

Health-related lifestyles and cancer-preventive behaviors of medical and nursing students and family medicine residents in relation to the European Code Against Cancer

AUTHORS: Esperanza Romero-Rodríguez <sup>a,b,f</sup>, Luis Ángel Pérula de Torres <sup>a,c,f,\*</sup>, José Ignacio Moscosio Cuevas <sup>d</sup>, Roger Ruiz Moral <sup>a,e</sup>, Celia Jiménez García <sup>a,d</sup>, Inmaculada Olaya Caro <sup>a,d</sup>, Francisco Camarelles Guillem <sup>g,h</sup>

<sup>a</sup> Instituto Maimónides de Investigación Biomédica de Córdoba (IMIBIC)/Hospital Universitario Reina Sofía/Universidad de Córdoba, Spain.

<sup>b</sup> Boston University School of Public Health, Boston, Massachusetts, United States.

<sup>c</sup> Unidad Docente de Medicina Familiar y Comunitaria de Córdoba, Córdoba, Spain

<sup>d</sup> Distrito Sanitario Córdoba y Guadalquivir, Córdoba, Spain.

<sup>e</sup> Facultad de Medicina de la Universidad Francisco de Vitoria, Madrid, Spain.

<sup>f</sup> Grupo de Evaluación y mejora del Programa de Actividades Preventivas y de Promoción de la Salud (PAPPS) de la Sociedad Española de Medicina Familiar y Comunitaria (semFYC), Barcelona, Spain.

<sup>g</sup> Centro de salud Infanta Mercedes, Madrid, Spain.

<sup>h</sup> Grupo de Educación para la Salud del PAPPS (semFYC), Barcelona, Spain.

\* Corresponding autor:

Email: [langel.perula.sspa@juntadeandalucia.es](mailto:langel.perula.sspa@juntadeandalucia.es) (Luis Ángel Pérula De Torres).

Menendez Pidal Avenue s/n. 14004, Cordoba. Spain. Phone: +34 610 21 10 10

## **Abstract**

**Background:** Family medicine (FM) residents and medical and nursing students play an important role in the development of preventive and health-promoting activities.

**Objective:** To evaluate the health-related lifestyles and cancer-preventive behaviors of medical and nursing students and FM residents in relation to the European Code Against Cancer (ECAC).

**Methods:** This was a descriptive, cross-sectional study performed in Spain. Medical and nursing students, and FM residents completed a self-administered questionnaire focused on health-related habits and clinical behaviors related to the ECAC.

**Results:** A total of 740 participants completed the questionnaire. 12.2% (95% CI [9.8–14.5]) were smokers and 77.3% (95% CI [74.3–80.3]) sporadically consumed alcohol; 34.2% (95% CI [30.8–37.6]) practiced physical activity 2–3 times a week, and 12.1% (95% CI [9.8–14.5]) were overweight or obese. 54.2% (95% CI [50.6–57.8]) regularly consumed vegetables. Differences were detected in the completion of screening tests for colorectal cancer ( $p < 0.001$ ), breast cancer ( $p = 0.023$ ), cervical cancer ( $p = 0.006$ ), and prostate-specific antigen determination ( $p < 0.001$ ) in relation to the participants' academic profiles.

**Conclusion:** Our results reveal heterogeneous practices between the participants in terms of health-related habits. Awareness about the risks of smoking and being overweight were high, however, the perception of the risks associated with solar exposure and alcohol consumption was poor. There was general agreement upon the importance of performing

screening tests for breast, cervical, and colorectal cancer, but there were discrepancies related to the need to perform the prostate cancer screening test.

**Key words:**

European Code Against Cancer, cancer prevention, primary care, health professionals, undergraduate students

## **Introduction**

Cancer is one of the main causes of morbidity and mortality in the world [1]. In 2018 an estimated 18.1 million cancer cases were detected, and 9.6 million cancer-related deaths were recorded worldwide. According to Global Cancer Observatory (GLOBOCAN) statistics from 2018 [2], 23.4% of all cancer cases presented in Europe, followed by 21% in America, and preceded by 48.4% of cases in Asia. The incidence of cancer and the mortality associated with this health problem have both notably increased over the past few decades. Among the reasons for this worldwide increase in cancer cases are: ageing population and changes in the prevalence and distribution of the main cancer risk factors associated with socioeconomic development.

The World Health Organization published data showing that 30–50% of diagnosed cancers are attributed to external and modifiable factors [3]. The consumption of tobacco and alcohol, poor diets, and physical inactivity represent the main risk factors both for cancer and other non-communicable diseases. Thus, awareness of this health problem and its early diagnosis by health professionals might be decisive in reducing the incidence of this disease.

The European Action on Cancer plan [4], promoted by the European Commission, which has included the European Code against Cancer (ECAC) [5] since 1981, aims to promote healthy lifestyles and reduce the individual risk of developing cancer. The recommendations included in the ECAC encompass the promotion of physical activity, consumption of fruits and vegetables, reduction in red meat consumption, controlled bodyweight, reduced tobacco and alcohol consumption, and protection from prolonged sun exposure. In addition, as secondary prevention measures, the ECAC includes

recommendations on the performance of screening tests for the early detection of colorectal, breast, and cervical cancer.

Some recent work has assessed the cancer-preventive strategies driven by primary care (PC) health professionals [6] or undergraduate students [7], who all play an important role in the development of preventive and health-promoting activities. Likewise, other groups [8, 9] have identified a significant association between the healthy behaviors promoted by health professionals and students in their own clinical practice versus their personal health-related habits; the implementation of preventive advice by the general population was higher when their care providers also personally applied these recommendations to themselves. At the national level, only one previous study has focused on the knowledge and practices of PC health professionals in relation to the ECAC [10]; highlighting the application of the ECAC's recommendations among PCs and, in turn, the association between these healthcare professionals' knowledge of the ECAC and the implementation of their own personal cancer-preventive practices.

Despite the role played by PC professionals in the prevention of cancer [11] and the relevance of the advice these professionals give, very little work has been done to study how medical and nursing students and postgraduate professionals apply the lifestyle habits and clinical behaviors mentioned in the ECAC within their own routines. Given that the sociodemographic characteristics of students and residents receiving training in health fields differ from those of health professionals [12], it would be useful to objectively assess the health-related habits and clinical behaviors of these populations and to determine whether their knowledge of the ECAC correlates with their own behavior.

Therefore, the objectives of this study were (a) to understand the health-related habits and clinical behaviors of medical or nursing students and FM residents in relation to the

recommendations set out in the ECAC; (b) to determine whether their own implementation of these habits and behaviors were related to their knowledge of the ECAC; (c) analyze the relationship between the sociodemographic characteristics and academic profiles of this population in relation to their knowledge of and personal implementation of the cancer-preventive practices set out in the ECAC.

## **Methods**

### **Design**

This was an observational, descriptive, cross-sectional study.

### **Participants**

The study population comprised two groups: (1) FM residents based at the FM teaching units in Cordoba ( $n = 79$ ) and Ceuta ( $n = 12$ ); (2) second year ( $n = 98$ ), third year ( $n = 89$ ), and fifth year ( $n = 54$ ) medical students, and first ( $n = 113$ ), second ( $n = 106$ ), and fourth year ( $n = 119$ ) nursing students in the Faculty of Medicine and Nursing at the University of Cordoba; and fourth year nursing students ( $n = 70$ ) in the Faculty of Medicine at Francisco de Vitoria University in Madrid.

The following inclusion criteria were applied: (1) FM residents at the FM teaching units in Cordoba or Ceuta or students in the Faculty of Medicine or Nursing at the University of Cordoba or Francisco de Vitoria University in Madrid; and (2) accepted the invitation to collaborate in the study by signing their informed consent to participation.

### **Sample size**

Using an alpha error of 5% and based on the assumption that 50% of the participants would have practiced the ECAC recommendations, we calculated that a sample size of at least 377 would be required to obtain a 5% level of statistical accuracy.

### **Sample recruitment**

The study population was recruited in two ways: (1) we sent e-mails to the FM residents at the Cordoba and Ceuta teaching units; each resident received a message explaining the purpose of the investigation, requested their informed consent to participation, and then asked them to complete the questionnaire via Google Forms and Google Drive. We delivered the questionnaire in person to the students in the Faculties of Medicine and Nursing at Cordoba and Francisco de Vitoria Universities, so that they could complete it before they started one of their classes delivered by teachers linked to one of these universities.

The questionnaire was created by professionals in the FM teaching unit at Cordoba university in collaboration with members of the Evaluation Group and Health Education Group at the SemFYC (Spanish Society of Family and Community Medicine) within the PAPPS (program of preventive activities and health promotion) [13]. The questionnaire was designed to be anonymously self-administered by each participant and its logical–apparent, consensus, and content validity had been previously shown [14].

### **Variables**

The questionnaire included sociodemographic variables (age and sex), academic variables (center and training course), health habits (physical activity, weight, level of sun exposure, consumption of fruits, vegetables, red meat, tobacco, and alcohol), and the opinion about the performance of clinical screening tests for colorectal, breast, and cervical cancer recommended by the ECAC. Prostate-specific antigen (PSA)

determination was also included, even though this test is not specifically recommended in the ECAC, because it is widely used means to screen for prostate cancer.

### **Main measurements**

The main measurements in this study were: the practice of health-related habits and clinical behaviors listed in the ECAC and their association with knowledge of the ECAC among the study cohorts.

### **Ethical and legal considerations**

This work was carried out between January 2017 and April 2017. The study was approved by the Ethics and Clinical Research Committee at the Reina Sofía Hospital in Cordoba.

### **Statistical plan**

We carried out a descriptive analysis of the variables and calculated the 95% confidence intervals (95% CI) for the main variables. Bivariate analysis (Chi-squared and Mann–Whitney U tests) were used to test the relationships between the sociodemographic and academic variables of the study participants, their implementation of the health-related habits and preventive behaviors listed in the ECAC, and the participants' knowledge of these and their adoption of these health-related habits and clinical behaviors (bilateral contrasts;  $p \leq 0.05$ ).

### **Results**

A total of 740 individuals participated in this study, of which 74.8% were women (95% CI [70.9–77.2]); 46.1% (95% CI [42.5–49.7]) were nursing students, 41.9% (95% CI [38.3–45.4]) were medical students, and 12.0% (95% CI [9.7–14.4]) were FM residents. The mean participant age was 22.10 years ( $SD = 4.68$  years; range = 18–52 years; 95%

CI 21.78–22.43]); 35.6% (95% CI [32.0–39.30]) were aged under 20 years, 49% (95% CI 45.0–52.70]) were 21–25 years old, and 11.4% (95% CI [8.9–13.8]) were between 26–30 years old.

The respondents were training or studying in the Faculty of Medicine at Francisco de Vitoria University (9.5%; 95% CI 7.4–11.6)], Faculty of Medicine and Nursing at Cordoba University (78.1%; 95% CI [75.1–81.1]), FC=M teaching unit in Ceuta (1.6%; 95% CI [0.7–2.5]), or FM teaching unit in Cordoba (10.8%; 95% CI [8.6–13.0]). The overall response rate for the study was 87.8%; and when considering the academic profile of the participants, 93.4% were nursing students, 62.10% were medical students at Cordoba University, 73.7% were medical students at Francisco de Vitoria University, and 84.0% were residents.

In relation to health-related habits, 12.2% (95% CI [9.8–14.5]) were smokers and 77.3% (95% CI [74.3–80.3]) sporadically consumed alcohol; 10.5% (95% CI [8.3–12.8]) were overweight and 1.6% (95% CI [0.7–2.5]) were obese; 34.2% (95% CI [30.8–37.6]) practiced physical activity 2–3 times a week or every day. Vegetables or fruits were regularly consumed by 54.2% and 59.3% of the population, respectively (95% CI [50.6–57.8] and [55.8–62.9], respectively), and 23.9% (95% CI [20.8–27.0]) consumed red meat every day or almost every day; 29.9% (95% CI [26.6–33.2]) avoided prolonged exposure to the sun, and 50.0% (95% CI [46.4–53.6]) always used sunscreen (Table 1).

Regarding the respondents' opinions about the performance of screening tests (Table 2), 90.6% indicated that they agreed that tests for the early detection of cervical cancer were important, 89.2% that mammograms to detect breast cancer were important, and 84.1% that the fecal occult blood test (FOBT) test for early detection of colorectal cancer was

important. However, 8.8% said that screening for PSA to detect prostate cancer was not necessary, followed by 7.6% who said that mammograms were not useful.

Table 3 shows respondents' opinions about the performance of early detection tests according to their academic profile; significant differences were found for breast ( $p = 0.023$ ), cervix ( $p = 0.006$ ), prostate ( $p < 0.001$ ), and colorectal ( $p < 0.001$ ) cancer screening. In addition, 85.3% of the nursing students agreed that the PSA determination test should be carried out, in contrast to 62.9% of the FM residents who agreed with this statement.

Table 4 shows the relationship between knowledge of the ECAC and the respondents' own habits. A relationship was found between the knowledge of the ECAC and greater adherence to its recommendations among the respondents in terms of physical activity ( $p < 0.001$ ), red meat consumption ( $p < 0.001$ ), and avoiding prolonged sun exposure ( $p = 0.044$ ). Table 5 shows the relationship between knowledge of the ECAC and the participants' opinions about screening tests; no significant differences were found with respect to the four screening tests considered.

## **Discussion**

This present study highlights the heterogeneous practice of the health-related habits recommended by the ECAC by medical and nursing students and FM residents. We found that FM residents were more aware of the risks related to smoking and being overweight but had a lower perception of the risk of sun exposure and alcohol consumption. Likewise, the participants were broadly in favor of implementing the secondary screening tests highlighted in the ECAC, with the determination of PSA levels having the lowest acceptance rates of the four early screening tests that were assessed.

Knowledge of the health-related lifestyles of FM residents and healthcare students is of utmost importance, given its effect on their own health as well as how these professionals may impact or influence the habits of the population they serve (or others whose role is to transmit this preventive advice) in their practice [15]. As health workers in training [16], throughout their learning period, FM residents and medicine and nursing students develop knowledge, attitudes, and practices whose goals are to promote health and prevent cancer, progressively assuming the responsibility of providing preventive counseling to their patients. Research in this field suggests that the implementation of health-related behaviors among healthcare workers influences patients' attitudes towards preventive counseling on healthy lifestyles [17]. In addition, several studies have found evidence for a positive association between healthy behaviors among medical and nursing students and their attitudes towards preventive counseling [18,19], with healthcare providers with healthier lifestyles being more likely to recommend these positive habits to their patients.

The 2017 National Health Survey of Spain (ENSE) [20] revealed that 22.1% of the Spanish population are smokers, 36.5% regularly consume alcohol, 54.5% were overweight or obese, 56.8% regularly consume fruits and vegetables, and 52.4% frequently engage in physical activity. We observed a similar trend for physical activity levels and the consumption of fruits and vegetables in our study. However, a significantly lower number of our participants were overweight (11.4%) or obese (1.7%) and 34.2% of the respondents in our study regularly engaged in physical activity. The prevalence of smoking among our cohort was also 10% lower than that reported in the 2017 ENSE at 12.2%. However, we were unable to adequately compare the alcohol consumption levels we recorded with that in the ENSE population because of differences in the way this variable was quantified.

Regarding the health-related habits of PC health workers, a study conducted among 798 professionals [21] indicated that 40% were physically inactive, 4.9% were smokers, and 25% reported eating 0–2 portions of fruit a day. Another study carried out among PC professionals in Spain [10], found that 5.9% were smokers, 79.6% regularly consumed fruit, 19% were regularly engaged in physical activity, and 52.7% said they avoided prolonged sun exposure. However, compared to this aforementioned study, more PC professionals in our study smoked and regularly engaged in physical activity, while fewer students and FM residents in our study regularly consumed fruit or avoided prolonged sun exposure. With respect to smoking, a previous study conducted among FM residents at Cordoba University between 2012 and 2016, obtained lower tobacco consumption figures (6.5%) than in this study [22]. However, unlike our study, the data in this previous work was collected via personal interviews, which could perhaps justify the lower prevalence of tobacco use recorded in that work. Likewise, the prevalence of smoking identified in our study contrasts with the figures published in the latest EDADES (survey of the use of alcohol and other drugs in Spain) [23] survey which recorded an increase in daily tobacco consumption in 2017 compared to previous years.

Our study revealed that there was an association between the respondents' knowledge of the ECAC's healthy lifestyle recommendations and their implementation of only three out of eight points. These results contrast with those reported for other PC health professionals [24] for which a significant relationship was found for five of these eight healthy-habit recommendations, revealing a stronger correlation between knowledge of the recommendations described in the ECAC and the practices personally implemented by PC professionals. However, the article indicates that the knowledge of professionals about the ECAC was low and, in turn, it was even lower among younger professionals working in healthcare for less time.

Of note, the results of other studies seem to agree with our findings that most PC professionals and medical or nursing students agree that the FOBT, mammography, and cytology screening tests indicated in the ECAC are good methods for the early detection of colorectal, breast, and cervical cancer, respectively. However, there was less agreement about the usefulness of requesting a PSA determination to screen for prostate cancer. The PAPPS [24] does not currently promote the use of this screening method among asymptomatic people because of its potential to generate confusion resulting from its propensity to give false positives. Similarly, PSA screening is not included in the ECAC. In contrast, the U.S. Preventive Services Task Force [25] has recently changed its stance to now incorporate PSA determinations into its recommendations but clarifies that cases must be assessed on an individual basis [26].

Our analysis of the link between medical and nursing students' and FM residents' opinions about performing screening tests and their knowledge of the ECAC showed no association between these variables, which contrasts with observations from another similar study carried out in PC health professionals [10] that showed a significant association with recommendations that screening tests for breast, cervical, and prostate cancer be undertaken. Several studies have shown that medical and nursing students had a poor level of knowledge related to screening tests for colorectal [27, 28], breast [29], or cervix [30] cancer. This suggests that their training in the prevention of these pathologies might have been insufficient and could perhaps also explain the results of our study. By analyzing our results according to the participants' work profile, we revealed that nursing students were more inclined to recommend screening tests for breast, colorectal, and cervical cancer in our study. This may be because nursing degree programs consider and promote training activities related to health promotion and cancer prevention [31]. Thus,

reviewing medical and nursing student cancer prevention training programs could help us to standardize their training related to the early detection of cancer.

It is also important to mention the limitations of this study. Firstly, the results may be subject to volunteer or selection bias because the individuals most interested in cancer prevention were probably the most likely to participate in the study [32]. Thus, the true prevalence of ECAC-recommended healthy habits among our participants could have been overestimated. However, in many cases entire classes of nursing or medical students answered the surveys on the day they were administered without the participants being previously notified about the investigators' intention to deliver a questionnaire. Second, in relation to the methodology of the study, certain University of Cordoba and Francisco de Vitoria University medicine or nursing courses were selected for participation in this study. This was done for operational reasons because the authors personally taught these classes to those courses. Third, we used the recommendations included in the third rather than the fourth edition of the ECAC [33] as the basis of this study. The latter [34] incorporates new recommendations, including the promotion of breastfeeding, limitation of hormone replacement therapy, promotion of hepatitis B vaccination in newborns, and human papillomavirus vaccination among young adolescents. It would be interesting to perform a similar study which incorporates these recommendations to evaluate the implementation of these recommendations among students in undergraduate and postgraduate training, as well as by health professionals themselves.

In conclusion, this present study highlights the heterogeneous practice of the health-related habits recommended by the ECAC by medical and nursing students and FM residents. We found that FM residents were more aware of the risks related to smoking and being overweight but had a lower perception of the risks of sun exposure and alcohol consumption. There was fairly unanimous agreement that the FOBT, mammography,

cytology, and PSA determination screening tests should be carried out, although to a lesser extent in the latter case. Further studies will be required to incorporate the new recommendations from the latest version of the ECAC and to evaluate the differences between training programs on the prevention of cancer among medical and nursing degree students and FM residents.

### **Disclosure statement**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

### **References**

- 1.- World Health Organization. Global Health Observatory. Geneva: World Health Organization; 2018. Available from: <https://www.who.int/gho/en/> [Accessed 10 July 2019].
- 2.- New Global Cancer Data: GLOBOCAN 2018. Available from: <https://www.uicc.org/new-global-cancer-data-globocan-2018>; [Accessed 10 July 2019].
- 3.- Cancer: Key Facts. World Health Organization. 2018. Available from: <https://www.who.int/es/news-room/fact-sheets/detail/cancer>; [Accessed 10 July 2019].
- 4.- Commission of the European Community. Europe against cancer action plan, 1987-1989. Official J Eur Community. 1987;87/C50/01:1-58.
- 5.- European Code Against Cancer: 12 ways to reduce your cancer risk, Available from: <http://cancer-code-europe.iarc.fr/>; 2018 [Accessed 10 July 2019].

- 6.- Suija K, Kordemets T, Annuk K, et al. The role of general practitioners in cancer care: a mixed method design. *J Cancer Educ.* 2016;31(1):136–141. doi: 10.1007/s13187-015-0834-z
- 7.- Memis S, Balkaya NA, Demirkiran F. Knowledge, attitudes, and behaviors of nursing and midwifery students regarding breast self-examination in Turkey. *Oncol Nurs Forum.* 2009 Jan;36(1):E39-46. doi: 10.1188/09.ONF.E39-E46.
- 8.- Oberg EB, Frank E. Physicians' health practices strongly influence patient health practices. *J R Coll Physicians Edinb.* 2009;39:290-291
- 9.- Frank E, Dresner Y, Shani M, Vinker S. The association between physicians' and patients' preventive health practices. *CMAJ.* 2013;185:649-653
- 10.- Pérula de Torres LA, et al. Conocimiento, conducta y actitud ante el Código europeo contra el cáncer por parte de los profesionales sanitarios de atención primaria. *Aten Primaria.* 2018. <https://doi.org/10.1016/j.aprim.2018.11.002>
- 11.- Pérula de Torres L, Espina García C. ¿Qué es el Código Europeo contra el Cáncer, quienes lo conocen y para qué sirve?. *Aten Primaria.* 2018; 50 (2): 71-73
- 12.- Wang MY, Lin GZ, Li Y, Dong H, Liao YH, Liu HZ, Ren ZF. Knowledge, Attitudes, Preventive Practices and Screening Intention about Colorectal Cancer and the Related Factors among Residents in Guangzhou, China. *Asian Pac J Cancer Prev.* 2017;18(12):3217-3223. doi: 10.22034/APJCP.2017.18.12.3217.
- 13.- Programa de actividades preventivas y de promoción de la salud (PAPPS). Grupos de trabajo [Accessed 10 July 2019]. Available from: [http://papps.es/grupos\\_trabajo.php](http://papps.es/grupos_trabajo.php)

- 14.- Ramada-Rodilla JM, Serra-Pujadas C, Delclós-Clanchet GL. Adaptación cultural y validación de cuestionarios de salud: revisión y recomendaciones metodológicas. *Salud pública Méx.* 2013;55: 57-66.
- 15.- Frank E, Elon L, Carrera JS, et al. Predictors of US medical students' prevention counseling practices. *Prev Med* 2007;44:76–81
- 16.- Malatskey L, Essa-Hadad J, Willis TA, Rudolf MCJ. Leading Healthy Lives: Lifestyle Medicine for Medical Students. *Am J Lifestyle Med.* 2017;13(2):213-219. doi:10.1177/1559827616689041
- 17.- Frank E, Breyan J, Elon L. Physician disclosure of healthy personal behaviors improves credibility and ability to motivate. *Arch Fam Med.* 2000;9:287–90. doi: 10.1001/archfami.9.3.287.
- 18.- Yu Y, Yang Y, Li Z, et al. The association between medical students' lifestyles and their attitudes towards preventive counseling in different countries. *BMC Public Health.* 2015; 15:1124. doi:10.1186/s12889-015-2458-y
- 19.- Duperly J, Lobelo RL, Segura C, et al. The association between Colombian medical students' healthy personal habits and a positive attitude toward preventive counseling: cross-sectional analyses. *BMC Public Health.* 2009;9:218
- 20.- Encuesta Nacional de Salud en España (ENSE) 2017. Instituto Nacional de Estadística. Available from: <https://www.mscbs.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2017.htm> [Accessed 10 July 2019].

- 21.- Hidalgo KD, Mielke GI, Parra DC, Lobelo F, Simões EJ, Gomes GO, et al. Health promoting practices and personal lifestyle behaviors of Brazilian health professionals. *BMC Public Health*. 2016;16:1–10. doi: 10.1186/s12889-016-3778-2.
- 22.- Ranchal Sánchez A, Pérula de Torres LÁ, Santos Luna F, et al. Prevalence of tobacco consumption among young physicians at a regional university hospital in southern Spain: a cross-sectional study. *BMJ Open* 2018;8:e018728. doi: 10.1136/bmjopen-2017-018728
- 23.- Ministerio de Sanidad, Servicios Sociales e Igualdad, Secretaría de Estado de Servicios Sociales e Igualdad. Encuesta sobre alcohol y drogas en España EDADES 1995-2017. Delegación del Gobierno para el Plan Nacional sobre Drogas. 2019. Available from: [http://www.pnsd.mscbs.gob.es/profesionales/sistemasInformacion/sistemaInformacion/pdf/EDADES\\_2017\\_Informe.pdf](http://www.pnsd.mscbs.gob.es/profesionales/sistemasInformacion/sistemaInformacion/pdf/EDADES_2017_Informe.pdf)
- 24.- Marzo-Castillejo M, Vela-Vallespín C, Bellas-Beceiro B, Bartolomé-Moreno C, Melús-Palazón E, Vilarrubí-Estrella M, Et al. Recomendaciones de prevención del cáncer. Actualización PAPPS 2018. *Aten Primaria*. 2018;50 Supl 1:41-65. doi:10.1016/S0212-6567(18)30362-7
- 25.- Moyer V. Screening for prostate cancer: U.S. preventive services task force recommendation statement. *Ann Intern Med*. 2012;17:120-34. doi:10.7326/0003-4819-157-2-201207170-00459
- 26.- Bibbins Domingo K, Grossman DC, Curry SJ. The US Preventive Services Task Force. Draft recommendation statement on screening for prostate cancer. An invitation to review and comment. *JAMA*. 2017;317:1949-50. doi:10.1001/jama.2017.4413

- 27.- Hauer KE, Wilkerson L, Teherani A. The relationship between medical students' knowledge, confidence, experience, and skills related to colorectal cancer screening. *J Cancer Educ.* 2008;23(4):209-13. doi: 10.1080/08858190802188586.
- 28.- Rodríguez-Feria P, Hernández-Flórez LJ, Rodríguez-Feria D. Knowledge, attitudes and practices of prevention for cervical cancer and breast cancer among medical students. *Rev Salud Publica (Bogota).* 2016;18(3):354-366. doi: 10.15446/rsap.v18n3.44487.
- 29.- Sambanje MN, Mafuvadze B. Breast cancer knowledge and awareness among university students in Angola. *Pan Afr Med J.* 2012; 11:70.
- 30.- Asgarlou Z, Tehrani S, Asghari E, et al. Cervical Cancer Prevention Knowledge and Attitudes among Female University Students and Hospital Staff in Iran. *Asian Pac J Cancer Prev.* 2016;17(11):4921-4927. doi:10.22034/APJCP.2016.17.11.4921
- 31.- González-Robledo María C, González-Robledo LM, Marta Caballero M, Aguilar-Martínez ME. Formación de médicos y enfermeras para la detección temprana del cáncer de mama en México. *Rev. salud pública.* 2011; 13(6): 966-979.
- 32.- Manterola C, Otzen T. Los sesgos en investigación clínica. *Int. J. Morphol.* 2015; 33(3):1156-1164.
- 33.- Martín Moreno J M. El Código europeo contra el cáncer. Tercera revisión (2003): insistiendo y avanzando en la prevención del cáncer. *Rev Esp Salud Publica [Internet].*2003;77:673-679 [Accessed 10 July 2019]. Available from: <http://scielo.isciii.es/scielo.php?script=sciarttext&pid=S1135-57272003000600001&lng=es>

34.- Schüz J, Espina C, Villain P, Herrero R, Leon ME, Minozzi S, et al. European Code against Cancer 4th Edition: 12 ways to reduce your cancer risk. *Cancer Epidemiol.*2015;39,S1-S10. doi: 10.1016/j.canep.2015.05.009

Tables

**Table 1. Respondent habits and behaviors in relation to the recommendations of the European Code Against Cancer**

Habits and behaviors	Absolute frequency (%)			
Tobacco consumption	Smoker (I have tried to quit)	Smoker (I have not tried to quit)	Ex-smoker	Non-smoker
	51 (6.9)	39 (5.3)	47 (6.4)	603 (81.5)
If you smoke, you do so:	Not in the presence of others	In the presence of others		
	13 (1.8)	87 (11.8)		
Current weight	Normoweight	Overweight	Obese	Unknown/No response
	621 (83.9)	78 (10.5)	12 (1.6)	29 (3.9)
Physical activity level	Regular (every day/almost every day)	2–3 times/week	Occasionally	Never
	120 (16.2)	253 (34.2)	276 (37.3)	91 (12.3)
Vegetable consumption	Regular (every day/almost every day)	2–3 times/week	Occasionally	Never
	401 (54.2)	254 (34.3)	74 (10.0)	11 (1.5)
Fruit consumption	Regular (every day/almost every day)	2–3 times/week	Occasionally	Never
	439 (59.3)	161 (21.8)	122 (16.5)	18 (2.4)
Red meat consumption	Regular (every day/almost every day)	2–3 times/week	Occasionally	Never
	177 (23.9)	420 (56.8)	124 (16.8)	19 (2.6)
Alcohol consumption	Sporadically	1 or 2 drinks/day	3 or more drinks/day	Never
	572 (77.3)	20 (2.7)	1 (0.1)	147 (19.9)
Avoidance of sun exposure	Yes, always	Sometimes	Never	
	221 (29.9%)	418 (56.5)	101 (13.6)	
Use of sunscreens	Yes, always	Sometimes	Never	
	370 (50.0)	323 (43.6)	47 (6.4)	

**Table 2. Respondents' opinions about the performance of the screening tests included in the European Code Against Cancer**

Screening tests	Absolute frequency (%)			
	Agreed	Neither agreed nor disagreed	Disagreed	Unknown/No response
Colorectal cancer (FOBT) <sup>a</sup>	622 (84.1)	45 (6.1)	51 (6.9)	22 (3.0)
Breast cancer (mammography)	660 (89.2)	18 (2.4)	56 (7.6)	6 (0.8)
Cervical cancer (vaginal cytology)	670 (90.6)	23 (3.1)	38 (5.1)	9 (1.2)

Prostate cancer (PSA) <sup>b</sup>	602 (81.4)	50 (6.8)	65 (8.8)	23 (3.1)
------------------------------------	------------	----------	----------	----------

<sup>a</sup> FOBT: fecal occult blood test; <sup>b</sup> PSA: prostate-specific antigen; said that this test was not included in the ECAC

**Table 3. Respondents' opinions in relation to the screening tests included in the European Code Against Cancer, according to their academic profiles**

Screening tests	Academic profile			<i>p</i>
	Nursing student	Medical student	FM residents <sup>a</sup>	
Colorectal cancer (FOBT) <sup>b</sup>				
Agreed	296 (86.8)	259 (83.5)	67 (75.3)	< 0.001
Neither agreed nor disagreed	12 (3.5)	20 (6.5)	13 (14.6)	
Disagreed	25 (7.3)	17 (5.5)	9 (10.1)	
Unknown/No response	8 (2.3)	14 (4.5)	0 (0.0)	
Breast cancer (mammography)				
Agreed	298 (87.4)	280 (90.3)	82 (92.1)	0.023
Neither agreed nor disagreed	8 (2.3)	5 (1.6)	5 (5.6)	

Disagreed	34 (10.0)	21 (6.8)	1 (1.1)	
Unknown/No response	1 (0.3)	4 (1.3)	1 (1.1)	
Cervical cancer (vaginal cytology)				
Agreed	311 (91.2)	281 (90.6)	78 (87.6)	0.006
Neither agreed nor disagreed	11 (3.2)	6 (1.9)	6 (6.7)	
Disagreed	19 (5.6)	14 (4.5)	5 (5.6)	
Unknown/No response	0 (0.0)	9 (2.9)	0 (0.0)	
Prostate cancer (PSA determination) <sup>c</sup>				
Agreed	291 (85.3)	255 (82.3)	56 (62.9)	< 0.001
Neither agreed nor disagreed	14 (4.1)	19 (6.1)	17 (19.1)	
Disagreed	23 (6.7)	26 (8.4)	16 (18.1)	
Unknown/No response	13 (3.8)	10 (3.2)	0 (0.0)	

<sup>a</sup> FM: Family Medicine; <sup>b</sup> FOBT: fecal occult blood test; <sup>c</sup> Said that this test was not included in the ECAC.

**Table 4. Knowledge of the European Code Against Cancer and respondents' own habits regarding these cancer-preventive recommendations**

Habits and behaviors		Knowledge of the ECAC		
		Yes	No	<i>p</i>
Tobacco consumption	Smoker (I have tried to quit)	10 (19.6)	41 (80.4)	0.790
	Smoker (I have not tried to quit)	8 (20.5)	31 (79.5)	
	Ex-smoker	13 (27.7)	34 (72.3)	
	Non-smoker	139 (23.1)	464 (76.9)	
Current weight	Normoweight	148 (23.8)	473 (76.2)	0.058
	Overweight	15 (19.2)	63 (80.8)	
	Obese	5 (41.7)	7 (58.3)	
	Unknown/No response	2 (6.9)	27 (93.1)	
Physical activity level	Regular (every day/almost every day)	31 (25.8)	89 (74.2)	< 0.001
	2–3 times/week	76 (30.0)	177 (70.0)	
	Occasionally	53 (19.2)	223 (80.8)	
	Never	10 (11.0)	81 (89.0)	
Vegetable consumption	Regular (every day/almost every day)	101 (25.2)	300 (74.8)	0.163
	2–3 times/week	54 (21.3)	200 (78.7)	
	Occasionally	15 (20.3)	59 (79.7)	
	Never	0 (0.0)	11 (100.0)	
Fruit consumption	Regular (every day/almost every day)	107 (24.4)	332 (75.6)	0.062
	2–3 times/week	40 (24.8)	121 (75.2)	
	Occasionally	23 (18.9)	99 (81.1)	
	Never	0 (0.0)	18 (100.0)	
Red meat consumption	Regular (every day/almost every day)	25 (14.1)	152 (85.9)	< 0.001
	2–3 times/week	97 (23.1)	323 (76.9)	
	Occasionally	41 (33.1)	83 (66.9)	
	Never	7 (36.8)	12 (63.2)	
Alcohol consumption	Sporadically	132 (23.1)	440 (76.9)	0.946
	1–2 times/day	5 (23.1)	15 (75.0)	

	3–5 times/day	0 (0.0)	1 (100.0)	
	Never	33 (22.4)	114 (77.6)	
Avoidance of prolonged sun exposure	Yes, always	63 (28.5)	158 (71.5)	0.044
	Sometimes	87 (20.8)	331 (79.2)	
Use of sunscreens	Never	20 (19.8)	81 (80.2)	0.264
	Yes, always	92 (24.9)	278 (75.1)	
	Sometimes	71 (22.0)	252 (78.0)	
	Never	7 (14.9)	40 (85.1)	

**Table 5. Knowledge of the European Code Against Cancer and respondents' opinions about the screening tests included in it**

Screening tests	Knowledge of the ECAC		
	Yes	No	<i>p</i>
Screening for colorectal cancer (FOBT) <sup>a</sup>			
Agreed	143 (23.0)	479 (77.0)	0.780
Neither agreed nor disagreed	9 (20.0)	36 (80.0)	
Disagreed	14 (27.5)	37 (72.5)	
Unknown/No response	4 (18.2)	18 (81.8)	
Screening for breast cancer (mammography)			
Agreed	155 (23.5)	505 (76.5)	0.214
Neither agreed nor disagreed	3 (16.7)	15 (83.3)	
Disagreed	9 (16.1)	47 (83.9)	
Unknown/No response	3 (50.0)	3 (50.0)	
Screening for cervical cancer (vaginal cytology)			
Agreed	149 (22.2)	521 (77.8)	0.225
Neither agreed nor disagreed	5 (21.7)	18 (78.3)	
Disagreed	14 (36.8)	24 (63.2)	
Unknown/No response	2 (22.2)	7 (77.8)	

---

Screening for prostate cancer (PSA <sup>b</sup> )			
Agreed	137 (22.8)	465 (77.2)	0.855
Neither agreed nor disagreed	13 (26.0)	37 (74.0)	
Disagreed	16 (24.6)	49 (75.4)	
Unknown/No response	4 (17.4)	19 (82.6)	

---

<sup>a</sup> FOBT: fecal occult blood test <sup>b</sup> PSA: prostate-specific antigen; said that this test is not included in the ECAC