Prospective study of predictors of attendance for breast screening in inner London

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Abstract

Objective - To investigate the predictors of first-round attendance for breast screening in an inner city area.

Design - Prospective design in which women were interviewed or completed a postal questionnaire before being sent their invitation for breast screening. Sociodemographic factors, health behaviours, and attitudes, beliefs, and intentions were used as predictors of subsequent attendance. A randomised control group was included to assess the effect of being interviewed on attendance.

Setting - Three neighbouring health districts in inner southeast London.

Participants - A total of 3291 women aged 50-64 years who were due to be called for breast screening for the first time. The analysis of predictors was based on a subsample of 1301, reflecting a response rate of 75% to interview and 36% to postal questionnaire.

Main results - Attendance was 42% overall, and 70% in those who gave an interview or returned a questionnaire. There was little evidence for an interview effect on attendance. The main findings from the analysis of predictors are listed below. (These were necessarily based on those women who responded to interview/questionnaire and so may not be generalisable to the full sample.) (1) Sociodemographic factors: Women in rented accommodation were less likely to go for screening but other indicators of social class and education were not predictive of attendance. Age and other risk factors for breast cancer were unrelated to attendance, as was the distance between home and the screening centre. Married or single women were more likely to attend than divorced, separated, or widowed women, and black women had a higher than average attendance rate; however, neither of these relationships was found in the interview sample. (2) Health behaviours: Attenders were less likely to have had a recent breast screen, more likely to have had a cervical smear, more likely to go to the dentist for check ups, and differed from non-attenders with regard to drinking frequency. Exercise, smoking, diet change, and breast self-examination were unrelated to attendance. (3) Attitudes, beliefs, and intentions: The two best predictors were measures of the perceived importance of regular screening for cervical and breast cancer and intentions to go for breast screening. Also predictive were beliefs about the following: the personal consequences of going for breast screening, the effectiveness of breast screening, the chances of getting breast cancer, and the attitudes of significant others (the woman's husband/partner and children). Women who reported a moderate amount of worry about breast cancer were more likely to attend than those at the other end of the scale.

Conclusions - Attenders and non-attenders differ in two broad areas: the health related behaviours they engage in and the attitudes, beliefs, and intentions they have towards breast cancer and breast screening. The latter are potentially amenable to change, and though different factors may operate among women who do not respond to questionnaires, the findings offer hope that attendance rates can be improved by targeting the relevant attitudes and beliefs. This could be done by changing the invitation letter and its accompanying literature, through national and local publicity campaigns, and by advice given by GPs, practice nurses, and other health professionals. It is essential that such interventions are properly evaluated, preferably in randomised controlled studies.

In the past five years, following the recommendations of the Forrest committee, a national breast screening programme has been set up in the United Kingdom, one of the first of its kind in the world. The aim is to screen women aged 50 to 64 years every three years by means of mammography (breast x ray) to detect breast cancer in its early stages. Evidence from studies conducted in a number of countries suggests that by the year 2000 regular screening for breast cancer could lead to a 25% reduction in mortality from this disease in the population of women invited for screening, a figure that has been adopted as a target in the government's recent white paper The Health of the Nation. In the United Kingdom, a reduction in mortality of this order would mean about 1250 fewer breast cancer deaths each year. However, the success of the programme depends, among other things, on high participation. So far, the overall attendance rate is marginally above the official target of 70%, but there is substantial variation, with take up rates ranging from below 50% in some inner city areas to 80% in suburban and rural areas.

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Accepted for publication June 1993
These figures are for first-round screening; attendance in subsequent rounds is likely to be lower.

There are two sorts of reasons for not attending. Firstly, the registers used by the screening programme are to a varying extent inaccurate and out of date, so a proportion of postal invitations do not reach the women they are intended for. Secondly, not all the women who receive an invitation take up the offer. The study reported here investigated this problem by attempting to identify predictive factors associated with attendance. With a few exceptions, most studies of attendance have used retrospective designs which are open to the criticism that some of the observed differences between attenders and non-attenders may be partly a function of attendance/non-attendance. By contrast, the present study employed a prospective design which rules out this particular threat to validity and allows stronger inferences to be drawn. A sample of women residing in an inner city area were interviewed, or sent a questionnaire, before being sent their first invitation for breast screening. Information was obtained on sociodemographic factors, health behaviours, other health related measures, and attitudes, beliefs, and intentions with regard to breast cancer and breast screening. This is a wider range of variables than has been included in most previous studies and enabled an assessment of the relative importance of the different classes of variables in predicting attendance.

In previous studies, measures of health behaviours have yielded the most consistent findings. A recent review concluded that "the one group of variables that was fairly consistently associated with breast screening participation was the practice of other preventive health behaviors" (p 1107). The findings concerning sociodemographic factors have been rather less consistent. Furthermore, although some studies have included measures of attitudes and beliefs, there has been insufficient emphasis on this potentially important class of variables. Guided by recent approaches to understanding the relationship between attitudes and behaviour, the present study included a comprehensive assessment of women's attitudes, beliefs, and intentions with respect to breast cancer and breast screening, focusing on personalised measures (for example, what they thought would happen to them if they were to go for breast screening) rather than generalised measures (that is, referring to women in general). We expected that such measures would be more predictive of attendance than demographic or other variables. In this paper, we report the results of univariate and multivariate analyses of the factors predicting attendance.

**Methods**

**SAMPLE**

The initial sample consisted of 3291 women aged 50–64 years who were due to be called for breast screening for the first time. The sample was drawn from five screening batches generated by the Lambeth, Southwark and Lewisham Family Health Services Authority (FHSA) and included women registered with 24 general practitioners (GPs) in 11 practices in three health districts (West Lambeth, Camberwell, Lewisham and North Southwark). Women whom the GPs wished to exclude from the screening programme were also excluded from the research.

**DESIGN AND PROCEDURE**

Data collection took place during the period May–August 1990. Up to four months before being invited for screening, the women were either interviewed in their homes or sent a questionnaire through the post. Information on subsequent attendance was obtained from the screening office. A randomised control group of women who were not contacted by either method was included to assess the effect of being interviewed on attendance. The design of the study is shown in the figure.

**Interview sample**

The main method of data collection was by personal interview. A total of 1691 women were allocated to the interview arm of the study from screening batches that were (a) specified sufficiently far in advance to allow the interviewing stage to be concluded before the screening invitations were sent out, and (b) located relatively close to the study base. Although interview was expected to yield a higher response rate than postal questionnaire and to enable more information to be collected, it is also much more expensive. To increase the...
efficiency of data collection, the names and addresses of women allocated to this arm of the study were first checked against the electoral register, and those who could not be matched (23.5%) were excluded. Checks on a random sample of the unmatched addresses indicated that this selection procedure did not introduce significant bias. The reduced sample was randomly allocated to the interview (n = 977) and control (n = 316) conditions. Those in the former group were sent a letter that explained the purpose of the study and informed them that a female interviewer would be calling on them in the next few weeks. (The allocation procedure involved randomly dividing the reduced sample of matches into a large number of smaller units which were then in turn randomly allocated to the interviewers. This meant that the proportion of women allocated to the interview group was not exactly 75%.)

Postal questionnaire sample
Altogether 1600 women from screening batches that were generated at around the same time but that could not be included in the interview arm were allocated to the postal questionnaire sample. This enabled a comparison of the results obtained using two different data collection methods. Since postal questionnaires are a relatively inexpensive method of data collection, the names and addresses of the women in this arm of the study were not checked against the electoral register. The questionnaire, which consisted of an eight sided, A4 size printed booklet, was accompanied by a covering letter and a FREEPOST return envelope; a second mailing to non-responders was done about two weeks after the first mailing.

Measures
The structured interview schedule covered four main areas:
(1) Sociodemographic factors – age; marital status; whether there are any children; age at which the first and last child were born; whether the subject has any educational qualifications; educational level; respondent’s occupation and social class; husband/partner’s occupation and social class; housing tenure; religion; ethnic group.
(2) Health behaviours – smoking; drinking; diet; exercise; dental check-ups; cervical smear tests; breast self-examination; mammography.
(3) Other health related variables – eg perceived health over the previous 12 months; height; weight; body mass index; whether respondent has had a period in the last 12 months; has had a hysterectomy; history of breast disease; current breast symptoms; has known anyone with breast cancer/other kind of cancer; knows someone who has been for breast screening; has read, heard or seen anything recently about breast screening in the media.
(4) Attitudes, beliefs, and intentions with regard to breast and cervical cancer and screening – eg how worried she is about getting breast cancer; perceived risk of breast cancer; perceived consequences of breast screening; perceived effectiveness of breast screening; intention to go for breast screening. Most of the attitude and belief measures used five point scales and were obtained by means of a self-completion questionnaire completed in the presence of the interviewer.

The interview schedule was piloted in a sample of 20 women drawn from a general practice that was not involved in the main study. In addition, information on the straight line and road distance between home and screening centre together with estimated drive-times was provided by Pinpoint Analysis Ltd from the file of addresses and postcodes. Altogether over 120 potential predictors of attendance were examined. The postal questionnaire was a greatly shortened version of the interview schedule.

Final sample
Information on attendance was obtained for the full sample of 3291 women, apart from one who could not be found on the screening office computer. Altogether 731 women were interviewed (75% response rate) and a further 570 returned a postal questionnaire (36% response rate), giving a final sample of 1301 for the analysis of predictors. Of the respondents, 37% had an educational qualification, 48% were classified as non-manual social class by their current or last occupation, 66% were married or living with a partner (26% divorced, separated or widowed; 7.5% single), and 75.5% described themselves as white (13% black). The two samples were similar with respect to social class, marital status, and ethnicity, but the postal questionnaire respondents were less likely to hold an educational qualification (27% vs 45%; $X^2(1) = 43.3$, p < 0.001).

statistical analysis
Statistical analysis was by cross-tabulations and logistic regression using the SPSSPC and EGRET statistical packages. All $X^2$ values reported are likelihood-ratio $X^2$. Because of the large number of significance tests conducted in the analysis of predictors, an alpha level of 0.01 was adopted.

Results
Attendance rates
The attendance rate in the full sample of 3290 was 42%, well below the official target of 70%, and was higher in the interview arm of the study ($X^2(1) = 35.2$, p < 0.001; table 1, last column), presumably reflecting unmeasured differences between the two samples.

The response rate of 75% to interview was more than twice that obtained from postal questionnaire ($X^2(1) = 385.7$, p < 0.001). This was partly due to the different way in which the samples were derived (see the figure) as well as to the different method of data collection. It may also reflect unmeasured sample differences.

The attendance rates in those who responded
had a regular smear test

Drinking
Do you ever have anything alcoholic to drink?

Table 2 Interview sample, univariate analysis: variables significantly related to attendance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response categories</th>
<th>Frequencies</th>
<th>Attendance rate (%)</th>
<th>LR $\chi^2$ p value (df)</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this your own home?</td>
<td>Yes</td>
<td>402 (56)</td>
<td>0.002 (1)</td>
<td>1.63 (1.19, 2.23)</td>
<td></td>
</tr>
<tr>
<td>Have you ever had your breasts x rayed?</td>
<td>No</td>
<td>321 (44)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you ever had a cervical smear test?</td>
<td>Yes</td>
<td>566 (78)</td>
<td>0.00008 (1)</td>
<td>2.08 (1.45, 2.98)</td>
<td></td>
</tr>
<tr>
<td>Have you ever had a bladder smear?</td>
<td>No</td>
<td>64 (8)</td>
<td>0.0003 (1)</td>
<td>2.36 (1.49, 3.75)</td>
<td></td>
</tr>
<tr>
<td>Do you ever have anything alcoholic to drink?</td>
<td>Yes</td>
<td>574 (79)</td>
<td>0.009 (1)</td>
<td>1.64 (1.14, 2.36)</td>
<td></td>
</tr>
<tr>
<td>Drinking frequency</td>
<td>No</td>
<td>157 (21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general, do you go to the dentist for a regular checkup, an occasional checkup, or only when you are having trouble with your teeth? (&quot;Dentist&quot;)</td>
<td>Yes</td>
<td>444 (61)</td>
<td>0.002 (2)</td>
<td>1.66 (1.21, 2.85)</td>
<td></td>
</tr>
<tr>
<td>Have you ever known anyone personally who has had breast cancer? (&quot;Know anyone&quot;)</td>
<td>No</td>
<td>265 (39)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How worried are you about getting breast cancer?</td>
<td>Not worried at all</td>
<td>448 (62)</td>
<td>0.002 (2)</td>
<td>1.15 (0.72, 1.86)</td>
<td></td>
</tr>
<tr>
<td>A bit worried</td>
<td>189 (26)</td>
<td>2.18 (1.25, 3.79)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very worried</td>
<td>86 (12)</td>
<td>2.26 (1.34, 3.77)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think that it is important for you to have a regular smear test?</td>
<td>Yes</td>
<td>515 (73)</td>
<td>&lt;0.000005 (1)</td>
<td>2.81 (1.98, 3.98)</td>
<td></td>
</tr>
<tr>
<td>Which do you think is more important for you: having a regular smear test or having a regular breast scan? (&quot;Importance&quot;)</td>
<td>No</td>
<td>188 (27)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulär breast scan</td>
<td>Yes</td>
<td>116 (16)</td>
<td>&lt;0.000005 (3)</td>
<td>11.18 (5.52, 22.93)</td>
<td></td>
</tr>
<tr>
<td>Equally important</td>
<td>398 (55)</td>
<td>7.71 (4.24, 14.03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular smear test</td>
<td>Yes</td>
<td>143 (20)</td>
<td>4.42 (3.18, 8.47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither/don't know</td>
<td>64 (9)</td>
<td>2.72 (1.55, 4.75)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you got a letter from your doctor inviting you to go for breast screening, do you think you would attend? (&quot;Intention 1&quot;)</td>
<td>Yes</td>
<td>485 (67)</td>
<td>&lt;0.000005 (2)</td>
<td>6.57 (4.06, 10.01)</td>
<td></td>
</tr>
<tr>
<td>I would definitely go for breast screening if it was offered to me</td>
<td>No</td>
<td>129 (18)</td>
<td>3.09 (1.85, 5.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived consequences</td>
<td>Yes, definitely</td>
<td>107 (15)</td>
<td>4.27 (2.31, 5.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not sure/probably not/definitely not</td>
<td>228 (32)</td>
<td>4.7 (2.53, 8.57)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk</td>
<td>Strongly agree</td>
<td>62 (9)</td>
<td>4.54 (2.85, 7.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived effectiveness</td>
<td>Not sure/disagree/strongly disagree</td>
<td>362 (52)</td>
<td>3.64 (2.40, 5.52)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norm?</td>
<td>Multi-item scale</td>
<td>&lt;0.000005 (1)</td>
<td>2.35 (1.70, 3.27)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| * Unadjusted (univariate) odds ratios. For each categorical variable, these estimate the odds of attending for screening in a given category relative to the final category. Each of the four multi-item scales (perceived consequences, perceived risk, perceived effectiveness, and subjective norm) was computed as the mean of a number of individual items scored from 1 to 5, and for these variables the odds ratios estimate the change in the odds of attending that is associated with a change of 1 scale point in the composite scale. 
| † The sample size for this variable is 537. Sample sizes for the other variables in the table range from 694 to 731. |
who said that they would go for breast screening and those who thought that it was important for them to have a regular smear test or a regular breast screen were more likely to attend. Women who saw the positive personal consequences of breast screening (such as reassurance) as relatively likely and the negative consequences (such as pain and embarrassment) as relatively unlikely, were more likely to go for screening. Those who saw themselves as more at risk for breast cancer and those who believed that breast screening was effective in detecting early signs of breast cancer were also more likely to go for breast screening. The “subjective norm” measure was also related to attendance; women who thought that significant others (their husband or partner, their children, and their doctor) would want them to go for breast screening were more likely to attend. The question about worry yielded a non-linear relationship. The highest attendance occurred in the group who said that they were “a bit worried”; women at the two extremes were less likely to go for screening.

In addition to age and alcohol consumption, a number of other breast cancer risk factors were also assessed: late age at first pregnancy or no children; personal history of breast disease; having a close blood relative with breast cancer; obesity (based on self-reported weight and height); and late age at menopause. These were unrelated to attendance, with one minor exception. The small number of women who had had breast cancer (11 of 731) were less likely to go for breast screening on this occasion, presumably because they were already under care and were being screened or followed up outside the call-recall system.

In order to derive a minimal adequate subset of predictors, all the variables in table 2 were entered in a forward stepwise logistic regression analysis. This yielded a model consisting of eight predictor variables, which are shown in table 3. The final model was significant ($\chi^2(12) = 133.7, p < 0.00005$), the deviance was non-significant ($\chi^2(456) = 439.8, p = 0.699$), and 77% of the sample were correctly classified (compared with 70% simply by predicting that everyone would attend for screening). This modest improvement in prediction would be expected to be smaller if the model were applied to a new sample. Backward stepwise logistic regression yielded the same set of predictors but with the addition of subjective norm and perceived importance of having a cervical smear.

Eight variables listed in table 2 as significant predictors of attendance in the univariate analyses did not appear in the multivariate model. In the case of drinking frequency, this was because of its association with the variable “Ever drink”. For most of the other variables, further analysis suggested that they were excluded from the final model by virtue of their association with intention 1 and/or importance. Comparing tables 2 and 3, it is worth noting that previous breast screen showed a sizable change in the estimated odds ratio; controlling for the other variables seemed to strengthen its effect on attendance.

### Table 3 Interview sample, multivariate analysis of predictors of attendance: variables in the final model produced by forward stepwise logistic regression analysis (n=469)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>p value (df)</th>
<th>Adjusted odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Yes, definitely” v ref cat</td>
<td>1.824</td>
<td>0.359</td>
<td>&lt;0.00005 (2)</td>
<td></td>
</tr>
<tr>
<td>“Yes, probably” v ref cat</td>
<td>0.532</td>
<td>0.402</td>
<td>&lt;0.00005 (1)</td>
<td></td>
</tr>
<tr>
<td>Previous breast screen</td>
<td>2.274</td>
<td>0.311</td>
<td>&lt;0.00005 (1)</td>
<td></td>
</tr>
<tr>
<td>Importance</td>
<td>0.007</td>
<td>0.007</td>
<td>&lt;0.00005 (3)</td>
<td></td>
</tr>
<tr>
<td>Regular breast screen v ref cat</td>
<td>2.145</td>
<td>0.610</td>
<td>0.004 (1)</td>
<td></td>
</tr>
<tr>
<td>Equally important v ref cat</td>
<td>1.104</td>
<td>0.495</td>
<td>0.025 (1)</td>
<td></td>
</tr>
<tr>
<td>Regular smear test v ref cat</td>
<td>0.508</td>
<td>0.511</td>
<td>0.526 (1)</td>
<td></td>
</tr>
<tr>
<td>Ever drink</td>
<td>0.605</td>
<td>0.290</td>
<td>0.037 (1)</td>
<td></td>
</tr>
<tr>
<td>Dentist</td>
<td>0.472</td>
<td>0.249</td>
<td>0.058 (1)</td>
<td></td>
</tr>
<tr>
<td>Worried</td>
<td>0.014</td>
<td>0.014</td>
<td>0.014 (1)</td>
<td></td>
</tr>
<tr>
<td>Not worried at all v ref cat</td>
<td>0.310</td>
<td>0.350</td>
<td>0.375 (1)</td>
<td></td>
</tr>
<tr>
<td>A bit worried v ref cat</td>
<td>1.096</td>
<td>0.416</td>
<td>0.004 (1)</td>
<td></td>
</tr>
<tr>
<td>Know anyone</td>
<td>0.533</td>
<td>0.250</td>
<td>0.030 (1)</td>
<td></td>
</tr>
<tr>
<td>Previous smear</td>
<td>0.935</td>
<td>0.448</td>
<td>0.030 (1)</td>
<td></td>
</tr>
</tbody>
</table>

ref cat = reference category.

PREDICTORS OF ATTENDANCE: POSTAL QUESTIONNAIRE SAMPLE

Table 4 lists the significant predictors in the postal questionnaire sample. Eight of the variables found to be predictive of attendance in the interview sample were also assessed on the postal questionnaire (although for some items the wording of the question and the response categories were simplified). Five of these were significantly ($p < 0.01$) predictive of attendance in the questionnaire sample: the two intention questions; previous breast screening; previous smear test; and the multi-item scale measuring the perceived consequences of breast screening. (Of the remaining three, the multi-item subjective norm scale was related to attendance but only at the 0.05 level, the “worried” question was associated with attendance only at a marginal level ($p = 0.06$) – though the non-linear relationship was still evident – but having known someone with breast cancer was not significantly related to attendance.)

Thus, there was reasonable consistency between the results yielded by the two different methods of data collection. However, analysis of the postal questionnaire sample yielded three new predictors: those women who returned the questionnaire in response to the first mailing – presumably an indicator of interest or motivation – were more likely to attend; women who were married or single were more likely to attend than divorced, separated, or widowed women; and black women had a higher than average attendance rate.

Forward stepwise logistic regression yielded...
the model in table 5. Of the significant predictors in the model, intention 1, previous breast screen, and previous smear also occurred in the multivariate model for the interview sample. Backward stepwise analysis produced the same model. The model was significant ($\chi^2(7) = 102.8$, $p < 0.00005$), the deviance was non-significant ($\chi^2(473) = 430.9$, $p = 0.918$), and 79% of the sample were correctly classified (compared with 76% in the absence of any information on predictors). Three variables listed in table 4 as significant univariate predictors did not appear in the final multivariate model: mailing, intention 2, and perceived consequences. Further analysis indicated that this was due largely to their association with intention 1.

### Discussion

The overall attendance rate in our sample was 42%, which is well below the 70% target but fairly typical of first-round attendance rates in the three districts we studied. The low attendance rate is partly accounted for by inaccuracies in the FHSA register. In the interview arm of the study, nearly a quarter of the names and addresses could not be matched with the electoral register. If these unmatched names and addresses are excluded, the overall attendance rate among women in this arm of the study increases from 47% to 58%. We have discussed the problem of inaccurate registers elsewhere. The focus of the present paper is on the factors predicting attendance in women who receive the invitation.

### SOCIODEMOGRAPHIC FACTORS

Of the several indicators of socioeconomic status assessed in this study, only housing...
Prospective study of predictors of attendance for breast screening in inner London

Tenure was found to be predictive of attendance, women living in rented accommodation were less likely to go for breast screening. However, the effect was not robust enough to persist in the multivariable analysis. There was no evidence in this study that women who attend for breast screening are better educated or more likely to be in non-manual occupations. Although social class differences are frequently found in take-up of other health services and on other health-related measures, previous studies of breast screening participation have been equivocal in this respect. Three studies conducted in Edinburgh found a significant positive association between attendance and socioeconomic status based on either occupational classification or small area statistics; two other British studies did not. Two studies in which educational level was assessed found no relationship with attendance. It is possible that receiving an invitation through the post has the effect of reducing the social class differential in uptake by comparison with other health services where participation requires an unprompted response.

There was no evidence that attenders and non-attenders differed with respect to age. Previous studies have usually found an inverse relationship between age and participation in breast screening, although in many cases the age-range studied was wider than 50–64 years and there are at least two studies in which no relationship was observed. Our findings are consistent with unpublished local data based on KC62 returns, which also indicate the absence of any systematic age trend.

Two other demographic factors, marital status and ethnic group, were found to be related to attendance, although only in the postal questionnaire sample. Married or single women were more likely to attend than divorced, separated, or widowed women; and black women had a higher than average attendance rate. Both effects persisted in the multivariate analysis, indicating that they are independent of the other predictors. Marital status has received attention in several earlier studies, with inconsistent results. Where an association with attendance has been found, it has been in the direction of married women being more likely to participate. Although concern is sometimes expressed that women from minority ethnic groups, and Asian women in particular, may have relatively low participation rates in the breast screening programme, there is little published evidence that bears on this question. This is clearly an area where more research is needed.

Risk factors for breast cancer

Some commentators have suggested that screening programmes tend to attract those who are least at risk for the disease being screened – so called “reverse targeting.” However, there was little or no evidence in this study that women who were at lower risk for breast cancer were more (or less) likely to attend for breast screening than women at higher risk for the disease. Women’s perceived risk of breast cancer, on the other hand, was related to the probability of attendance, with those who felt more vulnerable being more likely to go.

Health behaviours

Simple measures of exercise, smoking, diet change, and breast self-examination were not related to attendance. On the other hand, drinking, going to the dentist, cervical smear tests, and previous mammography were. Women who had been for breast screening within the previous 12 months were less likely to go on this occasion. This is in keeping with recommended practice and is not a cause for concern.

Visiting the dentist for regular check-ups and going for smear tests have been found to be related to attendance for breast screening in several studies. Unlike health maintenance behaviours such as taking regular exercise, both are behaviours that serve to monitor one’s state of health or to detect illness and both involve periodic contact with health care professionals. Going for a cervical smear test, in particular, is very similar to going for a breast screen. There may be common factors underlying these two behaviours, for example concern about women’s health problems or a tendency to comply with invitations from health professionals. In addition, going for a cervical smear test may lead to changes in attitudes and beliefs that make women more receptive to the idea of going for breast screening. This association between breast and cervical screening may be an advantage in efforts to improve the uptake of one or both types of screening. Encouraging young women to have a regular smear test may pay dividends in middle age when they receive their first invitation to go for breast screening. It also supports the idea of combining the two systems, which currently operate independently, into a single cancer screening programme for women.

Attitudes, beliefs, and intentions

Several of the attitude and belief measures were predictive of attendance, including beliefs about the personal consequences of breast screening (for example, reassurance; early detection if something is wrong; pain; embarrassment), beliefs about the effectiveness of breast screening, beliefs about one’s own chances of getting breast cancer, and beliefs about the views of significant others (“subjective norm”). Some of these beliefs may be amenable to change through modifying the health education leaflets that accompany the invitation or advice delivered by GPs and other health professionals. The results suggest that informational messages should emphasise the effectiveness of breast screening in the early detection of abnormalities, the advantages of early treatment, and the reassurance conferred by receiving a negative result, and should try to address women’s concerns about
experiencing discomfort and embarrassment. Although our findings also suggest that increasing women's perceived risk of getting breast cancer could increase the likelihood of attendance, this would need to be done with care since it seems that women who are very worried about getting breast cancer are less likely to attend for screening. The predictive role of the "subjective norm" measure suggests that another way to encourage women to attend might be by influencing the attitudes and behaviour of their husbands, partners, or children.

The two best predictors of breast screening uptake were intentions to go for breast screening and perceived importance of having a regular smear test/breast screen. No studies have assessed perceived importance, and only one study has included a measure of behavioural intentions, where it also emerged as the single best predictor of attendance. Although this finding may seem trivial, it may be useful for predictive purposes and, more importantly, it supports the notion that going or not going for breast screening can be regarded as a decision that is potentially susceptible to influence by provision of appropriate information. (Had intentions been found to be unrelated to subsequent attendance, a less optimistic conclusion would have been in order.) The variables most closely related to importance and intention were the specific personalized beliefs referred to above. Although based on items assessed at the same time on the same questionnaire, this finding is consistent with the idea that changing these specific beliefs would influence attendance by way of their effects on these global variables, in accordance with currently popular attitude-behaviour models.

CONCLUSION

This study highlights the problems faced by the breast screening programme in inner city areas. The overall attendance rate in our sample was under 50%, much lower than the official target but fairly typical of first round attendance rates in the study area. One important factor depressing uptake in inner city areas is the inaccuracy of the FHSA registers. In this study, almost one quarter of the names and addresses of women in the interview arm of the study could not be matched with the electoral register, suggesting a substantial degree of inaccuracy in the FHSA register. Making an adjustment for the likely number of wrong addresses improved the attendance rate to around 60%. The problem of inaccurate and out of date registers can be tackled by encouraging GPs' patients to inform the surgery of changes of address and encouraging practice staff to record these changes and to inform the FHSA. Checking of the breast screening registers against the electoral register may also provide a partial solution.

While acknowledging the importance of accurate population registers, the present paper focused on the factors predicting attendance among women who receive the invitation. The results suggest that attenders and non-attenders differ in two broad areas: the other health related behaviours they engage in and the attitudes, beliefs, and intentions they have towards breast cancer and breast screening. Our analysis was necessarily based on those women who gave an interview or returned a postal questionnaire. As expected, the attendance rate in these respondents (70%) was higher than in the full sample, even after adjusting for inaccurate addresses. Based as they are on the women who responded, our findings and conclusions may not be generalisable to the non-responders. It is possible that factors other than attitudes and health behaviours are associated with attendance in women who do not respond to questionnaires, or that these factors assume less importance in this group. Although this is a limitation of our study, our findings nevertheless offer hope that women can be encouraged to attend and to re-attend by targeting the relevant attitudes and beliefs. This could be done by modifying the invitation letter and its accompanying health education leaflet, through national and local publicity campaigns, and through advice given by GPs, practice nurses, and other health professionals in their routine contact with women in the target population. It is essential that such interventions are properly evaluated, preferably in randomised controlled studies. For example, the effect of brief opportunistic advice by GPs could be assessed by randomly assigning practices to "advice" or "control" conditions. GPs in the advice condition would be asked to raise the issue of breast screening with all women patients in the eligible age range. GPs in the control condition would continue as before. The effect on attendance rates would be monitored. Such a study could be extended by asking GPs in the advice condition to refer women in the 50–64 years age group to the practice nurse who could give more intensive advice and encouragement.

This research was funded by the Imperial Cancer Research Fund (ICRF). We would like to thank the following for their contribution to the study: Professor Michael Baum of the Institute of Cancer Research and the Royal Marsden Hospital, London, and Dr Heather Nunmley, Dr Mike Mitchell, and Mrs Pam Bowell of the South East London Breast Screening Service for their help, advice and support; Mrs Barbara Clark of Lambeth, Southwark and Lewisham FHSA; Mr Douglas Alman of ICRF for statistical advice; Deborah Bactawar, Ann Brody, Francesca Buglioni, Janet George, Jan Herd, Janet McMullen, Angela Richards, Joyce Sullivan, and Natasha Wilson for their help with the interviewing; Mrs Pamela Sutton for unpaid clerical help; our colleagues in the Health Behaviour Unit who commented on an earlier draft of the paper; the general practitioners who were involved in the study; and all the women who participated.

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