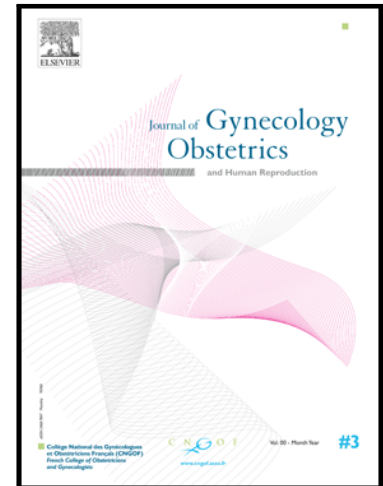


Journal Pre-proof

Prevalence of cumulative cardiovascular risk factors among women of childbearing age in France: results of the GYNRISK[®] survey

Manzo-Silberman Stéphane , Chabbert-Buffet Nathalie ,
Roux Edouard , Parisi Muriel , Regidor Pedro Antonio ,
Mounier-Vehier Claire

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Highlights

- Cardiovascular morbi-mortality is growing worldwide among women
- Young women also cumulate cardiovascular risk factors
- Actionable cardiovascular risk factors screening is a priority prevention strategy

Journal Pre-proof

Title: Prevalence of cumulative cardiovascular risk factors among women of childbearing age in France: results of the GYNRISK® survey

Authors: Manzo-Silberman Stéphane^a, Chabbert-Buffet Nathalie^b, Roux Edouard^c, Parisi Muriel^c, Regidor Pedro Antonio^d, Mounier-Vehier Claire^e

Affiliations: ^aSorbonne University; Institute of Cardiology– Hôpital Pitié-Salpêtrière (AP-HP), ACTION Study Group, Paris, France; ^bHôpital Tenon APHP, Paris, France; ^cExeltis Santé, Boulogne-Billancourt, France; ^dExeltis Healthcare, ^eInstitut Cœur-Poumon, CHU Lille, Lille, France

Corresponding author: Stéphane Manzo-Silberman

Institut de Cardiologie, La Pitié Salpêtrière, Paris, France

Tel: +33 06 61 13 53 34

Email: stephane.manzosilberman@aphp.fr

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ABSTRACT

Global burden of cardiovascular disease is growing worldwide among women, particularly in younger women. Corresponding increases in the number and severity of cardiovascular risk factors (CVRF)

associated with a greater impact in women could explain this increase in incidence. The prevalence of CVRF remains poorly known within young women, especially their cumulative prevalence. This study aimed to determine the prevalence of traditional and emerging CVRF, including female-specific CVRF, in young French women of childbearing age (16–45 years). The GYNRISK® survey aimed to analyse the magnitude and cumulation of CVRF. Two thousand women, representative of the general population, completed a self-administered, computer-assisted web interviewing survey.

Results highlighted the high prevalence of traditional CVRF (73.8% with at least one CVRF).

Modifiable CVRF were also particularly high, especially overweight/obesity (31.3%), tobacco/cannabis consumption (24.0%), sedentary lifestyle (55.4%), low fruit and vegetable intake (83.6%), and poor health literacy (87.2%). Additionally, a high prevalence of accumulated CVRF was reported, with 37.8% of young French women having ≥ 2 traditional CVRF, 69.6% having ≥ 1 traditional and ≥ 1 emergent CVRF, and 73.3% having ≥ 1 traditional in addition to ≥ 1 lifestyle associated CVRF.

Among women receiving combined hormonal contraception (CHC), 34.0% had a contraindication for CHC due of the presence of CVRF (single or cumulative) according to recommendations. GYNRISK® survey highlighted the need for more data in this understudied population of young women.

Increasing knowledge, screening, prevention, and information, with targeting on modifiable CVRF must be a priority to reduce women cardiovascular burden.

Key words: cardiovascular risk factors, prevention, women health, contraception, health education, lifestyle prevention

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in women worldwide [1] and in France [2]. Additionally, CVD is a major cause of morbidity and early death in French women [3]. More worrying is the increasing incidence of cardiovascular events among younger women, in particular the increase in hospitalizations for myocardial infarction recorded among women under 60 years of age [4]. The first step in addressing this critical rise is consideration of the impact of cardiovascular risk factor (CVRF). However, women, and specifically younger women have been traditionally excluded from cardiovascular research and clinical trials [5]. Thus, improved understanding of the effects of sex and gender, social determinants of health, behaviours, environment, and policy is necessary to ensure that sex-based disparities are addressed [5]. To this end, improved understanding of the prevalence of CVRF in women could participate in controlling the epidemic of CVD which affects women more and more frequently and at an increasingly younger age.

Data regarding the individual prevalence of traditional CVRF among women have been documented, including hypertension, dyslipidemia, diabetes, obesity, unhealthy diet, sedentary lifestyle, and smoking or tobacco use [6,7]. Also, associations between individual and cumulative traditional CVRF and cardiovascular morbidity/mortality are well established [8,9]. However, the prevalence of emergent CVRF, and those that are female-specific, is less documented [6,7,10]. Female-specific CVRF include early sex steroid deprivation, pregnancy complications (e.g., gestational diabetes, hypertensive disorders of pregnancy, premature delivery), the use of combined hormonal contraception (CHC), polycystic ovary syndrome as well as emerging CVRF including psychosocial risk factors, domestic abuse and violence, socioeconomic disadvantage and low health literacy in addition to inflammatory and autoimmune diseases [7]. Also, there are sparse or missing data in France regarding the accumulation of traditional and emergent CVRF specifically in women.

The GYNRISK® survey aimed to determine the prevalence of traditional, and emerging CVRF in young French women of childbearing age and to analyze how, and to what extent, CVRF are accumulated.

MATERIALS AND METHODS

Study design and survey methodology

This quantitative survey was conducted in collaboration with IPSOS, a global market research and public opinion company who conduct research using self-administrated online surveys. IPSOS has a robust panel of participants in France that is representative of the French population.

The overall panel size is 282,396 individuals with a total access of 4,084,113 individuals (including the IPSOS internal panel and partnerships with suppliers verified and validated in terms of quality and reliability), as well as 76% of smartphone penetration and 97% online penetration (smartphone penetration and online penetration are based on national statistics in the French population, from Eurostats). Since the overall reliability of any survey depends on controlling all error components, IPSOS imposes strict controls and procedures at every stage of a survey. Individuals within the panel, receive a daily general email inviting them to complete a computer-assisted web interviewing (CAWI) survey. Upon agreeing, the individual's demographic information is assessed, and the person redirected to a relevant survey that best matches their profile. If the individual does not qualify for the first survey, they are automatically redirected to a second survey.

In the current study, a total of 2000 French women were randomly chosen from within the IPSOS panel by an online recruitment system to complete the online survey. Women of childbearing age (16–45 years), were included in the study. In order to ensure representativeness of the sample, quotas for age, region, and socio-professional category were set, based on National Institute of Statistics and Economic Studies (INSEE) data (additional exclusion criteria: not responding to the

question about sex, or the participant participation in an online survey during the last 2 months, or refusal of health data collection). The demographics of the studied population is described in Table 1.

To guarantee the representativeness of the sample and of the results, the raw sample (i.e., the sample obtained at the end of the survey phase) was weighted by age, region, and socio-professional category, based on percentages obtained from the INSEE database <https://www.insee.fr/en/accueil>).

Sample adjustment is a technique which consists of correcting the sample of respondents during a survey to ensure its representativeness. Adjustment is necessary when we have an over-representation or under-representation of certain categories of respondents within the final sample.

The RIM weighting (Random Iterative Method Weighting) used for our study is an adjustment counting under-represented profiles several times to respect representativeness. The technique allows the analyst to adjust multiple features (variables) in a data set at the same time so that the different features remain proportionate as a whole.

The questionnaire was drafted according to an editorial standard comprising 12 mandatory standards (these standards are part of procedures governed by ISO 20252 standard (specific to market research) and comply with National Commission for Information Technology and Liberties/General control over data protection CNIL / RGPD legislation), reread and validated at a senior level within IPSOS, then sent to the Authors for final validation. The programming (or questionnaire script) was tested by at least 2 people prior to validation. The self-administered questionnaire took approximately 10 minutes to complete, and incentives were paid to respondents.

Data collection

To facilitate the analysis and description, CVRF assessed were arbitrary grouped as, traditional CVRF, lifestyle-associated CVRF, and emerging CVRF, the latter included female-specific CVRF related to obstetrical and gynecological history. A full list of the CVRF evaluated using the

questionnaire is shown in **Table 2**. The questionnaire in its entirety is shown in the **Supplementary Material**.

Data analyses

Data of interest (i.e., age, region, socio-professional information, etc.) were analyzed by subgroup, and the existence of significant differences between the data or subgroups were investigated. Predefined analyses were completed in the subgroup of patients reporting use of CHC. Statistical significance was calculated according to the Student's t-Test, the significance level was established as $p < 0.05$ (statistical software: Logiciel Dimension).

Subgroup analysis

As part of the questionnaire, women were asked about their current contraceptive method. It was pre-established that women reporting the use of CHC would be analyzed as a separate subgroup. In this subgroup, the French College of Gynecologists and Obstetricians (CNGOF) recommendations regarding CHC were considered to determine whether the presence of specific CVRF should be regarded as a contraindication for CHC or not. While some CVRF are deemed contraindications on their own, others require accumulation to be considered as such for CHC usage [11] (**Table 3**).

RESULTS

Respondents

A total of 2000 individuals, representative of the age matched population, responded to the survey between December 15 and 26, 2022. The mean age of respondents was 31 years, the majority were in paid employment (73%), high school diploma (24%), high school diploma and higher (51%), and in a permanent relationship (60%) **Table 1**.

Prevalence of CVRF in the whole study population

The prevalence of individual traditional CVRF evaluated are listed in **Table 2**. The two most common traditional CVRF reported were: being currently smokers of tobacco or cannabis (24.0%) and being overweight or obese (31.3%). Significant differences in smoking habits were found between factory workers and the overall respondent population regarding conventional cigarettes versus refillable electronic cigarettes use (40.2% vs 23.4% $p<0.05$ and 23.0% vs 15.2%, respectively; both $p<0.05$; **Figure 1**). We also found a significant difference regarding women with an educational level of less than high school diploma and cigarettes consumption compared with the overall respondent population (33.6% vs 23.4%; $p<0.05$). Interestingly, significantly more women who were classified as CSP- (farmers, factory workers or employees) smoked refillable electronic cigarettes than the overall respondent population (19.0% vs 15.2%; $p<0.05$). Disposable electronic cigarettes use was reported more often by women with a high income or executives than the overall respondent population (15.6% and 11.7% respectively, vs 8.0%; respectively, $p<0.05$), and chewing tobacco was used more often by executives than the overall respondent population (6.3% vs 2.0% $p<0.05$).

Regarding lifestyle associated CVRF, more than half of women (55.4%) reported being sedentary i.e. sitting >7 hours/day (**Figure 2A**). The prevalence was significantly higher among those aged 16–20 years than the overall respondent population (67.0% vs 55.4% $p<0.05$). Only approximately one-third of women (35.7%) reported performing >150 minutes of moderate-intensity physical activity per week. Also, the majority (83.6%) of respondents ate less than the recommended 5 portions of fruit or vegetables per day (**Figure 2B**), with the average consumption of fruit and vegetables being only 2.8 portions/day.

As for emerging CVRF, a very high number of women reported a poor health literacy (87.2%; **Table 2**), one-third of the women reported a history of abuse or violence (29.1%). A quarter of all responding women reported having experienced depression, anxiety, psychological stress (24.7%).

Prevalence of accumulated CVRF

As shown in **Table 2**, more than one-third (37.8%) of the women reported having ≥ 2 traditional CVRF, and 13.5% reported accumulation of ≥ 3 traditional CVRF. Overall, lifestyle CVRF were accumulated with ≥ 1 traditional CVRF in 73.8% of women, and ≥ 2 traditional CVRF in 37.8%. Emerging CVRF were also frequently accumulated with traditional CVRF, especially psychosocial CVRF.

Subgroup analysis

Data was collected in the questionnaire regarding the type of contraception used, and a separate analysis of CVRF in the subgroup of women receiving CHC was performed. We described the percentage of women declaring being using of CHC and reporting having CVRF according to the CNGOF recommendations (**Table 3**) [11].

The results showed that 549 (27.5%) of women reported the use of CHC (pill, vaginal ring, or patch). Among these, 388 (19.4%) reported at least one traditional CVRF and 190 (9.5%) had at least two traditional CVRF (**Table 2**). In this subgroup of 549 women reporting CHC use, 187 women (34.0%) had a potential contraindication to CHC according to their declared CVRF; 133 women (24.3%) had at least one CVRF considered to be, by its only presence to be a contraindication to CHC, and 53 (9.7%) declared at least 2 CVRF, which alone were not contraindications to CHC, but cumulatively were (**Table 4**).

DISCUSSION

In 2022, the American Heart Association published a call to action urging improved knowledge, screening, prevention, and information for CVD in women [5]. This call emphasized the crucial role of the collaborative effort of cardiologists, gynecologists, emergency physicians and

general practitioners to improve health education and all aspects of prevention, with the message that CVD affects everyone and that outcomes are worse for women [12,13]. Improved recognition of CVRF in women appeared as a cornerstone [6].

The GYNRISK® study provided valuable data that could help to improve CVD risk awareness for women in France. The survey highlighted the high prevalence of traditional and, more importantly, modifiable CVRF in young French women (16–45 years). Among women up to age 45 years, representative of the general childbearing female population in France, the current survey showed a high prevalence not only of traditional and modifiable lifestyle risk factors but also a significant prevalence of individual female specific and emerging CVRF. Almost one-third of the women surveyed were overweight or obese, more than half had sedentary lifestyles, the majority failed to meet the recommended exercise levels or consume the recommended amounts of fruit and vegetables, and almost one-third of respondents used tobacco products. The GYNRISK® survey also reported that almost one-third declared having been the victim of abuse or violence, and almost all the women surveyed (87.2%) declared that they never heard about the risks of myocardial infarction (MI), stroke, or venous thromboembolism (VTE) (**Table 2**).

When considering accumulation of CVRF, the picture becomes even more serious. More than one-third (37.8%) of young French women reported ≥ 2 traditional CVRF, and this prevalence increased to 69.6% if an additional emerging CVRFs were considered. Furthermore, the prevalence of one traditional CVRF in addition to at least one lifestyle CVRF, was 73.8%. Among women >35 years old and/or those who were overweight or obese, the majority used tobacco products, one third (34%) of women receiving CHC had a potential contraindication to CHC according to their declared CVRF and considering CNGOF guidelines [11].

Our findings of a high proportion of overweight and obesity in women aged 16–45 years is in line with other major French studies [14,15]. The Obepi-Roche study, conducted in 2020 in 9598 individuals (male and female) aged ≥ 18 years (mean age 49.1 years), showed that 41.3% of women were overweight/obese and 17.4% were obese [15]. In the Constance study, conducted

between 2013 and 2016 in 63,582 individuals (51% female) aged 18–69 years, 26.3% of women aged 18–29 years were overweight or obese, and 15.2% were obese [14]. Similarly, the smoking rate reported in the current study was as previously reported [16,17].

Results of the current study also added to the evidence of a high prevalence of psychosocial emerging CVRFs with major impact [7]. Also, direct physiological mechanisms and indirect effects of violence have been postulated to increase the risk of CVD in women [18,19]. The main direct effect of violence is chronic stress, which persists even after the violence has stopped and which, together with depression, can increase the risk of CVD. Inadequate health literacy (i.e., an individual's motivation and ability to access, understand, and use information in ways that promote and maintain good health) has also been associated with an increased risk of CVD, and contributes to poor health outcomes and low utilization of health services [20,21].

CHC are used worldwide due to their effectiveness and good tolerability. The sum of CVRF reported in women receiving CHC in our survey underline the need for larger, high-evidence level of evidence studies. This would allow improvement in guidelines for CVRF monitoring in women in general and in users of hormonal contraception, or any other treatment with cardiovascular impact.

Healthcare professionals, such as general practitioners, midwives, and gynecologists clearly have an important role to play in CVD prevention in women in France [22].

Additionally, while the gap in cardiovascular prevention between men and women in France has to be overcome, adequate support for women at increased cardiovascular risk is also important [22,23], including clear information and sensitization campaigns regarding modifiable risk factors. Noteworthy, any adverse pregnancy outcome is now included in the specific risks evaluation, as an emerging CVRF [24].

A strength of GYNRISK® is the originality of the survey, which used a bi-faceted approach from both cardiologist and gynecologist points of view. The most important data collected were

those regarding the accumulation of CVRF. Also, the survey included a young population, namely the ideal target population for cardiovascular prevention.

Limitations must be considered in GYNRISK®. The quantitative design of the survey, the declarative nature of the medical data obtained that cannot be verified, should be considered a limitation of the study. Also, acknowledged important limitations of web panel surveys have to be considered as the self-selection approach (seemingly relinquishing sampling error control), non- (or under-coverage (i.e., exclusion of those without access to the internet), and the inability to assess the quality of the results (generally sampling errors or confidence intervals cannot be calculated) [25,26].

GYNRISK study is an uncommon type of study for the medical community, however it shows information that has not been shown previously. The objective of this work and the importance of its dissemination within the medical community is to alert on the evolution of cardiovascular risk factors, their number and their accumulation within a young population, considered to be at "low risk" despite increase in the incidence of myocardial infarction and stroke. In order to reduce the burden and the rise of CVD in women, information regarding all CVRF, traditional and emerging ones should then be systematically collected in order to implement not only clinical research data but especially when monitoring these young women.

CONCLUSION

While CVD remains the leading cause of death for women in France, still killing 200 women a day, GYNRISK® highlights the frequency of modifiable CVRF in a representative panel of young French women. There is therefore an urgent need to rethink cardiovascular and preventive medicine, while speeding up the training of healthcare professionals in the specificities of female cardiovascular risk.

The GYNRISK® survey reinforces the need for a call to action in France. Given the high accumulation of CVRF, mostly modifiable CVRF, there is a pressing need to step up the prevention of CVRF in young women in France. Increasing knowledge, screening, prevention, and education regarding CVRF in young women must be a priority and actions should be taken at all levels to reduce women cardiovascular morbidity and mortality in women.

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DECLARATION OF INTEREST

Nathalie Chabbert-Bufferet is member of the Women Health Board Gedeon Richter, and Exeltis, has received occasional interventions fees from Theramex and Besins, and is a study investigator in Bayer- and Organon-sponsored studies.

Pedro Antonio Regidor is an employee of Exeltis Healthcare, and Edouard Roux and Muriel Parisi are employees of Exeltis Santé.

Stéphane Manzo-Silberman has received consulting fees from Bayer, Organon, Exeltis, Astra Zeneca, lecture fees from Bayer, BMS, Exeltis, Novo Nordisk, Astra Zeneca, and Organon, has served in the adjudication board for a study for Biotronik.

Claire Mounier Vehier has received occasional interventions/consultant fees from Servier, Bristol Meyer Squibb, Exeltis Santé, Organon France, Astrazeneca and Otsuka Pharmaceutical France.

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ROLE OF THE FUNDING SOURCE

Edouard Roux and Muriel Parisi as members of Exeltis Santé, contributed to the creation and validation of the questionnaire, analysis of the results and writing of the manuscript. Pedro Antonio Regidor contributed to the analysis of the results and writing of the manuscript.

REFERENCES

- [1] Woodward M. Cardiovascular Disease and the Female Disadvantage. *Int J Environ Res Public Health* 2019;16(7). <https://doi.org/10.3390/ijerph16071165>.
- [2] Ministère de la Santé et de la Prévention. Maladies cardiovasculaires ; 2023. <https://sante.gouv.fr/soins-et-maladies/maladies/maladies-cardiovasculaires/article/maladies-cardiovasculaires> [accessed 02 April 2024].
- [3] Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M. Cardiovascular disease in Europe: epidemiological update 2016. *Eur Heart J* 2016;37(42):3232-45. <https://doi.org/10.1093/eurheartj/ehw334>.
- [4] Puymirat E, Simon T, Steg PG, Schiele F, Guéret P, et al. Association of changes in clinical characteristics and management with improvement in survival among patients with ST-elevation myocardial infarction. *JAMA*. 2012;308(10):998-1006. <https://doi.org/10.1001/2012.jama.11348>.
- [5] Wenger NK, Lloyd-Jones DM, Elkind MSV, Fonarow GC, Warner JJ, Alger HM, et al. Call to Action for Cardiovascular Disease in Women: Epidemiology, Awareness, Access, and Delivery of Equitable Health Care: A Presidential Advisory From the American Heart Association. *Circulation* 2022;145(23):e1059-e71. <https://doi.org/10.1161/cir.0000000000001071>.
- [6] Cho L, Davis M, Elgendy I, Epps K, Lindley KJ, Mehta PK, et al. Summary of Updated Recommendations for Primary Prevention of Cardiovascular Disease in Women: JACC State-of-the-Art Review. *J Am Coll Cardiol* 2020;75(20):2602-18. <https://doi.org/10.1016/j.jacc.2020.03.060>.
- [7] Vogel B, Acevedo M, Appelman Y, Bairey Merz CN, Chieffo A, Figtree GA, et al. The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030. *Lancet* 2021;397(10292):2385-438. [https://doi.org/10.1016/s0140-6736\(21\)00684-x](https://doi.org/10.1016/s0140-6736(21)00684-x).
- [8] Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364(9438):937-52. [https://doi.org/10.1016/s0140-6736\(04\)17018-9](https://doi.org/10.1016/s0140-6736(04)17018-9).

- [9] Rabe T, Luxembourg B, Ludwig M, Dinger J, Bauersachs R, Rott H, et al. Contraception and Thrombophilia-A statement from the German Society of Gynecological Endocrinology and Reproductive Medicine (DGGEF e. V.) and the Professional Association of the German Gynaecologists (BVF e. V.). *Journal für Reproduktionsmedizin und Endokrinologie-Journal of Reproductive Medicine and Endocrinology* 2011;8(1):178-218.
- [10] Ivey SL, Hanley HR, Taylor C, Stock E, Vora N, Woo J, et al. Early identification and treatment of women's cardiovascular risk factors prevents cardiovascular disease, saves lives, and protects future generations: Policy recommendations and take action plan utilizing policy levers. *Clin Cardiol* 2022;45(11):1100-6. <https://doi.org/10.1002/clc.23921>.
- [11] Chabbert-Buffet N, Marret H, Agostini A, Cardinale C, Hamdaoui N, Hassoun D, et al. Clinical practice guidelines for contraception by the French National College of Gynecologists and Obstetricians (CNGOF). *J Gynecol Obstet Hum Reprod* 2019;48(7):441-54. <https://doi.org/10.1016/j.jogoh.2019.04.009>.
- [12] Huded CP, Johnson M, Kravitz K, Menon V, Abdallah M, Gullett TC, et al. 4-Step Protocol for Disparities in STEMI Care and Outcomes in Women. *J Am Coll Cardiol* 2018;71(19):2122-32. <https://doi.org/10.1016/j.jacc.2018.02.039>.
- [13] Lawless M, Brown S, Kunadian V. Raising awareness about cardiovascular disease in women. *Eur Heart J* 2023;44(33):3110-2. <https://doi.org/10.1093/eurheartj/ehad452>.
- [14] Czernichow S, Renuy A, Rives-Lange C, Carette C, Airagnes G, Wiernik E, et al. Evolution of the prevalence of obesity in the adult population in France, 2013-2016: the Constances study. *Sci Rep* 2021;11(1):14152. <https://doi.org/10.1038/s41598-021-93432-0>.
- [15] Fontbonne A, Currie A, Tounian P, Picot MC, Foulatier O, Nedelcu M, et al. Prevalence of Overweight and Obesity in France: The 2020 Obepi-Roche Study by the "Ligue Contre l'Obésité". *J Clin Med* 2023;12(3). <https://doi.org/10.3390/jcm12030925>.
- [16] Foundation for a Smoke-free World. State of smoking in France ; 2023. <https://www.smokefreeworld.org/health-science-research-2/health-science-technology-agenda/data-analytics/global-state-of-smoking-landscape/state-smoking-france/> [accessed 02 April 2024].

- [17] Statista. Progression of the amount of daily smokers among the French population between 2000 and 2021 ; 2023. <https://www.statista.com/statistics/937572/evolution-proportion-daily-smokers-by-gender-france/> [accessed 02 April 2024].
- [18] Scott-Storey KA. Abuse as a gendered risk factor for cardiovascular disease: a conceptual model. *J Cardiovasc Nurs* 2013;28(6):E1-8. <https://doi.org/10.1097/jcn.0b013e318279e372>.
- [19] Wright EN, Hanlon A, Lozano A, Teitelman AM. The Association Between Intimate Partner Violence and 30-Year Cardiovascular Disease Risk Among Young Adult Women. *J Interpers Violence* 2021;36(11-12):Np6643-np60. <https://doi.org/10.1177/0886260518816324>.
- [20] de Melo Ghisi GL, da Silva Chaves GS, Britto RR, Oh P. Health literacy and coronary artery disease: A systematic review. *Patient Educ Couns* 2018;101(2):177-84. <https://doi.org/10.1016/j.pec.2017.09.002>.
- [21] Greenberg KL, Leiter E, Donchin M, Agbaria N, Karjawally M, Zwas DR. Cardiovascular health literacy and patient-physician communication intervention in women from disadvantaged communities. *Eur J Prev Cardiol* 2019;26(16):1762-70. <https://doi.org/10.1177/2047487319853900>.
- [22] Gaye B, Hergault H, Lassale C, Ladouceur M, Valentin E, Vignac M, et al. Gender gap in annual preventive care services in France. *EclinicalMedicine* 2022;49:101469. <https://doi.org/10.1016/j.eclinm.2022.101469>.
- [23] Mounier-Vehier C, Nasseridine P, Madika A-L. Stratification du risque cardiovasculaire de la femme: optimiser les prises en charge. *La Presse Médicale* 2019;48(11):1249-56. <https://doi.org/10.1016/j.lpm.2019.09.049>.
- [24] Markovitz AR, Stuart JJ, Horn J, Williams PL, Rimm EB, Missmer SA, et al. Does pregnancy complication history improve cardiovascular disease risk prediction? Findings from the HUNT study in Norway. *Eur Heart J* 2019;40(14):1113-20. <https://doi.org/10.1093/eurheartj/ehy863>.
- [25] Svensson J. Web Panel Surveys-a challenge for official statistics. *Proceedings of Statistics Canada Symposium*. 2014.

- [26] Clark S, Hughes B, McDonald SS. The impact of nausea and vomiting of pregnancy on quality of life: report of a national consumer survey and recommendations for improving care. *Obstetrical & Gynecological Survey* 2013;68(9):S1-S10.

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GLOSSARY

Bac, baccalaureate

BMI, body mass index

CAWI, complete a computer-assisted web interviewing

CHC, combined hormonal contraception

CI, contraindication

CNGOF, French College of Gynecologists and Obstetricians

CNIL, National Commission for Information Technology and Liberties

CSP, socio-professional category

CVD, cardiovascular disease

CVRF, cardiovascular risk factors

INSEE, National Institute of Statistics and Economic Studies

IUD, intrauterine device

MI, myocardial infarction

RGPD, General control over data protection

VRFs, venous vascular risk factors

VTD, venous thromboembolic disease

VTE, venous thromboembolism

Figures legends

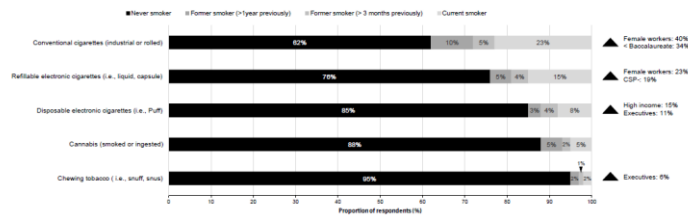


Figure 1. Lifestyle-associated CVRF: quantification of smoking habits. Black triangles denote significantly higher results in the specified subgroups than in the overall respondent population ($p < 0.05$). **CSP**, socio-professional category; **CSP+**, independent professions (craftsmen, shopkeepers, company directors) and executive manager; **CSP-**, farmer, factory worker, employee; **baccalaureate** = high school level.

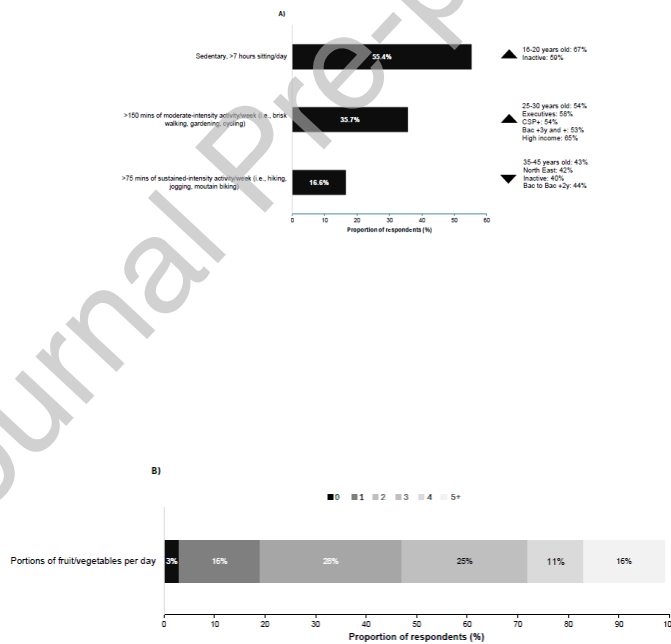


Figure 2. Lifestyle-associated CVRF: quantification of selected modifiable CVRF: A) physical activity by week and B) consumption of number of fruits and vegetables per day. Black triangles denote significantly higher or lower (dependent on direction of triangle) results in the specified subgroups than in the overall respondent population ($p < 0.05$). **Bac**, baccalaureate = high school level; **CSP**, socio-professional category; **CSP+**, independent professions (craftsmen, shopkeepers, company directors) and executive manager; **CSP-**, farmer, factory worker, employee; **CVRF**, cardiovascular risk factors.

Table 1: Demographics of the studied population and reference data, French women population aged 16 to 45 years

	Respondents	INSEE database ^a
Characteristics considered for sample representativeness		
Age		
16-20 years	16%	16%
21-24 years	12%	12%
25-30 years	19%	19%
31-34 years	14%	14%
35-40 years	21%	21%
41-45 years	18%	18%
Region		
Northwest region	21%	21%
Northeast region	22%	22%
Paris region	22%	22%
Southwest region	11%	11%
Southeast region	24%	24%
CSP^b of the respondent		
CSP +	36%	36%
CSP -	38%	38%
Inactive	26%	26%
Other characteristics of the population		
<i>Educational level</i>		
Primary school	2%	NA

Middle school (Collège)	6%	8%
NVQ ^c level 1,2 (CAP-BEP)	14%	NA
High school diploma	24%	23%
High school diploma + 2y	18%	15%
High school diploma + 3/+4y	18%	15%
High school diploma + 5 & more	15%	14%
I do not know	3%	NA

Family status

Single	36%	40%
In a common-law union	21%	18%
Married	27%	29%
Separated	1%	0%
Divorced	2%	3%
Widow	0%	1%
Civil union	12%	9%

Occupation

Farmer	0%	0%
Self-employed profession	2%	2%
Senior executive	11%	11%
Intermediate professions	22%	22%
Employee	32%	32%
Worker	6%	6%
Inactive	26%	26%
Retired	NA	0%

^aINSEE (National Institut of Statistics and Economics Studies) database

^bCSP, socio-professional category. CSP+, independent professions (craftsmen, shopkeepers, company directors) and executive manager; CSP-, farmer, factory worker, employee.

^cNVQ, National Vocational Qualifications. CAP, professional aptitude certificate. BEP, professional studies certificate

NA, not available

Table 2. Prevalence of individual and cumulative cardiovascular risk factors evaluated in French young women aged 16 to 45 years.

	Individual CVRF N=2000	Cumulative CVRF (N=2000)	
		With ≥1 other traditional CVRF	With ≥2 other traditional CVRF
Traditional CVRF, n (%)	1475 (73.8)	756 (37.8)	270 (13.5)
Age >35 years	719 (36.0)	475 (23.8)	194 (9.7)
Overweight (BMI ≥25 and <30 kg/m ²)	349 (17.5)	235 (11.8)	87 (4.4)
Obesity (BMI ≥30 kg/m ²)	275 (13.8)	203 (10.2)	99 (5.0)
Tobacco and/or cannabis ^a	480 (24.0)	339 (17.0)	153 (7.7)
Hypertension	64 (3.2)	58 (2.9)	47 (2.4)
Migraine with aura	112 (5.6)	93 (4.7)	56 (2.8)
Migraine without aura	125 (6.3)	99 (5.0)	45 (2.3)
Type 1 or type 2 diabetes	43 (2.2)	41 (2.1)	27 (1.4)
Dyslipidemia	16 (0.8)	16 (0.8)	13 (0.7)
First-degree history of MI ^b , stroke ^b , VTE ^c , or thrombophilia	341 (17.1)	261 (13.1)	143 (7.2)
Personal CVD history ^d	71 (3.6)	57 (2.9)	39 (2.0)
Lifestyle CVRF, n (%)	1982 (99.1)	1465 (73.3)	751 (37.6)
Sedentary lifestyle (sitting >7 hours/day)	1108 (55.4)	807 (40.4)	411 (20.6)

<150 minutes of moderate-intensity ^e physical activity/week	1285 (64.3)	960 (48.0)	499 (25.0)
<75 minutes of sustained-intensity ^f physical activity/week	1668 (83.4)	1240 (62.0)	646 (32.3)
<5 portions of fruits or vegetables/day	1672 (83.6)	1233 (61.7)	632 (31.6)
Emerging CVRF, n (%)	1883 (94.2)	1391 (69.6)	718 (35.9)
Autoimmune disease ^g	79 (4.0)	68 (3.4)	44 (2.2)
Gynecologic-obstetric risk factors	330 (16.5)	290 (14.5)	194 (9.7)
Pregnancy pathologic antecedent ^h	206 (10.3)	193 (9.6)	133 (6.7)
Endometriosis	86 (4.3)	68 (3.4)	38 (1.9)
Polycystic ovary syndrome	64 (3.2)	52 (2.6)	41 (2.1)
Psychological disorders ⁱ	494 (24.7)	407 (20.4)	226 (11.3)
Abuse or violence ^j	581 (29.1)	466 (23.3)	271 (13.6)
Poor health literacy ^k	1743 (87.2)	1273 (63.7)	640 (32.0)
Combined hormonal contraception (pill, vaginal ring, patch), n (%)	549 (27.5)	388 (19.4)	190 (9.5)

Abbreviations: BMI, body mass index; CVD, cardiovascular disease; CVRF, cardiovascular risk factor; MI, myocardial infarction; VTE, venous thromboembolism.

^aTobacco: conventional cigarettes (industrial or rolled), cannabis (smoked or ingested).

^bBefore the age of 55 years (men) or 65 years (women).

^cBefore the age of 50 years.

^dDeep vein thrombosis, pulmonary embolism, MI, cerebrovascular accident, transient ischemic attack, angina, cardiovascular disorders.

^eBrisk walking, gardening, cycling, etc.

^fWalking, jogging, mountain biking, etc.

^gLupus, Crohn's disease, ulcerative colitis, autoimmune inflammatory diseases.

^hEclampsia, pre-eclampsia, hypertension, thrombosis, gestational diabetes.

ⁱDepression, anxiety, psychological stress.

^jWomen reporting abuse or violence.

^kDefined as a negative response to the question, “Have you ever been informed about the risk of MI, stroke, or VTE?”.

Table 3. Contraception recommendations of the French College of Gynecologists and Obstetricians (CNGOF) [11].

Arterial or venous vascular risk factors (VRFs) and use of combined hormonal (estrogen-progestin) contraception (CHC)	
Risk factors	Use of CHC
Age > 35 years	Possible, if no other VRFs
Overweight - obesity	Possible, if no other VRFs
Smokes > 15 cig/day	Possible, if no other VRFs
1 st degree family history of MI or stroke before the age of 55 years (men) or 65 years (women)	Contraindication
Hypertension	Contraindication
Dyslipidemia	Contraindication
Uncontrolled	Possible, if no other VRFs
Controlled	Relative contraindication, if dyslipidemia began with CHC
Insulin-dependent (Type I) diabetes	Contraindication if diabetes > 20 years or if vascular complications
Type 2 diabetes	Possible, if no other VRFs but in second line (1 st choice: progestin-only contraception or copper IUD).
Migraine with aura	Contraindication
Migraine simple	Possible if no other VRFs
Venous risk factors Use of CHC	
Age > 35 years	Possible, if no other VRFs
Overweight – obesity	Possible, if no other VRFs
Laboratory-diagnosed thrombophilia	Contraindication
1 st degree family history of VTD (venous)	Contraindication

thromboembolic disease) before the age of 50 years	
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Abbreviations: CHC, combined hormonal (estrogen-progestin) contraception; CVRF, cardiovascular risk factor; IUD, intrauterine device; MI, myocardial infarction; VRFs, venous vascular risk factors; VTD, venous thromboembolic disease.

Table 4. Subgroup analysis of respondents declaring use of CHC. CVRF were considered according to the French College of Gynecologists and Obstetricians (CNGOF) recommendations [11] as CVRF that contraindicated by its only presence the use of CHC and were named absolute contraindication (CI) and CVRF needed to be accumulated to be a CI, were named relative CI.

Respondents receiving CHC	N=549 (100.0)
At least one CVRF being an absolute contraindication^a, n (%)	133 (24.3)
One absolute	56 (10.1)
≥1 absolute + 1 relative	50 (9.1)
≥1 absolute + ≥2 relative	28 (5.1)
At least one relative CVRF (without any absolute contraindications)^a, n (%)	209 (38.1)
One relative	155 (28.3)
≥2 relative	53 (9.7)
POTENTIAL CONTRAINDICATION^a, n (%)	187 (34.0)
One absolute	56 (10.1)
≥1 absolute + 1 relative	50 (9.1)
≥1 absolute + ≥2 relative	28 (5.1)
≥2 relative	53 (9.7)

^aCVRF were considered, according to CNGOF recommendations [11], as absolute contraindications (i.e., CVRF contraindicating the use of CHC) or relative contraindications (i.e., CVRF requiring accumulation to be a contraindication).

Abbreviations: CHC, combined oral contraception; CI, contraindication; CNGOF, French College of Gynecologists and Obstetricians; CVRF, cardiovascular risk factor.

Declaration of interests

- The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
- The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

We declare that we have financial and personal relationships with other people or organizations that can inappropriately influence our work, there is no professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled, "*Prevalence of cumulative cardiovascular risk factors among women of childbearing age in France: results of the GYNRISK® survey*"