



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

The associations of personality traits and parental education with smoking behaviour among adolescents

Citation for published version:

Yáñez, AM, Leiva, A, Estela, A & Cukic, I 2017, 'The associations of personality traits and parental education with smoking behaviour among adolescents' PLoS One, vol. 12, no. 3, e0174211. DOI: 10.1371/journal.pone.0174211

Digital Object Identifier (DOI):

[10.1371/journal.pone.0174211](https://doi.org/10.1371/journal.pone.0174211)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

PLoS One

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



RESEARCH ARTICLE

The associations of personality traits and parental education with smoking behaviour among adolescents

Aina M. Yáñez^{1,2}, Alfonso Leiva^{1,3}, Andreu Estela⁴, Iva Čukić^{5,6*}

1 Instituto de Investigación Sanitaria de Palma (IdISPa), Mallorca, Spain, **2** Research Group on Evidence, Lifestyles and Health, Universitat Illes Balears, Mallorca, Spain, **3** Primary Care Research Unit of Mallorca, Balears Health Services-IbSalut, Mallorca, Spain, **4** Dalt Sant Joan Health Centre, Balears Health Services-IbSalut, Menorca, Spain, **5** Centre for Cognitive Ageing and Cognitive Epidemiology, University of Edinburgh, Edinburgh, United Kingdom, **6** Department of Psychology, University of Edinburgh, Edinburgh, United Kingdom

* iva.cukic@ed.ac.uk



OPEN ACCESS

Citation: Yáñez AM, Leiva A, Estela A, Čukić I (2017) The associations of personality traits and parental education with smoking behaviour among adolescents. PLoS ONE 12(3): e0174211. <https://doi.org/10.1371/journal.pone.0174211>

Editor: Antonio Verdejo-García, University of Granada, SPAIN

Received: November 18, 2016

Accepted: March 6, 2017

Published: March 23, 2017

Copyright: © 2017 Yáñez et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All relevant data are within the paper and the following URL: <https://github.com/ivacukic/spanish-adolescent-data>.

Funding: This project was funded by Health Research Funds of the “Instituto de Salud Carlos III” from Spanish Government (P10/00517) co-financed with European Union ERDF funds. The work is also being supported by the Health Promotion and Preventive Activities-Primary Health Care Network, which is sustained by the Ministry of Health of Spain (ISCIII-RETCI G03/170 and RD06/0018). The funders had no role in study design,

Abstract

We examined whether personality traits and parental education are associated with smoking initiation in a sample of Spanish secondary school students. Participants, taken from the ITACA study (842 adolescents aged 14–15 years), completed a questionnaire assessing personality traits of the Five Factor Model, smoking behaviours and parental education. Multinomial logistic regression models controlling for age and sex were used to determine the independent associations and interactions of personality traits and parental education with risk of ever trying smoking, as well as with being a regular smoker in adolescence. Higher conscientiousness was related to a lower chance of trying smoking at least once (OR = 0.57, 95% CIs = 0.46, 0.71) as well as being a regular smoker (OR = 0.39, 95% CIs = 0.27, 0.55). Higher emotional instability (neuroticism) was associated with higher risk of being in either smoking category (OR = 1.33, 95% CIs = 1.10, 1.60 and OR = 1.76, 95% CIs = 1.31, 2.35, respectively). Higher extraversion was also associated with a higher risk of both types of smoking behaviour (OR = 1.38, 95% CIs = 1.12, 1.70 and OR = 2.43 (1.67, 3.55, respectively). Higher parental education was significantly related to lower risk of being a regular smoker (OR = 0.70, 95% CIs = 0.54, 0.89), but not with trying smoking in the past. Finally, we found no evidence of the interactions between adolescents’ personality and parental education in predicting adolescent smoking behaviours. We conclude that personality factors and parental education are important and independent factors associated with smoking behaviour in adolescents.

Introduction

Smoking is one of the leading preventable causes of early death, disease and disability [1–3]. In addition, smoking is a major contributor to socio-economic inequalities in health since smoking-attributed mortality accounts for more than a half of the difference in mortality rates between social strata in middle age [4]. Smoking is typically taken up in adolescence [5], and

data collection and analysis, decision to publish, or preparation of the manuscript.

Competing interests: The authors have declared that no competing interests exist.

early nicotine exposure directly increases risks of later nicotine dependence [6]. Given that the major risk period for smoking initiation is mostly over by the age of twenty [5, 7], understanding how environmental and individual risk factors contribute to smoking initiation in adolescence is a crucial step in designing appropriate intervention and prevention strategies.

Among environmental factors, socioeconomic status (SES), a combination of factors including income, education and occupation, has been shown to impact health due to lifestyle choices [8]. Furthermore, SES has been associated with adult smoking. For example, smoking is more common among people of lower education and lower SES levels in European countries [9, 10]. Some studies found an association between parental SES and smoking initiation of adolescents [11–13]. A recent cross-sectional study of 35 countries showed socioeconomic inequalities in adolescent smoking behaviour: boys and girls from poorer families were more likely to be smokers, and this association was mediated by an unequal distribution of family factors such as family structure and relationships with parents [12]. Crucially, while smoking rates among adults and adolescents are in decline in many western countries, including Spain [14, 15], these changes do not occur equally across different socioeconomic levels [10, 16, 17]. Adults with at least some college education had a significantly greater decline in smoking prevalence than those whose highest level of education is high school or less [18].

Among individual factors, personality traits described by the Five Factor Model (FFM) [19, 20], have been associated with a variety of health behaviours [21–23], including smoking [24, 25]. A study conducted on an elderly population showed that current smokers had higher levels of neuroticism, and lower levels of agreeableness and conscientiousness than former smokers, and those who never smoked had lowest levels of neuroticism and highest levels of agreeableness and conscientiousness of all groups [26]. Higher openness and higher neuroticism have been associated with lifetime-smoking, and higher conscientiousness appears to protect against smoking progression and persistence in adults [27]. A study conducted in an undergraduate student population showed that higher extraversion, higher neuroticism, lower agreeableness and lower conscientiousness were all associated with higher current smoking behaviour, and that higher neuroticism was more strongly associated with smoking in a Mexican, than in the Mexican-American sample [28]. Furthermore, Conner et al. [24] found that adolescent non-smokers had higher levels of conscientiousness than adolescent smokers.

Finally, Chapman et al. [25] evaluated, in an adult sample, whether the relationships between the level of education, a common marker of SES, and smoking behaviour would be confounded or modified by personality traits. While they found that never smokers had lower levels of openness and higher levels of conscientiousness, and that those who quit smoking had higher levels of neuroticism, they found that the effects of education and personality were additive, and therefore these two sets of risk factors should be considered independent.

To the best of our knowledge, the role of SES on the associations between personality traits and smoking in adolescents has not been explored to date. Building on the findings that parental SES affects smoking initiation among adolescents [12] and the studies that show that personality traits are associated with adolescent smoking status [24], here we explore whether personality traits and parental education are associated with smoking initiation in a cohort of Spanish secondary school students. Furthermore, we test whether the associations between personality traits and smoking vary across levels of parental education.

Methods

Sample

The study participants were students aged 14 to 15 years, who participated in the project ITACA: a multi-centre, cluster-randomized controlled trial, aimed at reducing the prevalence

of smoking among secondary education students [29]. The initial ITACA sample comprised 1708 students (11–12 year-old) of 16 secondary education schools covering a wide range of communities (urban, semi urban and rural), socioeconomic status and prevalence of smoking. Schools were randomly assigned to a 4-year curriculum based multifactorial intervention or control groups. The research protocol was approved by the Primary Care Research Committee and the Balearic Ethical Committee of Research (IB 1146/09 PI). Here we focused on the second wave of assessment (October–December 2014) when personality was assessed. Participants met the inclusion criteria if they attended school on the day of the survey and if their parents agreed with participation in the study. The final sample comprised of 842 students (45.5% boys and 54.5% girls).

Measures

Smoking status. Smoking status was assessed using seven items adapted from a previously validated questionnaire designed to assess smoking behaviours in adolescents [29]. Information on tobacco use was collected through the following question: “Which of the following statements best describes you? (A) I have never tried to smoke; (B) I have tried cigarettes a few times, but I do not smoke now; (C) I currently smoke at least one cigarette per month, but less than one cigarette per week; (D) I currently smoke at least one cigarette per week; (E) I smoke every day; (F) I used to smoke regularly in the past, but I do not smoke now”. The smoking status of adolescents were classified into never smokers (those who answered A) triers (answers B and F) and regular smokers (categories C, D and E).

Personality traits. Personality was assessed using the Big Five Questionnaire for Children (BFQ-C) [30] designed to assess the five basic personality traits: extraversion, agreeableness, conscientiousness, openness and emotional instability (neuroticism). Extraversion assesses characteristics such as activity, enthusiasm, assertiveness and self-confidence. Agreeableness assesses concern and sensitivity towards others and their needs. Conscientiousness assesses dependability, orderliness, precision, and fulfilling of commitments. Emotional instability refers to feelings of anxiety, depression, discontent, and anger and finally. Finally, openness taps both self-reported intellect, especially in the school domain, and broadness or narrowness of cultural interests and fantasy/creativity [30]. The Spanish adaptation of the questionnaire [31] included all 65 items with five possible responses, ranging from 5 (nearly always) to 1 (almost never). Reliabilities assessed by Cronbach’s Alpha in the present study were satisfactory: 0.87 for conscientiousness; 0.77 for extraversion; 0.82 for openness; 0.77 for instability; and 0.71 for agreeableness. Previous studies showed good psychometric properties of the BFQ-C [32, 33].

Parental education. The parental education measure describes the highest educational attainment of parents. The categories were as follows: a) incomplete primary education (less than six years of school), b) primary education completed (six-eight years), c) secondary education (four to six years), or d) university degree. The highest parental education variable was computed by taking the highest educational level obtained by either parent.

Procedure

Students completed surveys during a 45-minute class at Grade 3 of secondary education. The surveys were administered by two trained data collectors. The teachers were asked to leave the classroom during the process to ensure students’ confidentiality. Written informed consent was obtained from all students and from at least one parent/guardian per student prior to the survey.

Analyses

Descriptive statistics. To test differences in mean levels of personality traits between smoking categories a univariate analysis of variance (ANOVA) was calculated for the five personality traits. Similarly, to test whether parental educational levels differ across the smoking status categories, a Chi squared test was performed. The Pearson coefficient correlation was used to analyse the correlation between predictor factors.

Main analysis. Three multinomial logistic regression models were fitted to determine the independent associations of personality traits: extraversion, agreeableness, conscientiousness, emotional instability and openness, and parental education with smoking status. Odds ratios (ORs) were calculated for personality z-scores ($SD = 1$). The dependent variable was smoking status categorized as never smokers, triers and regular smokers. All models controlled for age, gender and allocation group (control and intervention). An overall model to test the statistical interaction between all possible interactions between personality traits and parental education was also fitted. All analyses were conducted using Stata version 11.0 (StataCorp, College Station, TX).

Results

Descriptive statistics of the sample are presented in [Table 1](#). Of the 842 adolescents included in the study, 62 (12.9%) self-reported being a smoker. Further 182 (21.6%) were classified as triers, and the remaining 598 (71%) as never smokers. Both triers and regular smokers were older than never smokers. Mean levels of extraversion and neuroticism were significantly higher among regular smokers and triers, and the mean level of conscientiousness was significantly lower among triers and regular smokers than in never smokers. There were significantly fewer smokers among adolescents whose parents had a university degree.

To examine the independent associations of adolescent personality and parental education to smoking behaviour among adolescents, we fitted a set of three stage multinomial logistic regression models ([Table 2](#)). Adjusting for the effects of age and gender, lower levels of conscientiousness and higher levels of extraversion and agreeableness were associated with higher risk of being classified as both ever smoker and regular smoker (Model 1). The associations were stronger for the regular smoker category. Furthermore, higher parental education was associated with regular smoking (Model 2). When personality and parental education were taken together, the associations remained significant and similar in magnitude to those observed before (Model 3)

To test whether parental education moderated the associations between students' personality traits and smoking status, we fit an additional multinomial logistic model. In this model ([Table 3](#)) none of the interactions between personality and parental education was statistically significant.

Discussion

Our results indicate that parental education and adolescents' personality traits are independently associated with adolescent smoking behaviour. Adolescents with higher levels of extraversion and neuroticism and lower level of conscientiousness were more likely to smoke. Furthermore, adolescents whose parents had lower educational level were more likely to smoke regularly. Finally, we found no evidence that parental education moderates the associations between adolescent's personality and smoking behaviour.

Our results regarding extraversion and neuroticism corroborate those reported in previous studies conducted on adolescent samples [34, 35]. Of the five personality traits, neuroticism has been most consistently associated with smoking. One possible explanation is that adolescents

Table 1. Sample characteristics by smoking status.

	Total Sample N = 842	Never smokers N = 598	Triers N = 182	Smokers N = 62	p-value*
Age, mean (SD)	14.6 (0.6)	14.5 (0.5)	14.7 (0.6)	14.7 (0.6)	<0.001
Female n (%)	459 (54.5)	324 (54.2)	96 (52.7)	39 (62.9)	0.635
Male n (%)	383 (45.5)	274 (45.8)	86 (47.3)	23 (37.1)	
Openness, mean (SD)	0 (1)	-0.02 (0.99)	-0.01 (1.01)	0.21 (1.03)	0.214
Conscientiousness, mean (SD)	0 (1)	0.13 (0.97)	-0.28 (1.03)	-0.43 (0.89)	<0.001 ^{a,b}
Extraversion, mean (SD)	0 (1)	-0.05 (0.98)	0.03 (1.08)	0.40 (0.89)	0.002 ^{b,c}
Agreeableness, mean (SD)	0 (1)	0.01 (1)	-0.06 (1.01)	0.08 (1.02)	0.605
Emotional Instability, mean (SD)	0 (1)	-0.09 (0.98)	0.15 (0.99)	0.45 (1.06)	<0.001 ^{a,b}
Mother's education (N = 828) n (%)					0.049
Less than primary	48 (5.8)	32 (5.4)	11 (6.2)	5 (8.1)	
Primary	189 (22.8)	131 (22.2)	35 (19.8)	23 (37.1)	
Secondary	361 (43.6)	259 (44.0)	78 (44.1)	24 (38.7)	
University	230 (27.8)	167 (28.4)	53 (29.9)	10 (16.1)	
Father's education (N = 800) n (%)					
Less than primary	54 (6.8)	33 (5.8)	14 (8.2)	7 (11.7)	0.013
Primary	208 (26.0)	147 (25.8)	37 (21.6)	24 (40.0)	
Secondary	388 (48.5)	282 (49.6)	81 (47.4)	25 (41.7)	
University	150 (18.8%)	107 (18.8)	39 (22.8)	4 (6.7)	

Note. Personality traits are given in z-scores.

*ANOVA and chi-Square Test.

^a $p < 0.05$ between never smokers and triers.

^b $p < 0.05$ between never smokers and smokers.

^c $p < 0.05$ between triers and smokers.

<https://doi.org/10.1371/journal.pone.0174211.t001>

with higher levels of neuroticism use smoking to reduce unpleasant emotions [35]. On the other hand, it is possible that individuals higher in extraversion show higher probability to smoke because both their high sociability and their increased dopaminergic activity that would be associated with increased likelihood of smoking [36]. Lastly, with respect to personality traits, we found that higher levels of conscientiousness were associated with lower likelihood of smoking in adolescence. This is not surprising, given that conscientiousness is most commonly associated with better health-related behavioural patterns in adult life, including lower prevalence of smoking [36–38].

Furthermore, our results are similar to those reported in previous studies that found an association between family SES and smoking among adolescents [12, 17]. We found an association between an indicator of family SES, highest parental educational level, and regular smoking, but we did not find an association between parental education and triers. It is possible that individual factors, such as personality, explain whether or not adolescents initiate smoking, while environmental factors, such as SES, contribute to explain why smoking eventually becomes a persistent habit. One proposed mechanism of the associations between parental affluence and adolescent health behaviours is through modelling processes [17]. To test this possibility, we utilised information on parental smoking collected two years prior to the data presented here. There were significantly more parent smokers among those with lower education (primary or less) than those of medium and higher education (36% vs 25% of smokers for mothers, and 37% vs 30% for fathers, data available upon request). Interestingly, parental education was also related to adolescent smoking when controlling for parental smoking

Table 2. Odd Ratios (OR) and 95% Confidence Intervals (95% CI) for the models containing personality traits and parental education, predicting adolescent smoking status.

	Model 1 ^a		Model 2 ^a		Model 3 ^a	
	Triers	Regular smokers	Triers	Regular smokers	Triers	Regular smokers
Demographic						
Age	2.16 (1.61–2.91)***	2.19 (1.34–3.52)**	2.12 (1.59–2.82)***	1.54 (0.98–2.43)	2.21 (1.64–2.99)***	1.94 (1.18–3.20)**
Male	1.01 (0.72–1.53)	0.69 (0.37–1.28)	1.00 (0.71–1.40)	0.690 (0.40–1.20)	1.05 (0.72–1.53)	0.69 (0.36–1.29)
Personality						
Openness	1.02 (0.85–1.21)	1.19 (0.89–1.58)			1.00 (0.84–1.20)	1.25 (0.93–1.68)
Conscientiousness	0.57 (0.46–0.71)***	0.39 (0.27–0.55)***			0.57 (0.46–0.71)***	0.39 (0.27–0.56)***
Extraversion	1.38 (1.12–1.70)**	2.43 (1.67–3.55)***			1.37 (1.12–1.69)**	2.42 (1.65–3.55)***
Agreeableness	1.15 (0.93–1.43)	1.29 (0.92–1.80)			1.16 (0.93–1.44)	1.28 (0.91–1.80)
Em. Instability	1.33 (1.10–1.60)**	1.76 (1.31–2.35)***			1.32 (1.10–1.59)**	1.77 (1.32–2.38)***
Parent. education						
			1.12 (0.94–1.33)	0.70 (0.54–0.89)**	1.11 (0.93–1.33)	0.65 (0.50–0.86)**

Note. Em. Instability = Emotional Instability; Parent. education = Highest parental education

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$; $N = 842$.

^aReference category for both “triers” and “regular smokers” is “never smoker”. All models controlled for the RCT group (control and intervention).

<https://doi.org/10.1371/journal.pone.0174211.t002>

Table 3. Odd Ratios (95% Confidence Intervals) for the model including interactions between adolescent personality and parental education predicting adolescent smoking status.

	Model 4	
	Triers	Regular Smokers
	OR (95% CI)	OR (95%CI)
Demographics		
Age	2.24 (1.66–3.03)***	1.96 (1.18–3.27)**
Male vs. Female	1.05 (0.72–1.53)	0.68 (0.36–1.28)
Personality		
Openness	1.01 (0.85–1.22)	1.35 (0.99–1.84)
Conscientiousness	0.57 (0.46–0.70)***	0.36 (0.25–0.52)***
Extraversion	1.37 (1.12–1.69)**	2.26 (1.53–3.33)***
Agreeableness	1.15 (0.92–1.43)	1.46 (1.01–2.11)*
Emotional Instability	1.32 (1.10–1.59)**	1.74 (1.28–2.36)***
Parental education		
	1.09 (0.90–1.31)	0.72 (0.51–1.02)
Interactions		
Parental education x O	0.88 (0.77–1.06)	1.11 (0.84–1.45)
Parental education x C	0.95 (0.77–1.18)	0.93 (0.68–1.28)
Parental education x E	1.10 (0.90–1.36)	0.74 (0.51–1.06)
Parental education x A	0.96 (0.77–1.19)	1.38 (1.00–1.89)
Parental education x EI	0.93 (0.78–1.13)	0.90 (0.67–1.21)

Note. OR: Odds Ratio; CI: Confidence Interval; O = Openness; C = Conscientiousness; E = Extraversion; A = Agreeableness, E.I. = Emotional Instability. $N = 842$.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.

<https://doi.org/10.1371/journal.pone.0174211.t003>

(OR = 0.7; 95%CI 0.5–0.9, data available upon request) that could indicate also some effect of parental education independent of modelling behaviour.

Finally, parental education was associated with adolescent smoking independently of adolescent personality. This finding replicates and expands those reported by Chapman et al. [25] who utilised measures of own education and smoking behaviour in adults. Therefore, the two sets of predictors may act independently in adolescent as well as in adult populations. Future studies should also examine whether similar patterns apply to other substances [39].

This study had several limitations. First, the current analysis was limited to cross-sectional data. Although personality traits are relatively stable across the life span [40], longitudinal design is needed to better address causal direction of the effect. Future studies of smoking behaviour in adolescence should include a measure of personality traits prior to smoking initiation. Second, we include a measure of parental education as the only SES indicator. It is possible that a more comprehensive measure of parental SES would yield different results, especially with respect to interactions with personality traits [41]. Finally, we relied on self-reported measures of smoking behaviour. However, while direct methods such as coximetry exist, they suffer from reliability issues due to uneven inhalation and false positives due to exposure to environmental smoke. Coximetry was also not shown to accurately assess smoking in adolescents [42].

Our study contributes to the evidence that personality factors and parental education are important factors associated with smoking behaviour during adolescence. Furthermore, these factors should be addressed independently. Effective interventions tailored for individual personality traits and SES backgrounds could be useful to reduce future social disparities in morbidity and mortality.

Acknowledgments

The authors would like to thank the participants, schools, and all those involved in the “ITACA” study. This Project was funded by a Health Research Funds of the “Instituto de Salud Carlos III” from Spanish Government (P10/00517) co-financed with European Union ERDF funds. The work is also being supported by the Health Promotion and Preventive Activities-Primary Health Care Network, which is sustained by the Ministry of Health of Spain (ISCIII-RETCI G03/170 and RD06/0018).

Author Contributions

Conceptualization: AE AMY.

Data curation: AMY AL IČ.

Formal analysis: AMY.

Funding acquisition: AMY AE.

Investigation: AE AMY AL.

Methodology: AL IČ.

Project administration: AMY AE.

Supervision: AMY AE.

Writing – original draft: AMY IČ.

Writing – review & editing: AE AL AMY IČ.

References

1. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Medicine*. 2006; 3(11):e442. <https://doi.org/10.1371/journal.pmed.0030442> PMID: 17132052
2. Ezzati M, Lopez AD, Rodgers A, Hoon SV, Murray CJL, Group tCRAC. Selected major risk factors and global and regional burden of disease. *The Lancet*. 2002; 360:1347–60.
3. World Health Organization. WHO report on the global tobacco epidemic 2011: warning about dangers of tobacco 2015 [cited 2015 May 18]. Available from: http://www.who.int/tobacco/global_report/2011/en/.
4. Jha P, Peto R, Zatonski W, Boreham J, Jarvis MJ, Lopez AD. Social inequalities in male mortality, and in male mortality from smoking: indirect estimation from national death rates in England and Wales, Poland, and North America. *Lancet*. 2006; 368(9533):367–70. [https://doi.org/10.1016/S0140-6736\(06\)68975-7](https://doi.org/10.1016/S0140-6736(06)68975-7) PMID: 16876664
5. Chen K, Kandel DB. The natural history of drug use from adolescence to the mid-thirties in a general population sample. *American Journal of Public Health*. 1995; 85(1):41–7. PMID: 7832260
6. Kendler KS, Myers J, Damaj MI, Chen X. Early smoking onset and risk for subsequent nicotine dependence: a monozygotic co-twin control study. *American Journal of Psychiatry*. 2013; 170:408–13. <https://doi.org/10.1176/appi.ajp.2012.12030321> PMID: 23318372
7. Lantz PM. Smoking on the rise among young adults: implications for research and policy. *Tobacco Control* 2003; 12(suppl 1):i60–i70.
8. Nandi A, Glymour MM, Subramanian SV. Association among socioeconomic status, health behaviors, and all-cause mortality in the United States. *Epidemiology*. 2014; 25:170–7. <https://doi.org/10.1097/EDE.000000000000038> PMID: 24487200
9. Mackenbach JP, Stirbu I, Roskam AJR, Schaap MM, Menvielle G, Leinsalu M, et al. Socioeconomic inequalities in health in 22 European countries. *New England Journal of Medicine*. 2008; 358(23):2468–81. <https://doi.org/10.1056/NEJMsa0707519> PMID: 18525043
10. López-González ÁA, Bannasar-Veny M, Tauler P, Aguilo A, Tomàs-Salvà M, Yáñez A. Socioeconomic inequalities and age and gender differences in cardiovascular risk factors. *Gaceta Sanitaria*. 2015; 29(1):27–36. <https://doi.org/10.1016/j.gaceta.2014.08.004> PMID: 25438743
11. Tjora T, Hetland J, Aarø LE, Øverland S. Distal and proximal family predictors of adolescents' smoking initiation and development: a longitudinal latent curve model analysis. *BMC Public Health*. 2011; 11:911. <https://doi.org/10.1186/1471-2458-11-911> PMID: 22152017
12. Moor I, Rathmann K, Lenzi M, Pfortner TK, Nagelhout GE, de Looze M, et al. Socioeconomic inequalities in adolescent smoking across 35 countries: a multilevel analysis of the role of family, school and peers. *The European Journal of Public Health*. 2015; 25:457–634. <https://doi.org/10.1093/eurpub/cku244> PMID: 25713016
13. Hanson MD, Chen EJ. Socioeconomic status and health behaviors in adolescence: a review of the literature. *Journal of Behavioral Medicine*. 2007; 30:263–85. <https://doi.org/10.1007/s10865-007-9098-3> PMID: 17514418
14. Delegación del Gobierno para el Plan Nacional sobre Drogas. Encuesta Estatal sobre Uso de Drogas en ENSEÑANZAS Secundarias (ESTUDES) 2012 2015 [March 15, 2015]. Available from: http://www.pnsd.msc.es/Categoria2/observa/pdf/8_ESTUDES_2012_Informe.pdf.
15. Ministerio de Sanidad y Consumo. Encuesta Nacional de Salud 2015 [May 18, 2015]. Available from: <http://www.msssi.gob.es/estadEstudios/estadisticas/encuestaNacional/encuestaNac2011/PresentacionENSE2012.pdf>.
16. Doku D, Koivusilta L, Rainio S, Rimpelä A. Socioeconomic differences in smoking among Finnish adolescents from 1977 to 2007. *Journal of Adolescent Health*. 2010; 47(5):479–87. <https://doi.org/10.1016/j.jadohealth.2010.03.012> PMID: 20970083
17. Moore GF, Littlecott HJ. School- and family-level socioeconomic status and health behaviors: multilevel analysis of a national survey in Wales, United Kingdom. *Journal of School Health*. 2015; 85(4):267–75. <https://doi.org/10.1111/josh.12242> PMID: 25731201
18. Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G, et al. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among US adults 1971–2002. *Archives of Internal Medicine*. 2006; 166(21):2348–55. <https://doi.org/10.1001/archinte.166.21.2348> PMID: 17130388
19. Digman JM. Personality structure: Emergence of the Five-Factor Model. *Annual Review of Psychology*. 1990; 41:417–40.
20. McCrae RR, Costa PT. Personality in adulthood: A five-factor theory perspective. 2003.

21. Raynor DA, Levine H. Associations Between the Five-Factor Model of Personality and Health Behaviors Among College Students. *Journal of American College Health*. 2009; 58(1):73–82. <https://doi.org/10.3200/JACH.58.1.73-82> PMID: 19592356
22. Čukić I, Möttus R, Realo A, Allik J. Elucidating the links between personality traits and diabetes mellitus: Examining the role of facets, assessment methods, and selected mediators.
23. Čukić I, Möttus R, Luciano M, Starr JM, Weiss A, Deary IJ. Do personality traits moderate the manifestation of type 2 diabetes mellitus genetic risk? *Journal of Psychosomatic Research*. 2015; 79(4):303–8. <https://doi.org/10.1016/j.jpsychores.2015.07.003> PMID: 26213352
24. Conner M, Grogan S, Fry G, Gough B, Higgins AR. Direct, mediated and moderated impacts of personality variables on smoking initiation in adolescents. *Psychology and Health*. 2009; 24(9):1085–104. <https://doi.org/10.1080/08870440802239192> PMID: 20205047
25. Chapman B, Fiscella K, Duberstein P, Kawachi I. Education and smoking: confounding or effect modification by phenotypic personality traits? *Annals of Behavioral Medicine*. 2009; 38(3):237–48. <https://doi.org/10.1007/s12160-009-9142-3> PMID: 20049661
26. Terracciano A, Costa PTJ. Smoking and the Five-Factor Model of personality. *Addiction*. 2004; 99:472–81. <https://doi.org/10.1111/j.1360-0443.2004.00687.x> PMID: 15049747
27. Zvolensky MJ, Taha F, Bono A, Goodwin RD. Big five personality factors and cigarette smoking: A 10-year study among US adults. *Journal of psychiatric research*. 2015; 63:91–6. <https://doi.org/10.1016/j.jpsychires.2015.02.008> PMID: 25799395
28. Mercado A, Rogers DL, Rodriguez CC, Villarreal D, Terracciano A, Nguyen-Finn K. Personality and Substance Use in Mexicans and Mexican-Americans. *International Journal of Mental Health and Addiction*. 2016; 14(6):907–20.
29. Leiva A, Estela A, Torrent M, Calafat A, Bannasar M, Yáñez A. Effectiveness of a complex intervention in reducing the prevalence of smoking among adolescents: study design of a cluster-randomized controlled trial. *BMC public health*. 2014; 14(1):1.
30. Barbaranelli C, Caprara GV, Rabasca A, Pastorelli C. A questionnaire for measuring the Big Five in late childhood. *Personality and Individual Differences*. 2003; 34(4):645–64.
31. Ortiz MC, Tello FPH, del Barrio Gándara V. Dimensionalidad del cuestionario de los cinco grandes (BFQ-N) en población infantil española. *Psicothema*. 2005; 17(2):286–91.
32. Barbaranelli C, Fida R, Paciello M, Di Giunta L, Caprara GV. Assessing personality in early adolescence through self-report and other-ratings a multitrait-multimethod analysis of the BFQ-C. *Personality and Individual Differences*. 2008; 44(4):876–86.
33. Muris P, Meesters C, Diederer R. Psychometric properties of the Big Five Questionnaire for Children (BFQ-C) in a Dutch sample of young adolescents. *Personality and individual differences*. 2005; 38(8):1757–69.
34. Otten R, Engels RC, Van den Eijnden RJ. Smoking behavior in asthmatic and non-asthmatic adolescents: The role of smoking models and personality. *Substance use & misuse*. 2008; 43(3–4):341–60.
35. de Leeuw RN, Scholte RH, Sargent JD, Vermulst AA, Engels RC. Do interactions between personality and social-environmental factors explain smoking development in adolescence? *Journal of family psychology*. 2010; 24(1):68. <https://doi.org/10.1037/a0018182> PMID: 20175610
36. Bogg T, Roberts BW. Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*. 2004; 130:887–919. <https://doi.org/10.1037/0033-2909.130.6.887> PMID: 15535742
37. Turiano NA, Chapman BP, Gruenewald TL, Mroczek DK. Personality and the leading behavioral contributors of mortality. *Health Psychology*. 2015; 34(1):51. <https://doi.org/10.1037/hea0000038> PMID: 24364374
38. Hakulinen C, Hintsanen M, Munafò MR, Virtanen M, Kivimaki M, Batty D, et al. Personality and smoking: individual-participant meta-analysis of 9 cohort studies. 2015.
39. Terracciano A, Löckenhoff CE, Crum RM, Bienvenu OJ, Costa PT. Five-Factor Model personality profiles of drug users. *Bmc Psychiatry*. 2008; 8(1):22.
40. Roberts BW, DelVecchio WF. The rank-order consistency of personality traits from childhood to old age: a quantitative review of longitudinal studies. *Psychological bulletin*. 2000; 126(1):3. PMID: 10668348
41. Jonassaint CR, Siegler IC, Barefoot JC, Edwards CL, Williams RB. Low Life Course Socioeconomic Status (SES) is Associated with Negative NEO PI-R Personality Patterns. *International journal of behavioral medicine*. 2011; 18(1):13–21. <https://doi.org/10.1007/s12529-009-9069-x> PMID: 20012811
42. Valdivieso E, Rey C, Barrera M, Arija V, Basora J, Marsal JR. Factors associated with commencing smoking in 12-year-old students in Catalonia (Spain): a cross-sectional population-based study. *BMC public health*. 2010; 10(1):665.