Trade-Offs in Cervical Cancer Screening
Balancing Detected Cancer Precursors and Resource Use

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BACKGROUND
Following new advances in cervical cancer screening technology, Norwegian health authorities are considering alternative triage strategies for women with abnormal results in an attempt to improve the effectiveness of the current triennial cytology-based screening program for women aged 25-69.

Subsequently, decision-makers are faced with a trade-off between maximizing the detection of precancerous lesions (referred to as CIN2+) while simultaneously keeping the number of diagnostic tests (e.g., colposcopies) at an acceptable level.

OBJECTIVE:
Enumerate the short-term resource trade-offs associated with alternative screening strategies in terms of number of CIN2+ detected and resource use.

METHODS
We developed a decision tree model following a cohort of women attending primary screening through one screening round (i.e., 3 years).

The model is stratified by age (25-33 and 34-69), and allows for loss-to-follow-up and spontaneous regression of CIN2+.

Model inputs were informed by data from the Cancer Registry of Norway. Norwegian fee schedules, published literature, and expert opinion in the event of unavailable data.

- We accounted for parameter uncertainty by using probabilistic Monte Carlo simulation with 10,000 samples.
- Probabilities were assigned beta distributions.
- Gamma distributions were assigned to cost parameters. (1 USD = 6.35 NOK)

We adopted a societal perspective and discounted costs and benefits by 4% per year, in line with Norwegian guidelines for economic evaluation.

The model assessed a total of 10 strategies: The current Norwegian guideline compared with 9 alternative strategies involving reflex HPV testing (Figure 1).

The final strategy (i.e., pathway 1c-2b-3a in Figure 1) represents the proposed strategy from Norwegian health authorities.

OUTCOMES:
1) Incremental cost-effectiveness ratios (ICER): The additional costs per additional CIN2+ detected of a strategy compared with the next most costly strategy
2) Incremental harm-benefit ratios (IHBR): The additional number of colposcopies required to detect an additional CIN2+ compared with the next most harmful strategy

RESULTS 1: COST – EFFECTIVENESS

- For ages 25-33, the IHBRs ranged from 3.75 to 12.22 colposcopies per additional CIN2+ detected, and ranged from 0.67 to 28.93 for ages 34-69.
- For ages 25-33, five strategies provided more value for use of colposcopies than the current strategy, while for ages 34-69, the current strategy was among the four strategies that yielded greatest value in terms of colposcopy use.
- The most effective strategy in terms of CIN2+ detection (1a-2b-3b) was deemed ‘cost-effective’ in the majority of iterations given that the WTP exceeded 13.0 (ages 25-33) or 28.0 (ages 34-69) additional colposcopies per additional CIN2+ detected.
- The proposed strategy (1c-2b-3a) was dominated for all ages.

CONCLUSION:
By adding reflex HPV-testing to primary screening there is a potential to improve both effectiveness and efficiency of the current screening algorithm. Through this modeling exercise, we were able to detect that both the current and the proposed strategies were among the least effective strategies, leaving policy makers with a range of undominated strategies. However, the optimal strategy depends on society’s willingness, as well as women’s preferences, to trade off the harms and benefits associated with alternative screening intensities.

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