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Awareness and Misconceptions of Breast Cancer Risk Factors Among Laypersons and Physicians

Jean-François Morère [1] · Jérôme Viguier [2] · Sébastien Couraud [3] · Lysel Brignoli-Guibaudet [4,5] · Christine Lhomel [5] · Xavier B. Pivot [6] · François Eisinger [7,8]

Abstract

Background Primary prevention of cancer relies on awareness of and consequent identification of risk factors. We investigated knowledge of breast cancer risk factors not only among laywomen but also among female physicians.

Methods The EDIFICE 4 nationwide observational survey was conducted by phone interviews of a representative female population (737 laywomen and 105 female physicians) aged 40–75 years, using the quota method. This analysis focuses on spontaneous replies to the question "In your opinion, what are the five main risk factors that increase the risk of breast cancer?".

Results *Heredity/Family history* of breast cancer was the most widely recognized risk factor in both study populations (98.1% physicians vs. 54.2% laywomen; $P \leq 0.01$). Smoking (19.0 and 17.5%) and alcohol consumption (3.8 and 5.5%) were among the lifestyle risk factors that were cited by similar proportions of physicians and laywomen, respectively. Other established risk factors were however very rarely cited by either physicians or laywomen, e.g., *Exposure to medical radiation* (4.8 vs. 0.4%, respectively; $P \leq 0.05$) or not cited at all, i.e., *Benign mastopathy* and *Personal history of breast cancer*.

Conclusion This survey highlights a number of misconceptions relating to behavioral risk factors for breast cancer, including the relative impact of alcohol and tobacco consumption and the importance of menopausal status. The limited awareness of the risk related to *Exposure to medical radiation*, *Benign mastopathy*, or *Personal history* raises concern regarding compliance with national screening recommendations.

Keywords Breast cancer · Risk factors · Heredity · Smoking · Alcohol consumption · Personal history

✉ Jean-François Morère
jean-francois.morere@pbr.aphp.fr

1 INSERM U1193, département d'oncologie médicale, Hôpital Paul Brousse, 12 avenue Paul Vaillant Couturier, 94800 Villejuif, France

2 CCDC 37, Hôpital Bretonneau, 2 boulevard Tonnellé, 37044 Tours Cedex 9, France

3 Service de Pneumologie Aiguë Spécialisée et Cancérologie Thoracique, Centre Hospitalier Lyon Sud, 165 chemin du Grand Revoyet, 69495 Pierre Bénite Cedex, France

4 Kantar Health, 3 avenue Pierre Masse, 75014 Paris, France

5 Roche SAS, 30 cours de l'île Seguin, 92650 Boulogne Billancourt, Boulogne-Billancourt, France

6 Centre de lutte contre le cancer Paul Strauss de Strasbourg/ Hôpitaux Universitaires de Strasbourg, 3 Rue de la Porte de l'Hôpital, 67 065, Strasbourg Cedex, France

7 INSERM, IRD, SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information Médicale, Aix Marseille University, 23 rue Stanislas-Torrents, 13006 Marseille, France

8 Département d'Anticipation et de Suivi du Cancer DASC, Institut Paoli-Calmettes, 232, boulevard Sainte Marguerite, BP 156, 13273 Marseille Cedex 9, France

Introduction

Primary Prevention of Cancer

Prevention and screening are the two main strategies for reducing the burden of cancer. Primary prevention of cancer in general and breast cancer (BC) in particular is based on awareness of and thus consequent identification of risk factors (RF).

The French National Cancer Institute (INCa) works to raise awareness regarding exposure to individual BCRFs, including hormone therapy, tobacco consumption, alcohol consumption, and overweight [1]. In the context of the nationwide BC screening program in France, the question of adapting screening according to individual BCRFs is currently under debate [2]. The widely implemented program in France recommends a mammography every 2 years for all women in the average-risk population aged 50–74 years. However, the latest public health guidelines published in 2014 [2] also defined populations at high and very high risk of BC, irrespective of age, including women with a personal history of BC, benign

breast pathology (in situ carcinoma, hyperplasia), or high-dose thoracic medical irradiation, as well as those with a family history of cancer. Specific screening strategies are recommended for this population, screening examinations based on imaging techniques other than X-Ray (echography or magnetic resonance imaging), and initiated earlier or repeated more frequently. Oncogenetic testing is also used.

The EDIFICE Surveys

EDIFICE surveys aim to improve insight into the behavior of the French population with regard to cancer prevention and screening uptake. Since 2005, they have addressed various issues regarding participation in population-based national screening programs (breast, colorectal) and individual attitudes towards screening for prostate, cervical, or lung cancer. Other health-related issues have also been addressed, including tobacco, e-cigarette or alcohol consumption, and the assessment of individual risks of cancer. Factors likely to impede or trigger screening uptake have also been studied.

Effective prevention strategies such as improved understanding and thus identification of RFs among the general population are useful from two standpoints. By encouraging a change in individual behavior, with a potentially positive impact on individual risk, they may also incite greater compliance to screening programs at the same time as boosting individual decision-making initiatives.

Although this topic has previously been studied in different countries [3–6], our analysis provides current-day insight into the knowledge and awareness of BCRFs not only in the population at large but also among physicians. We compared RFs as perceived by the laypopulation with those that are scientifically acknowledged.

Methods

Methodology of the EDIFICE Surveys

This fourth nationwide observational survey, EDIFICE 4, was conducted by phone interviews, using the quota method [7]. Survey questionnaires were administered by experienced independent interviewers (Kantar Health) using the computer-assisted telephone interview (CATI) technique. They collected information on sociodemographic characteristics (age, area of residence, town size) and socioprofessional factors. The present work focuses on the breakdown of spontaneous replies to the question "In your opinion, what are the five main RFs that increase the risk of breast cancer?". When interviewees cited "tobacco," they were asked to specify whether it was passive or active smoking. Similarly, details were requested when diet was cited.

Sample Populations

An initial representative sample of 1602 individuals (age 40–75 years) was interviewed between June 12 and July 10, 2014. Population statistics were adjusted for sex, age, and profession and stratified by territory and size of urban areas based on data from the French Employment Survey conducted in 2009 and updated in 2012 by the French National Institute for Statistics and Economic Studies (*Institut National de Statistiques et d'Etudes Economiques* [INSEE]) [8].

A mirror survey on a representative sample of 301 physicians was conducted between July 9 and August 8, 2014. This population comprised 201 general practitioners (GPs) and 100 oncologists. Data on the former were adjusted for age and geographical area and on the latter, for the type of healthcare institution and geographical area.

Statistics

Student's *t*test for quantitative data was used for all comparisons between two populations and the *Z*test and the χ^2test were used for comparisons of categorical data. Differences were considered statistically significant when the *P* value was < 0.05 (two-sided test) (SAS software, version 8.2 SAS Institute Inc., Cary, NC, USA).

Results

Cited Risk Factors

The present analysis is based on two subpopulations: 737 laywomen with no history of cancer and 105 female physicians. When asked to cite five BCRFs, laywomen cited an average of 2.2 (standard deviation [SD] 1.3) and physicians 3.9 (SD 1.2). All physicians cited at least one RF whereas 22% of laywomen did not answer the question.

Heredity/Family history of breast cancer was the most widely recognized RF in both populations (Table 1). In second place, after this non-behavioral RF, both populations cited behavioral RFs, namely *Drug therapy* for physicians and *Unhealthy lifestyle* for laywomen. Lifestyle RFs cited by similar proportions of physicians and laywomen included *Smoking* and significantly less frequently, *Alcohol consumption*.

Late/No childbearing was rated in the middle range by physicians and rarely cited by laywomen. *Overweight/obesity*, *No breastfeeding*, *Age*, and *Menopause* were all ranked at similar levels by physicians though at much lower levels by laywomen.

Surprisingly, a number of established RFs were very rarely cited by either physicians or laywomen, e.g., *Exposure to medical radiation* or even not at all, i.e., *Benign breast*

Table 1 Breakdown of answers to the question "In your opinion, what are the five main risk factors that increase the risk of breast cancer?" Comparison between female physicians and laywomen with no history of cancer. NC, not cited

Risk factors	Physicians N = 105	Laywomen N = 737	P
Non-behavioral factors			
Heredity/family history	98.1%	54.2%	≤ 0.01
Hormonal factors	28.6%	2.4%	≤ 0.01
Menopause	22.9%	1.3%	≤ 0.01
Young age at menarche	5.7%	–	NS
Hormonal disorders	1.9%	1.1%	NS
Multiple pregnancies	1%	–	NS
Age	20.0%	2.0%	≤ 0.01
Breast cyst	6.7%	2.1%	NS
Genetic factors	4.8%	0.4%	< 0.01
Large breasts	3.8%	0.8%	NS
Mastopathy	1.0%	–	NS
Benign breast conditions	NC	NC	–
Personal history of breast cancer	NC	NC	–
Behavioral factors			
Drug therapy	50.5%	15.1%	≤ 0.01
Hormone replacement therapy	43.8%	4.1%	≤ 0.01
Contraceptive pill	17.1%	11.5%	NS
Late/no childbearing	39.0%	3.6%	≤ 0.01
Unhealthy lifestyle	32.4%	29.4%	NS
Tobacco use	19.0%	17.5%	NS
Poor exercise habits	10.5%	2.5%	≤ 0.01
Stress	2.9%	7.2%	≤ 0.05
Alcohol	3.8%	5.5%	NS
Bad eating habits	6.7%	10.0%	NS
Unhealthy lifestyle not specified	0.0%	2.4%	NS
Overweight, obesity	21.9%	1.8%	≤ 0.01
No breast-feeding	21.9%	3.4%	≤ 0.01
Exposure to medical radiation	4.8%	0.4%	≤ 0.05
Frequency of mammograms	2.9%	0.5%	NS

Table 2 Breakdown of answers to the question "In your opinion, what are the five main risk factors that increase the risk of breast cancer?" Comparison between female general practitioners (GPs) and oncologists

Risk factors cited	GPs N = 70	Oncologists N = 35	P value
Non-behavioral factors			
Heredity/family history	98.6%	97.1%	NS
Hormonal factors	24.3%	37.1%	NS
Menopause	15.7%	37.1%	= 0.03
Young age at menarche	7.1%	2.9%	NS
Hormonal disorders	2.9%	–	NS
Multiple pregnancies	1.4%	–	NS
Age	12.9%	34.3%	= 0.02
Breast cyst	8.6%	2.9%	NS
Genetic factors	2.9%	8.6%	NS
Large breasts	4.3%	2.9%	NS
Mastopathy	1.4%	–	NS
Benign breast conditions	Not cited	Not cited	
Personal history of breast cancer	Not cited	Not cited	
Behavioral factors			
Drug therapy	51.4%	48.6%	NS
Hormone replacement therapy	45.7%	40.0%	NS
Contraceptive pill	18.6%	14.3%	NS
Late/no childbearing	35.7%	45.7%	NS
Unhealthy lifestyle	30.0%	37.1%	NS
Tobacco use	24.3%	8.6%	≤ 0.05
Poor exercise habits	7.1%	17.1%	NS
Stress	1.4%	5.7%	NS
Alcohol	2.9%	5.7%	NS
Unhealthy eating habits	2.3%	14.3%	NS
Overweight, obesity	15.7%	34.3%	≤ 0.05
No breast feeding	22.9%	20.0%	NS
Exposure to medical radiation	1.4%	11.4%	NS
Frequency of mammograms	4.3%	–	NS

conditions and a *Personal history of breast cancer*. Other RFs were cited by less than one in ten laywomen.

Medical Population

The breakdown of answers from GPs and oncologists shows that physicians all ranked heredity/family history first, drug therapy second, and an unhealthy life style third, as risk factors for breast cancer (Table 2). However, compared to GPs, oncologists were more likely to cite age (34.3 vs. 12.9%, $P = 0.02$), overweight/obesity (34.3 vs 15.7%, $P ≤ 0.05$), and menopause (37.1 vs. 15.7%, $P = 0.03$) but less likely to cite tobacco use (8.6 vs. 24.3%, $P ≤ 0.05$).

Discussion

Our analysis suggests that both physicians and laywomen are largely aware of *Heredity/Family history* as the major RFs for BC. Other recognized RFs such as *Exposure to medical radiation* or *Alcohol* were however cited at surprisingly low levels. Moreover, and unexpectedly, *Benign mastopathy* and a *Personal history of breast cancer* were either omitted or not acknowledged, notably by physicians. This may be due to the inherent potential bias of declarative surveys where participants are not asked to select a response but to provide spontaneous replies, with the obvious risk of memorization bias or social desirability bias. Our survey does however have the advantage of a robust, validated methodology [8].

Risk Factor Ranking

Ranking BCRFs according to their relative impact on morbimortality is a key issue for targeting prevention. However, it becomes critical in the absence of any absolute scale [9, 10]. The relative risk for a given RF and the population-attributable fraction of cancer incidence and/or death are generally used to provide a quantitative, relative evaluation of the impact of a given RF.

Obesity, smoking, alcohol, and lack of physical activity are nowadays recognized as the most prevalent lifestyle RFs [11, 12•, 13, 14]. A US prospective cohort study showed that 15% of BC and 45% of BC deaths could be prevented in the USA through lifestyle changes [15].

However, prevention strategies should also take into consideration the fact that the absolute level of risk is likely to be the result of a combination of RFs, which notably is closely related to hormonal status [14, 16, 17, 18•] or genetic susceptibility [19•].

One attempt to rate BCRFs [10] reached the conclusion that factors associated with personal or familial history of BC were correlated with the highest relative risks, ranging from 3 to 200 (for BRCA1 and BRCA2 mutations). Exposure to medical radiation was associated with a relative risk of 5.2, whereas lower relative risks (< 2) were associated with hormone use, alcohol consumption, or even obesity.

Heredity and Family History

Our analysis highlights *Heredity/Family history* as the primary RF recognized by both physicians and laywomen. Interestingly, *Genetic factors* ranked lower but may have been implicitly included with the more general *Heredity/Family history* item for most interviewees. Previous investigations have reported conflicting opinions on this subject [4, 5]. Extensive media coverage of cases such as that of Angelina Jolie, which without question increased public awareness regarding BC, may well account for this observation [20]. One can legitimately extrapolate this observation and hypothesize that media coverage also increased awareness of the hereditary component of BC.

Little Known Risk Factors

In contrast, *Exposure to medical radiation* was very seldom mentioned in our study, and *Benign mastopathy* along with *Personal history of breast cancer* was not spontaneously cited by either physicians or laywomen. In other investigations, *Personal history of breast cancer* was indeed acknowledged but only when suggested by the interviewer [21]. However, because both are conditions requiring specific follow-up and screening procedures [2], these findings raise concerns regarding compliance with the national recommendations.

Awareness of Actual Risk Factors

It is nowadays widely acknowledged that reproductive factors and drug therapies (hormone replacement or oral contraception) have contributed to the increased incidence of BC [12•, 22, 23]. Therefore, as expected, these criteria were rated in the middle range of our survey, although less frequently acknowledged by laywomen.

A number of modifiable RFs related to specific at-risk behavior or exposure are individual components of the risk of BC. The most widely acknowledged BCRFs are alcohol consumption [12•, 24–29], overweight/obesity [12•, 30, 31], lack of physical activity [12•, 32, 16], and diet [12•, 33, 34]. The link with tobacco consumption is still under debate and the inconsistency of results is recognized in the literature [35–40]. High body mass index (BMI) has been shown to be the highest ranking BCRF in postmenopausal women, followed by alcohol consumption and lack of physical activity, with tobacco in the last position [18•]. Tobacco was however not ranked at all in other studies [12•, 10].

Our results suggest that the impact of tobacco was overestimated by both healthcare professionals (GPs) and laywomen in our survey. Laywomen and GPs under-estimate the risks associated with a high BMI, and there is little awareness of the relationship between alcohol consumption and breast cancer. This has already been reported [41, 42], and ignorance of the cancer risk in countries where alcohol consumption is closely linked to cultural aspects has been suggested [42].

Conclusion

Heredity/Family history is widely recognized by both the laypopulation and physicians as a major RF for BC, no doubt partly due to recent extensive media coverage of high-profile cases. The limited awareness of the risk related to *Exposure to medical radiation*, *Benign mastopathy*, or *Personal history* highlights the issue of compliance with the national guidelines, which recommend specific screening procedures for high-risk populations. A number of misconceptions with regard to behavioral RFs have also been highlighted, including the relative impact of alcohol and tobacco consumption and the importance of menopausal status. Future breast-cancer awareness-raising campaigns should include messages on at-risk behavior that is largely unknown to the general population. Physicians should be encouraged to focus strongly on these issues in their discussions with patients.

Compliance with Ethical Standards

Conflict of Interest   Jean-François Morère has received honoraria from Roche.

Jérôme Viguier declares that he has no conflict of interest.
Sébastien Couraud has received honoraria from Roche.
Lysel Brignoli-Guibaudet has received honoraria from Roche.
Christine Lhomel is an employee of Roche.
Xavier B. Pivot has received honoraria from Roche.
François Eisinger has received honoraria from Roche.

Human and Animal Rights and Informed Consent   Protection of personal data was ensured in line with the European Directives. A consent form validated by the French Data-Protection Watchdog (CNIL [Commission nationale de l'Informatique et des Libertés]) was read to each interviewee. The survey was carried out in accordance with the international code of ethics governing opinion polls.

References

Papers of particular interest, published recently, have been highlighted as:

• Of importance

1.   INCa. Risk factors [facteurs de risque]. http://www.e-cancer.fr/Patients-et-proches/Les-cancers/Cancer-du-sein/Facteurs-de-risque. Accessed April 6 2017.

2.   HAS (French health autority). Breast cancer screening in France: identifying high risk women and screening techniques. 2014. http://www.has-sante.fr/portail/jcms/c_1741170/fr/depistage-du-cancer-du-sein-en-france-identification-des-femmes-a-haut-risque-et-modalites-de-depistage. Accessed June 2016.

3.   McMenamin M, Barry H, Lennon AM, Purcell H, Baum M, Keegan D, et al. A survey of breast cancer awareness and knowledge in a Western population: lots of light but little illumination. Eur J Cancer. 2005;41(3):393–7. https://doi.org/10.1016/j.ejca.2004.11.015.

4.   Peacey V, Steptoe A, Davidsdottir S, Baban A, Wardle J. Low levels of breast cancer risk awareness in young women: an international survey. Eur J Cancer. 2006;42(15):2585–9. https://doi.org/10.1016/j.ejca.2006.03.017.

5.   Bogusz R, Humeniuk E, Walecka I, Bojar I. Level and conditioning of knowledge about breast cancer displayed by women in perimenopausal age. Ann Agric Environ Med. 2016;23(2):324–8. https://doi.org/10.5604/12321966.1203899.

6.   Livaudais-Toman J, Karliner LS, Tice JA, Kerlikowske K, Gregorich S, Pérez-Stable EJ, et al. Impact of a primary care based intervention on breast cancer knowledge, risk perception and concern: a randomized, controlled trial. Breast. 2015;24(6):758–66. https://doi.org/10.1016/j.breast.2015.09.009.

7.   Deville J. A theory of quota surveys. Surv Methodol. 1991;17(2):163–81.

8.   Roussel C, Touboul C. Large population survey: strengths and limits. Methodology of the EDIFICE survey. Eur J Cancer Prev. 2011;20(Suppl 1):S5–7. https://doi.org/10.1097/01.cej.0000391561.10889.28.

9.   McPherson K, Steel CM, Dixon JM. ABC of breast diseases. Breast cancer-epidemiology, risk factors, and genetics. BMJ. 2000;321(7261):624–8. https://doi.org/10.1136/bmj.321.7261.624.

10.   Singletary SE. Rating the risk factors for breast cancer. Ann Surg. 2003;237(4):474–82. https://doi.org/10.1097/01.sla.0000059969.64262.87.

11.   Doll R, Peto R. The causes of cancer: quantitative estimates of avoidable risks of cancer in the United States today. J Natl Cancer Inst. 1981;66(6):1191–308.

12.•   International Agency for Research on Cancer (IARC). Attributable causes of cancer in France in the year 2000. 150 cours Albert Thomas, 69372 Lyon Cedex 08: International Agency for Research on Cancer2007. **Relative risk, incidence (p39) and attributable fractions of cancer deaths (p 115–116) are provided for a wide range of cancers and risk factors (obesity, p62 and 63; lack of physical activity p68 ; hormone replacement therapy p80, 82, 84). Page numbers relate to breast cancer data.**

13.   Schuz J, Espina C, Villain P, et al. European code against cancer 4th edition: 12 ways to reduce your cancer risk. Cancer Epidemiol. 2015;39(Suppl 1):S1–10. https://doi.org/10.1016/j.canep.2015.05.009.

14.   World Cancer Research Fund International/Americain Institute for Cancer Research. Continuous update project report : diet, nutrition, physical activity and breast cancer. 2017. wcrf.org/breast-cancer-2017.

15.   Song M, Giovannucci E. Preventable incidence and mortality of carcinoma associated with lifestyle factors among white adults in the United States. JAMA Oncol. 2016;2(9):1154–61. https://doi.org/10.1001/jamaoncol.2016.0843.

16.   Liu Y, Tobias DK, Sturgeon KM, Rosner B, Malik V, Cespedes E, et al. Physical activity from menarche to first pregnancy and risk of breast cancer. Int J Cancer. 2016;139(6):1223–30. https://doi.org/10.1002/ijc.30167.

17.   Cadeau C, Fournier A, Mesrine S, Clavel-Chapelon F, Fagherazzi G, Boutron-Ruault MC. Postmenopausal breast cancer risk and interactions between body mass index, menopausal hormone therapy use, and vitamin D supplementation: evidence from the E3N cohort. Int J Cancer. 2016;139(10):2193–200. https://doi.org/10.1002/ijc.30282.

18.•   Dartois L, Fagherazzi G, Baglietto L, et al. Proportion of premenopausal and postmenopausal breast cancers attributable to known risk factors: Estimates from the E3N-EPIC cohort. Int J Cancer. 2016;138(10):2415–27. https://doi.org/10.1002/ijc.29987. **This work assesses the combined effects of risk factors for breast cancer, and notably highlights the critical role of the hormonal status.**

19.•   Maas P, Barrdahl M, Joshi AD, et al. Breast cancer risk from modifiable and nonmodifiable risk factors among White women in the United States. JAMA Oncol. 2016;2(10):1295–302. https://doi.org/10.1001/jamaoncol.2016.1025. **This model for absolute risk of breast cancer provides stratification for the population according to a number of modifiable and non-modifiable risk factors.**

20.   Lebo PB, Quehenberger F, Kamolz LP, Lumenta DB. The Angelina effect revisited: exploring a media-related impact on public awareness. Cancer. 2015;121(22):3959–64. https://doi.org/10.1002/cncr.29461.

21.   Grunfeld EA, Ramirez AJ, Hunter MS, Richards MA. Women's knowledge and beliefs regarding breast cancer. Br J Cancer. 2002;86(9):1373–8. https://doi.org/10.1038/sj.bjc.6600260.

22.   Chlebowski RT, Anderson GL. Changing concepts: menopausal hormone therapy and breast cancer. J Natl Cancer Inst. 2012;104(7):517–27. https://doi.org/10.1093/jnci/djs014.

23.   Beral V, Reeves G, Bull D, Green J, Million Women StudyCollaborators. Breast cancer risk in relation to the interval between menopause and starting hormone therapy. J Natl Cancer Inst. 2011;103(4):296–305. https://doi.org/10.1093/jnci/djq527.

24.   Fagherazzi G, Vilier A, Boutron-Ruault MC, Mesrine S, Clavel-Chapelon F. Alcohol consumption and breast cancer risk subtypes in the E3N-EPIC cohort. Eur J Cancer Prev. 2015;24(3):209–14. https://doi.org/10.1097/cej.0000000000000031.

25. Shield KD, Soerjomataram I, Rehm J. Alcohol use and breast cancer: a critical review. Alcohol Clin Exp Res. 2016;40(6):1166–81. https://doi.org/10.1111/acer.13071.

26. Shin A, Sandin S, Lof M, Margolis KL, Kim K, Couto E, et al. Alcohol consumption, body mass index and breast cancer risk by hormone receptor status: Women' Lifestyle and Health Study. BMC Cancer. 2015;15(1):881. https://doi.org/10.1186/s12885-015-1896-3.

27. Hvidtfeldt UA, Tjonneland A, Keiding N, et al. Risk of breast cancer in relation to combined effects of hormone therapy, body mass index, and alcohol use, by hormone-receptor status. Epidemiology. 2015;26(3):353–61. https://doi.org/10.1097/ede.0000000000000261.

28. Romieu I, Scoccianti C, Chajes V, et al. Alcohol intake and breast cancer in the European prospective investigation into cancer and nutrition. Int J Cancer. 2015;137(8):1921–30. https://doi.org/10.1002/ijc.29469.

29. Connor J. Alcohol consumption as a cause of cancer. Addiction. 2017;112(2):222–8. https://doi.org/10.1111/add.13477.

30. Neuhouser ML, Aragaki AK, Prentice RL, Manson JAE, Chlebowski R, Carty CL, et al. Overweight, obesity, and postmenopausal invasive breast cancer risk: a secondary analysis of the women's health initiative randomized clinical trials. JAMA Oncol. 2015;1(5):611–21. https://doi.org/10.1001/jamaoncol.2015.1546.

31. Orecchioni S, Reggiani F, Talarico G, Bertolini F. Mechanisms of obesity in the development of breast cancer. Discov Med. 2015;20(109):121–8.

32. Pizot C, Boniol M, Mullie P, Koechlin A, Boniol M, Boyle P, et al. Physical activity, hormone replacement therapy and breast cancer risk: a meta-analysis of prospective studies. Eur J Cancer. 2016;52: 138–54. https://doi.org/10.1016/j.ejca.2015.10.063.

33. Emaus MJ, Peeters PH, Bakker MF, Overvad K, Tjonneland A, Olsen A, et al. Vegetable and fruit consumption and the risk of hormone receptor-defined breast cancer in the EPIC cohort. Am J Clin Nutr. 2016;103(1):168–77. https://doi.org/10.3945/ajcn.114.101436.

34. Inoue-Choi M, Sinha R, Gierach GL, Ward MH. Red and processed meat, nitrite, and heme iron intakes and postmenopausal breast cancer risk in the NIH-AARP Diet and Health Study. Int J Cancer. 2016;138(7):1609–18. https://doi.org/10.1002/ijc.29901.

35. Bjerkaas E, Parajuli R, Weiderpass E, Engeland A, Maskarinec G, Selmer R, et al. Smoking duration before first childbirth: an emerging risk factor for breast cancer? Results from 302,865 Norwegian women. Cancer Causes Control. 2013;24(7):1347–56. https://doi.org/10.1007/s10552-013-0213-1.

36. Nyante SJ, Gierach GL, Dallal CM, Freedman ND, Park Y, Danforth KN, et al. Cigarette smoking and postmenopausal breast cancer risk in a prospective cohort. Br J Cancer. 2014;110(9):2339–47. https://doi.org/10.1038/bjc.2014.132.

37. Gram IT, Park SY, Kolonel LN, Maskarinec G, Wilkens LR, Henderson BE, et al. Smoking and risk of breast cancer in a racially/ethnically diverse population of mainly women who do not drink alcohol: the MEC study. Am J Epidemiol. 2015;182(11):917–25. https://doi.org/10.1093/aje/kwv092.

38. Gaudet MM, Gapstur SM, Sun J, Diver WR, Hannan LM, Thun MJ. Active smoking and breast cancer risk: original cohort data and meta-analysis. J Natl Cancer Inst. 2013;105(8):515–25. https://doi.org/10.1093/jnci/djt023.

39. Catsburg C, Miller AB, Rohan TE. Active cigarette smoking and risk of breast cancer. Int J Cancer. 2015;136(9):2204–9. https://doi.org/10.1002/ijc.29266.

40. Cui Y, Miller AB, Rohan TE. Cigarette smoking and breast cancer risk: update of a prospective cohort study. Breast Cancer Res Treat. 2006;100(3):293–9. https://doi.org/10.1007/s10549-006-9255-3.

41. Buykx P, Li J, Gavens L, Hooper L, Lovatt M, Gomes de Matos E, et al. Public awareness of the link between alcohol and cancer in England in 2015: a population-based survey. BMC Public Health. 2016;16(1):1194. https://doi.org/10.1186/s12889-016-3855-6.

42. Bocquier A, Fressard L, Verger P, Legleye S, Peretti-Watel P. Alcohol and cancer: risk perception and risk denial beliefs among the French general population. Eur J Pub Health. 2017;27(4):705–10. https://doi.org/10.1093/eurpub/ckx024.