Determinants of non-compliance to recommendations on breast cancer screening among women participating in the French E3N cohort study

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Abstract

Background

Evidence of the benefit of screening for breast cancer using mammography after the age of 50 is considered sufficient. Information on the determinants of compliance to the recommendations on mammography is needed to identify women to which public health messages should be specifically addressed and also to interpret results from epidemiological data in which some breast cancer cases are detected through screening programmes and others are not.

Methods

The general characteristics and dietary data of French women participating in the E3N cohort study were analysed. Odds Ratios of the frequency of non-compliance to recommendations on breast cancer screening were computed in women over and under the age of 50.

Results

Non-compliant women over 50 (i.e. never attenders) had a poorer access to physicians and poorer health with regard to specific risk factors even after adjustment for age and educational level. Women who were used to refer to gynaecologists early in life were better attenders later on. Logically, women under 50 who were over-screened, as compared to public health recommendations, had opposite characteristics.

Conclusion

Public health recommendations should be designed specifically according to targeted subgroups of women. Determinants of attendance for screening should be kept in mind in the interpretation of epidemiological studies in which some cases may be over-screened and others not.

MESH Keywords Adult ; Age Factors ; Aged ; Breast Neoplasms ; radiography ; Cohort Studies ; Diet ; Female ; France ; Hormone Replacement Therapy ; Humans ; Mammography ; utilization ; Middle Aged ; Patient Compliance ; Prospective Studies ; Treatment Refusal ; statistics & numerical data

Author Keywords breast cancer ; cohort study ; compliance ; mammography ; public health ; recommendations ; screening

Introduction

There is a general acceptance of the effectiveness of screening women aged over 50 by mammography (IARC 2002), despite a recent controversy on its efficacy (Götzsche and Olsen 2000). In France, the ANAES (the National Agency for Accreditation and Evaluation in Health) concluded that mammography was to be favoured and that breast cancer screening every 2 years between the ages of 50 and 69 should be extended to all French departments before the end of 2006 (ANAES 1999, 2002). There is limited evidence for the efficacy of screening women aged 40–49 years by mammography (IARC 2002).

The effectiveness of breast cancer screening programmes in reducing mortality from breast cancer is highly dependent, however, on adequate attendance by eligible women. Information on the factors affecting compliance to the recommendations is limited (Mandelblatt and Yabroff, 1999; Sadler and Fullerton,2001), and a better knowledge of these factors might help to identify groups of women to whom public health messages should be specifically addressed.

Identifying factors (related to breast cancer risk, to health consciousness and to various aspects of life habits, including diet) that may play a role in compliance towards breast cancer screening may also be useful in interpreting results from epidemiological data in which some breast cancer cases are detected through screening programmes and others are not.

Few studies have been devoted to the analysis of predictors of screening for breast cancer. Most have relied on data collected on participants to national breast cancer screening programmes during (or around) their visit for mammography, and identified women who did not answer positively to one particular invitation to screening. No studies have been aimed at characterizing women under 50 (i.e. under the age at which mammography is currently a public health recommendation).

Using data from a large sample of French women aged 50 or over participating in the E3N-EPIC cohort study, we analysed factors associated with never having had a mammography as compared to being regularly screened, over a 10-years period. In parallel, among women under 50 years of age, we looked at overscreened women (i.e. women who had been regularly screened within the past 10 years), comparing them with women who had never had any mammography during that period.

Material and methods

E3N is a prospective cohort study on cancer risk factors conducted in France. The cohort comprises 98,997 women living in France. They are insured by the Mutuelle Générale de l'Education Nationale (MGEN), a national health insurance plan, covering mostly teachers and allowing for a complete coverage of all medical fees. In particular, MGEN covers mammographies prescribed by the practitioner, whatever the reason and the rhythm. Participants were aged 40–65 years at baseline. The main objective of the study was to investigate risk factors for cancer and other diseases (cardiovascular diseases, diabetes and osteoporosis). Participants were entered into the study between June 1990 and November 1991 when they replied to a baseline questionnaire containing questions on lifestyle (i.e. reproductive factors, body build, smoking, past medical history and familial history of cancers). Follow-up questionnaires were sent approximately every 24 months thereafter. Until now, seven questionnaires have already been sent to the participants; six are available for analysis.

Mammography screening was recorded at baseline and each questionnaire (except the fifth one) asked about mammography since. Ninety-six per cent of women older than 50 years and 98% of women younger than 50 years reported having had at least one mammography. The study population was composed of women who have answered the whole set of five questionnaires and who have no history of cancer (n=56,518; 23,799 aged over 50 and 32,719 under 50). In these, we first analysed non-compliance to recommendations among women aged over 50 (i.e. non attendance), comparing women who reported no mammography in any of the five questionnaires (n= 941) with women who reported a mammography in all questionnaires (n= 6,911). Second, we performed a similar mirror analysis among women aged under 50. In that subgroup, non-compliants were those who had undergone systematic mammography in each questionnaire (n= 7,924) and compliants those who had not (n= 404). We Analysed the effects on compliance of some general characteristics (age, educational level and marital status), of some aspects of health status (familial history of breast cancer or of other cancer and personal history of benign breast disease, use of hormone replacement therapy (HRT) and use of dietary supplements (calcium, trace elements, vitamins A, B, C, D and E, beta-carotene and others vitamins)), of other medical examinations (Pap smear, ultrasonography of the breast, colonoscopy and faecal occult blood; also included in the models were cholesterol and blood pressure levels) and of dietary habits derived from a dietary history questionnaire that enabled estimation of the daily consumption of 208 foods items (Lucas et al., 1995; Van Liere et al., 1997).

Data were analysed using the SAS and STATA softwares. A logistic regression analysis was used to estimate odds ratios (OR) and 95 % confidence intervals (CI) of the frequency of non-compliance to recommendations on breast cancer screening in both age groups, according to general characteristics and to dietary habits. Only those variables that were significant in an univariate analysis, according to the likelihood ratio test, were kept in the multivariate models.

Results

Most women with regular mammographies had also regular other medical exams in both subgroups over and under 50 years of age. Among women aged over 50 who had had regular mammographies, 99.3% reported having had at least once Pap smear, 42.7% had ultrasonography of the breast, 43.0% colonoscopy and 51.0% faecal occult blood testing. Among women aged under 50 who had had regular mammographies, 99.9% reported having had at least once Pap smear, 54.0% had ultrasonography of the breast, 37.2% had colonoscopy and 42.0% faecal occult blood testing. To avoid colinearity, these variables were not included in the logistic regressions.

Use of HRT, defined as a cumulative duration of use exceeding 6 months, was highly correlated to compliance to mammography. Among women over 50, 2.1% of HRT users had never undergone any mammography, whereas 39.6% of HRT non-users had not undergone mammography ($P<10^{-4}$). Among women under 50, 98.9% of the HRT users reported systematic mammography in each questionnaire; whereas 85.4% of the HRT non-users reported systematic mammography ($P<10^{-4}$) (data not shown). Moreover, the correlation between HRT use and age was highly significant ($P<10^{-4}$). We thus analysed compliance to mammography screening among HRT users and non-users separately, with the same variables in both subgroups.

Women over 50 years of age

Table 1 shows results on general characteristics in relation to non-compliance among women over the age of 50. Non-compliance (i.e. non-attendance) increased significantly with increasing age ($P_{trend}<10^{-4}$) among both HRT users and non-users.

In both subgroups, non-compliant women were more frequently single and had less often had a familial history of breast cancer and a personal history of benign breast disease than compliant women. They were also less often users of vitamin supplementation and more often ignored their cholesterol level.

In the subgroup of HRT users, non-compliance significantly decreased with increasing educational level ($P_{trend}<0.02$).

Among HRT non users, non-compliant women (i.e. never attenders) were either more corpulent or leaner and had a lower parity than women who attended screening.

Other general characteristics, such as type of employment, menopausal status, smoking status, oral contraceptive use or physical activity were not significantly related to attendance.

Dietary habits in relation to compliance to screening recommendations are shown in Table 2. Overall, energy intake was not related to compliance. In HRT users and non-users, non-compliance increased with increasing consumption of potatoes (both $P_{trend}<2\%$) and in HRT users only, with increasing consumption of vegetables ($P_{trend}<10^{-3}$). In HRT non-users, non-compliance decreased, though not significantly, with increasing consumption of fish ($P_{trend}<7\%$) and dairy products ($P_{trend}<0.10$). The consumption of other food items (fruit, meat, fat and alcohol) did not differ among compliant and non compliant women.

Women under 50 years of age

General characteristics in relation to non-compliance among women under 50 (i.e. those being screened regularly) are shown in Table 3. In both HRT users and non-users, women who attended screening more often had a familial history of breast cancer and a personal history of benign breast disease than women who did not attend. Among HRT users, age was significantly related to attendance. Among HRT non-users, women who attended regular screening were also more often married, premenopausal and more likely to have a normal corpulence than women who did not attend breast cancer screening.

No significant difference in the level of education, type of employment, oral contraceptives use, smoking habits or physical activity was detected between compliant and non-compliant women under 50.

Dietary habits in relation to compliance to screening recommendations are shown in Table 4. Non-compliance (i.e. regular screening) decreased with increasing caloric intake, and increasing consumption of potatoes. In contrast, it increased with increasing consumption of vegetables, though not significantly.

Discussion

Our results revealed that women over 50 years of age who do not respect recommendations on breast cancer screening with mammography have poor health with regard to specific risk factors (higher body mass index, some poorer dietary habits, unknown cholesterol level) even after adjustment for age and educational level, compared with women who are screened regularly. Women who were used to referring to gynaecologists early in life (personal or familial breast problems) are better attenders later on. As would be expected, women under 50 who, as compared to public health recommendations, are over-screened (i.e. undergo mammographies at regular intervals, though no such public recommendations exist at that age), have opposite characteristics (higher current or previous access to gynaecologists, higher health consciousness).

Results for non-compliance among women over 50 were comparable with those published previously. Concerning general characteristics, our finding that non-attenders are older than attenders is in line with the result of other studies (Kee et al. 1992; Calle et al. 1993; Schofield et al. 1994; Eisinger et al. 1995; Otten et al. 1996; Ruffin et al. 2000; Zackrisson et al. 2004). Only one study found no relation with age (Banks et al. 2002). Several studies, like ours, found that women who do not attend screening for breast cancer are more likely to be single (Eisinger et al. 1995; Katz et al. 2000; Lagerlund et al. 2000, 2002; Ruffin et al. 2000; Zackrisson et al. 2004). A higher frequency of non attendance in both childless and high-parity women was found in a previous study (Lagerlund et al. 2002). In some studies (Hobbs et al. 1980; French et al. 1982; Ciatto et al. 1992; Mandelblatt et al. 1999; Lagerlund et al. 2000; Selvin and Brett 2003; Tatla et al. 2003; Taylor et al. 2003; Zackrisson et al. 2004), but not all (Calle et al. 1993; Bostick et al. 1994; Eisinger et al. 1995; Katz et al. 2000) educational level or socio-economic level was related to attendance to breast cancer screening. Smoking decreased the probability of attendance to screening in all studies reviewed (Eisinger et al. 1995; Aro et al. 1999; Lagerlund et al. 2000; Selvin and Brett 2003), but not in ours; however we had a very low prevalence of smokers (8% among women aged over 50 and 12% among women aged under 50 at inclusion). Use of alcohol was not related to attendance in our study, in agreement with one other study (Ruffin et al. 2000) and contrary to another (Lagerlund et al. 2000).

Women who do not attend screening for breast cancer were previously found to more often be non-users of HRT (Lagerlund et al. 2000; Ruffin et al. 2000; Banks et al. 2002) and of oral contraceptives (Lagerlund et al. 2000). In other studies, as in ours, attenders more often had breast disease in their family (Vernon et al. 1990; Bostick et al. 1994; Lagerlund et al. 2000) or personally (Vernon et al. 1990; Lagerlund et al. 2000), in agreement with previous authors, which propose that individuals take health-related action if they believe that they are susceptible to the disease (Silver Wallace and Gupta, 2003). Most results published so far on general characteristics, on factors related to risk of breast cancer and on various aspects of life habits are homogeneous across studies. Discrepancies observed may be attributed to economic reasons: our population is 100% covered by a health insurance and the requirement for copayment for preventive services was shown to be an obstacle to undergoing mammography (Blustein, 1995).

Compliance to mammography was found to be correlated with compliance to other screening tests (Hobbs et al. 1980; Kee et al. 1992; Eisinger et al. 1995; Seow et al. 1997; Aro et al. 1999; Lagerlund et al. 2000). However, that these studies analysed participation to screening programmes and not, like ours, the behaviour of women towards general recommendations, over a 10-year period somewhat limits the comparability.

To our knowledge, no study was published yet on the characteristics of women under 50.

Similar but less pronounced results were produced when women who have had at least one screen but not every 2 years were considered.

We found no studies in the literature studies relating diet to attendance to breast cancer screening. Our findings indicate that some dietary habits differ between women whose breast cancer was diagnosed through regular screening and women never screened. Differences were mainly on food items which have messages of low health consciousness (potatoes, vegetables etc.). These results, which require confirmation, may be of importance in interpreting the epidemiological literature on diet and breast cancer. Meanwhile, until further confirmation, studies on that topic should adjust for the regularity of screening, or at least on the size of the tumour. Age and years of schooling were the factors which differed most markedly according to use of HRT: prevalence of non-attendance with increasing age and decreasing education level was higher among HRT users than among HRT non-users.

Breast cancer screening practices were very high in our population, exceeding the rate reported from a cross-sectional investigation performed in 1995 on a representative sample of the French population (Eisinger et al. 1995). In that study, 55% of women over 50 years of age and 70% of women aged 40–49 years had ever had a mammography. The corresponding values, in our population in 1995 were 88 % and 95% respectively. The complete coverage of the cost of mammography for women of the E3N cohort, together with their high educational level, with over 85% having completed high school whereas in France only 20% of women of the same age had completed high school, may account for our extremely high rate of mammography.

The relation between the practice of mammography and the accessibility to screening is questionable. The rate of non-compliance to mammography recommendations between the years 1989 and 1997 among women over 50 years was higher in the French departments with no screening program than in those where screening programs were on-going. The global age-standardized rate of non-attendance was equal to 115 per 1,000 women in the departments where a screening program was running in the years 1989–1997, whereas it was equal to 186 per 1,000 women overall elsewhere, in France.

Also, part of the non-compliance to public health recommendations may be explained by a lack of adapted medicals structures. Comparing the geographic distribution of radiologists in France with the rate we observed in our population revealed similar figures, with areas with the highest rates of non-compliance having the lowest density of radiologists (Limousin, Franche-Comté, Nord-Pas-de-Calais and Picardie). In contrast, it could be that a high level of accessibility to adequate medical structures might prompt women under 50 years to attend for mammography. The comparison of the geographical distributions of over-compliant women and of radiologists did not, however, confirm this hypothesis.

Additional data, especially on samples representative of the general population are needed. Our findings suggest that public health recommendations should focus on under-compliant women who have no regular access to medical advice, possibly by developing the network in the more poorly equipped geographic areas, and also by identifying under-compliant women as specific targets so that they can feel personally concerned.

Also, determinants of compliance and non-compliance to recommendations towards breast cancer screening should be kept in mind in the interpretation of epidemiological studies, where some cases may be over-screened and others not.

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Table 1

Characteristics related to non-compliance to recommendations on breast cancer screening among women over 50 years of age. E3N cohort study

Variables	HRT users				HRT non-users			
	Regular attenders (5,662)	Non attenders (122)	OR[a]	95% CI	Regular attenders (1,249)	Non attenders (819)	OR[a]	95% CI
Age (years)								
50–55	60.8	14.8	1.00	-	39.9	17.5	1.00	-
55–60	29.2	34.4	5.07	2.88–8.92	34.8	31.0	2.17	1.63–2.87
60–65	10.0	50.8	20.64	11.88–35.88	25.3	51.5	5.12	3.85–6.81
P_{trend}				$< 10^{-4}$				$< 10^{-4}$
Married								
Ever	85.1	72.1	1.00	-	84.0	70.2	1.00	-
Never	14.9	27.9	1.78	1.12–2.82	16.0	29.8	1.74	1.31–2.31
Number of years school								
< 12	14.8	16.4	1.00	-	22.5	22.7	1.00	-
12–14	53.2	61.5	1.10	0.65–1.87	54.6	52.3	1.08	0.83–1.41
15 –16	13.2	6.5	0.32	0.14–0.77	10.7	10.1	1.08	0.72–1.62
≥16	18.8	15.6	0.64	0.33–1.26	12.2	14.9	1.15	0.77–1.70
P_{trend}				< 2%				ns
Body mass index at baseline (kg/m^2)								
≤22	14.1	13.9	1.33	0.75–2.36	10.3	12.0	1.62	1.11–2.38
22–25	71.3	61.5	1.00	-	64.2	55.3	1.00	–
25–30	13.2	19.7	1.32	0.80–2.17	21.0	25.4	1.37	1.05–1.77
≥30	1.4	4.9	3.54	1.35–9.32	4.5	7.3	1.99	1.25–3.16
Cholesterol level (mmol/l)								
Low (< 4.5)	3.6	1.6	0.89	0.21–3.76	2.0	2.4	1.57	0.78–3.16
Normal (4.5 – 7)	79.3	73.0	1.00	-	79.3	64.4	1.00	-
High (> 7)	8.5	8.2	0.86	0.43–1.72	9.4	9.5	1.01	0.70–1.45
Unknown	8.6	17.2	2.95	1.73–5.03	9.3	23.7	3.59	2.62–4.92
Parity								
0	11.2	18.9	2.06	1.12–3.78	12.8	21.1	1.85	1.29–2.65
1	14.4	15.6	1.43	0.78–2.61	15.7	15.4	1.48	1.06–2.07
2	40.9	27.0	1.00	-	37.3	25.4	1.00	-
3+	33.5	38.5	1.52	0.95–2.44	34.2	38.1	1.27	0.98–1.65
Familial history of breast cancer								
No	72.3	86.1	1.00	-	68.2	83.1	1.00	-
Yes, 1^{st} or 2^{nd} degree relative	15.2	5.7	0.30	0.14–0.66	19.6	7.0	0.34	0.24–0.48
Yes, 2^{nd} degree relative only	12.5	8.2	0.68	0.34–1.33	12.2	9.9	0.73	0.51–1.04
Personal history of benign breast disease								
Yes	39.4	8.2	0.17	0.09–0.33	36.4	2.8	0.06	0.04–0.09

No	60.6	91.8	1.00	1.00	63.6	97.2	1.00	1.00
Vitamin supplementation								
Never	54.5	59.8	1.00	-	48.8	71.1	1.00	-
Irregular	26.7	29.5	0.98	0.64–1.52	29.7	18.4	0.42	0.32–0.54
Regular	18.8	10.7	0.44	0.24–0.83	21.5	10.5	0.39	0.28–0.53
P $_{trend}$			< 3%				< 10^{-4}	

a Odds ratio of the probability of being non-compliant versus being compliant to recommendations (non attenders versus regular attenders), adjusted for all covariates in the table.
HRT, Hormone replacement therapy; ns, not significant; 95% CI, 95% confidence interval.

Table 2

Dietary characteristics related to non-compliance to recommendations on breast cancer screening among women over 50 years of age. E3N cohort study

Variables	**HRT users** [a]		**HRT non-users** [b]	
	OR[c]	**95% CI**	**OR**[c]	**95% CI**
Caloric intake (gr per day)				
< 1800	1.00	-	1.00	-
1800 – 2100	0.44	0.24–0.80	0.91	0.66–1.24
2100 – 2500	0.80	0.45–1.43	1.06	0.75–1.49
≥ 2500	0.80	0.40–1.59	0.97	0.66–1.44
P $_{trend}$		ns		ns
Potatoes				
1er quartile	1.00	–	1.00	–
2nd quartile	1.60	0.88–2.93	1.28	0.92–1.78
3rd quartile	1.81	0.95–3.44	1.63	1.16–2.28
4th quartile	2.18	1.19–3.99	1.67	1.20–2.33
P $_{trend}$		< 2%		< 1%
Vegetables				
1er quartile	1.00	-	1.00	-
2nd quartile	0.72	0.43–1.21	0.78	0.57–1.08
3rd quartile	0.31	0.17–0.59	0.84	0.61–1.17
4th quartile	0.41	0.22–0.78	0.86	0.61–1.21
P $_{trend}$		< 10^{-3}		ns
Fruits				
1er quartile	1.00	-	1.00	-
2nd quartile	0.82	0.44–1.54	0.75	0.53–1.07
3rd quartile	0.91	0.50–1.68	0.83	0.59–1.17
4th quartile	1.11	0.61–2.03	1.01	0.73–1.42
P $_{trend}$		ns		ns
Dairy products				
1er quartile	1.00	-	1.00	-
2nd quartile	0.99	0.57–1.74	0.78	0.57–1.07

3rd quartile	0.87	0.49–1.53	0.62	0.45–0.85
4th quartile	0.77	0.41–1.44	0.82	0.59–1.13
P trend	ns		< 10%	
Fish				
1er quartile	1.00	-	1.00	-
2nd quartile	0.56	0.31–0.99	0.85	0.62–1.15
3rd quartile	0.86	0.50–1.47	0.70	0.50–0.98
4th quartile	0.64	0.35–1.17	0.77	0.55–1.07
P trend	ns		< 7%	
Meat				
1er quartile	1.00	-	1.00	-
2nd quartile	0.90	0.53–1.54	0.96	0.71–1.29
3rd quartile	0.71	0.40–1.27	0.97	0.71–1.34
4th quartile	1.13	0.60–2.14	0.96	0.66–1.39
P trend	ns		ns	
Fat				
1er quartile	1.00	-	1.00	-
2nd quartile	1.21	0.69–2.14	1.25	0.91–1.72
3rd quartile	1.46	0.81–2.64	0.99	0.72–1.38
4th quartile	1.01	0.52–1.98	1.18	0.83–1.69
P trend	ns		ns	
Alcohol				
1er quartile	1.00	-	1.00	-
2nd quartile	1.09	0.63–1.89	0.68	0.50–0.94
3rd quartile	0.71	0.39–1.27	0.79	0.57–1.10
4th quartile	0.82	0.46–1.46	0.94	0.68–1.30
P trend	ns		ns	

Among 7,491 women aged over 50 with available dietary data.

a 5,420 regular attenders et 115 non-attenders.

b 1,185 regular attenders et 771 non-attenders.

c Odds ratio adjusted for all covariates in the table and covariates presented in the Table 1.

HRT, Hormone replacement therapy; ns: not significant; 95% CI, 95% confidence interval.

Table 3

Characteristics related to non-compliance to recommendations on breast cancer screening among women under 50 years of age. E3N cohort study

Variables	**HRT users**				**HRT non-users**			
	Non attenders (67)	**Regular (Over) attenders (5,947)**	**OR[a]**	**95% CI**	**Non attenders (337)**	**Regular (Over) attenders (1,977)**	**OR[a]**	**95% CI**
Age (years)								
< 45	65.7	40.7	1.00	-	70.6	73.1	1.00	-
≥45	34.3	59.3	3.14	1.82–5.42	29.4	26.9	0.91	0.66–1.25

P_{trend}				$< 10^{-4}$				ns
Married								
Ever	79.1	85.8	1.00	-	76.3	86.7	1.00	
Never	20.9	14.2	0.72	0.37–1.40	23.7	13.3	0.64	0.44–0.94
Number of years school								
< 12	4.5	11.8	1.00	-	14.6	12.1	1.00	-
12 – 14	44.7	47.4	0.37	0.11–1.23	44.2	46.3	1.14	0.76–1.72
15 – 16	26.9	21.0	0.29	0.08–1.01	25.5	23.1	0.94	0.60–1.47
≥16	23.9	19.8	0.33	0.09–1.15	15.7	18.5	1.59	0.98–2.59
P_{trend}				< 14%				< 16%
Body mass index at baseline (kg/m^2)								
≤22	22.4	22.6	0.98	0.53–1.80	24.1	23.5	0.66	0.48–0.92
22–25	62.7	67.5	1.00	-	53.1	66.4	1.00	-
25–30	11.9	8.8	0.70	0.32–1.53	16.3	7.9	0.48	0.32–0.72
≥30	3.0	1.1	0.34	0.08–1.51	6.5	2.2	0.26	0.14–0.51
Cholesterol level (mmol/l)								
Low (< 4.5)	5.9	5.8	0.82	0.29–2.35	6.2	5.5	0.46	0.26–0.81
Normal (4.5 – 7)	64.2	73.5	1.00	-	59.6	71.7	1.00	-
High (> 7)	3.0	3.7	0.96	0.23–4.11	2.4	4.0	1.64	0.73–3.70
Unknown	26.9	17.0	0.56	0.32–1.00	31.8	18.8	0.47	0.34–0.64
Parity								
0	13.4	11.9	0.67	0.29–1.55	22.0	10.4	0.34	0.22–0.52
1	16.4	17.4	0.77	0.37–1.60	16.0	16.8	0.79	0.54–1.17
2	38.8	49.3	1.00	-	34.7	49.3	1.00	-
3+	31.4	21.4	0.56	0.31–1.01	27.3	23.5	0.60	0.44–0.84
Menopausal status at baseline								
Premenopausal	62.7	71.1	1.00	-	55.2	65.2	1.00	-
Postmenopausal	10.4	14.4	1.07	0.46–2.46	8.0	5.0	0.45	0.26–0.77
Missing	26.9	14.5	0.59	0.33–1.06	36.8	29.8	0.63	0.47–0.85
Familial history of breast cancer								
No	88.0	68.7	1.00	-	85.2	66.8	1.00	-
Yes, 1st or 2nd degree relative	6.0	16.4	3.88	1.39–10.80	4.4	18.9	5.71	3.25–10.03
Yes, 2nd degree relative only	6.0	14.9	2.95	1.06–8.24	10.4	14.3	2.08	1.37–3.18
Personal history of benign breast disease								
Yes	7.5	55.0	16.60	6.62–41.62	3.6	50.3	30.24	16.67–54.86
No	92.5	45.0	1.00	1.00	96.4	49.7	1.00	1.00
Vitamin supplementation								
Never	73.1	59.1	1.00	-	70.6	63.2	1.00	-
Irregular	17.9	26.4	1.54	0.81–2.95	20.2	24.7	1.10	0.79–1.52
Regular	9.0	14.5	1.84	0.77–4.37	9.2	12.1	1.08	0.69–1.69

P $_{trend}$		< 9%		ns

a Odds ratio of the probability of being non-compliant versus being compliant to recommendations (regular (over) attenders versus non attenders), adjusted for all covariates in the table.
HRT, Hormone replacement therapy; ns, not significant; 95% CI, 95% confidence interval.

Table 4

Dietary characteristics related to non-compliance to recommendations on breast cancer screening among women under 50 years of age. E3N cohort study

Variables	**HRT users** [a]		**HRT non Users** [b]	
	OR[c]	**95% CI**	**OR**[c]	**95% CI**
Caloric intake (gr per day)				
< 1800	1.00	-	1.00	-
1800 – 2100	1.47	0.54–3.99	0.81	0.52–1.26
2100 – 2500	0.65	0.29–1.45	0.67	0.43–1.04
≥2500	0.53	0.21–1.32	0.56	0.35–0.92
P $_{trend}$		< 6%		< 2%
Potatoes				
1er quartile	1.00	-	1.00	-
2nd quartile	0.66	0.26–1.69	1.19	0.78–1.84
3rd quartile	0.50	0.20–1.26	0.75	0.49–1.16
4th quartile	0.28	0.11–0.71	0.60	0.39–0.93
P $_{trend}$		< 1%		< 1%
Vegetables				
1er quartile	1.00	-	1.00	-
2nd quartile	0.86	0.44–1.68	1.12	0.76–1.64
3rd quartile	1.21	0.57–2.55	1.66	1.10–2.51
4th quartile	2.44	0.98–6.09	1.30	0.85–1.99
P $_{trend}$		< 6%		< 9%
Fruits				
1er quartile	1.00	-	1.00	-
2nd quartile	1.77	0.86–3.62	1.18	0.82–1.71
3rd quartile	1.94	0.94–4.00	1.41	0.94–2.11
4th quartile	1.26	0.60–2.62	1.23	0.81–1.87
P $_{trend}$		ns		ns
Dairy products				
1er quartile	1.00	-	1.00	-
2nd quartile	1.09	0.51–2.36	1.04	0.70–1.55
3rd quartile	1.10	0.50–2.40	1.09	0.73–1.63
4th quartile	0.71	0.34–1.50	1.15	0.76–1.74
P $_{trend}$		ns		ns
Fish				
	1.00	-	1.00	-

1er quartile				
2nd quartile	1.15	0.56–2.33	1.24	0.85–1.82
3rd quartile	1.14	0.57–2.26	1.06	0.72–1.55
4th quartile	1.60	0.71–3.64	1.49	0.98–2.27
P_{trend}	ns		< 14%	
Meat				
1er quartile	1.00	-	1.00	-
2nd quartile	1.50	0.65–3.49	1.29	0.85–1.96
3rd quartile	1.90	0.81–4.47	1.22	0.80–1.84
4th quartile	0.87	0.41–1.84	1.54	1.02–2.32
P_{trend}	ns		< 7%	
Fat				
1er quartile	1.00	-	1.00	-
2nd quartile	1.75	0.85–3.60	1.14	0.76–1.73
3rd quartile	2.31	1.07–4.99	1.17	0.76–1.80
4th quartile	1.91	0.90–4.03	0.96	0.63–1.46
P_{trend}	< 9%		ns	
Alcohol				
1er quartile	1.00	-	1.00	-
2nd quartile	1.98	0.94–4.16	0.66	0.45–0.97
3rd quartile	1.67	0.84–3.34	1.11	0.75–1.66
4th quartile	2.39	1.11–5.14	1.26	0.83–1.91
P_{trend}	< 6%		< 8%	

Among 8,074 women aged under 50 with available dietary data.

a 5,765 regular attenders et 67 non-attenders.

b 1,912 regular attenders et 330 non-attenders.

c -adjusted for all covariates in the table and covariates presented in the Table 3.

HRT, Hormone replacement therapy; ns: not significant; 95% CI, 95% confidence interval.