Cost-effectiveness of an intervention to increase cancer screening in primary care settings
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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 Cancer Screening office System (SOS) was assessed. The system were non-computerised, and relied on personnel and resources readily available in primary care clinics to remind clinicians whether screening mammography, Pap smears and/or faecal occult blood (FOBT) tests were up-to-date. The comparison was screening without the SOS intervention.

Type of intervention
Other: Office system designed to improve the effectiveness of screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised disadvantaged populations. Clinics were eligible for inclusion if they provided primary medical care 5 days per week, if the majority of providers agreed to participate, and if the clinic was expected to continue operating for the next 24 months. Clinics had the option to join the trial.

Setting
The setting was primary care. The economic study was carried out in Florida, USA.

Dates to which data relate
The effectiveness evidence was taken from a single study (Roetzheim et al 2004, see "Other Publications of Related Interest" below for bibliographic details), while resource use was recorded during the study, although dates for the study were not reported. The costs were reported in 2000 prices.

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

Link between effectiveness and cost data
The costing was carried out prospectively, using the same patient sample as that used in the effectiveness study.

Study sample
The effectiveness evidence was taken from a single study that had been carried out by at least one of the authors. Further details, including information concerning the design, can be ascertained from this source (see Other Publications of Related Interest). The sample was selected by including 16 clinics participating in a county-funded health insurance plan. The insurance plan provided care for uninsured individuals who did not qualify for Medicaid or
Medicare, and who had a serious chronic health condition. This ensured that the study recruited patients who were from underserved populations and so were relevant to the study question. The current report did not mention the use of power calculations to estimate the impact of chance on the results. Women with personal history of breast cancer, cervical cancer, or colon cancer, and those who had had a hysterectomy, or received colonoscopy or double-contrast barium enema in the last 10 years, were excluded from the relevant analysis. A total of 1,196 records were abstracted at baseline and 1,237 at the 12-month follow-up.

**Study design**
The analysis was based on a cluster-randomised experimental trial. Of the 16 eligible clinics, 8 were randomised to either SOS conditions or control. The method of randomisation was not reported, although details might be available in the parent study. Clinics were from the same county in Florida. The screening outcomes were assessed at 12 months from patient charts. No attempts at blinding were reported.

**Analysis of effectiveness**
Analysis was based on the screening service used. There did not seem to be any possibility of switching between intervention and control, as these were based at different clinics. The primary outcomes were whether the patient was up-to-date with screening mammogram, Pap smear, or FOBT. The authors used generalised linear models, using PROC GENMOD in SAS (Version 8, SAS Institute Inc.) to adjust simultaneously for potential confounders. Further details are reported in the parent study. Indicator variables were created for clinic type (control, intervention) and for survey year (baseline, 12 month follow-up), and control for interactions was provided.

**Effectiveness results**
The authors reported actual screening rates and the adjusted odds ratio to assess whether adherence rates to screening were higher in the control group. The hypothesis that the odds ratio of the screening rates is one was used.

The 12-month screening rate for the SOS was 75.67% for mammography, 62.41% for Pap smear, 40.12 for FOBT, and 75.79 for any screening.

The 12-month screening rate for the control was 71.05% for mammography, 48.20% for Pap smear, 11.94% for FOBT, and 64.25% for any screening.

The difference in 12-month screening rates was 4.62% for mammography, 14.21% for Pap smear, 28.18% for FOBT, and 11.54% for any screening.

The odds ratio for SOS versus control was 1.62 (0.01<p<0.05) for mammography, 1.57 (0.01<p<0.05) for Pap smear, 2.56 (p<0.01) for FOBT, and 1.92 (p<0.01) for any screening.

**Clinical conclusions**
The authors did not draw conclusions relating only to the effectiveness evidence, although there were clearly increases in the screening rates.

**Measure of benefits used in the economic analysis**
The authors used the change in screening (see effectiveness analysis) and life-years gained (derived from review of the literature) as their summary measures of health benefit.

**Direct costs**
The costing was carried out from the perspectives of the third-party payer and society. Discounting was not necessary since the time horizon was reported to be less than one year. The authors focused on personnel and overhead costs attributable to the intervention. The costs of research were excluded, as these would not be incurred after the study. The
costs of the tests themselves were also excluded, as these were common to both alternatives. The authors aimed to estimate the marginal costs of the SOS intervention. The unit personnel costs were based on US Bureau of Labour statistics, while the quantities were measured directly through a questionnaire completed by personnel involved in implementing the SOS. An adjustment was made for overhead costs. The unit costs were reported separately from the quantities. The dates when the costs were collected were not reported (although these are likely to be reported in Roetzheim et al 2004 - see "Other Publications of Related Interest" below for bibliographic details). The costs themselves were reported in 2000 prices, with reflation occurring where necessary.

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

**Indirect Costs**
For the societal perspective, the costs incurred by the patients in terms of the implicit value of time put into the SOS intervention were incorporated. The unit costs were based on the minimum wage in the USA prevailing in the year 2000.

**Currency**
US dollars ($).

**Sensitivity analysis**
Limited one-way sensitivity analyses were carried out to assess the impact of higher overhead rates and the effect size of the change in screening rates.

**Estimated benefits used in the economic analysis**
For changes in screening rates, see the ‘Effectiveness Results’ section.

Adherence without SOS mammography yielded 0.0613 life-years, Pap smears yielded 0.0621 life-years, FOBT yielded 0.0073 life-years, and the weighted average was 0.0807 life-years.

Adherence with SOS mammography yielded 0.0653 life-years, Pap smears yielded 0.0804 life-years, FOBT yielded 0.0247 life-years, and the weighted average was 0.1066 life-years.

**Cost results**
The cost of SOS per eligible patient was $5.39 from the payer perspective and $5.85 from the societal perspective. The marginal cost of SOS from the payer perspective was $2.55 for mammography, $1.96 for Pap smears, $2.96 for FOBT, and $3.12 for any test. The marginal costs of SOS from the societal perspective were $2.77 (mammography), $2.13 (Pap smears), $3.25 (FOBT) and $3.39 (any test), respectively.

**Synthesis of costs and benefits**
The cost per percentage change in the screening rate from the payer perspective was $55.1 for mammography, $13.79 for Pap smears, $10.50 for FOBT, and $27.04 for any test. The costs per percentage change in the screening rate from the societal perspective were $59.96 (mammography), $14.99 (Pap smears), $11.53 (FOBT) and $29.38 (any test), respectively.

The cost per life-year without SOS was $38,500 for mammography, $11,500 for Pap smears and $162,300 for FOBT, and the weighted average was $39,400.

The cost per life-year with SOS was $37,100 for mammography, $9,500 for Pap smears and $52,200 for FOBT, and
the weighted average was $31,400.

The difference in cost per life-year was $1,400 for mammography, $2,000 for Pap smears and $110,100 for FOBT, and the weighted average was $8,000.

The sensitivity analysis revealed that the results were sensitive to an increase from 30 to 50% in the overheads allowance. The authors reported that the sensitivity to the effectiveness denominator "is probably greater" than to the cost numerators, and justified this hypothesis with an explanation.

Authors' conclusions
The difference between the overall incremental cost-effectiveness ratio with and without the Cancer Screening Office System (SOS) suggests that the intervention is highly cost-effective.

CRD COMMENTARY - Selection of comparators
The authors compared screening with and without the SOS. As the SOS represented a complement to existing services, screening without the SOS made an obvious and appropriate comparator.

Validity of estimate of measure of effectiveness
The analysis was based on a cluster-randomised experimental trial. This element of randomisation enabled differences between patients assigned to the two screening groups to be reduced. However, the authors did not report summary statistics for the patients and practices assigned to each group and, therefore, it is not possible to assess whether systematic differences remained. Even if this were the case, the authors took steps to adjust for potential confounders through their statistical analyses.

Validity of estimate of measure of benefit
The authors used the screening rates and life-years saved as the summary measures of benefit. Assessing changes in screening rates enables comparison with other methods to improve adherence to screening regimes. The use of life-years saved enables broader comparisons across a spectrum of technologies aimed at improving life expectancy.

Validity of estimate of costs
The costing was carried out from two perspectives. Categories of cost relevant to each of these perspectives were estimated. Discounting was appropriately not used, and a price year was given. This, in addition to reporting the unit costs and quantities, allows readers to potentially translate the results into their own setting. A limited sensitivity analysis exploring the impact of overheads was carried out. The impact of uncertainty might have been explored further with wider ranging sensitivity analyses, or a statistical analysis surrounding costs. Further details regarding the economic analysis are available in a separate Technical Appendix that can be obtained from the authors on request.

Other issues
The authors were able to compare their results with those that had been published. They concluded, for instance, "the $55 it takes SOS to produce an extra mammogram... compares quite favourably to other inreach interventions designed to promote breast screening". The issue of generalisability was not explicitly addressed, although the use of a randomised trial and clear reporting of the costs and quantities improved the ability to generalise results. Generalisation is limited to underserved populations, as these patients were recruited into the study. The results and the conclusions were reported clearly, with no evidence of selective reporting. The conclusions both accurately reflected the results presented and related well to the study question. Several limitations were considered, including the understating of incremental cost-effectiveness ratio estimates.

Implications of the study
The authors recommended "managed care plans and other health policy makers should find SOS an attractive means of reaping the benefits of additional cancer screening at modest cost". Suggestions for further work included reassessing the efficacy and cost-effectiveness of SOS when additional screening tests are added, and focusing on longer follow-up periods to ensure that screening rates remain high over time.

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**Other publications of related interest**

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