What is the most cost-effective population-based cancer screening program for Chinese women?

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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.

CRD summary
This study assessed the cost-effectiveness of population-based cancer screening strategies for Chinese women, with the aim of identifying the optimal budget allocation. The authors concluded that universal Papanicolaou screening every four years and colonoscopy at 30% coverage every 10 years appeared to be the most efficient use of the available budget. On the whole the methodology was satisfactory and the authors' conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
This study evaluated population-based cancer screening strategies for Chinese women, with the aim of assessing how best to allocate budgets to minimise the population's overall cancer burden. The three leading cancers in women, for which effective screening was available, were evaluated; cervical, breast, and colorectal cancer.

Interventions
The screening strategies were fully reported and represented the available options. For cervical cancer, three screening strategies using cervical cytology (Papanicolaou, Pap, smear) were evaluated. For breast cancer, four strategies using mammography were evaluated. For colorectal cancer eight strategies were evaluated using faecal occult blood testing, sigmoidoscopy, a combination of these two, or colonoscopy. These were all compared with no screening.

Location/setting
Hong Kong/primary care.

Methods
Analytical approach:
The authors constructed an integrated, multiple cancer screening, decision model. The time horizon was 30 years and the authors reported that a societal perspective was taken.

Effectiveness data:
The effectiveness data were mainly derived from published studies or clinical guidelines. The main clinical parameters were the age-specific incidence rates of the three types of cancer, age-specific mortalities for cervical and colorectal cancer, specificity of screening tests, and breast biopsy-related complication rate.

Monetary benefit and utility valuations:
Life-years lost were obtained from standard life-tables in the authors' setting. The disability weights were derived from studies published by the World Health Organization. The methods of estimation were fully reported.

Measure of benefit:
The measure of benefit was disability-adjusted life-years (DALYs) averted. These were discounted at an annual rate of 3%.

Cost data:
The cost categories included screening and confirmatory tests, stage-specific cancer treatment, managing true- and false-
positive screens, and transportation. The productivity losses due to screening and management procedures were also included. The cancer treatment costs were based on Patient Related Group (PRG) data in the authors’ setting. Time and transportation costs were obtained from official published sources. All costs were appropriately converted from Hong Kong dollars to US dollars ($) and were reported for the price year 2001. They were discounted at an annual rate of 3%.

Analysis of uncertainty:
The parameter uncertainty was investigated through probabilistic sensitivity analysis, using second order Monte Carlo simulation. All the parameters in the model were assigned prior probability distributions, which were fully reported. The results were presented in cost-effectiveness league tables.

Results
An incremental analysis was performed for each cancer-specific set of mutually exclusive strategies. Dominated strategies were excluded and all cost-effective options were ranked. In total, 18 screening strategies were evaluated. Nine of these were found to be cost-effective depending on willingness-to-pay and budget constraints. All the currently used screening strategies in the authors’ setting were dominated, as they were more costly and less effective than the alternatives. All the results were fully presented.

With the current screening and treatment budget threshold ($50 million), universal Pap screening every four years ($51,993 per DALY averted) and colonoscopy every 10 years ($55,545 per DALY averted) substantially increased the benefits (averting 1,161 DALYs per year compared with the current 471), whilst maintaining the same expenditure. Biennial mammography commencing at age 50, cost $90,771 per DALY averted, but this required an increased budget.

The sensitivity analysis demonstrated that these results were robust.

Authors’ conclusions
The authors concluded that, with the current expenditure in their setting, universal Pap coverage every four years and 30% coverage for colonoscopy screening every 10 years appeared to be a more efficient allocation of resources than the current practice.

CRD commentary
Interventions:
The interventions were clearly described. The authors stated that only established interventions were included, which excluded options such as human papillomavirus DNA testing and human papillomavirus vaccination, which may have made the results less generalisable for some settings.

Effectiveness/benefits:
The model parameters were derived from published literature and the sources were clearly reported. No details of how these studies were identified were reported. Therefore, it is not possible to ascertain if the best available evidence was used. It is also not possible to judge the validity nor quality of the clinical data with only the information reported. The methods used to derive the benefits, which were DALYs, were reported with full details in an appendix.

Costs:
The costs appeared to reflect the perspective stated. Overall, the level of reporting of the cost analysis was adequate with base-case point estimates and ranges presented in the main paper and full details in an accompanying appendix. Appropriate adjustments, including discounting and the price year were reported. The methodology and the results of the probabilistic sensitivity analyses were also fully presented.

Analysis and results:
The model structure was presented in a diagram along with the relevant details and the modelling assumptions. The methods used were generally well reported. The parameter uncertainty was investigated through probabilistic analysis for all the input parameters. This, along with clear reporting, improves the generalisability and the validity of the study. The authors outlined a number of limitations and considered the impact of these on their results.

Concluding remarks:
Despite some limitations in the reporting of the identification and inclusion criteria for the effectiveness data, the authors provided a relatively transparent analysis and their conclusions appear to be appropriate.

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