Effect of breast self-examination techniques on the risk of death from breast cancer

Evidence

Études

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Abstract

Objective: To measure the effect of breast self-examination (BSE) technique and frequency on the risk of death from breast cancer.

Design: Case–control study nested within the Canadian National Breast Screening Study (NBSS).

Setting: The Canadian NBSS, a multicentre randomized controlled trial of screening for breast cancer in Canadian women.

Subjects: The case subjects were 163 women who had died from breast cancer and 57 women with distant metastases. Ten control subjects matched by 5-year age group, screening centre, year of enrolment and random allocation group were randomly selected for each case subject.

Exposure measures: Self-reported BSE frequency before enrolment in the NBSS, annual self-reports of BSE frequency during the program and annual objective assessments of BSE technique.

Outcome measures: Odds ratios (ORs) associated with BSE practice were estimated by conditional multiple logistic regression modelling, which permitted control of covariates.

Results: Relative to women who, when assessed 2 years before diagnosis, examined their breasts visually, used their finger pads for palpation and examined with their 3 middle fingers, the OR for death from breast cancer or distant metastatic disease for women who omitted 1, 2 or 3 of these components was 2.20 (95% confidence interval [CI] 1.30 to 3.71, $p = 0.003$). The OR for women who omitted 1 of the 3 components was 1.82 (95% CI 1.00 to 3.29, $p = 0.05$), for those who omitted 2 of the 3 components, 2.84 (95% CI 1.44 to 5.59, $p = 0.003$), and for those who omitted all 3 components, 2.95 (95% CI 1.19 to 7.30, $p = 0.02$). The results remained unchanged after adjustment for potential confounders.

Conclusion: The results, obtained with the use of prospectively collected data, suggest that the performance of specific BSE components may reduce the risk of death from breast cancer.

Résumé

Objectif : Mesurer l'effet de la technique d'autoexamen des seins et sa fréquence d'utilisation sur le risque de décès des suites d'un cancer du sein.

Conception : Étude cas–témoin incluse dans l'Étude nationale sur le dépistage du cancer du sein au Canada.

Contexte : L'Étude nationale sur le dépistage du cancer du sein au Canada, étude contrôlée, randomisée et multicentrique sur le dépistage du cancer du sein chez les femmes du Canada.

Sujets : Les sujets étaient 163 femmes mortes du cancer du sein et 57 femmes atteintes de métastases à distance. Pour chaque cas sujet, on a choisi 10 sujets témoins jumelés par groupe d'âge étalé sur 5 ans, centre de dépistage, année d'inscription et groupe de randomisation.

Mesures du risque : Fréquence autodéclarée de l'autoexamen des seins avant la participation à l'enquête nationale, rapports annuels des intéressées sur la

fréquence de l'autoexamen des seins au cours du programme et évaluation annuelle objective de la technique d'autoexamen des seins.

Mesures des résultats : On a estimé des coefficients de probabilité associés à l'autoexamen des seins par modélisation de régression logistique multiple conditionnelle, ce qui a permis de contrôler les covariables.

Résultats : Dans le cas des femmes qui, évaluées 2 ans avant le diagnostic, procédaient à un autoexamen des seins, utilisaient leur coussinet tactile pour procéder à une palpation et utilisaient leurs 3 doigts du milieu pour l'examen, le coefficient de probabilité (CP) de décès des suites d'un cancer du sein ou de métastases à distance chez les femmes qui ont omis 1, 2 ou 3 de ces éléments s'est établi à 2,20 (intervalle de confiance [IC] à 95 %, 1,30 à 3,71 $p = 0,003$). Le CP s'est établi à 1,82 (IC à 95 %, 1,00 à 3,29, $p = 0,05$) chez les femmes qui ont omis 1 des 3 éléments, à 2,84 (IC à 95 %, 1,44 à 5,59, $p = 0,003$) chez celles qui en ont omis 2, et à 2,95 (IC à 95 %, 1,19 à 7,30, $p = 0,02$) chez celles qui les ont omises toutes les 3. Les résultats sont demeurés inchangés après rajustement pour facteurs de confusion éventuels.

Conclusion : Les résultats, tirés de données recueillies de façon prospective, indiquent que l'utilisation de certaines techniques en particulier d'autoexamen des seins peut réduire le risque de décès des suites d'un cancer du sein.

Breast cancer is an important cause of illness and a leading cause of death and potential years of life lost.[1–3] Early detection followed by timely treatment is important.

Periodic screening mammography with or without clinical breast examination reduces rates of death from breast cancer for women aged 50 to 69 years.[4,5] Another method, breast self-examination (BSE), is self-administered and inexpensive. However, it is not without risks.[6–11] Both false-positive and false-negative results of BSE carry costs and risks. Furthermore, if BSE leads to earlier detection without affecting rates of illness and death due to breast cancer, it results only in an extension of the time a woman is aware of the diagnosis. Thus, it is important to determine the benefits of BSE and to compare them with the associated risks and costs.[12,13]

Although BSE has long been advocated,[14,15] the first evidence of its effectiveness came in 1978 from 2 descriptive studies.[16,17] Despite a call for more rigorous studies of BSE,[13] many similar studies followed. These examined the correlation between the practice of BSE and the stage of disease at, or survival following, diagnosis. The conclusions from these correlational studies were questioned by 2 review groups[6,18] and other investigators[7,8,11] because of the potential effects of recall, loss to follow-up, nonresponse, self-selection, lead time and length biases.

Two randomized controlled trials are currently under way, one in Russia[19] and the other in China.[20] The Russian trial has not yet provided results. However, Thomas and colleagues[20] recently reported preliminary results from the first 5 years of follow-up. That analysis showed neither lower death rates nor a shift toward the diagnosis of less advanced disease among the subjects practising BSE. It is uncertain whether these trial results will be in any way generalizable to a North American population.

A nonrandomized community-controlled trial in the United Kingdom has provided equivocal 10-year results.[21] The relative risk for death from breast cancer was 1.13 (95% confidence interval [CI] 0.95 to 1.35) for one BSE centre but only 0.78 (95% CI 0.61 to 1.00) for the other BSE centre. The investigators have been unable to account for the conflicting results.[22]

In a cohort study Gastrin and associates[23] examined the experience of women enrolled in the comprehensive BSE-promoting Mama Program in Finland. The rate of death from breast cancer for the 28 785 program enrollees who completed and returned a calendar recording their BSE practice was found to be significantly lower than national rates, with an observed-to-expected ratio of 0.71 (95% CI 0.57 to 0.87). This occurred despite the fact that the enrollees' incidence of breast cancer was 20% higher than expected.

Case–control studies are also used to evaluate screening.[24] Newcomb and collaborators[25] carried out a population-based case–control study to examine the relation between BSE and the occurrence of advanced breast cancer. Although they found no beneficial effect associated with reported BSE frequency, the small proportion of women who reported more thorough BSE had a significantly decreased occurrence of advanced disease compared with less proficient practitioners. Muscat and Huncharek[26] found no significant difference in the frequency of BSE between a group of women with advanced breast cancer and a comparison group (odds ratio [OR] 1.27, 95% CI 0.77 to 2.07). In contrast, a study by Locker and coworkers,[27] nested within the Nottingham Centre of the UK

Trial of Early Detection of Breast Cancer,[21] found attendance for BSE education to be protective against death from breast cancer (OR 0.70, 95% CI 0.50 to 0.97).

In this article we describe a case–control study of BSE, nested within the Canadian National Breast Screening Study (NBSS), designed to measure the effect of BSE techniques on the risk of death due to breast cancer.

Methods

Canadian National Breast Screening Study

The Canadian NBSS is a multicentre randomized controlled trial of screening mammography[28–32] that recruited 89 835 volunteers between 1980 and 1985. Eligible women were aged 40 to 59 years, had no history of breast cancer, were not pregnant, had not undergone mammography in the 12 months before study entry and signed informed consent. Self-administered questionnaires yielded information on menstrual, reproductive, hormonal and family history and on frequency of BSE. All of the participants received BSE instruction.

At their initial visits, 50 430 women aged 40 to 49 years were randomly allocated either to a group that received 4 or 5 annual screenings consisting of 2-view mammography and clinical breast examination or to a group that received only clinical breast examination on enrolment but not rescreening. A total of 39 405 women aged 50 to 59 years were allocated either to a group that received 4 or 5 annual screenings consisting of mammography and clinical breast examination or to a group that received 4 or 5 annual screenings of clinical breast examination only.

Each year each participant, including those not eligible for rescreening, also received a self-administered questionnaire inquiring about BSE practice in the preceding year. BSE evaluation and instruction were conducted at each rescreening visit.

Subjects

Eligible subjects for the case–control study of BSE were all NBSS participants except those in whom breast cancer was diagnosed before their second year in the NBSS, who were excluded to eliminate the influence of pre-existing cancer. The initial assessment of BSE practice did not occur until each woman's first rescreening visit.

Case subjects were women who had died from breast cancer or in whom distant metastatic disease was reported during follow-up. Women with metastatic disease, a valid surrogate end-point for death, were included to enhance the study's power. Study cases were identified by the ongoing annual NBSS follow-up procedures[31] for all women with a diagnosis of breast cancer and by record linkages with Statistics Canada's National Mortality Database and the cancer registries of the 6 provinces where the NBSS operated.

For each case subject, 10 control subjects were randomly selected from the remaining eligible women (all women who were alive at the time the case subject died or was determined to have distant metastatic disease). Therefore, the control subjects could include women with diagnosed breast cancer. However, if they subsequently manifested distant metastases or died from breast cancer they were eligible to become case subjects. To ensure that case and control subjects had comparable opportunities for breast cancer screening, the control subjects were matched by 5-year age group, screening centre, enrolment year and random allocation group.

Exposure measures

During the NBSS, the following data on BSE were collected prospectively: self-reported BSE frequency before enrolment in the NBSS, annual self-reports of BSE frequency during the program and annual assessments of BSE technique by the NBSS screen-examiners. The last 2 measures were examined in relation to each of up to 3 years preceding the diagnosis of breast cancer.

Because the objective, structured assessment of BSE technique was instituted after the NBSS started, approximately 15% of the participants did not have their BSE technique assessed at their year-2 screening visit. Women aged 40 to 49 years who were randomly allocated to the control group were not eligible for rescreening, so their BSE technique was never assessed.

Screen-examiners conducted assessments of the subjects' BSE technique before performing the clinical examination of the breasts.[32] To avoid undermining a participant's willingness to attend further screening visits, the screen-examiners were flexible in conducting the BSE assessments. Although most women agreed to demonstrate their technique, others wished only to describe it, some provided information during the clinical examination of their breasts, and a small number declined the evaluation.

Eight components were evaluated individually to assess BSE technique and frequency (the practices considered proficient are noted in parentheses): visual examination (included), fingers used for examination (middle three), surfaces used for examination (finger pads), search pattern used (not random), palpation technique used (small circles), coverage of the examination (all or most of the breast), axillae examination (included) and BSE frequency (12 or more times per year).

Because women were ineligible for screening after a diagnosis of breast cancer, BSE technique was evaluated only up until the time of diagnosis. For each case–control set, assessment of BSE and other screening procedures

was limited to the same interval — the time before the first breast-cancer diagnosis within the set.

We examined the effect of covariates such as age, family history of breast cancer, age at menarche, past history of breast problems, parity, age at first live birth, age at menopause, marital status, smoking history, education and occupation.

Data analysis

We used conditional multiple logistic regression modelling to estimate the ORs, 95% CIs and probability values associated with BSE, and to control for covariates (PHREG procedure, SAS/STAT software, ver. 6, SAS Institute Inc., Cary, NC, 1991).

Results

The case subjects were 163 women (74.1%) who died from breast cancer and 57 women (25.9%) with distant metastases. Of the 2200 randomly selected matched control subjects, 18 were found to have breast cancer, 3 of whom were also included as cases (owing to subsequent development of distant metastases in 2 of these subjects and death from breast cancer in 1).

The demographic characteristics of the case and control subjects were similar in many respects (Table 1). However, a larger proportion of case subjects than of control subjects held management or professional occupations and were current smokers. Breast cancer risk factors, such as lower age at menarche, higher age at menopause and family history of breast cancer, were more common among the case subjects than among the control subjects (Table 2). The apparently decreased risk associated with hysterectomy did not persist after we adjusted for age at menopause (adjusted OR 0.89, 95% CI 0.57 to 1.39, $p = 0.60$).

Table 3 shows that similar proportions of case and control subjects reported having undergone mammography (27% v. 29%) ($p = 0.57$) and having practised BSE (44% v. 50%) ($p = 0.10$) before entry into the NBSS.

Table 1: Demographic characteristics of women who died from breast cancer or had distant metastases and matched control subjects in the Canadian National Breast Screening Study (NBSS)*

Characteristic	Group; no. (and %) of subjects: Cases *n = 220*	Controls *n = 2200*	OR† (and 95% CI‡)	*p* value
Birthplace				
North America	187 (85)	1885 (86)	1.00 RV§	
Europe	31 (14)	270 (12)	1.17 (0.77–1.77)	0.47
Elsewhere	2 (1)	42 (2)	0.47 (0.11–2.01)	0.31
Marital status				
Married	167 (76)	1778 (81)	1.00 RV	
Never married	16 (7)	158 (7)	1.09 (0.63–1.87)	0.77
Separated/divorced	21 (9)	174 (8)	1.28 (0.78–2.07)	0.32
Widowed	16 (7)	90 (4)	1.93 (1.10–3.39)	0.02
Educational level completed				
Elementary school	17 (8)	227 (10)	1.00 RV	
High school/technical school	144 (66)	1479 (68)	1.34 (0.78–2.31)	0.29
University	56 (26)	474 (22)	1.63 (0.91–2.94)	0.11
Occupation				
All others	143 (69)	1548 (76)	1.00 RV	
Management/professional	64 (31)	491 (24)	1.44 (1.05–1.98)	0.02
Smoking history				
Never smoked	109 (50)	1113 (51)	1.00 RV	
Ever smoked	111 (50)	1083 (49)	1.05 (0.79–1.38)	0.75
Current smoker	65 (30)	469 (21)	1.42 (1.02–1.97)	0.04
Past smoker	46 (21)	614 (28)	0.76 (0.53–1.09)	0.13
Not currently smoking	155 (70)	1727 (79)	1.00 RV	
Current smoker	65 (30)	469 (21)	1.55 (1.14–2.11)	0.01
Body mass index, kg/m²				
≤ 21	49 (22)	510 (23)	0.90 (0.63–1.27)	0.53
22–26	121 (55)	1130 (52)	1.00 RV	
≥ 27	50 (23)	546 (25)	0.86 (0.61–1.21)	0.37

*Missing responses were excluded.
†Odds ratio estimated by conditional logistic regression.
‡95% confidence interval = antiln {ln(OR) ± 1.96 × standard error [ln(OR)]}.
§RV = reference variable.

Self-reported information about BSE practice was available for more than 85% of the eligible case and control subjects. Failure to return follow-up questionnaires (8%) and returning questionnaires without specifying BSE practice (6%) were responsible for the missing responses. Information from the screen-examiner assessment was available for more than 80% of the eligible case and control subjects. This information was not available for the remainder of the subjects, for the following reasons: the subject did not attend the rescreening visit (11%), the rescreening visit occurred before the structured assessment of BSE technique was implemented (6%), or the assessment was not completed during the rescreening visit (1%).

Self-reported BSE frequency, which was stable over the 3 periods examined, was not associated with case status (Table 4).

When all 8 BSE components assessed were examined in a single regression model, the ORs associated with failure to perform 3 of the components — a visual examination, palpation with the 3 middle fingers and examination with the finger pads — were found to vary over the 3 periods examined. The ORs for each of these components were greatest for the assessment 2 years before diagnosis: relative to women who included all 3 components, the OR for death from breast cancer or distant metastatic disease for women who omitted 1 of the 3 components was 1.82 (95% CI 1.00 to 3.29, $p = 0.05$), for those who omitted 2 of the 3 components, 2.84 (95% CI 1.44 to 5.59, $p = 0.003$), and for those who omitted all 3 components, 2.95 (95% CI 1.19 to 7.30, $p = 0.02$) (Table 4). Because factors such as family history of breast cancer, age at menarche, age at menopause, education and occupation did not affect the results, unadjusted ORs are presented.

Discussion

These results, like those from other studies, support a

Table 2: Breast cancer risk factors for the case and control subjects*

Risk factor	Group; no. (and %) of subjects		OR (and 95% CI)	*p* value
	Case	Control		
Age at menarche, yr				
≥ 13	119 (54)	1329 (61)	1.00 RV	
≤ 12	101 (46)	854 (39)	1.32 (0.99–1.75)	0.051
Age at first live birth				
≤ 29 yr	156 (71)	1647 (75)	1.00 RV	
≥ 30 yr or nulliparous	64 (29)	546 (25)	1.24 (0.91–1.68)	0.17
No. of births				
0	39 (18)	320 (15)	1.00 RV	
1	27 (12)	192 (9)	1.17 (0.69–1.98)	0.56
≥ 2	151 (70)	1668 (77)	0.74 (0.51–1.08)	0.12
Age at menopause, yr†				
≤ 44	29 (17)	446 (27)	1.00 RV	
≥ 45	139 (83)	1208 (73)	1.79 (1.18–2.71)	0.01
Hysterectomy				
No	163 (74)	1466 (67)	1.00 RV	
Yes	57 (26)	729 (33)	0.69 (0.50–0.96)	0.03
Oophorectomy				
No	194 (90)	1881 (87)	1.00 RV	
Yes	22 (10)	270 (13)	0.78 (0.49–1.24)	0.29
Oral contraceptive use				
Never	105 (48)	972 (44)	1.00 RV	
Ever	115 (52)	1224 (56)	0.86 (0.64–1.15)	0.30
Estrogen use				
Never	152 (70)	1482 (68)	1.00 RV	
Ever	64 (30)	696 (32)	0.88 (0.64–1.22)	0.45
Family history of breast cancer				
No	121 (55)	1464 (67)	1.00 RV	
Yes	99 (45)	733 (33)	1.63 (1.23–2.16)	0.001
Previous breast problem				
No	177 (82)	1789 (83)	1.00 RV	
Yes	40 (18)	356 (17)	1.14 (0.79–1.64)	0.48

*Missing responses were excluded.
†Women aged less than 45 years at enrolment (49 case subjects and 490 control subjects) were excluded from analysis.

benefit from BSE. However, the potential effects of lead time, length and recall biases have been eliminated by the study's design. In addition, ours is the only study to categorize BSE technique according to prospective, objective assessments. However, the post hoc assessment of the 8 components over 3 periods may have resulted in an overestimate of the observed associations. In addition, because we did not use an experimental design, our results may be

Table 3: Pre-NBSS breast cancer screening history of the case and control subjects*

Screening procedure	Group; no. (and %) of subjects: Case	Control	OR (and 95% CI)	*p* value
Mammographic examination				
No	160 (73)	1559 (71)	1.00 RV	
Yes	60 (27)	639 (29)	0.91 (0.67–1.25)	0.57
No. of mammographic examinations				
0	160 (73)	1559 (71)	1.00 RV	
1–2	43 (20)	550 (25)	0.77 (0.54–1.09)	0.14
≥ 3	15 (7)	72 (4)	2.06 (1.13–3.77)	0.02
Breast self-examination				
No	121 (56)	1091 (50)	1.27 (0.96–1.68)	0.10
Yes	97 (44)	1095 (50)	1.00 RV	
Frequency per yr				
0	121 (58)	1091 (51)	1.38 (0.93–2.05)	0.11
1–11	53 (25)	616 (29)	1.09 (0.69–1.71)	0.71
≥ 12	34 (16)	421 (20)	1.00 RV	

*Missing responses were excluded.

Table 4: BSE practice characteristics relative to year of diagnosis of breast cancer

Characteristic	No. of yr preceding diagnosis; OR (and 95% CI): 1*	2†	3‡
According to self-administered questionnaire			
Practised BSE	1.00	1.00	1.00
Did not practise BSE	1.22 (0.65–2.29)	1.25 (0.62–2.51)	1.13 (0.49–2.61)
Frequency per yr			
≥ 12	1.00	1.00	1.00
1–11	0.81 (0.55–1.20)	1.20 (0.79–1.84)	1.10 (0.67–1.83)
0	1.13 (0.59–2.15)	1.34 (0.65–2.77)	1.17 (0.50–2.76)
According to screen-examiner assessment			
No visual examination	1.24 (0.73–2.09)	1.54 (0.87–2.73)	1.33 (0.69–2.56)
3 middle fingers not used	1.22 (0.74–2.01)	1.78 (1.01–3.14)	1.39 (0.69–2.78)
Finger pads not used	1.47 (0.84–2.57)	2.08 (1.11–3.88)	0.87 (0.42–1.78)
Systematic search not used	0.92 (0.48–1.78)	0.59 (0.27–1.28)	1.18 (0.52–2.65)
Circular palpation not used	0.50 (0.30–0.86)	0.67 (0.36–1.24)	0.83 (0.43–1.60)
Most of breast not covered	1.17 (0.67–2.04)	0.91 (0.48–1.70)	0.83 (0.38–1.82)
Axillae not examined	1.01 (0.59–1.71)	1.12 (0.63–1.97)	0.80 (0.41–1.57)
< 12 examinations performed per yr	1.11 (0.72–1.70)	1.28 (0.79–2.07)	1.18 (0.68–2.03)
All of first 3 practices included	1.00	1.00	1.00
1, 2 or 3 of first 3 practices omitted	1.51 (0.97–2.34)	2.20 (1.30–3.71)	1.18 (0.66–2.10)
1 of first 3 practices omitted	1.52 (0.93–2.48)	1.82 (1.00–3.29)	1.21 (0.65–2.28)
2 of first 3 practices omitted	1.53 (0.83–2.84)	2.84 (1.44–5.59)	0.92 (0.38–2.22)
All of first 3 practices omitted	1.40 (0.58–3.39)	2.95 (1.19–7.30)	1.68 (0.59–4.76)

*A total of 193 case subjects and 1669 control subjects who completed self-administered questionnaires and 142 case subjects and 1215 control subjects assessed by screen-examiners.
†A total of 144 case subjects and 1232 control subjects who completed self-administered questionnaires and 105 case subjects and 907 control subjects assessed by screen-examiners.
‡A total of 100 case subjects and 857 control subjects who completed self-administered questionnaires and 75 case subjects and 622 control subjects assessed by screen-examiners.

confounded, owing to differing risks inherent in the 2 groups rather than a true screening effect.

Nesting this study within the NBSS reduced the possibility of selection bias. Each participant was a volunteer who gave informed consent before entering the NBSS. Compliance was similar: 82.8% (144/174) of the case subjects and 80.9% (1408/1740) of the control subjects attended all scheduled NBSS screening visits. The control subjects were matched with the case subjects by age, random allocation group, screening centre and enrolment year. Potential confounders did not affect the results.

The effect of BSE practice was evident only when assessed 2 years before the diagnosis of breast cancer. This appears consistent with the observations of Weiss, McKnight and Stevens,[33] who pointed out that if screening is to be effective it must be done during the time when the tumour is both detectable and curable. Our results suggest that BSE 1 year before diagnosis is too late to be effective.

Our overall results are consistent with those of the population-based case–control study carried out in Seattle by Newcomb and collaborators.[25] Their study suggested that women who are not proficient at BSE are at significantly greater risk for advanced breast cancer than their more proficient counterparts.

Although our study and that of Newcomb and collaborators[25] arrived at similar results, the 2 studies examined different BSE practices. Newcomb and collaborators assessed BSE practice using a 10-point scale, based on the sum of positions and techniques mentioned in each woman's BSE description: lying down; sitting upright; with arm over or behind head; standing in front of mirror; using a circular motion or all around or outward and inward motion; using the flat of 2 or 3 fingertips; checking nipples; checking underarms; looking for dimpling, swelling and discoloration; and any other reasonable examination technique (Polly A. Newcomb, PhD, University of Wisconsin Cancer Center, Madison, Wis.: personal communication, 1994). The data presented by Newcomb and collaborators allow only 1 of the common factors to be compared: examination of the axillae. Although those investigators found a significant difference in this component of BSE between the case and control subjects, a similar effect was not evident from the NBSS data.

Both studies found no association between BSE frequency and the risk of death from breast cancer. Also, neither found a protective effect associated with prior mammography; rather, both found an increased risk associated with multiple previous mammographic examinations. In seeking explanations for this finding, the Seattle investigators found that women who reported frequent previous mammographic examinations were far more likely than women without such a history to have had previous "benign breast disease" or palpable lumps that were followed with mammography (Polly A. Newcomb: personal communication, 1994). Similarly, we found that women who had multiple previous mammographic examinations were more likely to have reported prior "breast problems" and a family history of breast cancer.

The Seattle investigation,[25] like the study carried out by Senie and colleagues,[34] showed a significant protective effect associated with the number of previous clinical breast examinations. Information about prior clinical breast examinations was not collected from women when they entered the NBSS. However, because existing cases of breast cancer were excluded, mammography and clinical breast examinations done before the NBSS should be of less relevance to our study.

Our findings are also compatible with the results of the correlational study by Hislop, Coldman and Skippen.[35] Those investigators found that women who did not palpate their breasts were twice as likely as women who included this practice to have lymph node involvement at diagnosis and that women who included a thorough visual inspection of their breasts were twice as likely as those who omitted this practice to have tumours smaller than 2 cm in diameter at diagnosis ($p = 0.05$ for both findings).

In conclusion, evidence from our study and from the population-based case–control study by Newcomb and collaborators[25] suggests that proficient BSE practice may reduce the risk of death from breast cancer.

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