



# Health Promoting Behaviors among Reproductive Age Women in Serbia: The Results from a National Health Survey

\*Jovana Todorovic<sup>1</sup>, Zeljka Stamenkovic<sup>1</sup>, Dejan Nesic<sup>2</sup>, Katarina Vojvodic<sup>3</sup>, Aleksandar Stevanovic<sup>1</sup>, Pavle Piperac<sup>4</sup>, Stefan Dugalic<sup>5</sup>, Miroslava Gojnic<sup>5</sup>, Zorica Terzic-Supic<sup>1</sup>

1. Institute of Social Medicine, Faculty of Medicine, University of Belgrade, Dr Subotica 15, 11000 Belgrade, Serbia
2. Institute of Medical Physiology, Faculty of Medicine, University of Belgrade, Dr Subotica 15, 11000 Belgrade, Serbia
3. City Institute of Public Health of Belgrade, Belgrade, Serbia
4. Department of Humanities, Faculty of Medicine, University of Belgrade, Belgrade, Serbia
5. Clinic of Obstetrics and Gynecology, Clinical Centre of Serbia, Belgrade, Belgrade, Serbia

\*Corresponding Author: Email: jovana.todorovic@med.bg.ac.rs

(Received 19 Sep 2023; accepted 11 Nov 2023)

## Abstract

**Background:** Certain lifestyle characteristics, such as dietary patterns, physical activity, and maintenance of recommended body weight, low-risk alcohol consumption and non-smoking are associated with the lower likelihood for the development of chronic-non communicable disease in the general population. These lifestyles are called health promoting behaviors (HPBs). We aimed to examine the prevalence of the HPBs among the women of reproductive age in Serbia and the factors associated with the compliance with four or more of these behaviors.

**Methods:** The study was the secondary analysis of the data from the National Health survey in Serbia from 2019 that examined social, health status, mental health (using PHQ-8) and lifestyle characteristics of the general population in Serbia.

**Results:** The prevalence of compliance with four or more HPBs was 22%. Among the HPBs the most frequent was a non-risky alcohol consumption reported by 2585 participants (99.2%), followed by normal weight (2018-69.2%) and non-smoking (1469-69%), daily fruit and vegetables intake (969-33.2%) and sufficient aerobic PA (216-7.9%). Multivariate logistic regression analysis with four or more HPBs as an outcome variable showed that the association of compliance with four or more HPBs with tertiary education (OR 1.91, 95% CI: 1.32-2.76) use of prescription medications (OR: 0.62, 95% CI: 0.44-0.87) and score on PHQ-8 (OR: 0.88, 95% CI: 0.79-0.98).

**Conclusion:** There is a need for deeper promotion of health-related behaviors among all educational and vocational groups, including health promotion activities at the primary health care level, which is available to the entire population.

**Keywords:** Health promoting behaviors; Physical activity; Alcohol; Weight; Diet; Smoking; Women

## Introduction

According to the Global Burden of disease database, between the years of 1990 and 2019 total of 1.6 billion Disability-adjusted life-years (DALYs)

was lost due to chronic non-communicable diseases (1,2). Certain lifestyle characteristics, such as dietary patterns, physical activity, and mainte-



Copyright © 2024 Todorovic et al. Published by Tehran University of Medical Sciences.  
This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license.  
(<https://creativecommons.org/licenses/by-nc/4.0/>). Non-commercial uses of the work are permitted, provided the original work is properly cited

nance of recommended body weight, low-risk alcohol consumption and non-smoking are associated with the lower likelihood for the development of chronic-non communicable disease in the general population (3).

These lifestyle characteristics are jointly named health-promoting behaviors (3). Health promoting behaviors are multidimensional behavioral patterns that help maintain and promote well-being, life satisfaction and self-realization (4). Health promoting lifestyles are among women of the reproductive age not only important for their own health, but also for the health of their potential offspring (5,6).

Limit for women in order to avoid health risks associated with alcohol consumption is lower than for men (7). Alcohol influences the sex hormone levels and can be associated with the risk of high estradiol such as breast cancer or polycystic ovarian syndrome (8,9).

There is no safe amount of smoking during pregnancy and smoking during pregnancy increases risk for pre-term births, even with the significant reduction to no more than two cigarettes per day in early pregnancy (10). Women have higher likelihood to be underweight, overweight and obese compared to men (11). The maintenance of normal range body weight among women of reproductive age is of significance as both underweight and overweight/obese women have decreased fertility, and numerous adverse pregnancy outcomes such as spontaneous abortion, preterm delivery, and higher neonatal and infant mortality (11).

WHO recommends at least 400g of fruit and vegetables daily and non-compliance with these recommendations leads to underweight, overweight, obesity and/ or micronutrient deficiencies (12,13).

The compliance with multiple of these behaviors was shown to have higher protective effect (3). According to the European Health Interview Study (EHIS) in Germany in 2019, the prevalence of the compliance with four of more health promoting behaviors among women was 35.6%, and it was increasing with the increasing age (3).

Health promoting lifestyles have been examined for the entire population in Serbia and for men and women separately, independently and not all together, as part of few different studies, including the Diet and Physical Activity for Health Initiative (DiPAH) (14) and the study titled Targeted Educational Intervention on Healthy Lifestyle Behaviors in Serbian population (TEDI-HL) (15) which examined Body mass index, diet and physical activity (14,15). Smoking habits among women of the reproductive age in Serbia were examined as a part of the multicenter study of smoking during pregnancy in 15 European countries, but the data is presented as aggregate for the entire region (16). The alcohol consumption specifically among women was examined in the study conducted on the sample of patients in fourteen different clinics in Serbia, however, this study only included women from three cities in Serbia (17). To the best of our knowledge, no study in Serbia has examined the five health promoting behaviors together and the factors that are associated with the compliance with the combination of these behaviors.

We aimed to examine the prevalence of each of the health promoting behaviors, prevalence of compliance with four or more health promoting behaviors and the factors associated with the compliance with four of more health promoting behaviors among women of reproductive age in Serbia, using the data from the Serbian National Health Survey from 2019.

## **Methods**

This was a secondary analysis of the data from the Serbian National Health Survey from 2019 (18). The Serbian National Health Survey included total of 15621 participants, out of which there were 13178 participants older than 15 yr of age. Our analysis included only women of the reproductive age (15 to 49) total of 2072 of them. The Serbian National Health Survey was conducted during the last three months of the 2019 the Oct, Nov and Dec of 2019.

The population for the Serbian National Health survey from 2019 included all residents of Serbia, who were not living in the institutions such as students' dorms, elderly homes, or monasteries. The exclusion criteria for Serbian National Health Survey were: living in the institutions, such as student's dorms, elderly homes or monasteries. The sample size was determined based on the compromise between the study power and survey costs and was calculated to be 6000 households. Sampling was done using the two-step cluster sampling. The first step used the random cluster sample of the households in so called 'census circles' and in the second step was the random selection of the households in each cluster (18,19), with total of 600 census circles and 10 households in each circle. Total of 6335 households were contacted in this survey, out of which 5114 agreed to participate in the study, with the response rate of (80.7%). In these households there were total of 13589 potential participants over 15 yr of age, out of whom 13178 agreed to be interview by the field researchers (the response rate of 97%).

All the participants in the survey received oral and written information about the study, its process and aims and all participants gave a written consent for participation in the study. From our analyses we excluded all men in the study as well as all women who were not in the reproductive age (all women aged over 49).

The Serbian National Health Survey uses the European Health Interview survey (EHIS) questionnaire as a research instrument, and includes self-reporting questionnaire, objective measurement of the anthropometric characteristics done by the field researchers (height, weight, blood pressure) and interviewer led face-to-face interview (19). Based on the height and weight measured by the researchers the body mass index (BMI) was calculated.

The examined data referred to socio-demographic characteristics (sex, age, place of residence, marital status, and educational level), socio-economic characteristics (income quintiles, employment status), health status (self-rated health, presence of chronic illnesses and use of

prescription medications), lifestyle characteristics (physical activity, smoking, alcohol use, dietary characteristics).

Based on the reported marital status participants were classified as single (never been married, divorced, widowed) and married (married or living together with a partner), educational level was classified as primary only, secondary and tertiary. Income quintiles were self-reported as the poorest, poor, average, good and the highest. Based on the employment status (students, retired, housewife, unemployed, employed) were classified as employed or inactive (students, retired, housewives, and unemployed). Self-rated health was categorized as poor (categories of very poor and poor), average and good (categories of good and very good).

Physical activity (PA) was examined using the European Health Interview Survey Physical Activity Questionnaire (EHIS-PAQ) (20) that examines separately work related PA, transportation-related PA, leisure-time PA, health-enhancing PA and muscle-strengthening PA (21) using the nine item scale. Based on the recommendations from the WHO on the minimal recommended aerobic physical activity per week (22) and based on the calculated energy expenditures the participants were classified in two categories: sufficient aerobic physical activity (>150 minutes of moderate intensity aerobic physical activity per week or more than 75 minutes of vigorous intensity aerobic physical activity per week) and insufficient physical activity. As in previous studies, self-reported moderate PA is strongly related to the objective information when walking is excluded, so we also excluded walking from the calculations for the moderate- intensity aerobic PA (20).

EHIS diet questionnaire was used to examined the dietary characteristics, and it examines the frequency of intake of food and beverages, eight different types, using a ten item questionnaire (23). Based on these questions participants were classified in two groups: with daily intake of fruit and vegetables and without daily intake of fruits and vegetables.

The alcohol consumption was examined with the set of six questions on the frequency of alcohol

use. For all participants who reported drinking at least once per week the average weekly intake of alcohol was calculated based on the questions- 'How many days per week do you usually drink?' and 'How many drinks per day do you usually drink?' to calculate the average number of drinks per day. One drink was considered the amount of 10g of pure alcohol and everything above 10g of pure alcohol per day on average was considered as risky alcohol consumption (3).

Based on calculated body mass index, the participants were classified as underweight ( $BMI < 18.5 \text{ kg/m}^2$ ), normal weight ( $18.5 \text{ kg/m}^2 - 25 \text{ kg/m}^2$ ), overweight ( $> 25.00 \text{ kg/m}^2$  and  $< 30.00 \text{ kg/m}^2$ ) and obese ( $> 30 \text{ kg/m}^2$ ). The participants were then classified in two categories (normal weight  $\geq 18.5 \text{ kg/m}^2$  and  $\leq 25 \text{ kg/m}^2$ ) and without normal weight ( $< 18.5 \text{ kg/m}^2$  OR  $> 25 \text{ kg/m}^2$ ) (3). Smoking status was examined as current smoking (yes/no).

Based on the presence of the five health promoting behaviors (sufficient PA, daily intake of fruit and vegetables, non-risky alcohol consumption, non-smoking and normal weight) participants were classified in two groups: with four or more HPBs and with less than four HPBs (3).

Statistical analyses were done using the methods of descriptive and analytical statistics. The differences between the categorical variables were examined using the Chi-square test and the differences between the numerical variables with normal distribution were examined using the *t*-test. The differences between the numerical variables without normal distribution were examined using the Kruskal Wallis test. The normality was examined using the Kolmogorov Smirnov test. All variables that were shown significant were entered in the multivariate logistic regression model with the four or more HPBs as an outcome variable. Odds ratios and 95% confidence intervals are presented. All analyses were done using the SPSS 22.0 (IBM Corp., Armonk, NY, USA).

### *Ethical approval*

The study was approved by the Ethical Committee of the Faculty of Medicine, University of Belgrade (No. 1322/VII-4).

### **Results**

Total of 2072 women of reproductive age who filled all the questions regarding the HPBs were included in the study. In our study, 151 women (7.3%) reported one of the HPBs, 581 (28.0%) reported having two HPBs, 883 (42.6%) had three, 423 (20.4%) had four and 34 women (1.6%) reported all five HPBs, meaning that total of 457 women (22.1%) were in the category of having four or more HPBs.

Among the HPBs the most frequent was a non-risky alcohol consumption reported by 2585 participants (99.2%), followed by normal weight (2018-69.2%) and non-smoking (1469-69%), daily fruit and vegetables intake (969-33.2%) and sufficient aerobic PA (216-7.9%).

There were significant differences in the average age, as well as in marital status, income quintiles, education, self-rated health, presence of chronic illnesses, use of medication and average PHQ score between women with four or more reported HPBs and women with three or less reported HPBs (Table 1). The socio-demographic, socio-economic and health status characteristics of women in both groups are presented in Table 1.

Multivariate logistic regression analysis with four or more HPBs as an outcome variable showed that the participants with tertiary education had significantly higher likelihood for reporting four or more HPBs compared to participants with primary education, participants who used any prescription medications had lower likelihood for reporting four or more HPBs. Higher score on PHQ-8 was associated with lower likelihood for reporting four or more HPBs. The results of the multivariate logistic regression analysis with four or more HPBs are presented in Table 2.

**Table 1:** Socio-demographic, socio-economic and health status characteristics of the participants

<i>Characteristics</i>	<i>Four or more HPBs N (%)</i>	<i>Less than four HPBs N (%)</i>	<i>P-value</i>
Age	31.97±9.96	34.10±9.92	0.001
Marital status			
Single	214 (46.8)	606 (37.5)	
Married	243 (53.2)	1009 (62.5)	0.001
Income quintiles			
Poorest	72 (15.8)	348 (21.5)	
Second	90 (19.7)	339 (21.0)	
Third	80 (17.5)	310 (19.2)	
Fourth	115 (25.2)	342 (21.2)	
Richest	100 (21.9)	276 (17.1)	0.008
Education			
Primary	67 (14.7)	311 (19.3)	
Secondary	243 (53.2)	955 (59.1)	
Tertiary	147 (32.2)	349 (21.6)	0.001
Employment status			
Unemployed/ student/retired/ inactive	231 (50.5)	812 (50.4)	
Employed	226 (49.5)	799 (49.6)	0.957
Self-rated health			
Poor	1 (0.2)	42 (2.6)	
Average	32 (7.0)	228 (14.1)	
Good	424 (92.8)	1345 (83.3)	0.001
Chronic illnesses			
Yes	76 (16.6)	402 (24.9)	
No	381 (83.4)	1213 (75.1)	0.001
Use of medications			
Yes	67 (14.7)	430 (26.6)	
No	390 (85.3)	1185 (73.4)	0.001
PHQ-8* (X±SD)	8.27±0.82	8.67±1.94	0.001

\*PHQ-8: Patient Health questionnaire

**Table 2:** Multivariate logistic regression analysis with four or more HPBs as an outcome variable

<i>Characteristics</i>	<i>OR (95% CI)</i>
Age	0.99 (0.98-1.01)
Marital status	
Single	0.82 (0.63-1.06)
Married	1.0 reference category
Income quintiles	
Poorest	1.0 reference category
Second	1.21 (0.85-1.73)
Third	1.12 (0.78-1.61)
Fourth	1.36 (0.96-1.92)
Richest	1.35 (0.93-1.94)
Education	
Primary	1.0 reference category
Secondary	1.22 (0.89-1.69)
Tertiary	1.91 (1.32-2.76)
Self-rated health	
Poor	1.0 reference category
Average	4.44 (0.58-33.94)
Good	6.05 (0.80-45.53)
Use of medications	
Yes	0.62 (0.44-0.87)
No	1.0 reference category
PHQ-8* (X±SD)	0.88 (0.79-0.98)

\*PHQ-8: Patient Health questionnaire

## Discussion

Our study aimed to examine the frequencies of the five of the health promoting behaviors (non-risk alcohol consumption, normal weight, non-smoking, daily fruit and vegetables intake and sufficient aerobic physical activity) among women of reproductive age, along with the frequency of compliance with at least four of these five behaviors and the factors associated with it and showed that 22.1% of women of reproductive age in Serbia comply with four or more of the health promoting behaviors, most commonly non-risky alcohol consumption, followed by normal weight and non-smoking, while the frequency of daily fruit and vegetable intake and especially compliance with the recommendations on sufficient aerobic physical activity were significantly lower. Compliance with four or more of the health promoting behaviors was positively associated with tertiary education and negatively associated with prescription medication and the score on PHQ-8 scale.

Health promotion and adequate health protection among women of the reproductive age is of high societal importance as the women's health and health behavior is associated with the health of potential offspring, as well as with the fertility, and pregnancy outcomes. Public health professionals, but also all clinicians have therefore the obligation to provide proper information to women in the reproductive age on the health promoting behaviors, the recommendations, counseling and guidance in order to help women to comply with these behaviors. Finally, the societal responsibility would be to create and develop adequate conditions in which the women of the reproductive age could comply with these recommendations and could include them in their daily routines. Therefore, we aimed to initially examine, which factors are associated with the compliance with the health promoting behaviors in this population, with aim to promote these enabling factors.

Only 22.1% of our population reported compliance with four or more health promoting behaviors, which is just under one quarter. This is lower than in the study conducted in Germany in which almost a half of women aged 18 to 29 and just under 40% of women aged 30 to 44 reported compliance with at least four of the health promoting behaviors (3). The most common health promoting behavior in our study was the non-risky alcohol consumption, reported by 99.2% of the participants, which is slightly higher than in the mentioned German study, but comparable, as in this study it was also above 90% for the women of reproductive age (3). Almost one third of the women in the study did not have the weight in the normal BMI range, being underweight or overweight or obese. Although, the prevalence of normal weight in our study is higher than in the reported global average, the potential offspring consequences are significant (24) and with worrying prevalence from this study can have serious impact on the general population health in the future.

The prevalence of current non-smoking was in our study almost exact as the prevalence of the current non-smoking among women ages 18 to 29 and ages 30 to 44 in the study on health promoting behaviors in Germany (3). The prevalence of daily fruit and vegetable consumption was, on the contrary, significantly lower than in the German study (33% vs. around 40%) (3). It is important to note that this health promoting behavior was defined with both daily fruit and daily vegetable consumption, so the participant reporting high amounts of only vegetable intake would not comply with this health promoting behavior. Out of the five examined health promoting behaviors, the lowest prevalence was of the sufficient aerobic physical activity, which was only 7%. The compliance with the recommended levels of aerobic physical activity is not equal to the recommendations on the minimal physical activity from WHO (22), as the recommendations from WHO also include the minimum of two times of strength exercises per week, and the

prevalence of compliance with full recommendations may be even lower.

The compliance with four of more health promoting behaviors was associated with having tertiary education, use of prescription medications and score on PHQ-8 questionnaire. Women with tertiary education had almost double the likelihood to comply with four of more health promoting behaviors compared to women with primary education only. This is in accordance with the current knowledge on the associations between health literacy and health promoting behaviors, as higher health literacy is associated with higher educational level (25).

Women who reported using any prescription medications had almost 40% lower likelihood to comply with four of more health promoting behaviors in our study. The relationship between chronic diseases and health promoting behaviors is complex and multidimensional as, for example, smoking is among all health associated behaviors associated with the highest number of chronic illnesses, and consequential use of prescription medications may be initially higher among smokers (26). The existence of chronic illnesses and the need for the use of prescription medications may also be associated with lower socio-economic status (27), that can further be associated with more difficulties in compliance with dietary recommendations.

The participants with higher PHQ score had 12% lower likelihood for compliance with four or more health promoting behaviors with each higher point of the score. The presence of depressive symptoms may affect the health promoting behaviors, especially physical activity and dietary patterns, but may also be associated with the lower likelihood for smoking cessation (28). Depression is known for its influence on the health promoting behaviors and its negative influence on the lifestyle (4).

This study has a few possible limitations. The first is in its design, as the cross-sectional study design does not allow the establishment of causal relationship between the variables. Additionally, the data used was from the Serbian National Health Survey that is being done in accordance

with the EHIS methodology and using the standard questionnaire. Therefore, the indicators used differ in the timeframe examined; smoking refers to current smoking, while alcohol consumption refers to the alcohol consumption in the past year. The indicators set were based on the recommendations and may underestimate or overestimate the prevalence of the behaviors and their relationship. The physical activity only included aerobic physical activity; dietary patterns only examined the daily consumption of both fruit and vegetables. However, this is the first study to examine the prevalence of these five behaviors among women of the reproductive age in Serbia and factors associated with it.

## **Conclusion**

The prevalence of the compliance with four or more health promoting behaviors among women of reproductive age in Serbia was low. The future studies should focus more thoroughly on the association between the mental health determinants and mental health characteristics with health promoting behaviors in order to develop the most effective behavioral change interventions at the population level. There is a need for deeper promotion of health-related behaviors and especially need for work on health literacy among all educational and vocational groups and, on the other hand, clear need for the counseling activities at the primary health care level to increase the compliance with these behaviors among women with the need for prescription medications and depressive symptoms.

## **Journalism Ethics considerations**

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## Acknowledgements

This work is supported by Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No.451-03-6672024-03/200110).

## Conflict of Interest

The authors declare that they have no conflict of interest.

## References

- Bai J, Cui J, Shi F, Yu C (2023). Global Epidemiological Patterns in the Burden of Main Non-Communicable Diseases, 1990-2019: Relationships with Socio-Demographic Index. *Int J Public Health*, 68:1605502.
- Our world in data. Disease burden from non-communicable diseases, World, 1990-2019. (2019). Available from: <https://ourworldindata.org/grapher/disease-burden-from-ncds>
- Richter A, Schienkiewitz A, Starker A, et al (2021). Health-promoting behaviour among adults in Germany - Results from GEDA 2019/2020-EHIS. *J Health Monit*, 6(3):26-44.
- Park J, Lee H (2023). The relationship between depression, self-efficacy, social support, and health-promoting behaviors in Korean single-household women. *Prev Med Rep*, 32:102156.
- Guinhouya BC, Duclos M, Enea C, Storme L (2022). Beneficial Effects of Maternal Physical Activity during Pregnancy on Fetal, Newborn, and Child Health: Guidelines for Interventions during the Perinatal Period from the French National College of Midwives. *J Midwifery Womens Health*, 67 Suppl 1(Suppl 1):S149-S157.
- Wang S-M, Dezinno P, Maranets I, Berman MR, Caldwell-Andrews AA, Kain ZN (2004). Low Back Pain During Pregnancy. *Obstet Gynecol*, 104(1):65-70.
- Greaves L, Poole N, Brabete AC (2022). Sex, Gender, and Alcohol Use: Implications for Women and Low-Risk Drinking Guidelines. *Int J Environ Res Public Health*, 19(8):4523.
- Khan NAJ, Tirona M (2021). An updated review of epidemiology, risk factors, and management of male breast cancer. *Med Oncol*, 38(4):39.
- Khmil M, Khmil S, Marushchak M (2020). Hormone imbalance in women with infertility caused by polycystic ovary syndrome: Is there a connection with body mass index? *Open Access Maced J Med Sci*, 8(8):731-7.
- Liu B, Xu G, Sun Y, et al (2020). Maternal cigarette smoking before and during pregnancy and the risk of preterm birth: A dose-response analysis of 25 million mother-infant pairs. *PLoS Med*, 17(8): e1003158.
- Al Kibria GM, Swasey K, Hasan MZ, Sharmeen A, Day B (2019). Prevalence and factors associated with underweight, overweight and obesity among women of reproductive age in India. *Glob Health Res Policy*, 4:24.
- Kehoe SH, Dhurde V, Bhaise S, et al (2019). Barriers and Facilitators to Fruit and Vegetable Consumption Among Rural Indian Women of Reproductive Age. *Food Nutr Bull*, 40(1):87-98.
- Yiga P, Ogwok P, Achieng J, Auma MD, Seghers J, Matthys C (2021). Determinants of dietary and physical activity behaviours among women of reproductive age in urban Uganda, a qualitative study. *Public Health Nutr*, 24(12):3624-3636.
- NCD risk (2017). Available from: <https://www.ncdrisc.org/downloads/country-pdf/NCD-RisC%20country%20factsheet%20United%20Kingdom.pdf>
- Đorđić V, Božić P, Milanović I, et al (2019). Guidelines-driven educational intervention promotes healthy lifestyle among adolescents and adults: A serbian national longitudinal study. *Medicina (Kaunas)*, 55(2):39.
- Smedberg J, Lupattelli A, Mårdby AC, Nordeng H (2014). Characteristics of women who continue smoking during pregnancy: A cross-sectional study of pregnant women and new mothers in 15 European countries. *BMC Pregnancy Childbirth*, 14:213.
- Lugonja S, Pantic I, Dumic I, Milovanovic T (2021). Alcohol Use by Women in Serbia-A First Report. *Alcohol Alcohol*, 56(6):689-94.
- Republic Institute of Public Health of Serbia "Dr Milan Jovanovic Batut." Serbian National Health Survey (2019) [Истраживање



- здравља становништва Србије 2019. године]. Belgrade.
19. Eurostat. Eurostat. European Health Interview Survey (2023). Available from: <https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey>
  20. Finger JD, Tafforeau J, Gisle L, et al (2015). Development of the European Health Interview Survey - Physical Activity Questionnaire (EHIS-PAQ) to monitor physical activity in the European Union. *Arch Public Health*, 73:59.
  21. Baumeister SE, Ricci C, Kohler S, et al (2016). Physical activity surveillance in the European Union: Reliability and validity of the European Health Interview Survey- Physical Activity Questionnaire (EHIS-PAQ). *Int J Behav Nutr Phys Act*, 13:61.
  22. Bull FC, Al-Ansari SS, Biddle S, et al (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*, 54(24):1451–62.
  23. Tabacchi G, Garbagnati F, Wijnhoven TMA, Cairella G (2019). Dietary assessment methods in surveillance systems targeted to adolescents: A review of the literature. *Nutr Metab Cardiovasc Dis*, 29(8):761–774.
  24. Dow ML, Szymanski LM (2020). Effects of Overweight and Obesity in Pregnancy on Health of the Offspring. *Endocrinol Metab Clin North Am*, 49(2):251–63.
  25. Fleary SA, Joseph P, Pappagianopoulos JE (2018). Adolescent health literacy and health behaviors: A systematic review. *J Adolesc*, 62:116–27.
  26. Cockerham WC, Hamby BW, Oates GR (2017). The Social Determinants of Chronic Disease. *Am J Prev Med*, 52(1S1):S5–S12.
  27. Michie S, Yardley L, West R, Patrick K, Greaves F (2017). Developing and evaluating digital interventions to promote behavior change in health and health care: Recommendations resulting from an international workshop. *J Med Internet Res*, 19(6):e232.
  28. Yun JY, Yun YH (2023). Health-promoting behavior to enhance perceived meaning and control of life in chronic disease patients with role limitations and depressive symptoms: a network approach. *Sci Rep*, 13(1):4848.