Worker with permanent contract (0-1)	4,704 (23.6%)	41.0%	28.4%	30.6%		9.0%	48.6%	36.9%	5.5%	
Worker with temporary contract (0-1)	1,313 (6.6%)	43.8%	22.5%	33.7%		9.5%	47.2%	37.4%	5.9%	
Other work situation (0-1) [d]	179 (0.9%)	41.3%	27.4%	31.3%		3.6%	44.6%	41.1%	10.7%	
Unemployed (0-1)	2,717 (13.6%)	36.7%	24.8%	38.5%		8.4%	46.0%	37.8%	7.8%	
Student (0-1)	1,077 (5.4%)	78.0%	5.8%	16.2%		17.2%	69.5%	12.1%	1.2%	
Retiree or early retiree (0-1)	5,115 (25.7%)	54.6%	36.3%	9.1%		3.9%	47.0%	41.4%	7.7%	
Work disability (0-1)	369 (1.8%)	29.8%	37.4%	32.8%		7.4%	39.7%	40.5%	12.4%	
Housework (0-1)	1,604 (8.0%)	66.3%	17.8%	15.9%		6.3%	51.4%	37.6%	4.7%	
Other jobless situation (0-1)	54 (0.3%)	37.0%	31.5%	31.5%		5.9%	17.6%	47.1%	29.4%	
Health insurance					< 0.001					0.285
Only public health -no state mutuals- (0-1)	15,850 (79.5%)	48.1%	27.4%	24.5%		8.1%	46.9%	38.0%	7.0%	
State mutuals or private insurance (0-1)	4,081 (20.5%)	47.5%	30.5%	22.0%		9.8%	47.7%	36.4%	6.1%	
Only workers										
Total	8,995 (45.1%)	41.6%	28.4%	30.0%		8.9%	46.2%	38.4%	6.5%	
Sector (NACE Rev.2)					< 0.001					< 0.001
A Agriculture, forestry and fishing (0-1)	415 (4.6%)	40.7%	27.0%	32.3%		10.4%	33.6%	47.8%	8.2%	
B Mining industry (0-1)	28 (0.3%)	17.9%	46.4%	35.7%		20.0%	20.0%	60.0%	0.0%	
C Manufacturing industry (0-1)	1,155 (12.8%)	34.1%	30.3%	35.6%		9.0%	43.1%	41.3%	6.6%	
D Electric power, gas, steam and air conditioning (0-1)	63 (0.7%)	39.7%	33.3%	27.0%		5.9%	64.7%	29.4%	0.0%	
E Water supply, sanitation, waste and decontamination (0-1)	74 (0.8%)	29.7%	32.4%	37.9%		10.7%	46.4%	32.2%	10.7%	
F Construction (0-1)	493 (5.5%)	35.9%	30.6%	33.5%		4.3%	40.6%	41.2%	13.9%	
G Car sales and repairs (0-1)	1,366 (15.2%)	41.4%	26.2%	32.4%		10.4%	53.2%	30.8%	5.6%	
H Transport and storage (0-1)	403 (4.5%)	35.7%	31.3%	33.0%		3.8%	41.3%	44.4%	10.5%	
I Hospitality (0-1)	647 (7.2%)	36.9%	24.9%	38.2%		8.1%	39.7%	44.5%	7.7%	
J Information and communications (0-1)	251 (2.8%)	48.6%	22.3%	29.1%		8.2%	43.8%	41.1%	6.9%	
K Finance and insurance (0-1)	244 (2.7%)	49.2%	25.8%	25.0%		13.1%	45.9%	37.7%	3.3%	
L Real estate (0-1)	63 (0.7%)	33.3%	34.9%	31.8%		5.0%	50.0%	40.0%	5.0%	

M	Professional, scientific and technical activities (0-1)	435 (4.8%)	47.8%	28.5%	23.7%		17.5%	48.5%	27.2%	6.8%	
N	Administrative and auxiliary services (0-1)	424 (4.7%)	39.4%	27.6%	33.0%		7.1%	53.6%	35.7%	3.6%	
O	Public administration and defence; Obligatory social security (0-1)	776 (8.6%)	42.4%	32.2%	25.4%		9.6%	42.7%	41.6%	6.1%	
P	Education (0-1)	707 (7.9%)	52.6%	26.9%	20.5%		5.5%	55.2%	34.5%	4.8%	
Q	Health and social services (0-1)	827 (9.2%)	43.3%	30.7%	26.0%		7.9%	48.4%	39.5%	4.2%	
R	Artistic, recreational and entertainment activities (0-1)	160 (1.8%)	48.1%	27.5%	24.4%		17.9%	46.2%	30.8%	5.1%	
S	Other services (0-1)	193 (2.1%)	39.9%	31.1%	29.0%		10.7%	53.6%	33.9%	1.8%	
T	Household activities (0-1)	266 (3.0%)	54.5%	20.7%	24.8%		10.6%	51.5%	34.9%	3.0%	
U	Working for extraterritorial organisations (0-1)	5 (0.1%)	40.0%	40.0%	20.0%		0.0%	0.0%	100.0%	0.0%	
Independent Control Variables											
Sociodemographic variables											
Sex						< 0.001					< 0.001
	Women (0-1)	9,399 (47.2%)	59.1%	20.4%	20.5%		8.8%	53.2%	34.0%	4.0%	
	Men (0-1)	10,532 (52.8%)	35.5%	36.6%	27.9%		8.2%	42.0%	40.6%	9.2%	
	Age (15-99) [a]		52.0 (20.3)	55.3 (15.6)	44.9 (13.4)		40.4 (13.1)	43.8 (14.1)	46.4 (12.5)	49.0 (11.0)	
Age						< 0.001					< 0.001
	15-35 years (0-1)	4,006 (20.1%)	48.0%	18.2%	33.8%		12.1%	53.5%	31.9%	2.5%	
	36-50 years (0-1)	6,204 (31.1%)	40.6%	27.2%	32.2%		7.9%	45.1%	40.2%	6.9%	
	51-65 years (0-1)	4,906 (24.6%)	38.0%	36.3%	25.7%		5.9%	41.8%	42.2%	10.1%	
	Over 65 years (0-1)	4,815 (24.2%)	61.1%	32.1%	6.8%		4.5%	50.3%	37.9%	7.3%	
Marital status						< 0.001					< 0.001
	Single (0-1)	5,209 (26.1%)	49.8%	18.7%	31.5%		9.9%	50.5%	34.1%	5.6%	
	Married (0-1)	11,096 (55.7%)	44.4%	33.8%	21.8%		8.7%	46.1%	38.4%	6.8%	
	Separated (0-1)	507 (2.5%)	36.1%	28.4%	35.5%		7.2%	42.8%	37.8%	12.2%	
	Divorced (0-1)	937 (4.7%)	33.8%	28.5%	37.7%		4.0%	39.4%	47.0%	9.6%	
	Widow/Widower (0-1)	2,182 (11.0%)	70.5%	20.4%	9.1%		3.0%	47.3%	42.2%	7.5%	
Number of children in the household (0-6) [a]			0.39 (0.74)	0.39 (0.74)	0.45 (0.75)		0.55 (0.83)	0.46 (0.76)	0.43 (0.73)	0.33 (0.66)	
Healthy lifestyle habits											
	Weekly hours of physical exercise in leisure time (0-50)		2.20 (3.66)	2.45 (4.04)	1.99 (3.68)		2.72 (4.35)	2.27 (3.87)	1.67 (3.36)	0.93 (2.53)	
	Healthy diet index (-13 to 25) [g]		11.2 (5.05)	11.4 (4.92)	8.87 (5.76)		9.42 (5.19)	9.31 (5.70)	8.39 (5.87)	7.74 (5.80)	
	Average daily consumption of pure alcohol in grams (0-185.71) [h]		3.03 (7.14)	6.95 (10.8)	7.42 (12.5)		6.57 (9.96)	6.11 (10.5)	8.22 (13.1)	13.0 (20.6)	
State of Health											
	Body Mass Index (1-4) [a, e]		2.67 (0.77)	2.80 (0.75)	2.58 (0.76)		2.55 (0.76)	2.50 (0.72)	2.62 (0.76)	2.90 (0.83)	
Mental health (last 12 months)						< 0.001					< 0.001
	Mental health disease/problem (0-1) [f]	2,402 (12.1%)	50.4%	24.0%	25.6%		6.5%	40.6%	38.9%	14.0%	
	Mentally healthy (ref.) (0-1)	17,529 (87.9%)	47.6%	28.6%	23.8%		8.7%	48.0%	37.5%	5.8%	

Note. a) Quantitative variable. Information reported is mean and standard deviation; b) Information only available for daily smokers; c) Derived variable based on the occupation of the reference person: I – Directors and managers of businesses with 10 or more salaried employees and professionals traditionally associated with university degrees, II – Directors and managers of businesses with fewer than 10 salaried employees and professionals traditionally associated with university degrees and other technical support professionals. Athletes and artists, III – Intermediate occupations and self-employed, IV – Supervisors and workers in qualified technical occupations, V – Qualified workers in the primary sector and other semi-skilled workers, VI – Unskilled workers; d) Includes workers with a verbal contract or with no contract, family help, members of a cooperative and other situations; e) This discrete ordered variable has values between 1 and 4 and captures whether the individual's weight-height ratio, measured as their BMI value within the International Obesity Task Force (IOFT) scale is classified as underweight (BMI < 18.5; BMI variable value = 1), normal weight (18.5 ≤ BMI < 25; BMI variable value = 2), overweight (25 ≤ BMI < 30; BMI variable value = 3) or obese (BMI ≥ 30; BMI variable value = 4); f) Depression, chronic anxiety or other mental problems; g) This index is calculated by adding frequencies of eating fresh fruit (excluding juices), natural fruit or vegetable juices, vegetables, salads and vegetables, legumes and dairy products, and in turn subtracting the frequencies of eating sweets, sugared soft drinks, fast food, and salty snacks. The frequency of each of these food groups is measured on the following scale: 0 - Never, 1 - Less than once a week, 2 - Once or twice a week, 3 - Three times a week, 4 - Four to six times a week, 5 - Once or more per day; h) Equivalent used in grams of pure alcohol: beer with alcohol: 10g per drink unit, wine or cava: 10g per drink unit, aperitifs with alcohol (vermouth, sherry): 20g per drink unit, liqueurs, anise, pacharán: 20g per drink unit, whisky, cognac, mixed: 20g per drink unit, local drinks (cider, carajillo ...): 10g per drink unit; p: significance level of the chi-square test. *Source.* Own research with data from the EHSS-2014.

ercise, lower healthy eating index and fewer children in the household.

Multivariate analysis

The results of the multivariate analysis of cigarette smoking prevalence are presented in four regression models, 1A, 1B, 2A and 2B, in Table 2. To assess prevalence, three situations were considered: (1) never smoker, (2) ex-smoker and (3) smoker. The ordered nature of the model used generates two outputs in each regression: (i) situations 3-2 versus 1, smoker and ex-smoker (versus never smoker), and (ii) situation 3 versus 2-1, smoker (versus ex-smoker and never smoker). It is precisely the orderly nature of the model which means that, in each of the two regression outputs, the alternative situation or situations (situation 1 or situations 2-1) are better, from a health perspective, than the main situations or situation (situations 3-2 or situation 3).

Models 1A and 1B include the entire final sample (19,931) while models 2A and 2B only comprise the working population (8,995). Type A models capture the information on the socioeconomic gradient through social class. Type B models, meanwhile, replace the compact information on the socioeconomic gradient captured by social class with those variables directly related to this gradient: educational level and economic/work-related variables as the main activity, health insurance (as a proxy of the economic situation) and sector of activity (only model 2B).

First, the results associated with the *probability of belonging to the smoker and ex-smoker population (versus never smokers)* are analysed, as shown in the left panel of Table 2. In relation to the variables associated with the *socioeconomic gradient*, model 1A shows how this probability in the *total sample* increases in social classes IV (OR = 1.13), V (OR = 1.20) and VI (OR = 1.19) versus social class I. In model 1B, this probability increases in the population with secondary education (OR = 1.52) and vocational training (OR = 1.35) compared to the population with university education. Regarding the main employment activity (model 1B), and compared to the situation of a business owners without employees or the solo self-employed, this probability increases in people with work disabilities (OR = 1.49), the unemployed (OR = 1.30), retirees or early retirees (OR = 1.28) and decreased for students (OR = 0.24) and people doing housework (OR = 0.66). On the other hand, having only public healthcare (model 1B) increases this probability (OR = 1.10).

When analysing this probability for the *sample of workers*, models 2A and 2B show greater effects of social class and educational level, respectively, than that observed for the *total sample* in models 1A and 1B. Regarding activity sector, and compared to hospitality workers, model 2B shows how this probability decreases, in particular for people doing household activities (OR = 0.52), working in artistic, recreational and entertainment sectors (OR = 0.59), or in information and communications (OR = 0.61) and education (OR = 0.68) sectors.

Regarding the *independent control variables*, models 1A and 1B show how this probability decreases for the *total sample* in women, increases in people aged 36-65 years (compared to people aged 15-35 years), increases in separated and divorced and decreases for widow/widowers (compared to singles), increases for the population with worse habits (less physical exercise, less healthy eating, greater alcohol use), decreases for people with lower BMI, and increases for those with some disease or mental health problem. Models 2A and 2B, meanwhile, show similar results for the *working population.*

Results regarding the *probability of belonging to the smoking population (compared to ex-smokers and never smokers)* are shown in the right panel of Table 2. In relation to the variables associated with the *socioeconomic gradient*, model 1A shows how this probability for the *total sample* increases significantly in social classes III (OR = 1.16), IV (OR = 1.23), V (OR = 1.32) and VI (OR = 1.47) compared to social class I. In model 1B, this probability increases for the population with primary (OR = 1.53) or secondary education (OR = 1.87) and vocational training (OR = 1.53), compared to the population with university education. Regarding the main activity (model 1B), and compared to the situation of business owners without employees or the solo self-employed, this probability increases for the unemployed (OR = 1.20), while it decreases for students (OR = 0.26), retirees or early retirees (OR = 0.60), people doing housework (OR = 0.75) and civil servants (OR = 0.76). On the other hand, having only public health cover (model 1B) increases this probability (OR = 1.15).

When analysing this probability for the *sample of workers*, models 2A and 2B show greater effects of social class and similar effects of educational level, respectively, than that observed for the *total sample* in models 1A and 1B. Regarding the main employment activity (model 2B), and compared to the situation of business owners without employees or the solo self-employed, this probability decreases for business owners or professionals with employees (OR = 0.78). Regarding activity sectors (model 2B), and compared to hospitality workers, this probability decreases significantly for workers in artistic, recreational and entertainment sectors (OR = 0.63), household activities (OR = 0.65), other services (OR = 0.66), agriculture, livestock, forestry and fishing (OR = 0.70), education (OR = 0.72), and professional, scientific and technical activities (OR = 0.74).

As for the *independent control variables*, models 1A and 1B show for the *total sample* how this probability decreases in women, increases in people aged between 36 and 50 years and decreases in people over 65 years (compared to people aged 15-35), increases for the divorced and separated, and decreases for married and widows/widowers (compared

Table 2. *Results of the multivariate analysis of the association between cigarette smoking prevalence in Spain in 2014 and different characteristics.*

	Smoker and Ex-smoker (vs Never smoker)								Smoker (vs Ex-smoker and Never smoker)							
Model	**1A**		**1B**		**2A**		**2B**		**1A**		**1B**		**2A**		**2B**	
Sample	**All (n = 19,931)**		**All (n = 19,931)**		**Only workers (n = 8,995)**		**Only workers (n = 8,995)**		**All (n = 19,931)**		**All (n = 19,931)**		**Only workers (n = 8,995)**		**Only workers (n = 8,995)**	
Variables capturing social class	**Yes**		**No**		**Yes**		**No**		**Yes**		**No**		**Yes**		**No**	
Variables linked to social class	**No**		**Yes**		**No**		**Yes**		**No**		**Yes**		**No**		**Yes**	
Main Independent Variables –Socioeconomic Gradient–	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**
Social class																
Class I (ref.) (0-1)	1				1				1				1			
Class II (0-1)	1.04	0.91 1.18			1.01	0.85 1.19			1.07	0.92 1.25			1.02	0.84 1.24		
Class III (0-1)	1.10	0.99 1.22			1.18 *	1.03 1.36			1.16 *	1.02 1.31			1.22 *	1.04 1.42		
Class IV (0-1)	1.13 *	1.00 1.27			1.40 ***	1.18 1.64			1.23 **	1.08 1.41			1.37 **	1.14 1.64		
Class V (0-1)	1.20 ***	1.08 1.33			1.44 ***	1.25 1.65			1.32 ***	1.17 1.49			1.48 ***	1.27 1.72		
Class VI (0-1)	1.19 **	1.05 1.34			1.55 ***	1.29 1.85			1.47 ***	1.28 1.69			1.77 ***	1.47 2.14		
Educational attainment																
Primary education (0-1)			0.96	0.86 1.07			1.19 **	1.06 1.35			1.53 ***	1.28 1.83			1.48 ***	1.22 1.79
Secondary education (0-1)			1.52 ***	1.39 1.66			1.66 ***	1.51 1.84			1.87 ***	1.65 2.12			1.77 ***	1.54 2.03
Vocational training (0-1)			1.35 ***	1.21 1.49			1.47 ***	1.31 1.65			1.53 ***	1.34 1.74			1.63 ***	1.41 1.89
University education (ref.) (0-1)			1				1				1				1	
Economic/work-related variables																
Main activity																
Business owner or professional with employees (0-1)			0.85	0.68 1.05			0.85	0.68 1.06			0.79	0.63 1.00			0.78 *	0.62 0.99
Business owner without employees or solo self-employed (ref.) (0-1)			1				1				1				1	
Civil servant (0-1)			0.93	0.78 1.11			0.93	0.75 1.16			0.76 **	0.63 0.93			0.80	0.63 1.03
Worker with permanent contract (0-1)			0.97	0.84 1.11			0.94	0.81 1.09			0.91	0.79 1.05			0.87	0.75 1.01
Worker with temporary contract (0-1)			1.02	0.86 1.21			0.95	0.80 1.13			1.00	0.83 1.19			0.92	0.76 1.10
Other work situation (0-1)			1.28	0.91 1.78			1.24	0.88 1.75			1.05	0.74 1.49			0.98	0.68 1.41
Unemployed (0-1)			1.30 **	1.12 1.51							1.20 *	1.03 1.40				
Student (0-1)			0.24 ***	0.20 0.30							0.26 ***	0.21 0.32				
Retiree or early retiree (0-1)			1.28 **	1.07 1.54							0.60 ***	0.49 0.74				
Work disability (0-1)			1.49 **	1.15 1.94							0.99	0.76 1.29				
Housework (0-1)			0.66 ***	0.55 0.79							0.75 **	0.62 0.92				
Other jobless situation (0-1)			0.96	0.54 1.72							0.89	0.48 1.63				
Health insurance																
Only public health -no state mutuals- (0-1)			1.10 *	1.01 1.19			1.05	0.95 1.17			1.15 **	1.05 1.26			1.10	0.98 1.23
State mutuals or private insurance (ref.) (0-1)			1				1				1				1	
Only workers																
Sector (NACE Rev.2)																
A Agriculture, forestry and fishing (0-1)							0.71 *	0.54 0.93							0.70 *	0.53 0,92
B Mining industry (0-1)							2.24	0.82 6.08							0.93	0.41 2,13
C Manufacturing industry (0-1)							0.94	0.76 1.16							0.95	0.77 1,18
D Electric power, gas, steam and air conditioning (0-1)							0.79	0.45 1.37							0.75	0.41 1,35
E Water supply, sanitation, waste and decontamination (0-1)							0.96	0.56 1.66							1.13	0.67 1,91
F Construction (0-1)							0.77 *	0.59 0.99							0.82	0.63 1,07
G Car sales and repairs (0-1)							0.73 **	0.60 0.89							0.79 *	0.65 0,97
H Transport and storage (0-1)							0.80	0.61 1.05							0.86	0.65 1,13

Table 2. *Results of the multivariate analysis of the association between cigarette smoking prevalence in Spain in 2014 and different characteristics* (cont.).

I	Hospitality (ref.) (0-1)										1												1		
J	Information and communications (0-1)										0.61 **	0.45	0.83										0.79	0.57	1,10
K	Finance and insurance (0-1)										0.67 *	0.49	0.92										0.75	0.53	1,07
L	Real estate (0-1)										1.27	0.72	2.22										1.01	0.57	1,78
M	Professional, scientific and technical activities (0-1)										0.72 *	0.55	0.93										0.74 *	0.55	0,98
N	Administrative and auxiliary services (0-1)										0.82	0.64	1.07										0.88	0.68	1,15
O	Public administration and defence; Obligatory social security (0-1)										0.78	0.61	1.01										0.76 *	0.58	1,00
P	Education (0-1)										0.68 **	0.53	0.88										0.72 *	0.55	0,94
Q	Health and social services (0-1)										0.90	0.72	1.14										0.82	0.64	1,04
R	Artistic, recreational and entertainment activities (0-1)										0.59 **	0.41	0.85										0.63 *	0.42	0,95
S	Other services (0-1)										0.86	0.61	1.20										0.66 *	0.46	0,95
T	Household activities (0-1)										0.52 ***	0.38	0.71										0.65 *	0.46	0,91
U	Working for extraterritorial organisations (0-1)										0.60	0.08	4.41										0.26	0.03	2,67
Independent Control Variables																									
Sociodemographic variables																									
Sex																									
	Women (0-1)	0.48 ***	0.45	0.51	0.52 ***	0.48	0.56	0.89 *	0.81	0.98	0.94	0.85	1.04	0.62 ***	0.57	0.67	0.65 ***	0.60	0.70	0.89 *	0.80	0.98	0.96	0.85	1.07
	Men (ref.) (0-1)	1			1			1			1			1			1			1			1		
Age																									
	15-35 years (ref.) (0-1)	1			1			1			1			1			1			1			1		
	36-50 years (0-1)	1.74 ***	1.59	1.91	1.39 ***	1.26	1.53	1.28 ***	1.14	1.44	1.28 ***	1.14	1.45	1.38 ***	1.25	1.52	1.16 **	1.04	1.28	1.09	0.96	1.23	1.11	0.98	1.26
	51-65 years (0-1)	1.92 ***	1.72	2.14	1.64 ***	1.45	1.85	1.72 ***	1.49	1.99	1.69 ***	1.46	1.97	0.95	0.84	1.07	0.91	0.80	1.03	0.91	0.78	1.06	0.94	0.80	1.11
	Over 65 years (0-1)	0.91	0.81	1.02	0.78 **	0.65	0.93							0.23 ***	0.19	0.27	0.34 ***	0.27	0.43						
Marital status																									
	Single (ref.) (0-1)	1						1						1						1					
	Married (0-1)	1.13 **	1.04	1.22	1.03	0.95	1.13	1.04	0.92	1.16	1.00	0.89	1.12	0.81 ***	0.74	0.88	0.72 ***	0.66	0.79	0.75 ***	0.67	0.85	0.71 ***	0.63	0.80
	Separated (0-1)	1.58 ***	1.29	1.93	1.35 **	1.11	1.65	0.98	0.75	1.28	0.93	0.71	1.23	1.45 ***	1.18	1.78	1.27 *	1.03	1.55	0.97	0.73	1.29	0.94	0.70	1.25
	Divorced (0-1)	1.75 ***	1.50	2.04	1.51 ***	1.29	1.77	1.37 **	1.11	1.68	1.32 **	1.07	1.62	1.53 ***	1.31	1.79	1.32 ***	1.13	1.55	1.31 *	1.07	1.60	1.25 *	1.02	1.54
	Widow/widower (0-1)	0.64 ***	0.56	0.74	0.54 ***	0.47	0.62	0.68 *	0.49	0.94	0.65 *	0.47	0.90	0.78 **	0.65	0.93	0.74 **	0.62	0.88	1.00	0.71	1.42	0.95	0.67	1.35
Number of children in the household (0-6)		0.97	0.92	1.02	0.97	0.93	1.02	0.98	0.92	1.04	0.99	0.93	1.05	0.86 ***	0.82	0.91	0.87 ***	0.83	0.92	0.88 ***	0.83	0.94	0.89 **	0.83	0.95
Healthy lifestyle habits																									
	Weekly hours of physical exercise in leisure time (0-50)	0.98 ***	0.97	0.99	0.98 ***	0.97	0.99	0.99	0.98	1.00	0.99	0.98	1.00	0.96 ***	0.95	0.97	0.96 ***	0.95	0.97	0.96 ***	0.95	0.98	0.96 ***	0.95	0.98
	Healthy diet index (-13 to 25)	0.97 ***	0.97	0.98	0.97 ***	0.97	0.98	0.97 ***	0.96	0.98	0.97 ***	0.97	0.98	0.96 ***	0.95	0.97	0.96 ***	0.95	0.97	0.95 ***	0.94	0.96	0.95 ***	0.94	0.96
	Average daily consumption of pure alcohol in grams (0-185.71)	1.04 ***	1.03	1.04	1.04 ***	1.03	1.04	1.04 ***	1.03	1.05	1.04 ***	1.04	1.05	1.03 ***	1.02	1.03	1.02 ***	1.02	1.03	1.03 ***	1.02	1.03	1.03 ***	1.02	1.03
State of Health																									
	Body Mass Index (1-4)	0.94 **	0.90	0.97	0.92 ***	0.88	0.96	0.98	0.92	1.05	0.97	0.91	1.03	0.82 ***	0.78	0.86	0.80 ***	0.76	0.84	0.81 ***	0.76	0.87	0.80 ***	0.75	0.86
Mental health (last 12 months)																									
	Mental health disease/problem (0-1)	1.16 **	1.06	1.27	1.11 *	1.01	1.22	1.20 *	1.00	1.43	1.18	0.99	1.41	1.27 ***	1.15	1.40	1.24 ***	1.12	1.38	1.31 **	1.10	1.57	1.31 **	1.09	1.57
	Mentally healthy (ref.) (0-1)	1			1			1			1			1			1			1			1		

Note. * p ‹ 0.05; ** p ‹ 0.01; *** p ‹ 0.001; All models also include the following geographic variables as control variables: place of birth (categorical variable indicating whether participant was born in or outside Spain), size of the municipality (7 categorical variables from smallest to largest population: ‹ 10 thousand inhabitants, 10-20 thousand inhabitants, 20-50 thousand inhabitants, 50-100 thousand inhabitants, 100-500 thousand inhabitants not provincial capital, provincial capital ‹ 500 thousand inhabitants, › 500 thousand inhabitants), autonomous community (or city) (19 categorical variables corresponding to the 17 autonomous communities and the 2 autonomous cities in Spain); a In models 2A and 2B only for workers, age ranges from 18 to 65 years.

Source. Own research with data from EHSS-2014.

to singles), increases for the population with less healthy habits, decreases for people with lower BMI, and increases for people with some disease or health problem For their part, models 2A and 2B show similar results for the *working population.*

The results of the multivariate analysis of cigarette smoking levels in the *total sample of smokers* are presented in models 3A and 3B of Table 3 (4,785 records). To measure the level of smoking, four levels were considered: (1) occasional smoker, (2) daily smoker of up to 10 cigarettes, (3) daily smoker of 11 to 20 cigarettes and (4) daily smoker of over 20 cigarettes. The ordered nature of the model generates three outputs in each regression: (i) levels 4-3-2 vs. 1, daily smoker (vs. occasional smoker), (ii) levels 4-3 vs. 2-1, daily smoker of more than 10 cigarettes (vs. daily smokers of up to 10 cigarettes and occasional smokers) - and (iii) level 4 vs. 3-2-1, daily smoker of over 20 cigarettes (vs. daily smokers of up to 20 cigarettes and occasional smokers). In this case, the ordered nature of the model again means that, in each of the three outputs in the regression, the alternative level or levels (level 1, levels 2-1 or levels 3-2-1) are better in health terms than the levels or the main level (levels 4-3-2, levels 4-3 or level 4).

Analogously to Table 2, model 3A captures the information on the socioeconomic gradient through social class, while 3B includes those variables directly related to this gradient: educational attainment and economic/work-related variables such as the main work activity and health insurance.

First, the results related to the *probability of belonging to the daily smoker population (versus occasional smoker),* presented in the left panel of Table 3, are analysed. Regarding the variables associated with the *socioeconomic gradient,* model 3A shows how this probability increases for social classes III (OR = 1.48), IV (OR = 1.64), V (OR = 1.99) and VI (OR = 1.68) compared to social class I. Model 3B shows how, compared to the population with a university education, this probability increases for the population with basic (OR = 1.49) and secondary education (OR = 1.48). Regarding main work activity, and compared to the situation of business people without employees or the solo self-employed, it is observed how this probability decreases for those people whose main activity is studying (OR = 0.51).

With respect to the *independent control variables,* models 3A and 3B show how this probability increases in people aged between 36 and 65 years (compared to those aged 15-35 years) and in divorcees (compared to singles), as well as for the population doing less physical exercise and eating a less healthy diet.

Next, the results related to the *probability of belonging to the population that smokes over 10 cigarettes daily (versus daily smokers of under 10 cigarettes and occasional smokers)* are analysed; these are presented in the central panel of Table 3. Regarding the variables associated with the socioeconomic gradient, model 3A shows how this probability increases significantly in social classes IV (OR = 1.36), V (OR = 1.34) and VI (OR = 1.50) as against social class I. In model 3B, compared to the population with a university education, this probability increases for the population with primary (OR = 1.84) or secondary education (OR = 1.66) and vocational training (OR = 1.55). Regarding the main activity (model 3B), and compared to the situation of business owners without employees or the solo self-employed, this probability decreases for students (OR = 0.20), workers on permanent contracts (OR = 0.72) and the unemployed (OR = 0.73).

In relation to the *independent control variables,* models 3A and 3B show how this probability is reduced in women and in households with a greater number of children, while increasing in people between 36 and 65 years of age (compared to those aged 15-35 years), in divorcees (compared to singles), in the population with less healthy behaviours, and among those with higher BMI or with some disease or mental health problem.

Finally, the results related to the *probability of belonging to the daily population of smokers of over 20 cigarettes* are analysed (versus *daily smokers of under 20 cigarettes* and *occasional smokers*), as shown in the right panel of Table 3. In relation to the variables associated with the *socioeconomic gradient* and, contrary to findings regarding the rest of the probabilities analysed in this study, models 3A and 3B do not show any significant effect of social class, education or health insurance. Regarding the main work activity (model 3B), however, compared to the situation of business owner without employees or the solo self-employed, this probability decreases for retirees or early retirees (OR = 0.44) and workers with a permanent contract (OR = 0.57).

Regarding the *independent control variables,* models 3A and 3B show how this probability decreases in women and increases in people aged 36 to 65 years (compared to those aged 15-35 years), in the population with the worst habits, and in people with higher BMI or with some disease or mental health problem.

Discussion

To tackle inequalities in smoking prevalence, interventions and socio-health policies should target groups with a higher risk of prevalence, so the main aim of this study was to identify such risk groups.

The findings confirm the relationship between the *socioeconomic gradient* and both the prevalence and the intensity of smoking in Spain, which is consistent with the predictions of the epidemiological model by López et al. (1994) for the spread of the epidemic in the most disadvantaged groups and with the international academic literature documenting this association (Schaap et al., 2008; White et al., 2016). These results are robust in their identification either

Table 3. Results of the multivariate analysis of the association between the intensity of cigarette smoking in Spain in 2014 and different characteristics.

	Daily smoker (vs Occasional smoker)				Daily smoker › 10 cigarettes (vs Daily smoker ≤ 10 and Occasional smoker)				Daily smoker › 20 cigarettes (vs Daily smoker ≤ 20 and Occasional smoker)			
Model	**3A**		**3B**		**3A**		**3B**		**3A**		**3B**	
Sample	**Only smokers (n = 4,785)**		**Only smokers (n = 4,785)**		**Only smokers (n = 4,785)**		**Only smokers (n = 4,785)**		**Only smokers (n = 4,785)**		**Only smokers (n = 4,785)**	
Variables capturing social class	**Yes**		**No**		**Yes**		**No**		**Yes**		**No**	
Variables linked to social class	**No**		**Yes**		**No**		**Yes**		**No**		**Yes**	
Main Independent Variables –Socioeconomic Gradient–	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**	**OR**	**CI 95%**
Social class												
Class I (ref.) (0-1)	1				1				1			
Class II (0-1)	1.37	0.87 2.17			1.13	0.85 1.51			0.93	0.51 1.69		
Class III (0-1)	1.48 *	1.02 2.13			1.24	0.98 1.57			0.87	0.54 1.39		
Class IV (0-1)	1.64 *	1.09 2.46			1.36 *	1.06 1.75			0.83	0.51 1.36		
Class V (0-1)	1.99 ***	1.40 2.84			1.34 *	1.07 1.67			1.02	0.66 1.57		
Class VI (0-1)	1.68 *	1.13 2.51			1.50 **	1.17 1.93			1.12	0.70 1.79		
Educational attainment												
Primary education (0-1)			1.49 *	1.01 2.20			1.84 ***	1.47 2.32			1.07	0.69 1.67
Secondary education (0-1)			1.48 *	1.10 1.99			1.66 ***	1.37 2.01			1.06	0.71 1.57
Vocational training (0-1)			1.38	0.98 1.94			1.55 ***	1.25 1.92			0.92	0.58 1.44
University education (ref.) (0-1)			1				1				1	
Economic/work-related variables												
Main activity												
Business owner or professional with employees (0-1)			0.61	0.32 1.15			0.91	0.61 1.35			0.74	0.38 1.47
Business owner without employees or solo self-employed (ref.) (0-1)			1				1				1	
Civil servant (0-1)			1.06	0.58 1.95			0.89	0.63 1.27			0.53	0.26 1.08
Worker with permanent contract (0-1)			0.90	0.58 1.38			0.72 **	0.56 0.91			0.57 *	0.38 0.88
Worker with temporary contract (0-1)			1.02	0.61 1.71			0.80	0.59 1.07			0.75	0.43 1.29
Other work situation (0-1)			2.33	0.53 10.27			1.16	0.64 2.11			1.59	0.61 4.15
Unemployed (0-1)			0.97	0.61 1.53			0.73 *	0.57 0.94			0.74	0.47 1.15
Student (0-1)			0.51 *	0.28 0.94			0.20 ***	0.12 0.33			0.27	0.06 1.18
Retiree or early retiree (0-1)			1.82	0.79 4.21			0.78	0.54 1.14			0.44 *	0.23 0.86
Work disability (0-1)			0.77	0.35 1.73			0.79	0.51 1.23			0.64	0.32 1.28
Housework (0-1)			1.27	0.65 2.50			0.81	0.57 1.15			0.65	0.31 1.36
Other jobless situation (0-1)			0.91	0.11 7.77			1.84	0.56 6.05			1.96	0.59 6.48
Health insurance												
Only public health -no state mutuals- (0-1)			1.16	0.87 1.53			0.90	0.76 1.07			0.94	0.66 1.32
State mutuals or private insurance (ref.) (0-1)			1				1				1	
Independent Control Variables												
Sociodemographic variables												
Sex												
Women (0-1)	0.91	0.73 1.15	0.92	0.72 1.16	0.66 ***	0.57 0.75	0.69 ***	0.60 0.79	0.45 ***	0.34 0.60	0.46 ***	0.34 0.62
Men (ref.) (0-1)	1		1		1		1		1		1	
Age												
15-35 years (ref.) (0-1)	1		1		1		1		1		1	
36-50 years (0-1)	1.94 ***	1.49 2.53	1.83 ***	1.39 2.40	1.98 ***	1.67 2.34	1.75 ***	1.47 2.08	1.92 **	1.30 2.84	1.83 **	1.23 2.73
51-65 years (0-1)	2.54 ***	1.77 3.64	2.15 ***	1.47 3.14	2.29 ***	1.86 2.81	1.92 ***	1.54 2.39	2.55 ***	1.65 3.93	2.47 ***	1.58 3.87
Over 65 years (0-1)	3.15 ***	1.71 5.78	1.54	0.64 3.72	1.65 **	1.22 2.21	1.33	0.88 2.00	1.79	0.98 3.26	2.37 *	1.07 5.25
Marital status												
Single (ref.) (0-1)	1		1		1		1		1		1	
Married (0-1)	0.97	0.75 1.27	0.92	0.70 1.21	1.12	0.96 1.30	1.03	0.88 1.20	1.12	0.83 1.52	1.11	0.81 1.51
Separated (0-1)	1.06	0.57 1.97	1.05	0.56 1.97	1.18	0.84 1.64	1.10	0.79 1.53	1.56	0.92 2.65	1.56	0.92 2.65
Divorced (0-1)	2.01 *	1.12 3.62	1.94 *	1.07 3.50	1.79 ***	1.39 2.31	1.72 ***	1.33 2.22	1.51	0.96 2.36	1.46	0.93 2.28
Widow/widower (0-1)	2.46 *	1.02 5.89	2.22	0.92 5.37	1.41 *	1.01 1.97	1.29	0.92 1.81	1.35	0.72 2.54	1.49	0.78 2.83
Number of children in the household (0-6)	0.86	0.74 1.00	0.86	0.74 1.00	0.89 *	0.81 0.97	0.88 **	0.80 0.97	0.88	0.72 1.07	0.86	0.70 1.04
Healthy lifestyle habits												
Weekly hours of physical exercise in leisure time (0-50)	0.96 **	0.94 0.99	0.96 **	0.94 0.99	0.95 ***	0.93 0.96	0.95 ***	0.93 0.96	0.90 ***	0.85 0.94	0.90 ***	0.85 0.94
Healthy diet index (-13 to 25)	0.96 ***	0.94 0.98	0.96 ***	0.94 0.98	0.96 ***	0.94 0.97	0.96 ***	0.94 0.97	0.95 ***	0.93 0.97	0.95 ***	0.93 0.98
Average daily consumption of pure alcohol in grams (0-185.71)	1.00	0.99 1.01	1.00	0.99 1.01	1.01 ***	1.01 1.02	1.01 ***	1.01 1.02	1.02 ***	1.01 1.03	1.02 ***	1.01 1.03
State of Health												
Body Mass Index (1-4)	0.93	0.80 1.08	0.92	0.79 1.06	1.15 **	1.06 1.25	1.13 **	1.04 1.23	1.58 ***	1.36 1.83	1.55 ***	1.34 1.81
Mental health (last 12 months)												
Mental health disease/problem (0-1)	1.08	0.76 1.54	1.08	0.76 1.55	1.35 **	1.13 1.62	1.33 **	1.11 1.61	2.79 ***	2.09 3.71	2.79 ***	2.07 3.77
Mentally healthy (ref.) (0-1)	1		1		1		1		1		1	

Note. * p ‹ 0.05; ** p ‹ 0.01; *** p ‹ 0.001; All models also include the following geographic variables as control variables: place of birth (categorical variable indicating whether participant was born in or outside Spain), size of the municipality (7 categorical variables from smallest to largest population: ‹ 10 thousand inhabitants, 10-20 thousand inhabitants, 20-50 thousand inhabitants, 50-100 thousand inhabitants, 100-500 thousand inhabitants not provincial capital, provincial capital ‹ 500 thousand inhabitants, › 500 thousand inhabitants), autonomous community (or city) (19 categorical variables corresponding to the 17 autonomous communities and the 2 autonomous cities in Spain). *Source*. Own research with data from EHSS-2014.

through the variables capturing social class, or through level of education and economic/work-related variables.

More specifically, regarding social class, both prevalence and intensity of cigarette smoking is seen to increase in groups of lower social class. Class (based on occupation) can point to differences between workers in the workplace and social relationships at work, which can generate important differences in relation to smoking given the heterogeneity within each group in terms of attitudes, social norms and social support (Sorensen, Barbeau, Hunt & Emmons, 2004).

Regarding educational attainment, it is observed in particular how university study is associated not only with lower smoking prevalence but also, within the population of smokers, lower intensity. Regarding this result, it is also observed how studying as the main activity is associated with lower prevalence and intensity, suggesting the importance of formal educational processes in the fight against this epidemic. Not surprisingly, educational level is the most used factor of the socioeconomic gradient in the set of studies analysing the association between socioeconomic status and smoking (Schaap et al., 2008). In practice, those with more education perform better in almost all dimensions of health, adopt healthier behaviours and live longer (Maralani, 2014).

Also interesting is the result regarding unemployed participants, with high smoking prevalence but lower levels of intensity. This duality seems indicative of a double effect. On the one hand, redundancy could not only be considered a stress-inducing event, associated with relapse into smoking (McKee, Maciejewski, Falba & Mazure, 2003), but also places the individual in a more disadvantaged and vulnerable collective where smoking is more frequent (Falba, Teng, Sindelar & Gallo, 2005; Okechukwu, Bacic, Cheng & Catalano, 2012). This higher prevalence observed among the unemployed is consistent with that observed in those participants whose only form of health insurance is the public health system (and, therefore, a worse economic situation), whose prevalence is also higher. There is, therefore, evidence associating lower levels of work income with the population of smokers (Levine, Gustafson & Velenchik, 1997). On the other hand, the lower purchasing power of these groups may cause people to simply reduce their levels of smoking (Falba et al., 2005). In the case of the unemployed in Spain, in particular, the financial difficulties associated with the lack of employment coexist with the effects of the 2008 crisis and high cigarette prices.

This situation allows some interesting arguments to be posited. In the first place, the need to incorporate the unemployed into specific prevention and smoking cessation plans seems urgent. Second, the employment policies developed by the different public services not only have a direct effect in terms of reducing unemployment, but could also have a significant indirect effect in the fight against smoking. Third, tax increases on tobacco products appear to trigger greater decreases in the smoking levels of lower-income groups, that is, those showing a higher prevalence, which suggests the suitability of these measures. In other words, a higher price elasticity of demand for cigarettes is observed among the most vulnerable socioeconomic groups, which is consistent with the existing evidence for other countries (Colman & Remler, 2008; Nargis, Fong, Chaloupka & Li, 2014). The latest tax increases, however, have turned Spain from being a transit country for illicit tobacco into a destination market, precisely in regions such as Andalusia and Extremadura where the level of unemployment is higher (Calderoni, Angelini, Mancuso & Rotondi, 2014). Such tax increases must therefore be accompanied by greater pressure against tax evasion and smuggling to prevent a substitution effect from occurring in the change from legal towards illicit product use.

In terms of the working population, various sectors are seen to have lower prevalence, some of which are associated with higher educational levels, such as the education sector, professional, scientific and technical activities, in public administration and defence, or in artistic, recreational and entertainment sectors. The opposite is observed, however, in other sectors such as hospitality, construction or transport and storage. These results are consistent with the evidence available in the international literature on higher prevalence and intensity of smoking in manual (or blue-collar) workers compared to office (or white-collar) workers (Okechukwu et al., 2012). Thus, the need for greater watchfulness regarding workers in specific sectors is urgent, and more systematic programs to control smoking should be designed for them. In this sense, the working environment itself has been revealed as an effective context for habit control interventions in manual workers (Cahill & Lancaster, 2014). However, the very nature of many manual jobs causes workers to change employers frequently, making it difficult to reach them through these programs (Okechukwu et al., 2012). Furthermore, it is precisely these sectors that are most sensitive to economic fluctuation, leading workers to repeatedly alternate between employment and jobless situations (as can be seen in the current COVID-19 crisis, especially in the hospitality sector). This state of flux doubles the vulnerability of these workers regarding their smoking habit: higher smoking prevalence and intensity in situations of job loss (Montgomery, Cook, Bartley & Wadsworth, 1998) on the one hand and, on the other, higher smoking intensity in recessive economic situations (Okechukwu et al., 2012).

These results as a whole make it possible not only to identify more precisely the at-risk groups in the fight against smoking in Spain, but also to highlight the need for more evidence to be collected to improve treatment of dependence in special populations, such as are the groups with the lowest socioeconomic levels (Fagan et al., 2004).

This study also includes in its analysis other control variables related to smoking, such as *sociodemographic characteristics, healthy lifestyle habits*, and *health status*. The analysis of the results obtained in relation to these variables gives rise to some further interesting arguments.

In the first place, this study reveals some demographic factors characterising cigarette users in Spain. In particular, men, people aged between 36 and 50 years, divorcees, and people whose children do not live at home show both higher prevalence and intensity in their smoking. In this sense, although the results associated with the sex and age of the smoker are very common in epidemiological studies (Pinilla & Abásolo, 2017; Leal-López, Sánchez-Queija & Moreno, 2019; Rodríguez-Muñoz, Carmona-Torres, Hidalgo -Lopezosa, Cobo-Cuenca & Rodríguez-Borrego, 2019), the evidence obtained as regards marital status and number of children in the household is more novel and could be of interest in designing better tobacco control programs for specific groups. In particular, these results suggest a relationship with the set of studies which identify a positive association between smoking and factors such as loneliness and negative affect (see Dyal & Valente, 2015, for a review).

Second, a robust association is observed between healthy lifestyle habits and reduced smoking prevalence and intensity, consistent with the existing academic literature; although within the latter, studies focused on specific population subgroups predominate, such as adolescents (Rodríguez-García, López Villalba, López-Miñarro & García-Cantó, 2013), marginalized groups (Watanabe et al., 2013) or pregnant women (Ino, Shibuya, Saito & Inaba, 2011). The results presented here therefore contribute to this literature in showing the existence of this virtuous association between healthy lifestyle habits and less smoking for the total population, which is less frequent in academic research (the work of Agudo et al., 2004 is an exception). In brief, regular physical exercise, good diet and nutrition and the responsible use of alcohol are not only highly recommended behaviours given their enormous physical and psychological benefits (Woodcock, Franco, Orsini & Roberts, 2011), but promoting them is shown to be an indispensable ally in the design of plans by the health authorities against the smoking epidemic.

Thirdly, this analysis presents other valuable evidence in terms of its contribution to the design of tobacco control programs targeting specific groups, such as those linking smoking and health status, as captured through BMI and mental health. Regarding BMI, this study shows how smokers present lower values than non-smokers. However, the results also show how BMI values increase with rising levels of smoking, yet both associations are consistent with the available evidence (Chiolero, Faeh, Paccaud & Cornuz, 2008). Specifically, the reduction in appetite and the higher energy expenditure associated with nicotine seem to explain the negative association between smoking prevalence BMI values. Higher levels of smoking, however, seems to be associated with a set of coexisting risk factors (sedentary lifestyle, irregular eating and excess alcohol use) which could explain the weight gain. As regards mental health, this study presents evidence showing a positive relationship between cigarette smoking and having a disease or mental health problem, which is consistent with the existing results in the epidemiological literature linking tobacco use to problems such as depression or anxiety (Mykletun, Overland, Aarø, Liabø & Stewart, 2008).

This work is not without limitations, of which the cross-section data available in the EHSS-2014 is probably the most important. Thus, the fact that the information available refers to a single period does not allow cause-effect relationships to be established, only statistical associations. In other words, it is not possible in light of this evidence to make statements of such as people are smokers because of their work, economic or family situation, or simply because of their lifestyle. Furthermore, the data from this study do not allow us to distinguish normal cigarettes from hand-rolled ones, which would be interesting in itself, or to incorporate other tobacco products such as cigars or pipes, given the small number of observations in the sample, or water pipes or e-cigarettes due to the exclusion of these products from the questionnaire. The exploration of possible joint effects between the different variables associated with the socio-economic gradient has also been outside the limits of this study for reasons of brevity and focus. Other natural extensions of this study would be the use of EHSS-2019 data (not yet available at the time of writing), which would allow us to know how the smoking habit has changed in Spain in the last five years, or the expansion of the reference frame to other countries also participating in the European Health Survey, which would enable a comparative perspective with countries of our socio-economic environment.

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Conflicts of interests

The authors declare no conflicts of interest.

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