

Women's interest in a personal breast cancer risk assessment and lifestyle advice at NHS mammography screening

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ABSTRACT

Background Although mortality from breast cancer is declining, incidence continues to increase and is often detected at routine NHS screening. Most middle aged and older women in England attend for screening every 3 years. Assessing their personal breast cancer risk and providing preventative lifestyle advice could help to further reduce breast cancer incidence.

Methods A cross-sectional, self-complete postal survey measured attendees' interest in having a personal risk assessment, expected impact on screening attendance, knowledge of associations between lifestyle and breast cancer and preferred ways of accessing preventative lifestyle advice.

Results A total of 1803/4948 (36.4%) completed questionnaires were returned. Most participants (93.7%) expressed interest in a personal risk assessment and 95% (1713/1803) believed it would make no difference or encourage re-attendance. Two-thirds (1208/1803) associated lifestyle with breast cancer, but many were unaware of specific risks such as weight gain, obesity, alcohol consumption and physical inactivity. NHS sourced advice was expected to be more credible than other sources, and booklets, brief counselling or an interactive website were most preferred for accessing this.

Conclusions Attendees appear to welcome an intervention that would facilitate more proactive clinical and lifestyle prevention and address critical research gaps in breast cancer prevention and early detection.

Keywords cancer, health promotion, screening

Introduction and objectives

During the last two decades, deaths from breast cancer in England have declined, but incidence continues to increase.¹ Around 40% of tumours occur during the 3 year NHS breast screening interval and often in women with a higher than average risk.^{2,3} Identifying these attendees and providing more tailored screening intervals, together with other preventative treatment(s) where appropriate, could help to further reduce incidence, increase early detection and improve prognosis. A large-scale, population-based study¹ is currently using a range of individual genetic and lifestyle variables to produce a 10 year probability (%) of women developing breast cancer.⁴ While early results support the feasibility of collecting individual risk relevant data, findings also indicated lower uptake among women from more socially deprived

areas, using post code deprivation scores.^{5,6} As both screening attendance and breast cancer survival rates are also lower within this population,^{7,8} additional investigations were required to ensure that offering a personal risk assessment would not inadvertently exacerbate health inequalities by further discouraging screening attendance in an already under-represented population group.^{9,10}

In addition to its potential clinical value, providing a personal risk assessment could create a powerful teachable moment for increasing women's understanding how their weight status and

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associated lifestyle choices can affect breast cancer risk. Almost one-fifth of all cases in England (18.5% or n 9000 UK cases pa) are now attributed to post-menopausal weight gain, obesity, physical inactivity and alcohol consumption,¹¹ with prevalence of adult female obesity and physical inactivity being highest among women eligible for breast screening.¹² This also exposes them to a 'high' or 'very high' risk of developing heart disease, type 2 diabetes, as well as breast and bowel cancer.¹² Conversely, there is evidence of risk reduction and improved post-treatment prognosis when women lose excess weight,^{13–16} take regular physical activity^{17–19} and minimize alcohol consumption.²⁰ Furthermore, obesity and suboptimal lifestyles remain most prevalent in lower income groups¹² where women often require more 'medically sanctioned', reasons for making lifestyle changes.²¹ Recommendations provided in the context of a personal breast cancer risk assessment may, however, be perceived as having this kind of 'legitimacy' and provide an effective prompt to action.²²

This study's objectives were to assess breast screening attendees' interest in having a personal risk assessment, anticipated effects on future screening, lifestyle factors associated with breast cancer and preferred formats for receiving advice.

Methods

Study sample, design and setting

Participants were drawn from three NHS breast screening clinics: the Rose Centre, South West London Breast Screening Service, Bart's Health NHS Trust, London and The Avon Breast Screening Unit, Bristol. Data were collected using a self-complete questionnaire, offered to all women attending for routine mammography, during December 2013 and January, 2014.

Survey instrument

The survey instrument was designed to minimize errors and encourage high levels of fully correct completions using the general principles recommended in the design of self-administered questionnaires.²² Variability in sampling procedure and resulting recruitment bias were minimized by using the same recruitment protocol to brief all radiographers immediately before data collection. To increase uptake, £1 was pledged to Cancer Research UK for every completed questionnaire returned.

Pilot testing and approval

A draft questionnaire was pilot tested among a convenience sample of 30 women of screening age, from diverse social backgrounds. All study documents were then reviewed and approved by the Breast Cancer Campaign, Independent Cancer Voices' Groups and Directors of participating screening clinics.

Ethics approval was given by National Research Ethics Committee, East of England (Hatfield) on 29 August 2013 (Rec. Ref.13/EE/0311, Project ID 133042); Bart's Health NHS Trust on 16 October 2013, St George's Healthcare Trust on 30 September, 2013 and University Hospitals Bristol on 07 October 2013.

Recruitment procedures and informed consent

During the data collection period, all women attending for screening were eligible to participate. On arrival, the radiographers briefly explained the research according to agreed protocol and asked each woman if she would like to take away an Information Pack containing a survey questionnaire, Participant Information Sheet and postage paid, pre-addressed envelope. All attendees then proceeded with their mammogram as usual. Informed consent was assumed only if and when a completed questionnaire was returned. No patient identifiable data were collected.

Sample power

A power analysis was used to calculate the minimum sample needed to enable comparisons between managerial and non-managerial and overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$) and not overweight ($\text{BMI} \leq 25 \text{ kg/m}^2$) participants. In the wider UK population, two-thirds (67%) of 45–74-year-old women are overweight or obese,²³ and one-third have managerial backgrounds.²⁴ Comparable data were not available for screening attendees but an earlier survey at NHS breast screening clinics²⁵ found 50% of participants to be overweight or obese and 40% to have managerial backgrounds. These latter proportions were therefore used for sample size estimation and 1000 respondents were required to give sufficient power ($\beta = 80\%$) to detect between subgroup differences of 20% in being 'very interested' in a personal risk assessment, with 95% confidence.

Statistical methods

Data were entered into and analysed using SPSS (v.21). Pearson's (χ^2) goodness-of-fit test compared participant characteristics with the wider population. Between-group differences in outcomes were assessed using (χ^2) for Independence with Yates Continuity Correction. Upper and lower confidence intervals were calculated for single proportions using the Wilson procedure, with continuity correction.²⁶

Results

During the fieldwork period, 4948 questionnaires were distributed and 1803 (36.4%) returned. Response rates varied across clinics, but as there were no significant differences in

being ‘very interested’ in having a risk assessment, $\chi^2(2) = 0.133$, $P = 0.936$, data were pooled to provide sufficient statistical power to conduct planned sub group analyses.

Participant characteristics

Sample mean age was 57.8 (SD 6.9) and Pearson’s (χ^2) goodness of fit test indicated that participants were no different to the wider, similar aged female population in their ethnic composition,²⁷ $\chi^2(3, n = 1803) = 9.7$, $P > 0.01$, whether married,²⁸ $\chi^2(1) = 2.1$, $P = 0.144$ or self-rated health,²⁹ $\chi^2(5) = 2.8$, $P = 0.732$. Proportionately more participants were in paid employment (sample = 61%, population = 58%)³⁰ $\chi^2(1) = 5.75$, $P = 0.02$, with managerial backgrounds (sample = 48.5%, population = 38.2%)²⁴ $\chi^2(1) = 56.1$, $P < 0.001$, and fewer were overweight or obese (sample = 48%, population = 67%)²³ $\chi^2(1) = 84.0$, $P = < 0.001$.

Main results

Interest in a personal breast cancer risk assessment and anticipated effects

Women rated their interest in receiving a personal breast cancer risk assessment on a four point scale, ranging from ‘not at all’ to ‘very’ interested (Table 1). Three quarters (74.4%) were ‘very’ or ‘quite interested’ and just 6.7% ‘not at all interested’. As there were no differences in overweight and obese women’s levels of being ‘very interested’, $\chi^2(1) =$

0.007, $P = 0.933$, data were combined to provide sufficient statistical power for all planned sub group analyses.

Participants who were more likely to be ‘very interested’ in a personal risk assessment were younger, < 55 years, $\chi^2(1) = 5.8$, $P = 0.016$, $\phi = 0.058$; with managerial backgrounds, $\chi^2(1) = 4.0$, $P = 0.045$, $\phi = 0.045$; and overweight or obese $\chi^2(1) = 8.9$, $P = 0.003$, $\phi = 0.071$.

Women indicated on a six point scale, ranging from ‘a lot more likely to attend’ to ‘a lot less likely/it would depend on the results’, how a personal breast cancer risk assessment could affect their screening attendance (Table 2). Over one-third (39.3%) expected to be, ‘a lot more likely to attend’ and just over half (50.6%) believed it would ‘make no difference’. More women with non-managerial backgrounds (42.7%) expected to be ‘a lot more likely to attend’ for future breast cancer screening, $\chi^2(1) = 8.9$, $P = 0.002$, $\phi = -0.072$, than those with managerial backgrounds (35.7%).

Current beliefs about lifestyle and breast cancer risk

Responses to the question: ‘Overall how much, if at all, do you think that lifestyle can affect a woman’s risk of breast cancer?’ were indicated on a four point scale ranging from ‘not at all’ to ‘a great deal’. Two-thirds of participants (64.8–69.2%) thought that lifestyle generally could affect a woman’s risk of breast cancer, ‘quite a lot’ (933/1803, 49.4–54.0%) or ‘a great deal’ (273/1803, 13.5–16.8%) with only 38/1803 (1.4–2.8%) saying, ‘not at all’.

Table 1 Interest in having a personal breast cancer appraisal (95% CI)

	<i>Not at all</i>	<i>A little</i>	<i>Quite</i>	<i>Very</i>	<i>n</i>
Level of interest, % of participants					
Total sample	6.7% (5.6–7.9%)	18.9% (17.3–20.9)	34.7% (32.2–36.6%)	39.7% (37.3–42.9%)	1803
Clinic location					
SW London	7.2% (5.3–9.1%)	18.9% (16.1–21.7%)	33.4% (30.0–36.8%)	40.5% (36.9–44.1%)	728
Bart’s	7.1% (4.1–10.1%)	18.8% (14.3–23.3%)	35.8% (30.1–41.4%)	38.3% (32.7–43.9%)	287
Bristol	6.1% (4.4–7.8%)	18.9% (16.2–21.6%)	35.5% (32.2–38.8%)	39.5% (36.1–42.9%)	788
BMI groups					
Not overweight (BMI ≤ 25 kg/m ²)	8.4% (6.6–10.2%)	20.8% (18.2–23.4%)	34.9% (31.9–37.9%)	35.9% (32.8–39.0%)	944
Overweight (BMI ≥ 25 kg/m ² <30 kg/m ²)	5.4% (3.5–7.3%)	16.9% (13.7–20.1%)	33.4% (29.4–37.5%)	44.3% (40.0–48.6%)*	521
Obese (BMI ≥ 30 kg/m ²)	4.1% (2.0–6.2%)	17.2% (13.2–21.2%)	36.4% (31.3–41.5%)	42.3% (37.0–47.6%)*	338
Occupational background					
Managerial	5.9% (4.3–7.5%)	18.0% (15.5–20.6%)	34.1% (31.0–37.2%)	42.0% (39.0–45.3%)*	874
Non-managerial	7.7% (6.0–9.4%)	19.9% (17.2–22.4%)	35.9% (32.0–38.2%)	36.6% (33.5–40.0%)	929
Age groups					
<55 years	6.0% (4.2–7.8%)	16.8% (14.0–20.0%)	34.0% (30.5–37.5%)	43.2% (40.0–47.0%)*	692
>55 years	7.2% (6.0–9.0%)	20.1% (17.7–22.5%)	35.3% (33.0–38.1%)	37.4% (35.0–40.1%)	1111

Statistically significant using χ^2 for independence with Yates Continuity Correction; * $P < 0.05$.

Table 2 How, if at all do you think that having a personal breast cancer risk assessment might affect your future attendance for routine breast screening? (95% CI)

Effect of having a personal risk assessment on future screening attendance	Total sample (95% CI)	Managerial (95% CI)	Non-managerial (95% CI)
I would be a lot more likely to attend	39.3% (37.1–41.6)	35.7% (32–38.8)	42.7% (39.5–45.9)*
I would be a little more likely to attend	5.2% (4.2–6.2)	5.5% (4.0–7.0)	4.8% (3.4–6.2)
It would make no difference	50.6% (48.3–52.9)	53.7% (50.5–57.0)	47.7% (44.4–51.0)*
I would be a little less likely to attend	0.2% (0.001–0.006)	0.2% (–0.001 to 0.005)	0.2% (–0.001 to 0.005)
I would be a lot less likely to attend	0% (0–0.002)	0% (to 0.004)	0% (0–0.004)
Depend on the risk assessment results	4.7% (3.7–5.7)	4.9% (3.5–6.3)	4.5% (3.2–5.9)
Totals (n)	1803	874	929

Statistically significant using χ^2 for independence with Yates Continuity Correction; * $P < 0.05$.

Table 3 Percentage agreeing 'I think these things may increase any woman's/my personal risk of developing breast cancer' (95% CI)

Potential risk factor	Could increase ANY woman's breast cancer risk			May be increasing MY personal breast cancer risk	
	Total sample (n = 1803)	Managerial background (n = 874)	Non-managerial background (n = 929)	Not overweight or obese (BMI \leq 25 kg/m ² ; n = 944)	Overweight or obese (BMI \geq 25 kg/m ² ; n = 859)
Having family history of breast cancer	88.1% (86.6–89.6)	91.0% (88.8–92.7)	85.5% (83.1–87.7)**	26.4% (23.6–29.3)	68.2% (65.0–71.3)**
Smoking	75.2% (73.2–77.2)	77.4% (74.5–80.1)	73.2% (70.2–76.0)*	22.6% (20.0–25.4)	28.6% (25.7–31.8)*
Being overweight or obese	73.0% (71.0–75.1)	77.8% (74.9–80.5)	68.5% (65.4–71.4)**	26.4% (23.6–29.3)	68.2% (65.0–71.3)**
Taking HRT	69.8% (67.7–71.9)	74.0% (71.0–76.9)	65.9% (62.7–68.9)**	27.7% (28.4–30.6)	32.7% (29.6–36.0)*
Drinking too much alcohol	64.7% (62.5–66.9)	68.9% (65.7–72.0)	61.0% (57.7–64.0)*	32.9% (29.9–35.9)	29.0% (26.0–32.0)
Not doing enough exercise	60.4% (58.1–62.7)	65.5% (62.2–68.6)	55.8% (52.6–59.0)**	34.7% (31.6–37.8)	44.5% (41.1–47.9)**
Not eating enough fruit and vegetables	56.3% (54.0–58.6)	63.0% (59.7–66.2)	50.1% (46.8–53.3)**	27.8% (24.9–30.7)	29.1% (26.1–32.0)
Having other types of breast disease	55.7% (53.4–58.0)	54.6% (51.2–57.9)	56.8% (53.6–60.0)	14.4% (12.3–16.9)	18.4% (15.9–21.2)*
Taking contraceptive pill	51.4% (49.1–53.7)	54.2% (51.0–58.0)	48.7% (45.4–51.9)*	33.3% (30.2–36.0)	32.0% (28.9–35.1)
Getting older generally	50.1% (47.7–52.3)	55.8% (52.4–59.1)	44.7% (41.5–47.9)**	52.0% (48.8–55.2)	46.1% (42.8–49.6)*
Gaining weight in midlife	47.9% (45.6–50.2)	52.9% (49.5–56.2)	43.2% (40.1–46.6)**	26.7% (23.9–29.7)	44.5% (41.1–47.9)**
Being very stressed	46.1% (43.8–48.4)	49.0% (45.7–52.5)	43.4% (40.2–46.7)*	30.8% (27.8–33.8)	33.9% (30.8–37.1)
Eating a lot of fat	44.8% (42.5–47.1)	46.3% (42.9–49.7)	43.5% (40.3–46.8)	17.3% (14.9–19.7)	21.5% (18.8–24.3)
Getting fat around the middle	40.9% (38.6–43.2)	46.1% (42.8–49.5)	36.0% (33.0–39.2)**	27.3% (24.5–30.3)	42.4% (39.1–45.8)**

Statistically significant using χ^2 for independence with Yates Continuity Correction; * $P < 0.05$, ** $P < 0.001$.

From a given list of factors, women indicated which they thought could increase firstly 'their own' and secondly, 'any woman's' breast cancer risk (Table 3).

Three quarters (75.2%) associated smoking with increasing 'any woman's risk', followed by overweight or obesity (73%), using Hormone Replacement Therapy (HRT) (69.8%), drinking too much alcohol (64.7%) and not doing enough exercise (60.4%). Lower proportions believed that gaining weight in

midlife (47.9%) or 'getting fat around the middle' (40.9%) increased risk.

Women with non-managerial backgrounds ($n = 929$) were significantly 'less likely' than those with managerial backgrounds ($n = 874$) to associate modifiable, evidence-based risk factors¹¹ with increasing breast cancer risk. These included, overweight or obesity, $\chi^2(2) = 20.6$, $P = 0.000$, $\phi = 0.11$; gaining weight in midlife, $\chi^2(2) = 19.3$, $P = 0.001$,

$\varphi = 0.1$; getting fat around the middle, $\chi^2(2) = 20.7$, $P = 0.000$, $\varphi = 0.11$; not doing enough exercise, $\chi^2(2) = 17.9$, $P = 0.000$, $\varphi = 0.1$ and drinking too much alcohol $\chi^2(2) = 15.8$, $P = 0.003$, $\varphi = 0.094$.

Overweight and obese participants ($n = 859$) were significantly 'more likely' than non-overweight participants ($n = 944$) to think 'their personal breast cancer risk' was increased by being overweight or obese, $\chi^2(1) = 315$, $P = 0.000$, $\varphi = 0.42$; gaining weight in midlife, $\chi^2(2) = 63$, $P = 0.000$, $\varphi = 0.19$; getting fat around the middle, $\chi^2(1) = 0.44.4$, $P = 0.000$, $\varphi = 0.16$ and not doing enough exercise, $\chi^2(1) = 17.4$, $P = 0.000$, $\varphi = 0.1$.

Attitudes to having a risk assessment and lifestyle advice

A four point scale, ranging from 'agree a lot' to 'disagree a lot', was used to assess attitudes to the following statements. The % who agreed 'a lot' or 'a little' are given:

- 93.1% (1679/1803)—'Knowing more about how lifestyle can affect breast cancer risk, would encourage me to have a personal risk assessment so that I could do more to help myself'.
- 26.0% (468/1803)—'I do not believe I have any control over whether I develop breast cancer or whether it returns after a diagnosis'. However, 41.1% of non-managerial participants ($n = 929$), $\chi^2(4) = 44.6$, $P = 0.000$, $\varphi = 0.2$ and 38% of overweight or obese participants ($n = 944$), $\chi^2(4) = 13.0$, $P = 0.12$, $\varphi = 0.9$, agreed with this.
- 92.5% (1949/1803)—'If I knew how my lifestyle could affect my risk of breast cancer risk, it would really motivate me to make lifestyle improvements'.
- 93.2% (1680/1803)—'If I was told by the NHS breast cancer screening service that my lifestyle could affect my risk of developing breast cancer, I would tend to believe it more than from most other sources'.

Options for how advice could be offered were rated on a five point scale ranging from 'crucial' to 'not at all important' (Table 4). Overall, a booklet, 58.8% (1060/1803), brief face-to-face discussion, 52.2% (941/1803) and interactive website, 30% (541/1803) were most rated as 'crucial' or 'very important'. Younger women (<55 years, 36.1%) were more likely, $\chi^2(4) = 42.7$, $P = 0.000$, $\varphi = 0.154$ to rate an interactive website as 'crucial' or 'very important', than older women (26.2%).

Discussion

Main findings

This survey among NHS breast screening attendees found the majority to be interested in having a personal breast

cancer risk assessment, with most believing it would make no difference to or encourage screening re-attendance. While two-thirds associated lifestyle with breast cancer, many participants seemed unaware of specific risk factors such as weight gain, obesity, alcohol consumption and physical inactivity. Almost all participants thought that breast cancer preventative lifestyle advice from the screening service would be more credible than from other sources and a booklet, brief face-to-face counselling or an interactive website were the most preferred ways to receive this.

Overweight and obese participants were particularly interested in receiving a personal risk assessment and more inclined to believe that their own weight status and lack of exercise increased their personal exposure. Although women from non-managerial backgrounds were less interested in a risk assessment and more fatalistic about breast cancer, they were more likely to think that having lifestyle advice would encourage both screening re attendance and a personal risk assessment.

What is already known on this subject?

Breast screening is vital for early diagnosis and reduced mortality from breast cancer.³¹ Almost 7 million women in England now regularly attend for NHS mammography screening every 3 years⁸ and collecting risk relevant data to assess personal exposure appears feasible within the existing programme.^{1,5} Post-menopausal breast cancer risk increases with alcohol consumption, physical inactivity and obesity,¹¹ but it is unclear whether women are aware of this. Attendees have already indicated their wish to have lifestyle advice at NHS breast screening clinics,^{25,32} but this is still not routinely provided. Consequently, the media and internet remain primary sources of often confusing and contradictory health information.^{33,34} Efficacy building support, such as personal counselling can be an important precursor to lifestyle change, especially among less the less socially advantaged.³⁵ However, interactive websites and smart phones are increasingly being used to engage these population groups in effective weight gain prevention, weight reduction and increased physical activity.^{36–39}

What this study adds

To our knowledge, this is the first multiple site investigation into women's attitudes towards receiving a personal breast risk assessment, together with lifestyle related preventive advice, at routine breast screening. Attitudes to this idea were generally positive and there may be some interdependency within the proposition, as most women agreed that knowing more about how lifestyle could affect their breast cancer risk

Table 4 Rating of importance for alternative ways of receiving lifestyle advice (95% CI)

	<i>Crucial</i>	<i>Very important</i>	<i>Quite important</i>	<i>A little important</i>	<i>Not at all important</i>	<i>Missing data</i>	<i>n</i>
A booklet explaining how lifestyle choices can affect breast cancer risk	18.8% (17.0–21.0)	40.0% (37.7–42.3)	24.6% (22.6–26.6)	9.0% (7.7–10.3)	4.2% (3.3–5.1)	3.3% (2.5–4.1)	1803
Aged <55 years	18.3% (15.6–21.0)	41.0% (37.5–44.5)	24.3% (21.3–27.3)	9.4% (7.4–11.5)	5.0% (3.5–6.5)	2.0% (1.0–3.0)	692
Aged >55 years	19.2% (16.8–21.6)	41.2% (38.2–44.2)	25.0% (22.4–27.7)	9.0% (7.3–10.8)	4.0% (2.8–5.2)	1.6% (0.8–2.4)	1111
A brief face-to-face discussion with a female lifestyle advisor	17.6% (15.5–19.4)	34.6% (32.4–36.8)	23.3% (21.4–25.3)	11.7% (10.2–13.2)	7.4% (6.2–8.6)	5.3% (4.3–6.3)	1803
Aged <55 years	19.4% (16.2–22.2)	33.1% (29.8–36.4)	23.4% (21.4–25.3)	12.3% (10.0–14.6)	7.2% (5.5–9.0)	4.6% (3.1–6.1)	692
Aged >55 years	16.3% (14.0–18.6)	36.0% (33.1–38.9)	23.3% (20.7–25.9)	11.2% (9.3–13.1)	7.6% (6.0–9.2)	5.6% (4.2–7.0)	1111
An interactive website to plan and track lifestyle changes	6.8% (5.6–8.0)	23.1% (21.2–25.1)	28.3% (26.2–30.4)	19.6% (17.8–21.4)	14.9% (13.3–16.5)	7.1% (5.9–8.3)	1803
Aged <55 years	9.0% (7.0–11.0)**	28.0% (24.4–31.2)**	30.0% (26.8–33.2)	18.3% (15.6–21.0)	11.0% (8.8–13.2)	3.7% (2.4–5.0)	692
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A phone consultation with a female lifestyle advisor	4.0% (3.1–4.9)	16.6% (14.9–18.3)	27.5% (25.4–30.0)	26.3% (24.3–28.3)	17.5% (15.8–19.3)	8.0% (6.8–9.3)	1803
Aged <55 years	4.4% (3.0–5.9)	20.0% (17.2–22.8)	27.5% (24.4–30.6)	27.0% (23.9–30.0)	16.1% (13.5–18.7)	5.4% (3.8–7.0)	692
Aged >55 years	3.8% (2.6–5.0)	14.1%* (12.0–16.2)	27.5% (24.8–30.2)	26.0% (23.3–28.7)	19.0% (16.6–21.4)	14.0% (11.9–16.1)	1111
Small group meetings with to discuss lifestyle changes	4.5% (3.5–5.5)	14.4% (12.8–16.0)	21.4% (19.5–23.3)	23.6% (21.6–25.6)	28.8% (26.7–30.9)	7.2% (6.0–8.4)	1803
Aged <55 years	4.5% (3.0–6.0)	15.7% (13.1–18.3)	21.4% (18.5–24.3)	24.0% (21.0–27.0)	29.3% (26.1–32.5)	5.1% (3.6–6.7)	692
Aged >55 years	4.7% (3.4–6.0)	13.4% (11.3–15.5)	21.3% (18.8–23.8)	23.4% (20.8–26.0)	28.5% (25.7–31.3)	8.7% (7.0–10.4)	1111

Statistically significant using χ^2 for independence with Yates Continuity Correction; * $P < 0.05$, ** $P < 0.001$.

would not only motivate lifestyle improvements but also encourage them to have a personal risk assessment. This would be consistent with wider evidence where engagement in personal health risk appraisal has been predicated on individuals believing there are actions they can subsequently take to reduce exposure.⁴⁰ Making breast cancer preventative lifestyle information freely available at all NHS screening clinics, e.g. using posters and leaflets, may therefore be a simple and potentially effective way of encouraging women to have a personal risk assessment, as well as predisposing them to lifestyle changes. Furthermore, most women, including those overweight or obese, will have an average risk assessment.¹ Failing to provide preventative advice alongside this could appear tacitly to endorse an unhealthy weight status, risky lifestyle behaviours and serve to reinforce fatalism about breast cancer.⁴¹ In addition, not providing breast cancer related lifestyle advice may disproportionately disadvantage younger, first time attendees (<55 years), as the evidence suggests that weight gain, obesity and physical inactivity can most adversely affect their breast cancer risk immediately before and after the menopause.^{14,42} The commencement of routine screening would therefore seem a particularly important juncture to offer women clear advice about how they can minimize their lifestyle related breast cancer risk. Furthermore, most women attend for screening every 3 years, over a 25-year period, so this provides many naturally occurring opportunities for follow-up support and encouragement.

Lifestyle advice emanating from the screening service was generally expected to be more credible than most and, as such, may provide a more effective prompt to action.⁴³ However, efficacy building support can also be an important precursor of change, especially among the less socially advantaged.^{44,45} This has often been achieved using face-to-face counselling,³⁵ but entirely mediated interventions, especially using interactive websites, are increasingly being used to reduce obesity and increase physical activity among more socially diverse populations.^{38,46,47} Most women of screening age already use the internet,⁴⁸ and over one-third of younger participants (>55 years) thought an interactive website would be 'crucial' or 'very important' for making lifestyle changes. Lifestyle advice might therefore initially be offered via printed material at screening clinics but with clear links to a dedicated website where women could obtain more personalized advice and support.⁴⁹

Limitations

A self-complete survey was an appropriate and cost-effective method for measuring interest and attitudes within the population of interest. However, confident generalization is limited

by non-random sampling and somewhat lower than anticipated response rates, probably due to the Christmas and New Year fieldwork period. This increases the risk of systematic sample bias or that participants may have differed from the wider population and been inherently more interested in the study proposition.⁵⁰ Nevertheless the sample's socio-demographic profile was not dissimilar to the wider, same aged female population and this study provides new insights into how women feel about having a personal breast cancer risk assessment and lifestyle advice at NHS mammography screening.

Conclusions and implications

Within the NHS, there remain many opportunities to develop services beyond the clinical and curative and use routine contacts to better educate, encourage and support more effective health self-management. These findings suggest that attendees of the NHS breast screening programme would be receptive to a personalized breast cancer risk assessment and preventative lifestyle information. This warrants further investigation in small-scale, exploratory randomized trials, and this next stage should also provide public health practitioners with an initial indication of the feasibility, costs and potential impact on current practice, of providing these additional services. From this, public health policy-makers will also be better able to determine whether and how this initiative could address some critical research gaps in breast cancer prevention.⁵¹

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