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Bonfill Cosp X, Marzo Castillejo M, Pladevall Vila M, Marti J, Emparanza JI

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[Intervention Review]

Strategies for increasing the participation of women in community breast cancer screening

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ABSTRACT

Background

Strategies for reducing breast cancer mortality in western countries have focused on screening, at least for women aged 50 to 69 years. One of the requirements of any community screening program is to achieve a high participation rate, which is related to methods of invitation. Therefore, it was decided to systematically review the scientific evidence on the different strategies aimed at improving women's participation in breast cancer screening programs and activities.

Objectives

To assess the effectiveness of different strategies for increasing the participation rate of women invited to community (population-based) breast cancer screening activities or mammography programs.

Search methods

MEDLINE (1966-2000), CENTRAL (2000), and EMBASE (1998-1999) searches for 1966 to 1999 were supplemented by reports and letters to the European Screening Breast Cancer Programs (Euref Network).

Selection criteria

Both published and unpublished trials were eligible for inclusion, provided the women had been invited to a community breast screening activity or program and had been randomised to an intervention group or a control group with no active intervention.

Data collection and analysis

We identified 151 articles, which were reviewed independently by two people. The discrepancies were resolved by a third reviewer in order to reach consensus. Thirty-four studies were excluded because they lacked a control group; 58 of the other 117 articles were considered as opportunistic and not community-based; 59 articles, which reported 70 community-based randomised controlled trials or clinical controlled trials, were accepted. In 24 of these, the control group had not been exposed to any active intervention, but 8 of the 24 had to be excluded because the denominator for estimating attendance was unknown. At the end, 16 studies constituted the material for this review, although two studies were further excluded because their groups were not comparable at baseline. Data from all but one study were based on or converted to an intention-to-treat analysis. Attendance in response to the mammogram invitation was the main outcome measure.

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Main results

The evidence favoured five active strategies for inviting women into community breast cancer screening services: letter of invitation (OR 1.66, 95% CI 1.43 to 1.92), mailed educational material (Odds Ratio(OR) 2.81, 95% Confidence Interval (CI) 1.96 to 4.02), letter of invitation plus phone call (OR 2.53, 95% CI 2.02 to 3.18), phone call (OR 1.94, 95% CI 1.70 to 2.23), and training activities plus direct reminders for the women (OR 2.46, 95% CI 1.72 to 3.50). Home visits did not prove to be effective (OR 1.06, 95 % CI 0.80 to 1.40) and letters of invitation to multiple examinations plus educational material favoured the control group (OR 0.62, 95 % CI 0.32 to 1.20).

Authors' conclusions

Most active recruitment strategies for breast cancer screening programs examined in this review were more effective than no intervention. Combinations of effective interventions can have an important effect. Some costly strategies, as a home visit and a letter of invitation to multiple screening examinations plus educational material, were not effective. Further reviews comparing the effective interventions and studies that include cost-effectiveness, women's satisfaction and equity issues are needed.

PLAIN LANGUAGE SUMMARY

Strategies for increasing the participation of women in community breast cancer screening

Screening aims to identify people who might have a disease, by testing a group of people for signs of disease. Breast cancer screening with mammography has focused on women aged 50 to 69 years. The review of trials found that a letter of invitation, mailed educational material, a phone call and some combined actions (such as a letter of invitation plus a phone call and training activities plus reminders) all seem to increase numbers of women participating. However it is not known which of these work better. Other interventions (such as a home visit) have not been proven to work.

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BACKGROUND

Breast cancer is responsible for significant morbidity, and its incidence and mortality are increasing in many countries (Parkin 1997). Efforts in reducing breast cancer mortality cancer have focused on early diagnosis of the disease to allow more effective and less aggressive treatments. Early treatment is beneficial, as long-term survival is quite low when the disease is diagnosed in advanced or metastatic stages (Battista 1999). On the other hand, risk factors are either difficult to change (such as those associated with reproduction) or not well understood. In addition, there has been widespread consensus on the benefits of screening mammography for women aged 50 years and over, driven from well-known and respected clinical trials, although this evidence has been recently and fully challenged (Gotzsche 2000).

So far, many programs and health plans in many countries and regions have assumed that breast cancer screening at a community level must be a priority, at least for women aged 50 to 69 years. Despite the consensus that breast cancer screening must be promoted to be successful, first some structural and functional requirements need to be met. A participation rate of at least 70% is one of the established goals. Lower levels of participation are undesirable for a population-based screening program because the cost-effectiveness of the program would be too low. Less representative participation associated with better education and higher social class raises questions of equity.

Participation in a breast cancer screening program can be influenced by factors either to those related to the women's eligibility (age, socioeconomic group, awareness of prevention programs, etc.) or aspects of the screening services (such as the methods of invitation). The type of invitation used in each community breast cancer screening program is influenced by the methods available and used to identify eligible women (electoral roll, general practice list, etc.) and the data that each contains (address, phone number, etc.). The strategy of invitation may play an important role in achieving a high level of participation, but currently information is lacking about which invitation strategy is most effective.

Therefore, we systematically reviewed the scientific evidence on the different strategies aimed at improving community participation in breast cancer screening programs and activities.

OBJECTIVES

The primary objective of this review was to assess the effectiveness of different strategies for increasing the participation rate of women invited to community breast cancer screening activities or mammography programs. The review assesses whether using different methods of contact, appointment, reminders or other activities will modify participation rates. The group was compared with a control group having no intervention. The usefulness of combinations of the strategies was also analysed.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised or controlled clinical trials assessing the effect of different strategies of recruitment into any community breast cancer screening activity or program, compared with no active intervention. Opportunistic interventions, that is, those arising from recruitment when women seek help for an non-specific problem in any health care setting, have not been included.

Types of participants

Participants were all women who had been invited to any community breast cancer screening activity or program, initially or at successive screening rounds. Women who had not been identified through a population database were excluded.

Types of interventions

Interventions comprised any planned strategy or any combination of strategies implemented by health managers or professionals responsible for community breast cancer screening activities or programs aiming to recruit from a target population: ways of establishing contact or attempting to increase participants (letters, phone calls, home visits, initiatives of general practitioners, information brochures, and so on). Inviting women into a breast cancer screening program could be either independent or combined with invitations to other preventive examinations.

Types of outcome measures

The main outcome measure was the attendance achieved in the groups exposed to recruitment strategies. Participants were those who attended an appointment for a mammogram (independently of their previous exposure to mammograms, physical examination or any other examination or investigation).

Search methods for identification of studies

See: Breast Cancer Collaborative Review Group search strategy

Studies were identified by electronic searches in CENTRAL (issue 1, 2000), MEDLINE (1966-2000), EMBASE (1988-99).

The search strategy was defined for MEDLINE and was adapted further to any other database used. OVID was used to search in all electronic databases:

#1 controlled trial in pt
#2 clinical trial in pt
#3 meta-analysis in pt
#4 explode "Clinical-Trials"/ all subheadings
#5 "Research-Design"/ all subheadings
#6 "Double-Blind-Method"
#7 "Meta-Analysis"
#8 "Random-Allocation"
#9 "Single-Blind-Method"
#10 (clinic* near trial*) in ti,ab
#11 ((singl* or doubl* or trebl* or tripl*) near (blind* or mask*)) in ti,ab
#12 "Placebos"/ all subheadings
#13 placebo* in ti,ab
#14 random* in ti, ab
#15 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or 14
#16 tg=comparative-study
#17 "Evaluation-Studies"
#18 explode "Program-Evaluation"/ all subheadings
#19 "Reproducibility-of-Results"
#20 "Follow-Up-Studies"

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#21 "Prospective-Studies"
#22 (control* or prospectiv* or volunteer*) in ti,ab
#23 #16 or #17 or #18 or #19 or #20 or #21 or #22
#24 #23 or #15
#25 (tg=human) not (tg=animal)
#26 #25 and #24
#27 "breast neoplasms"/all subheadings
#28 (breast near (neoplasm* or tumour* or tumor* or cancer* or carcinom* or onco*)) in ti,ab
#29 #27 or #28
#30 "Mass-screening"/all subheadings
#31 "neoplasms"/prevention-and-control
#32 explode "mammography"/all subheadings
#33 mammograph* in ti,ab
#34 screen* in ab,ti
#35 #30 or #31 or #32 or #33 or #34
#36 #29 and #35
#37 "Patient-Compliance"/ all subheadings
#38 "Patient-Participation"/ all subheadings
#39 "Patient-Acceptance-of-Health-Care"/ all subheadings
#40 (patient near (compliance or participat*)) in ti,ab
#41 ((letter or mail* or phone* or telephone*) near (invit* or send or sent)) in ti,ab
#42 attendan* in ti,ab
#43 explode "Appointments-and-Schedules"/ all subheadings
#44 (appointment* or recruitment* or invit*) in ti,ab
#45 #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44
#46 #45 and #26 and #36

CENTRAL was searched using the following strategy:

BREAST-NEOPLASMS*:ME
MASS-SCREENING*:ME
PREVENTIVE-HEALTH-SERVICES*:ME
HEALTH-PROMOTION*:ME
MAMMOGRAPHY*:ME
(#1 or #2) or #3) or #4) or #5)
PATIENT-ACCEPTANCE-OF-HEALTH-CARE*:ME
REMINDER-SYSTEMS*:ME
APPOINTMENTS-AND-SCHEDULES*:ME
CORRESPONDENCE*:ME
MOBILE-HEALTH-UNITS*:ME
(#7 or #8) or #9) or #10 or #11)
LETTER*
MAIL*
PHONE*
TELEPHONE*
INVIT*
SEND*
SENT*
ATTENDAN*
APPOINTMEN*
RECRUITM*
(#13 or #14) or #15) or #16)or #17)or #18) or #19)or #20)or#21)or #22)
(#6 and #11)and #23)

The combination of these searches yielded 547 articles. We also reviewed the reference list of studies that were initially selected for inclusion and of 4 existing meta-analyses related to the topic of this review (Snell 1996; Wagner 1998; Mandelblatt 1999; Yabroff 1999). Reports and letters to the European Screening Breast Cancer Programs' coordinators identified through the Euref Network Database and contacts with other authors identified 2 additional studies (Saigi 1995; Giorgi 1999). No hand searching identification of other studies was conducted.

Data collection and analysis

The protocol previously published was adapted during development of this review. Specifically, we focused our analyses on the effectiveness of different strategies for inviting women to the breast cancer mammography services compared with no intervention. During the initial stages of our work, we had not planned to discriminate between actions addressed to a defined target population and opportunistic interventions, but we then felt it necessary to distinguish them. Besides that, we found more studies than we expected, and to split the review into this and other reviews could allow us to later compare the specific interventions.

In addition, although we had planned to include all studies on any breast cancer screening activity in our protocol, we later decided to focus on mammography studies exclusively to increase consistency.

The 547 articles identified through the explicit search strategies were registered in a ProCite® database. According to the abstract content, two reviewers (MM and JM) selected articles specifically focused on the topic of this review. This strategy identified 151 articles. These articles were reviewed, and 34 were excluded because they lacked a control group. In case of doubt, the methods section of the original article was reviewed. The source, institution, authors and results of the studies were not taken into account in accepting the review. In case of disagreement about the inclusion of a study, it was discussed jointly.

The remaining 117 articles were randomly distributed among four reviewers (MM, JM, XB, JE), so that each article was reviewed independently by two different people. Discrepancies were solved between the corresponding reviewers. If there was a major disagreement between different assessments, it was resolved by a third reviewer (XB). In the case of exclusion of a study, the reasons were registered. All of the reviewers were trained and familiar with the methodology of systematic reviews and the Cochrane Collaboration. Two of them (XB and MM) have run some breast cancer screening programs directly.

The data collection forms used in this review had been tested previously and adapted accordingly.

RESULTS

Description of studies

Fifty-eight of 117 reviewed articles whose reported trials were considered as opportunistic were excluded. They focused on women who visited a clinical setting rather than being recruited specifically for screening, or their main aim was to modify professional practice.

The remaining 59 articles, which reported 70 randomised clinical trials with a community perspective (that is, they included women registered in a breast cancer screening program, a Family Health Centre, Health Maintenance Organisation, electoral roll, etc.) were initially accepted if the randomisation was individual (every single woman was the randomisation unit) or by cluster (by

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medical practice, community, etc.). However, the control group was considered as confounded (had been exposed to an intervention) in 46 out 70 studies and independent (had not been exposed to any kind of intervention) in only 24 studies. Eight of the 24 studies (Becker 1989; Burack 1996 (1); Champion 1994; Champion 1995 (1); King 1995; Mayer 1994; Rakowski 1998; Turnbull 1992) were additionally excluded because the denominator for estimating attendance rates was unknown, and efforts to obtain data from authors were not fruitful. Therefore, the remaining 16 trials were critically appraised.

Risk of bias in included studies

No scale for assessing the quality of included studies was used. The reviewers checked whether the studies were truly randomised trials or controlled clinical or community trials by assessing the methods of comparing the groups at baseline. Because the details of randomisation were not described in most studies, these studies were classified as level B for quality (The Reviewers' Handbook)

The interventions were grouped according to the different invitation strategies, whether implemented individually (i.e. invitation letter) or combined (i.e. invitation letter plus phone call).

The characteristics of the women in the intervention and the control groups were comparable in 12 of the 16 critically appraised studies. In two studies (Bodiya 1999; Irwig 1990) group characteristics were not described, but we decided to maintain their data in the comparison analysis, while later performing a sensitivity analysis. Two other trials (Crane 1998; Ornstein 1991) were definitively excluded because their groups were not comparable.

In the end, therefore, 14 studies provide the data analysed in this review. The studies varied, particularly in their time intervals and the women's previous participation in breast cancer screening. For analysis, the temporal attendance data were classified in two levels: within 12 months of the invitation (most studies) and within 24 months, because the most usual mammogram screening intervals are between 12 and 24 months. In some cases, the reviewers had to extrapolate from the data described to calculate the results corresponding to an intention-to-treat analysis. We planned to avoid merging individual randomised studies with cluster randomised studies, but we did not have to perform a sensitivity analysis because the only cluster randomised study (Atri 1997) was the only study within its comparison group. Information about the women's satisfaction was not found in any included study.

Effects of interventions

In 5 out of 7 comparisons, the evidence favoured the active strategies, whose aim was a higher rate of recruitment of women into breast cancer screening, compared with what was observed for the respective control groups. At 12 months after the invitation, the proportion of women who underwent a mammogram in the groups exposed to an active intervention was statistically significantly higher than in the control groups (the values of the odds ratios varied, depending on the interventions, between 1.66 and 2.81).

The comparison that assessed the effectiveness of an invitation letter plus educational material, based on one study (Clementz 1990), found a higher attendance in the control group, although the result lacked statistical significance. The comparisons that assessed the effectiveness of home visits, based on two studies (Hoare 1994; Sung 1992), slightly favoured the intervention but with no statistical significance.

Letters of invitation compared with control

Overall, the five studies comparing different types of invitation letter (signed by different people) with no intervention (Bodiya 1999; Mohler 1995; Somkin 1997; Sutton 1994; Turnbull 1991) had 2451 women in the intervention group and 1715 in the control group. The odds ratio in relation to the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation', was 1.66 (95% CI 1.43 to 1.92). Heterogeneity was not statistically significant. A sensitivity analysis excluding Bodiya's study increased the odds ratio slightly to 1.71 (95% CI 1.43 to 1.99) and increased the homogeneity.

Only one study used a 24-month interval (Irwig 1990), with 228 and 152 women in the intervention and control groups, respectively. The odds ratio was 4.10 (95% CI 2.57 to 6.54).

Letters of invitation to multiple examinations plus educational material compared with control

The one study that compared sending a letter of invitation plus educational material with no intervention (Clementz 1990) had 116 women in the intervention group and 104 in the control group. The breast cancer screening invitation was part of a combined pack of screening interventions (fecal occult testing, Papanicolau smears, etc.), and the outcome assessment was performed by auditing the medical charts instead of registering the attendance directly. The odds ratio for the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation', was 0.62 (95% CI 0.32 to 1.20), with no statistical significance.

Mailed educational material compared with control

The one study comparing the benefits of sending educational material with no intervention (Lerman 1992) had 305 women in the intervention group and 240 in the control group. The odds ratio for the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation', was 2.81 (95% CI 1.96 to 4.02), which was statistically significant.

Invitation letter plus phone call compared with control

The three studies comparing an invitation letter plus a phone call to the target women (Bodiya 1999; Janz 1997; Lantz 1995) had 739 women in the intervention group and 751 in the control group. The odds ratio for the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation', was 2.53 (95% CI 2.02 to 3.18), which was statistically significant. Heterogeneity was not statistically significant. A sensitivity analysis excluding Bodiya's study increased the odds ratio to 2.53 (95% CI 1.98 to 1.99), and homogeneity was greater.

Phone calls of invitation compared with control

The two studies comparing telephone calls with no intervention (Davis 1997 (1); Mohler 1995) had 2812 women in the intervention group and 1223 in the control group. The odds ratio for the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation,' was 1.94 (95% CI 1.70

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to 2.23), which was statistically significant. Heterogeneity was not statistically significant.

Training activities plus women reminders compared with control

The one study comparing a training program plus a reminder with no intervention (Atri 1997) had 995 women in the intervention group and 1069 in the control group. The odds ratio for the outcome, 'attendance in response to the mammogram invitation during the 12 months after the invitation', was 2.46 (95% CI 1.72 to 3.50), which was statistically significant. However, the study (Atri 1997) was a cluster-randomised study.

Home visits compared with control

The two studies comparing the effectiveness of home visits to targeted women with no intervention included 427 women in the intervention group and 421 in the control group. The odds ratio for the outcome, 'attendance in response to the mammogram invitation in the 12 months after the invitation,' was 1.06 (95% CI 0.80 to 1.40), with no statistical significance. Heterogeneity was not statistically significant.

DISCUSSION

Since the 1960s, several trials that, in principle, showed the potential effectiveness of population breast cancer screening among women aged over 50 years have been published. During recent decades, many community programs and activities have been organised worldwide to offer that kind of preventive service. Concern about attracting the greatest number of targeted women into breast screening services has been constant. The goal of benefiting as many women as possible and achieving reasonable cost-effectiveness has stimulated diverse initiatives, and fortunately, related research too. A substantial part of this research has aimed to assess the diverse invitation strategies for increasing women's participation in breast cancer screening.

Some initiatives have been integrated into an ongoing breast cancer screening program, designed to cover a population defined by age, geographical residence, insurance coverage, etc. These interventions have aimed to directly increase women's participation or, alternatively, to act on intermediate agents, particularly doctors. In contrast, other contexts have been quite different: the screening services have been implemented in an opportunistic way. This means that only women attending the health services for any other unspecified reason have been offered screening, usually by doctors. This strategy, the only one possible in some cases, departs clearly from the community perspective mentioned before.

Because of the community strategy and the opportunistic strategy are so divergent, this review focuses on the former exclusively. As has been explained, studies that lacked a population base have been excluded. However, we did consider any study whose aim was to study the effectiveness of different community interventions, whether they were integrated into an accredited breast cancer screening program or implemented in a less stable setting, and whether they constituted a first invitation or a reminder.

We accepted only randomised or controlled clinical trials, whether the randomisation unit was the individual woman or a cluster group. At the end of the selection process only one cluster-randomised study (Atri 1997) was included because it was the only study within its group and, therefore, it did not create any conflict with any other individual randomised study. Detail about the process of randomisation was lacking in most studies, perhaps because the opportunity for manipulating or altering the results are considered much lower than in conventional clinical studies. An alternative explanation could be that many authors underestimate the importance of providing all the necessary details about randomisation, as requested in the CONSORT statement (Begg 1996). Whatever the reason, it is a methodological limitation that must be explicitly mentioned.

The process of searching, obtaining, and classifying the articles was time-consuming, but the reward was identifying more studies than some related meta-analyses (Mandelblatt 1999; Yabroff 1999; Wagner 1998; Snell 1996). The number of studies finally fulfilling the inclusion criteria that we were able to identify convinced us about the convenience of splitting one potential review into several. Therefore, this current review compares the effectiveness of any community intervention with the effects observed in a pure control group, that is, a group with no intervention. The possible comparisons among the strategies proven to be effective will be undertaken in future reviews, and we envisage that a final overview of all the reviews conducted could be useful at a later stage.

The diversity of the proposed interventions (some were only letters, written by different people; others combined two or three interventions; some were addressed to women, others to health professionals) did not create insurmountable difficulties when data were pooled and the results analysed, because the most common outcome was an effective response to the invitation (attendance for mammogram). Any other information complementary to that outcome was absent in the great majority of studies, and no one reported on the satisfaction of the invited women. Participation probably depends in some way on the women's perceived satisfaction, but this review had no data for addressing this outcome specifically.

The required analyses of comparability between groups of included studies verify the correctness of the randomisation process in all of them, except in two (Bodiya 1999; Irwig 1990), in which the pertinent information was not provided. In relation to these two studies, we adopted a conservative approach and planned a sensitivity analysis: in one case (Bodiya 1999) its elimination would reinforce the effectiveness of the intervention, and the other one (Irwig 1990) was the only study within its class.

The lack of baseline comparability or the absence of pertinent data are sufficient arguments for many reviewers for definitively excluding the affected articles, as we did in two cases (Crane 1998; Ornstein 1991). The elimination of these two studies under suspicion clearly favoured the effectiveness of the active interventions being studied, since their results went in the opposite direction.

Only in 9 out 14 studies did the data analysis respect the intention-to-treat requirements. In four studies reanalysis of the data was possible and in one (Sutton 1994) it was not. The potential exclusion of the Sutton study would favour still more the effect of the intervention (letter of invitation).

For this review any study's control group was considered to meet the criteria for controls when no specific or explicit action was undertaken to encourage the participation of women in breast

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cancer screening services. Obviously, there are other generic actions, such as the general dissemination of news through the mass media or the spontaneous contacts made by health care professionals, relatives or friends, which cannot be accounted for. It is possible to assume that the potential effect of that diffuse information is equally distributed across the different groups thanks to randomisation. All the mentioned factors can partially explain the extremely variable (between 4% and 64%) participation of the women in control groups, besides their different local, social and cultural characteristics, summarised in the table of included studies. Moreover, the stability and potential prestige of community breast cancer screening programs are also elements that may contribute to disseminating information and stimulating participation, in contrast to discontinuous services that may develop a particular study or screening activity eventually.

Five interventions for increasing attendance in breast cancer screening services were effective. The values of odds ratios were between 1.66 and 2.81, and heterogeneity was not significant. Single letters of invitation were highly effective at 12 and 24 months of follow-up. The mailed educational material, the letter of invitation plus a phone call, the individual phone call and the training activities plus reminders for the women were equally effective. The effect of interventions shown to be effective was quite homogeneous across studies, independently of country (USA, UK, Australia) or age group.

Two of the analysed interventions were shown not to be effective. In one comparison, of two studies (Hoare 1994; Sung 1992), there were no statistical differences between the intervention (home visit) and control. In the other comparison (Clementz 1990), the control group had a higher rate of attendance in response to the mammogram invitation than the group in which the intervention (letter of invitation to multiple examinations plus educational material) was implemented.

Conversely, home visits were not effective, and the addition of educational material to the invitation letter worsened the results. Although the only available study (Clementz 1990) to address this latter combination had limitations already mentioned, the fact that the invitation to mammogram screening was included among five other invitations to different preventive examinations could have contaminated the effect of the specific invitation. Considering that this study is the only one with such multiple invitations, it seems reasonable to recommend that breast cancer screening invitations not be merged with other screening activities.

In the studies referred to, combined actions have been mostly addressed to poorer women or those living in a multiethnic context for exploring alternatives to the conventional channels of communication (letter, phone). It appears that the combination of a letter and phone call achieves a better response than those interventions separately, although no direct comparisons among interventions have been considered in this review. The combined initiatives may be more costly than the individual letter or phone call, and therefore, considerations about respective cost-effectiveness should always be borne in mind. The simplest and cheapest actions reach a very acceptable response rate, and therefore, any costly intervention to be added should be based on sound effectiveness data. Unfortunately, no data about costs from the included studies are available to permit that kind of assessment here.

The participation rates for breast cancer screening programs across the different intervention groups varied between 9% and 77%. This great variability in response is a logical consequence of the diverse perceptions and attitudes of targeted women. A myriad of factors can determine the final decision about participation: the existence or not of an established screening program, previous exposure to mammographic screening, the cost of the mammogram, health professionals' involvement, the availability of sufficient resources and logistic support, the diffusion of information campaigns, the efforts of social entities and associations, and the influence of age, social and educational status, among other unspecific elements.

It is reasonable to assume that all the recruitment strategies proven to be effective can be implemented worldwide, taking into account that the required technology is quite simple and universally available. However, people who are in process of running or designing any breast cancer screening program or initiative should perform cost-effectiveness analysis, considering participation, the desired results, and their local circumstances regarding logistics and costs before launching any recruitment action. Interventions that failed to prove their effectiveness, such as home visits or the combination of educational material and letters of invitation to multiple examinations, should be avoided.

The results of these studies do not specify whether they refer to the first or successive calls. There is no information about the long-term effects of the implemented interventions either, although this is relevant because breast cancer screening requires periodical examination. Information about targeted women exposed to repeated invitations could be interesting. No subgroup analysis (for example, by age group) has been done in this review, partly because the required data were not reported in the articles. In future, the availability of information technologies to citizens for accessing the health services and making personal choices will probably open new perspectives on how screening is disseminated and perceived.

This review has not taken into account the current controversy that questions the effectiveness or low cost-effectiveness of breast cancer screening (Gotzsche 2000; Miller 2000). However, the exploration of more effective recruitment strategies into breast cancer screening services implicitly assumes the benefits of periodical mammography and, thus, can be affected by the policies formulated about breast cancer screening in the future.

AUTHORS' CONCLUSIONS

Implications for practice

Breast cancer screening services are offered to specific groups of women, depending on the evidence that different people accept as convincingly sound, coupled with local health priorities and the available resources in each country or region. When the launch of such a program is being decided, a population perspective is recommended for maximising equity and efficiency. In this context, therefore, the goal of achieving a high participation rate is absolutely necessary, and people in charge of breast cancer screening should design and implement active initiatives for ensuring a wide coverage.

In general, most active recruitment strategies for breast cancer screening programs examined in this review were found to be more effective than no intervention. Sending letters, making phone calls, mailing educational materials and organising training activities

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with reminders for the women are actions that can increase the attendance rate of women invited to a community breast cancer screening service. Some combinations of effective actions (such as a letter and phone calls) have important effects and have been tested mostly among the lower socioeconomic groups of women. Home visits have not proven to be effective, and combining educational materials with invitation letters to multiple preventive examinations decreases the expected participation. Direct comparisons should be made in order to select the most effective interventions, but they have not been addressed in this review.

It is reasonable to assume that all the recruitment strategies proven to be effective can be implemented worldwide, taking into account that the required technology is quite simple and universally available. However, people who are in process of running or designing any breast cancer screening program or initiative should perform a cost-effectiveness analysis. It appears that the attendance rate in the breast cancer screening services is higher if recruitment is individually addressed and not merged with other examinations. The simplest and cheapest interventions, such as letters and phone calls, either separately or combined, are very good alternatives to consider at the first instance.

Implications for research

There is a need for future reviews to compare the different interventions that have proven to be effective for increasing the recruitment into breast cancer screening programs. Fortunately, many randomised clinical trials have already addressed this issue and others can be designed in the future to fill the existing gaps. More information about the diverse cost-effectiveness ratios and women's satisfaction is required, but the corresponding data are usually lacking in the trials. Monitoring the effect of periodically repeated interventions could also be useful.

Future studies should continue exploring the effect of more specific actions addressed to the diverse population social subgroups, particularly those that are less prone to attend the screening invitations. The new communication technologies could provide alternative or complementary ways for improving the relationship between people and the referent health care organisations, including the cancer screening services, but these possible approaches should be based on previous well-designed trials. Evidence from recruitment activities into breast cancer screening could be extrapolated to other cancer preventive services, but this ought to be investigated further.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Atri 1997

Methods	RCT by GP. Stratification and practices matched. No further details. Duration: 12 months. Losses 78 of 995 (8%) in the intervention group. No description of losses in the control group. Analysis by intention to treat.
Participants	Geographic region: London, UK Subjects: general multiethnic population. Eligibility criteria: women registered in a breast screening centre who failed to attend. Aged: 50-64 N = 2064
Interventions	1. Training programme for GP reception staff (contact all women by telephone or by sending a GP letters) (995) 2. Control (1069)
Outcomes	Overall attendance rate and by ethnic group.
Notes	Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Bodiya 1999

Methods	RCT by women. No further details. Duration: 3 months. No description of losses. Analysis by intention to treat.

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Bodiya 1999 *(Continued)*

Participants	Geographic region: Michigan, USA. Subjects: mixed urban and suburban population with a variety of ethnic and socieconomic backgrounds who are registered in a Family Medicine Center. Eligibility criteria: women who had a normal mammogram the previous year. Aged: >50 N = 298
Interventions	1. Reminder letter from the Radiology department's (102) 2. Reminder letter plus a reminder phone call from the Radiology department's (86) 3. Control (110)
Outcomes	Attendance rates
Notes	No description of the characteristics of the groups

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Clementz 1990

Methods	RCT by women. Random number computer-generated. Duration: 4 months. Losses: 14 of 116 in the intervention group (12 %). 28 of 104 in the control group (26,9 %). Reanalysis data by intention to treat.
Participants	Geographic region: Illinois Kansas (USA). Subjects: women registered in a Family Medicine Center. Eligibility criteria: no personal history of breast cancer. Aged: 50-69 N = 220
Interventions	1. Personalized letter signed in a blinded fashion by the patient's personal physician plus a second recall letter with patient educational material (116) 2. Control (104)
Outcomes	The percentage of patients having screening cancer test
Notes	Other intervention: fecal occult testing, Papanicolau smears. Intervention and control group were comparable. Chart audit evaluation

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate

Davis 1997 (1)

Methods	RCT by women. No further details Duration: 5 months Losses: 2502 of 3992 (63,7%). We reanalysed data by intention to treat.

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Davis 1997 (1) *(Continued)*

Participants	Geographic region: Houston, Texas, USA Subject: women registered in a HMO. Eligibility criteria: hadn't received a mammogram and no history of breast cancer. Aged: 50-64 N = 3922
Interventions	1. Telephone reminder counseling plus and scheduling component (2737) 2. Control (1185)
Outcomes	Attendance rates. Administrative cost
Notes	Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Hoare 1994

Methods	RCT by women. Balanced block details. No further details. Duration: Unknown Losses: 17 of 264 in the intervention group (6,4%). 12 of 263 in the control group (4,5%). Reanalysis date by intention to treat.
Participants	Geographic region: Manchester, UK Subject: Asian women. Eligibility criteria: women registered in a breast screening centre who failed to attend. Aged: 50-64 years. N = 527
Interventions	1. Follow-up by two linkworkers (1 or 2 visits) (264) 2. Control (263)
Outcomes	Attendance rates.
Notes	Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Irwig 1990

Methods	RCT by women. Stratification by the range of previous involvement with the Breast X-Ray Programme. No further details Duration: 2 years Losses: 22 the 440 (5%). Analysis by intention to treat.

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Irwig 1990 *(Continued)*

Participants	Geographic region: Sydney, Australia Subjects: general population. Eligibility criteria: women registered in a breast screening centre who failed to attend. Aged: 45-70 N = 440
Interventions	1. Letter from the GP with appointment (162) 2. Letter fron the GP without appointment. (126) 3. Control (152)
Outcomes	Attendance rates
Notes	No description of the characteristics of the groups

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Janz 1997

Methods	RCT by women. No further details Duration: 12 months Losses: 350 of 635 (55,1%). We reanalysed data by intention to treat
Participants	Geographic region: Michigan, USA Subjects: high percentage of low socioeconomic, minority population. Eligibility criteria: not breast screened and without history of cancer Aged: 65-85 N = 635
Interventions	1. Physician letter plus phone call to non-responders (316) 2. Control (319)
Outcomes	Attendance rate
Notes	Intervention and control groups were comparable. Coupon incentive

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Lantz 1995

Methods	RCT by women. No further details Duration: 6 months

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Lantz 1995 *(Continued)*

	Losses: 33 of 337 in the intervention group (9 %). No description of losses in the control group. Analysis by intention to treat
Participants	Geographic region: Wisconsin, USA Subjects: women enrolled in a low income managed care program Eligibility criteria: not breast screened in the previous 18 months. Aged: 40-79
Interventions	1. Reminders letters from GP plus follow up phone call from a health educator (337) 2. Control (322)
Outcomes	Attendance rates
Notes	Other intervention: Pap smear Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Lerman 1992

Methods	RCT by women with abnormal mammography. The randomization was stratified by prior mammogram result Duration: 12 months Losses: 11 % Analysis by intention to treat
Participants	Geographic region: Pennsylvania and New Jersey, USA Subjects: women members of a HMO. Women who had received an abnormal mammogram during the previous year and were eligible to receive an annual screening mammogram during the study period. Aged: 50-74 N = 446
Interventions	1. Control no survey (150) 2. Control survey (90) 3. Experimental survey, psychoeducational booklet / positive framing (95) 4. Experimental psychoeducational booklet / negative framing (110)
Outcomes	Adherence to mammogram
Notes	Intervention and control groups were comparable. Free mammogram

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

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Mohler 1995

Methods	RCT by women. Random number computer- generated Duration: 2 months. Losses: 0 Analysis by intention to treat
Participants	Geographic region: Colorado, USA Subjects: women registered in a private practice GP in a community hospital Eligibility criteria: No mammogram in the preceding 2 years, seen in the office the preceding 5 years, no current address and phone number, no personal history of breast cancer, active patient of the practice Aged: 50-59 years N = 151
Interventions	1. Physician telephone call (38) 2. Medical assistant telephone call (37) 3. Physician letter (38) 4. Control (38)
Outcomes	The proportion of mammograms obtained. Cost and cost-effectivenes
Notes	Women without health insurance had to pay up to 80$ for their mamography (15-20 %) Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Low risk	A - Adequate

Somkin 1997

Methods	RCT by women. Stratification by age. No further details Duration: 6 months No description of losses. Reanalysis data by intention to treat.
Participants	Geographic region: California, USA Subjects: Women registered in a HMO Eligibility criteria: women who hadn't received a mammogram in the previous 2 years. Aged: 50-74 N = 3513
Interventions	1. Letter inviting women to make an appointment (1171) 2. Control (1171)
Outcomes	The proportion of mammograms obtained The effectiveness of the intervention in the 3 different centers
Notes	Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement

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Somkin 1997 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	B - Unclear

Sung 1992

Methods	RCT by women. Stratification by the source of recruitment and age. No further details. Duration: 6 months Losses: 36 of 321 (11,2%). Analysis by intention to treat.
Participants	Geographic region: Atlanta, USA Subjects: low income, inner city black people Eligibility criteria: women not screened and without history of cancer Aged: > 35 N = 321
Interventions	1. Visit home plus educational material (163) 2. Control (158)
Outcomes	Changes in cancer screening compliance, knowledge, attitudes and practice.
Notes	Other intervention: Pap smear Intervention and control groups were comparable

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Sutton 1994

Methods	RCT by women. No further details. Duration: 4 months No description of losses. Impossible to know if analysis by intention to treat.
Participants	Geographic region: London, UK Subjects: general population of the inner city. Eligibility criteria: women registered in a breast screening centre who gave an interview or returned a questione. Aged: 50-64 N = 1293
Interventions	1. Letter informing that they would be calling on the next few weeks (977). 2. Control (316)
Outcomes	Assessment of women attitudes, beliefs and intentions regarding to breast cancer and breast screening. Predictor factors associated with attendance.
Notes	Intervention and control group were comparable

Risk of bias

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Sutton 1994 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Turnbull 1991

Methods	RCT by women. No further details. Duration: 2.5 months. No description of losses. Analyis by intention to treat
Participants	Geographic region: New South Wales, Australia Subjects: general population Eligibility criteria: women registered in a breast screening centre who failed to attend. Aged: 45-69 N = 243
Interventions	1- Letter signed by the Programme Director with appointment and with Greek and Italian translations (163) 2. Control (80)
Outcomes	Attendance rate Whether age and language spoken at home are related to attendance
Notes	Intervention and control groups were comparable

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Banks 1995	The comparison includes a control group with an active intervention
Banks 1998	The comparison includes a control group with an active intervention
Bastani 1994	The comparison includes a control group with an active intervention
Becker 1989	The comparison includes a control group without intervention, but also a reminder with physician endorsement
Burack 1994	The comparison includes a control group with an active intervention
Burack 1996 (1)	The comparison includes a control group without intervention, but the denominator for estimating attendance rates is unknown

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Study	Reason for exclusion
Calle 1994	The comparison includes a control group with intervention, but participants are volunteers. Therefore the study is not community-based
Champion 1994	The comparison includes a control group without intervention, but the denominator for estimating attendance rates is unknown
Champion 1995 (1)	The comparison includes a control group without intervention, but the denominator for estimating attendance rates is unknown
Clover 1992	The comparison includes a control group with an active intervention
Clover 1996 (A)	The comparison includes a control group with an active intervention
Clover 1996 (B)	The comparison includes a control group with an active intervention
Crane 1998	The comparison includes a control group without an intervention, but their groups were not comparable. Authors provided additional information on request, but this did not modify the final classification of the study
Curry 1993	The comparison includes a control group with an active intervention
Dalessandri 1988	The comparison includes a control group with an active intervention
Davis 1997 (2)	The comparison includes a control group with an active intervention
Dolan 1999	The comparison includes a control group with an active intervention
Giorgi 1999	The comparison includes a control group with an active intervention
Kiefe 1994	The comparison includes a control group with an active intervention
King 1994	The comparison includes a control group with an active intervention
King 1995	The comparison includes a control group without intervention, but the denominator for estimating attendance rates is unknown. There is imbalance between groups
King 1998	The comparison includes a control group with an active intervention
Lancaster 1992	The comparison includes a control group with an active intervention
Landis 1992	The comparison includes a control group with an active intervention
Manfredi 1998	The comparison includes a control group with an active intervention
Mayer 1994	The comparison includes a control group with an active intervention
Meldrum 1994	The comparison includes a control group with an active intervention
O'Connor 1998	The comparison includes a control group with an active intervention
Ore 1997	The comparison includes a control group with an active intervention
Ornstein 1991	The comparison includes a control group without intervention, but their groups were not comparable

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Study	Reason for exclusion
Peeters 1994	The comparison includes a control group with an active intervention
Rakowski 1998	The comparison includes a control group without intervention, but the denominator for estimating attendance rates is unknown
Richardson 1994	The comparison includes a control group with an active intervention
Rimer 1992	The comparison includes a control group with an active intervention
Saigi 1995	The comparison includes a control group with an active intervention
Schapira 1992	The comparison includes a control group with an active intervention
Segnan 1998	The comparison includes a control group with an active intervention
Sharp 1996	The comparison includes a control group with an active intervention
Skinner 1994	The comparison includes a control group with an active intervention
Stead 1998	The comparison includes a control group with an active intervention
Stoner 1998	The comparison includes a control group with an active intervention
Taplin 1994	The comparison includes a control group with an active intervention
Turnbull 1992	The denominator for estimating attendance rates is unknown
Turner 1994	The comparison includes a control group with an active intervention
Weber 1997	The comparison includes a control group with an active intervention
Williams 1989	The comparison includes a control group with an active intervention

DATA AND ANALYSES

Comparison 1. Letters of invitation compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	5	4166	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.66 [1.43, 1.92]
2 Attendance to the mammogram invitation during the following 24 months	1	440	Peto Odds Ratio (Peto, Fixed, 95% CI)	4.10 [2.57, 6.54]

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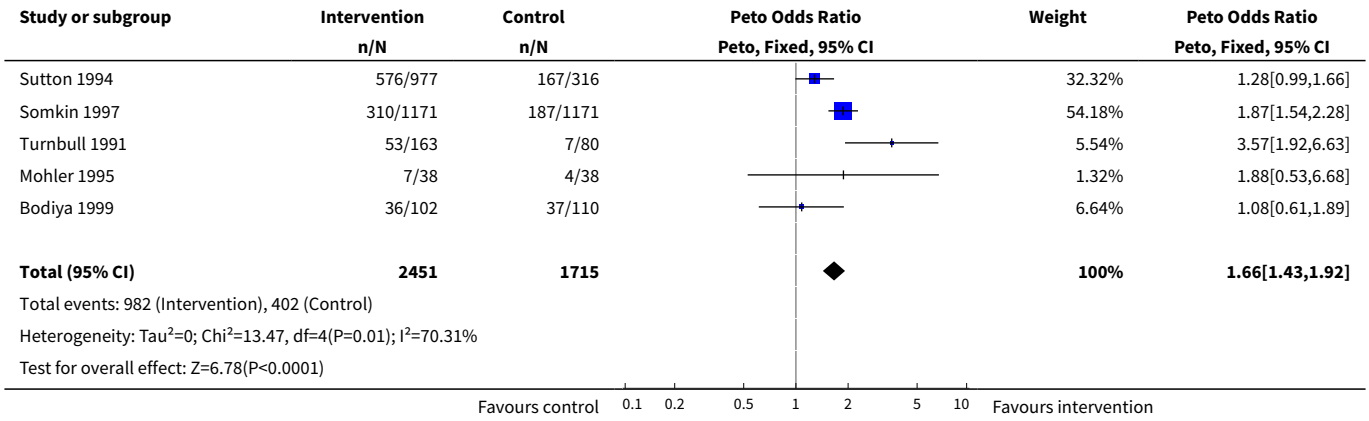
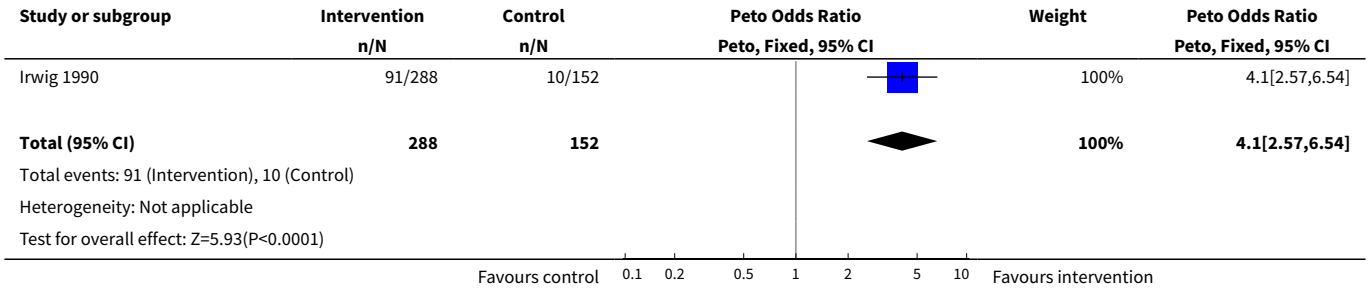
Analysis 1.1. Comparison 1 Letters of invitation compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



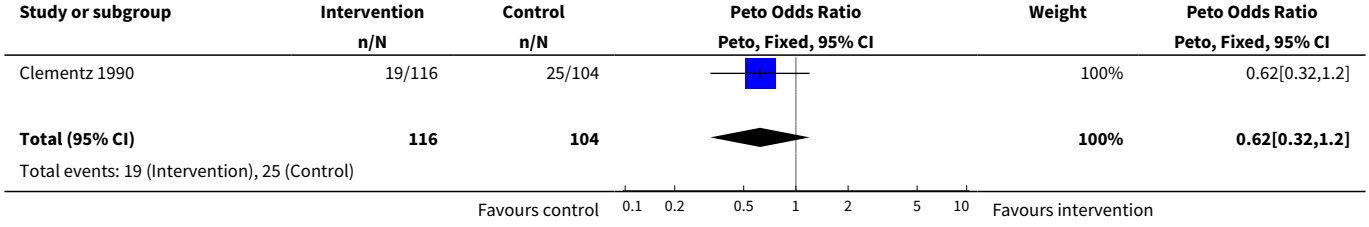
Analysis 1.2. Comparison 1 Letters of invitation compared with control, Outcome 2 Attendance to the mammogram invitation during the following 24 months.



Comparison 2. Letters of invitation to multiple examinations plus educational materials compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	1	220	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.62 [0.32, 1.20]

Analysis 2.1. Comparison 2 Letters of invitation to multiple examinations plus educational materials compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



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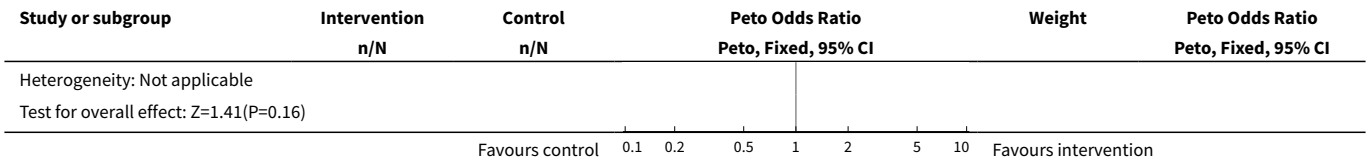
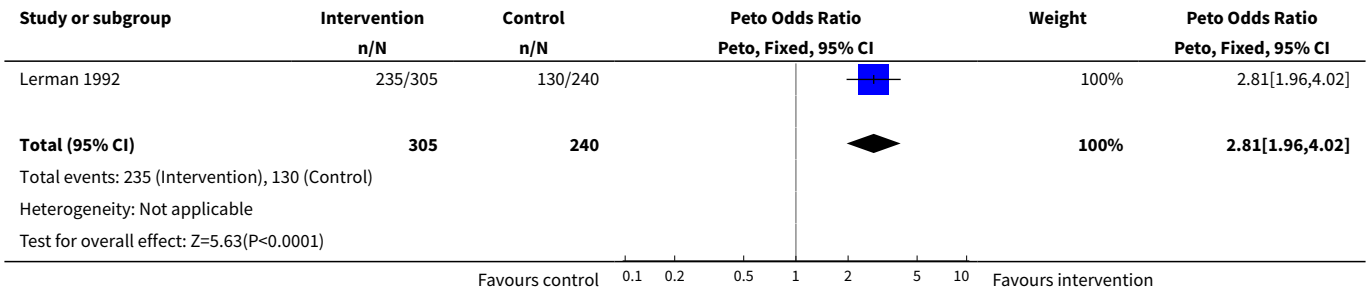


Comparison 3. Mailed educational material compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	1	545	Peto Odds Ratio (Peto, Fixed, 95% CI)	2.81 [1.96, 4.02]

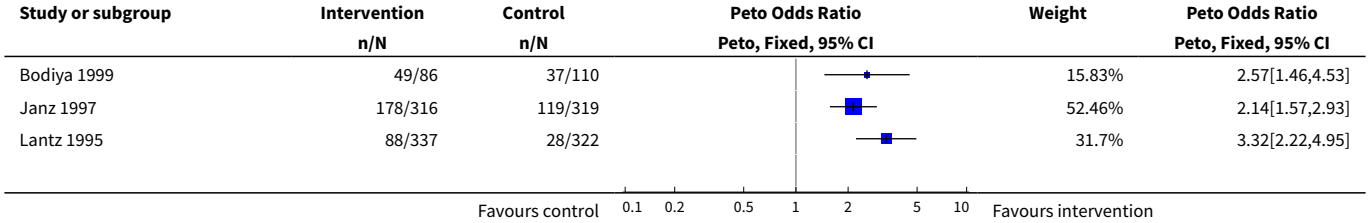
Analysis 3.1. Comparison 3 Mailed educational material compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



Comparison 4. Letters of invitation plus phone call compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	3	1490	Peto Odds Ratio (Peto, Fixed, 95% CI)	2.53 [2.02, 3.18]

Analysis 4.1. Comparison 4 Letters of invitation plus phone call compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



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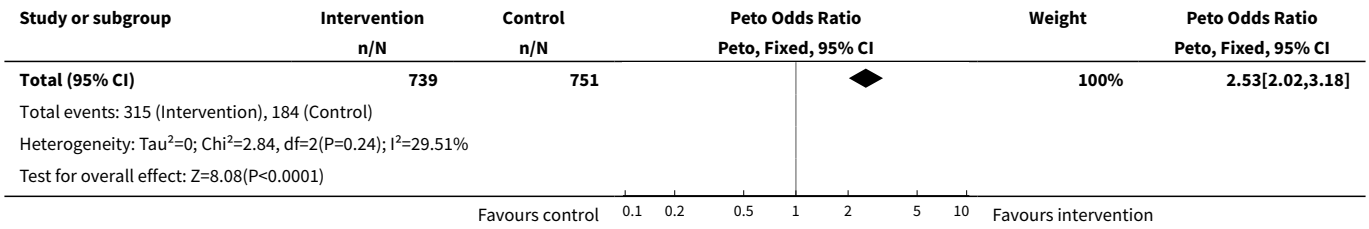
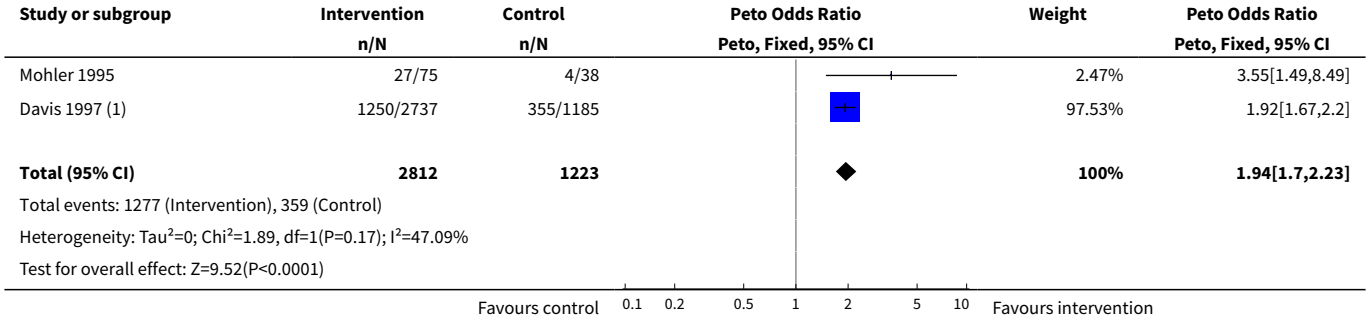


Comparison 5. Phone calls of invitation compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	2	4035	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.94 [1.70, 2.23]

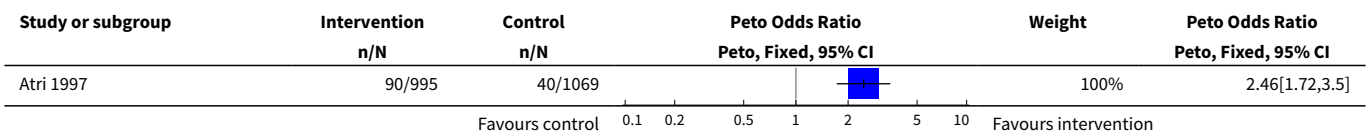
Analysis 5.1. Comparison 5 Phone calls of invitation compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



Comparison 6. Training activities plus women reminders compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	1	2064	Peto Odds Ratio (Peto, Fixed, 95% CI)	2.46 [1.72, 3.50]

Analysis 6.1. Comparison 6 Training activities plus women reminders compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



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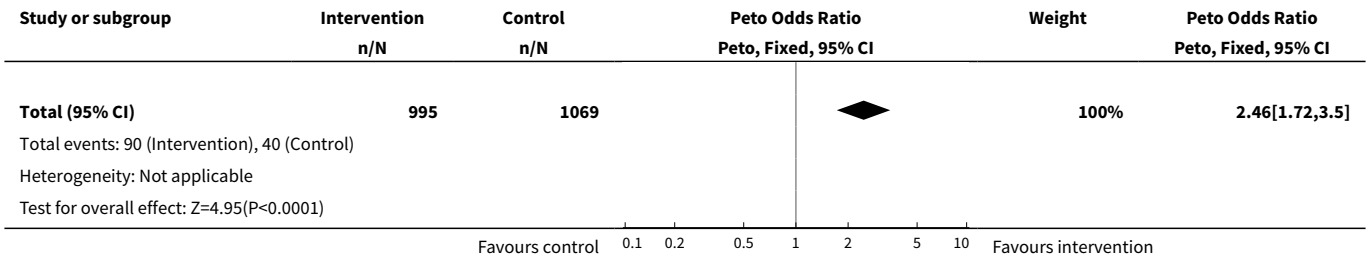
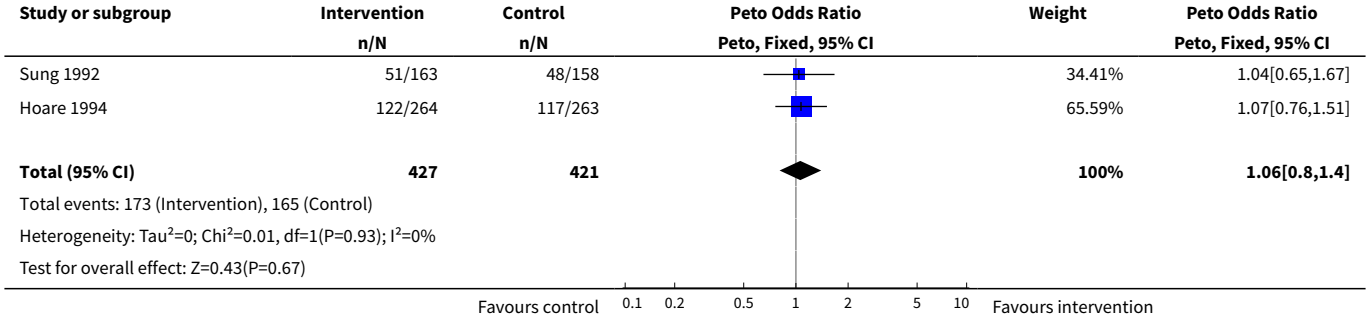


Comparison 7. Home visits compared with control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Attendance to the mammogram invitation during the following 12 months	2	848	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.06 [0.80, 1.40]

Analysis 7.1. Comparison 7 Home visits compared with control, Outcome 1 Attendance to the mammogram invitation during the following 12 months.



WHAT'S NEW

Date	Event	Description
28 September 2016	Review declared as stable	This Cochrane review is out of date and it is unlikely that it will be updated. The breast cancer screening environment has changed such that the research question has moved on from increasing participation to women being more informed about screening and, improving the quality of decision making. Therefore a new review question that addresses the complexities surrounding breast cancer screening is viewed as more appropriate

HISTORY

Protocol first published: Issue 1, 1998
Review first published: Issue 1, 2001

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Date	Event	Description
16 October 2008	Amended	Converted to new review format.
18 October 2000	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

Mercè Marzo (MM), Joan Martí (JM), Xavier Bonfill (XB), and JI Emparanza (JIE) conducted the reading, data extraction, and consensus activities related to included and excluded articles. XB and MM took the responsibility of writing the text of the review and were helped by Manel Pladevall, specially when working in the analyses section.

DECLARATIONS OF INTEREST

None known

SOURCES OF SUPPORT

Internal sources

- Hospital de la Santa Creu i Sant Pau. Barcelona, Spain.
- Iberoamerican Cochrane Centre, Spain.
- Institut Català de la Salut. Barcelona, Spain.

External sources

- No sources of support supplied

NOTES

This Cochrane review is out of date and it is unlikely that it will be updated. The breast cancer screening environment has changed such that the research question has moved on from increasing participation to women being more informed about screening and, improving the quality of decision making. Therefore a new review question that addresses the complexities surrounding breast cancer screening is viewed as more appropriate.

INDEX TERMS

Medical Subject Headings (MeSH)

*Patient Participation; *Patient Selection; *Program Evaluation; Breast Neoplasms [*prevention & control]; Clinical Trials as Topic; Community Health Services; Mass Screening [*methods]

MeSH check words

Female; Humans

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