Mammographic screening of women aged 40-49 years: benefit, risk, and cost considerations

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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
Mammographic screening of women aged 40-49 and 50-59 years.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Women aged 40-59 years.

Setting
Hospital. The economic study was carried out in the USA.

Dates to which data relate
Effectiveness data were based on published studies covering the period between 1963 and 1995. Resource use data and their corresponding dates were not reported. The price year was not explicitly specified.

Source of effectiveness data
Effectiveness data were derived from a review of the literature and assumptions made by the author.

Outcomes assessed in the review
The review assessed the following outcomes: mortality; lifetime risk; excess deaths per million women; breast cancer incidence; cancers detected at screening (true positive(TP) biopsies); and positive predictive value (PPV) of mammography.

Study designs and other criteria for inclusion in the review
A meta-analysis of 7 randomized trials covering the period between 1963 and 1988, and other studies or reports, the designs of which were not explicitly specified.

Sources searched to identify primary studies
Not reported.
Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
A total of 23 studies including a meta-analysis of 7 randomized trials.

Methods of combining primary studies
Not combined.

Investigation of differences between primary studies
Not reported.

Results of the review
Mortality reduction due to screening women aged 40-49 (based on a meta-analysis of 7 randomized trials) is 24% (RR, 0.76; 95% CI: 0.62 - 0.95). The reduction rises to 35% based on the assumption of full compliance in annual screening of 40-49 year old women.

The lifetime risk from 0.25 cGy for women at age 45 (assuming subsequent screening) was:

5 excess deaths/million women (0% mortality reduction due to subsequent screening);
4 excess deaths/million (20% mortality reduction);
3 excess deaths/million (40% mortality reduction);
2 excess deaths/million (60% mortality reduction).

The following probabilities were reported for annual mammographic screening of 10,000 women for age categories of 40-49 and 50-59, respectively:

breast cancer incidence, 16.3 and 25.2;
cancers detected at screening (TP biopsies), 10.8 and 19.3;
PPV of mammography, 22.2 and 36.1.

Methods used to derive estimates of effectiveness
Assumptions about effectiveness were also made by the authors.

Estimates of effectiveness and key assumptions
It was assumed that women with nonpalpable cancers not undergoing breast screening would undergo an excisional biopsy without needle localisation after cancers have grown large enough to be found clinically.

Measure of benefits used in the economic analysis
The benefit measures were years of life expectancy gained from an annual screening of 10,000 women in two age
categories (40-49 and 50-59 years) based on mortality reductions of 20%, 30%, 40%, and 50%.

**Direct costs**
Costs were not discounted. Quantities were reported separately from the costs. Cost items were reported separately. Cost analysis covered the costs of a screening mammogram plus downstream costs of supplementary mammographic views and/or ultrasound for further evaluation of some screened women, mammographic follow-up, and core or excisional biopsy. The perspective adopted in the cost analysis was not explicitly specified. The sources of cost data were the author's community and institutional experiences. The date for the price data was not explicitly specified. The cost analysis did not cover the costs of treating nonpalpable cancers, other disease contracted during the increased life span culminating from screening, or continuation of payments for social security.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way sensitivity analyses were performed on mortality reduction rates and the technique used for biopsies.

**Estimated benefits used in the economic analysis**
Years of life expectancy gained from an annual screening of 10,000 women based on differing mortality reductions were 59.3 (20%), 89.0 (30%), 118.7 (40%), and 148.3 (50%) for the age category of 40-49 years. This compared to 69.0, 103.6, 138.1, and 172.6, respectively, for the age category 50-59 years.

**Cost results**
The average total cost per woman screened ranged from $61.67 to $119.38 for the age category of 40-49 years versus $59.00 to $118.75 for the age category of 50-59 years.

**Synthesis of costs and benefits**
Costs per year of life expectancy gained based on a mortality reduction of 20%, 30%, 40%, and 50% was calculated as the cost-effectiveness measure:

1. Age category 40-49 years and an average cost per woman screened of $61.67: $10,400 for mortality reduction of 20%, $6,930 for 30%, $5,196 for 40%, and $4,159 for 50%;
2. Age category 40-49 years and an average cost per woman screened of $119.38: $20,132 for mortality reduction of 20%, $13,413 for 30%, $10,057 for 40%, and $8,050 for 50%;
3. Age category 50-59 years and an average cost of $59.00 per woman screened: $8,551 for mortality reduction of 20%, $5,695 for 30%, $4,272 for 40%, and $3,418 for 50%;
4. Age category 50-59 years and an average cost of $118.75 per woman screened: $17,211 for mortality reduction of 20%, $11,463 for 30%, $8,599 for 40%, and $6,880 for 50%.

**Authors’ conclusions**
Based on a range of procedural costs, a 30% reduction in breast cancer deaths due to incidence screening of women age
40-49 will cost $6,930-$13,413 per year of life expectancy gained.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of 'no screening' as the comparator is clear.

**Validity of estimate of measure of benefit**
The effectiveness evidence was based on a meta-analysis of 7 randomized trials and a literature review. However, it is not possible to assess the internal validity of the estimates of the benefit measure as insufficient information was provided on which to judge the methods of the review.

**Validity of estimate of costs**
Quantities were not reported separately from the costs. Adequate details of the methods of cost estimation were given. The cost components involved in the 'no screening' option were not reported in detail. The author stated that only "costs that are in excess of the ones encountered in a non-screening situation" were considered. Furthermore, other costs were not included in the analysis, namely time off from work for screening, treatment costs for nonpalpable cancers, costs from other diseases contracted during the increased life span, and costs from the continuation of payments for social security. Also, costs resulting from the non-screening alternative should be included in future analyses. Cost results may not be generalisable to other settings or countries.

**Other issues**
In view of the lack of a comprehensive sensitivity analysis, the study results may need to be treated with some caution. The issue of generalisability to other settings or countries was not addressed by the author, although appropriate comparisons were made with other studies.

**Implications of the study**
A complete cost-effectiveness analysis incorporating the omitted costs in this study is required.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
8635007

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Breast Neoplasms /radiography; Clinical Trials as Topic; Cost-Benefit Analysis; Dose-Response Relationship, Radiation; Female; Humans; Mammography /adverse effects /economics; Middle Aged; Risk Assessment