Analysis of the cost-effectiveness of mammography promotion by volunteers in rural communities

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study investigated three different intervention strategies to promote mammography uptake by women in rural areas. The strategies were:

- individual counselling (IC), which included barrier-specific telephone counselling;
- community activities (CA), which included video presentations, themed bingo games, poster display, community newsletters and promotional merchandise; and
- a combined intervention that included both of the above (IC-CA).

Type of intervention
Primary prevention, public health.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women aged between 50 and 80 years who were living in the community (based upon the Community Trial of Mammography Promotion - CTMP). Those with a personal history of breast cancer at baseline were excluded from the evaluation cohort.

Setting
The setting was the community. The economic analysis was carried out in the USA.

Dates to which data relate
The dates during which the effectiveness data were collected were not reported. However, the authors referred to a parent study focusing on the CTMP which might contain this information (Anderson et al. 2000, see 'Other Publications of Related Interest' below for bibliographic details). The majority of the costs were incurred in 1995 and were therefore calculated at 1995 US dollar prices.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken on the same patient sample as that used in the effectiveness study. Although not explicit, it
is likely that the costing was conducted prospectively.

**Study sample**
The sample selection method (of communities in the CTMP) was not reported. The choice of participants within each community was justified on the basis of positive disease outcomes associated with mammography promotion to women over the age of 50. The sample comprised 40 communities, with numbers excluded not reported. The number of participants within each community was not stated, although a later economic analysis was based upon an assumed standard population of 1,000 women. Again, more information on the characteristics of communities may be contained in the parent study (Anderson et al. 2000). The effectiveness results were based upon a random sample of 352 women, aged 50 to 80 years, who were living in the 40 communities. No details were given on how many were from each intervention group. Demographic or prognostic characteristics were also not described.

**Study design**
This was a community, randomised controlled trial of 3 years' duration. Further details were not provided in this publication.

**Analysis of effectiveness**
The primary health outcomes (measured by self report) were rates of mammography uptake in terms of:

(a) regular users at baseline who reported more than one mammogram, the most recent of which was within 2 years of the telephone interview, and the one prior to that within 2 years of her most recent test (those who did not comply with the definition of regular users were considered to be underusers); and

(b) new users at follow-up, namely those who had been underusers at baseline but reported the use of a mammography within 2 years of the follow-up interview.

Baseline regular users were considered to have relapsed if they did not report having a mammogram within 2 years of the follow-up interview.

The analysis was based on a random sample of 352 women from within the 40 communities who were interviewed by telephone at baseline and at the 3-year follow-up. It was unclear how many were from each intervention group, or whether these women were comparable (between intervention groups) at baseline or at analysis in terms of their demographics or prognostic features. However, comparability was assured in terms of the proportion of women using mammography regularly at baseline (approximately 50% of women in the 40 communities).

**Effectiveness results**
In terms of new users at follow-up, differences in mammography uptake relative to the control group were +2.1% (95% confidence interval, CI: -8.0 - 11.7) following the CA intervention, +2.8% (95% CI: -6.4 - 11.3) following the IC intervention, and +2.6% (95% CI: -6.2 - 12.2) following the IC-CA intervention. These increases were not statistically significant. (p>0.05).

In terms of relapse reduction in regular users, increased mammography use across the groups was +2.9% (95% CI: 0.8 - 5.2) with the CA intervention, 0.4% (95% CI: -4.3 - 3.2) with the IC intervention, and +1.4% (95% CI: -1.3 - 3.9) with the IC-CA intervention. This change was statistically significant only for the CA intervention, (p=0.01).

Further analysis was conducted to assess the overall effectiveness of each intervention by calculating relapse reduction in regular users, and then adding the effect for increased use in underusers. The overall increase in use of mammography as a result of the CA intervention was 2.5%.

**Clinical conclusions**
Of the three community-based interventions, only the CA intervention showed a statistically significant effect on
mammography use. It prevented the incidence of relapse, but failed to have a significant effect on new use amongst existing underusers of the technology.

**Modelling**
A micro-simulation model was used in the cost-effectiveness analysis in order to calculate the cost per life-year saved.

**Measure of benefits used in the economic analysis**
The measures of benefit used were the additional regular mammograms undertaken and the years of life saved.

**Direct costs**
The direct costs included those pertaining to the sponsoring organisation, along with those borne by volunteers (who delivered the interventions) and participants. These costs included all material and personnel items relating to the delivery of the interventions, as well as those incurred in the development and training of volunteer groups. The unit costs of education intervention materials (e.g. stationary, posters, bingo cards) were included. Materials that were free to the project were assigned an imputed value. The cost of volunteer and participant time was also calculated. Research costs and costs associated with the development of intervention materials were not included.

Personnel costs were based upon methods of calculation used in another study (Urban et al. 1990, see 'Other Publications of Related Interest' below for bibliographic details). Professional and staff salaries were based on those offered to people doing similar tasks at the research organisation (Fred Hutchinson Cancer Research Center). Volunteers and participants were assigned a salary based upon programme assistants and field research coordinators. Average task time was calculated from self-reported logs and various data collection forms completed by project staff and volunteers in the process of delivering the interventions. Participant time spent in relation to involvement in the intervention was ascertained from the follow-up evaluation survey. The resource quantities and the costs (per woman) were reported separately. Discounting (no rate specified) was mentioned as part of the model simulation process when calculating the cost-effectiveness of interventions in underusers of mammography at baseline.

**Statistical analysis of costs**
The cost data were treated deterministically.

**Indirect Costs**
Although the authors referred to the indirect costs in terms of shared administrative services, utilities, maintenance and office space, these are not regarded as indirect costs for the purposes of this abstract.

**Currency**
US dollars ($).

**Sensitivity analysis**
There was no formal sensitivity analysis, although the potential effect on the cost-effectiveness of repeating the CA intervention over a woman's lifetime was discussed.

**Estimated benefits used in the economic analysis**
The overall benefit over 3 years was summarised (in terms of relapse reduction in regular users, plus increased use in underusers) as the overall increase in mammography use as a result of the interventions. The results were 2.5% in the CA group, 1.6% in the IC group and 2.0% in the IC-CA group.
Cost results
In a hypothetical community where a population of 1,000 was assumed, the total cost per eligible woman was $48.82 for the CA intervention, $31.74 for the IC intervention and $49.02 for the IC-CA intervention.

In the analysis of new users, the total cost per woman was $97.64 for CA, $63.48 for IC and $98.04 for IC-CA.

Synthesis of costs and benefits
The cost of each additional mammography user was $1,953 (95% CI: 578 - infinite) for the CA intervention (based on a 2.5% gain in mammography use), slightly higher at $1,984 per additional mammogram (95% CI: 437 - infinite) for the IC intervention, and $2,451 (95% CI: 608 - infinite) for the IC-CA intervention.

In a separate analysis of underusers, the cost per additional new user was $4,650 in the CA group, $2,267 in the IC group and $3,371 in the IC-CA group.

The cost per additional life-year saved associated with mammography promotion was calculated as approximately $56,000. This was reported to be within the range of estimates for the cost-effectiveness of mammography, but slightly above the acceptable level.

The authors proposed that regular repetition of interventions would increase the cost per life-year saved to an unacceptable level of cost-effectiveness.

Authors’ conclusions
Among the general population of women aged between 50 and 80 years in this study, the community activities (CA) intervention was the most cost-effective method in reducing relapse amongst regular mammography users, and was considered to be the most cost-effective method for promoting mammography use in general. However, none of the interventions were considered effective in promoting mammography use in underusers, although both CA and the individual counselling (IC) strategies offered some potential in certain population sub-groups.

CRD COMMENTARY - Selection of comparators
The selection of the comparators was justified on the basis that they represented common practice within public health agency and community group work. You should decide if these represent widely used technologies in your own setting.

Validity of estimate of measure of effectiveness
The analysis in this study (although part of a community randomised trial) was based upon the results of telephone interviews conducted on a random sample of 352 women living in the communities under investigation. Given that no details were reported, it was unclear whether the study sample was representative of the study population, or whether the intervention groups from which they were derived were comparable at baseline (except for regular mammography use) or analysis in terms of their demographic or prognostic features. Indeed, it is not possible to comment on other aspects of internal validity, as details of the full trial design were reported elsewhere (Anderson et al. 2000).

The outcomes were analysed only for those in the random sample, and there was no statistical analysis of potential biases or confounding factors. An acknowledgement of the difficulties in evaluating multi-component programmes in a community setting would have been useful. This is also relevant in terms of potentially confounding issues present in the no-intervention control group with which the results were compared. The results were limited to the statistical significance of changes within, rather than between groups. In addition, the authors acknowledged that limitations arising from a heavy reliance upon self-reported behaviour were a major threat to the reliability of the findings.

Validity of estimate of measure of benefit
The measures of benefit were additional regular mammogram uptake and years of life saved. These were appropriate given the high costs and potential survival benefits associated with regular mammography screening for breast cancer.
Validity of estimate of costs
Relevant costs appear to have been included for the sponsoring organisation, volunteers and participants. The decision to exclude research and developmental costs is debatable, given that the CA intervention is likely to have incurred higher costs at this stage (potentially affecting cost-effectiveness). The resource quantities, which were obtained largely from self-reported assessment, represent a major threat to the reliability of the conclusions drawn (see above comment). In addition, the absence of a formal sensitivity analysis on resources and costs limits the interpretation of findings. It was unclear how representative the source of the cost data (derived from the research organisation) is of true community-based costs, and sources of other (unit) costs were not reported. The costs and the quantities (i.e. per woman) were reported separately, thus enhancing the generalisability of the study in other settings. The price year was reported, which will aid any future reflation exercises.

Other issues
The authors did not compare their findings with those from other studies, although this was reported to be an under-researched area. The authors claimed that their results were potentially generalisable to other rural settings where a substantial proportion of women are users of mammography.

Implications of the study
The authors suggested that CA interventions are a potentially effective way to reduce relapse amongst mammography users in rural areas. They recommended that, in future, the interventions should be assessed in relation to different groups of women, to the numbers of regular users and underusers, and to existing levels of promotional activities within a given community.

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Bibliographic details

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Other publications of related interest


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