WHAT ARE THE LONG-TERM COSTS AND BENEFITS OF SCREENING FOR OVARIAN CANCER AMONGST POSTMENOPAUSAL WOMEN?

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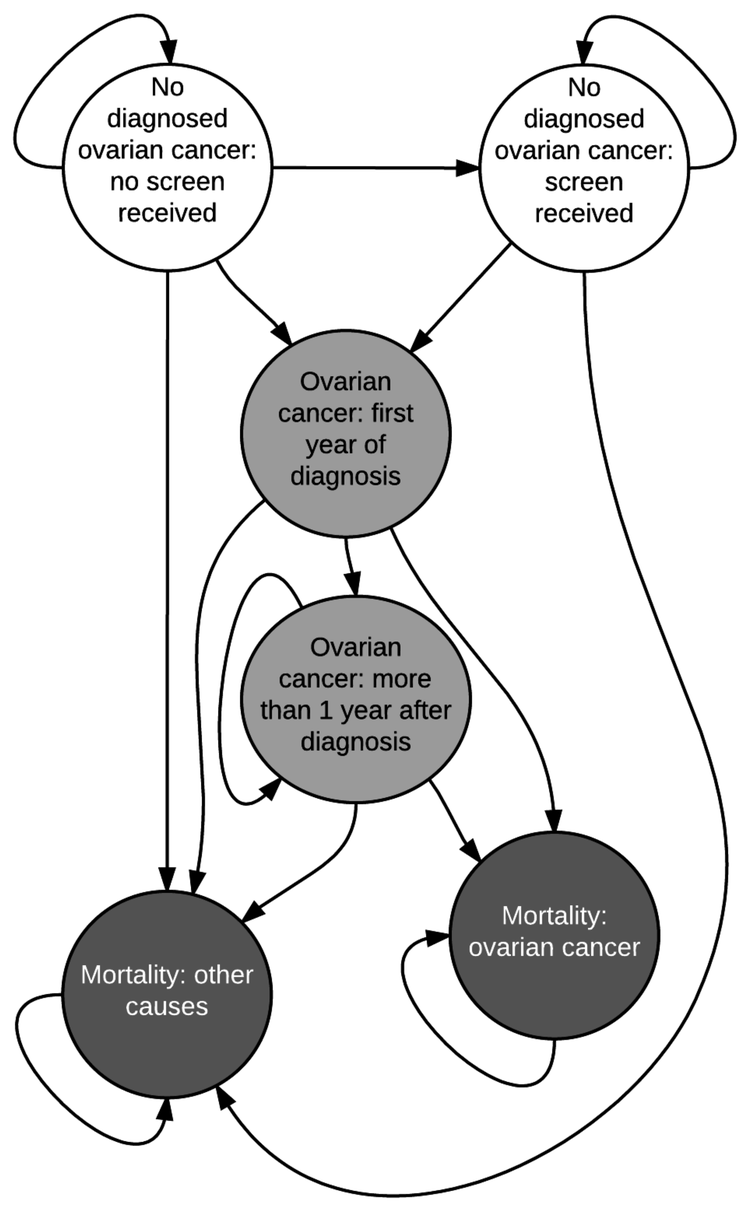
Background

Within the United Kingdom, ovarian cancer is among the top-five leading causes of female cancer deaths. Diagnosis is often after the disease has progressed to an advanced stage. If screening can detect ovarian cancer earlier at a less advanced stage, it may lead to improvements in survival.
The United Kingdom Collaborative Trial of Ovarian Cancer Screening (UKCTOCS) evaluated the impact of screening on ovarian cancer mortality. Over 200,000 women were enrolled and randomised to either no screening, ultrasound screening or multimodal screening (MMS). Results based on a median follow-up of 11.1 years did not show any statistically significant reduction in mortality amongst women in either screening arm. However, a potential delayed effect of screening was noted, with calls for further follow-up to fully assess the extent of the mortality reductions. The primary objective of this study was to evaluate the potential long-term costs and benefits of screening for ovarian cancer in the United Kingdom. The focus here is on comparing MMS (the most effective screening strategy) with no screening.

Methods

We performed an economic evaluation to assess the long-term effects of ovarian cancer screening on women's life expectancy and quality of life, as well as on healthcare costs. The impact of screening on ovarian cancer mortality was taken from the UKCTOCS. Evidence on the costs associated with screening, diagnosis and treatment along with the effects on patients' health-related quality of life were derived from systematic reviews and clinical expert opinion. To generate long-term estimates a rigorous and novel prospective evaluation of different extrapolation methods was performed. Data were synthesised in a mathematical (Markov) model. The impact of screening on life expectancy and quality of life was summarised using quality-adjusted life years (QALYs). The primary outcome was the incremental cost-effectiveness ratio (ICER), defined as the incremental cost per QALY gained when comparing screening with no screening. Research has suggested that interventions with ICER values less than £13,000 per QALY may be cost-effective.

Model schematic



Key model inputs (OC = ovarian cancer)

Cost parameters	Mean
Cost of screening	£63.09
Diagnosis and treatment: Borderline	£3,110
Diagnosis and treatment: Stage 1 OC	£7,077
Diagnosis and treatment: Stage 2 OC	£7,451
Diagnosis and treatment: Stage 3 OC	£9,142
Diagnosis and treatment: Stage 4 OC	£6,004
End of life cost: ovarian cancer	£7,080
Utility parameters	
Utility cancer free	0·900
Disutility Stage 1 OC or false positive	0·200
Disutility Stage 2 OC	0·325
Disutility Stage 3 OC	0·413
Disutility Stage 4 OC	0·455
False positives per cancer identified	2·302

Extrapolation methods:

- Standard parametric models (exponential, Weibull, Gompertz, log-logistic, lognormal): either separate model structures for each trial arm, or the same structure for both.
- Royston-Parmar flexible parametric splines.
- Exponential smoothing state space (time series) models with or without dampening.
- Including model discrepancy terms (to reduce the extrapolated treatment effect).

Results

Over a woman's lifetime, screening was estimated to be both more effective and more expensive than not screening.
Different extrapolation methods led to markedly different estimates of cost-effectiveness, with four-fold variation in the point estimate.
For four of the six extrapolation scenarios, the 95% confidence interval included screening being both more expensive and less effective than no screening, highlighting the uncertainty in the long-term estimates.

Cost-effectiveness results (MMS vs no screening)

Method	ICER	95% confidence interval
No dampening, no discrepancy (base)	£8,864	£2,600 to £51,576
No dampening, with discrepancy	£12,643	£3,734 to dominated
Dampening, no discrepancy	£12,549	£3,103 to dominated
Dampening, with discrepancy	£15,955	£3,870 to dominated
Separate parametric models	£18,372	£7,709 to £96,784
Same parametric model	£36,769	£13,888 to dominated

Implications

Long-term cost-effectiveness is promising, but there remains considerable uncertainty regarding extrapolated effectiveness. Assuming a willingness to pay of £13,000 per QALY, the funding decision changes depending on the extrapolation method used. Hence there is a need to reduce this methodological uncertainty. I shall be exploring these issues in more detail as part of an NIHR doctoral research fellowship.

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