What is the Most Cost-effective Population-based Cancer Screening Package for Chinese Women?

Dr Pauline PS Woo, Dr Jane J Kim, Professor Gabriel M Leung
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Acknowledgements

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Why?

1. Most previous studies have focused on the efficacy and cost-effectiveness of screening for specific cancers without regard for overall policy coherence or total budget constraints faced by policymakers.

2. To address this gap between scientific research and the day-to-day imperatives of policymaking.
What Did We Do?

We developed an integrated cost-effectiveness analytic model (breast, cervical and colorectal cancers) for Hong Kong Chinese women given the fixed current budget.
Screening Strategies Evaluated

What is the most cost-effective way to screen?

Cervical cancer Pap screening (25-64 years)
- Pap smear screening every 3 years
- Pap smear screening every 4 years
- Pap smear screening every 5 years

Breast cancer mammography (MMG) screening
- MMG screening for 40-74 years (every 1 year)
- MMG screening for 40-74 years (every 2 years)
- MMG screening for 50-74 years (every 1 year)
- MMG screening for 50-74 years (every 2 years)

Colorectal cancer screening (50-74 years)
- FOBT screening every 1 year
- FOBT screening every 2 years
- SIG screening every 3 years
- SIG screening every 5 years
- Annual FOBT plus SIG screening every 5 years
- Colonoscopy screening every 5 years
- Colonoscopy screening every 7 years
- Colonoscopy screening every 10 years

FOBT = fecal occult blood testing
SIG = sigmoidoscopy
Health Effectiveness Measure

- Disability-adjusted life-years (DALYs)
- \( \text{DALYs} = \text{YLLs} + \text{YLDs} \)
  \[= \text{Years of life lost due to premature mortality} + \]
  \[\text{Years lived with disability}\]

- By using cancer incident cases, deaths (obtained from the Hong Kong Cancer registry), standard life expectancy (obtained from the Hong Kong standard life table) and disability weights and duration (adapted from the WHO Global Burden of Disease studies)
Cost Measure

- Screening, associated travel and total time costs.
- Direct medical (confirmatory tests and for treating pre-invasive lesions), travel and time costs of managing both true and false positive screens.
- Cancer treatment costs derived from the Hospital Authority’s Patient-Related Group (PRG) costing models.
Expansion Path for 18 Cancer Screening Strategies

Cost in Millions (HK$) vs. DALYs Averted
## Generalised Cost-effectiveness League Table

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Costs (HK$, in millions)</th>
<th>DALYs averted</th>
<th>Cost/ effect (HK$/ DALY averted)</th>
<th>Cumulative costs (HK$, in millions)</th>
<th>Cumulative effects (DALYs averted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pap smear screening every 5 years</td>
<td>80</td>
<td>437</td>
<td>181,985</td>
<td>80</td>
<td>437</td>
</tr>
<tr>
<td>Incremental from Pap smear screening every 5 years to every 4 years</td>
<td>46</td>
<td>114</td>
<td>405,545</td>
<td>126</td>
<td>551</td>
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<tr>
<td>COL screening every 10 years</td>
<td>892</td>
<td>2,059</td>
<td>433,248</td>
<td>1,018</td>
<td>2,610</td>
</tr>
<tr>
<td>MMG screening for ages 50 to 74 years, every 2 years</td>
<td>338</td>
<td>478</td>
<td>708,013</td>
<td>1,356</td>
<td>3,088</td>
</tr>
<tr>
<td>Incremental from MMG screening for ages 50 to 74 years, every 2 years, to include ages 40 to 49 years</td>
<td>320</td>
<td>308</td>
<td>1,037,219</td>
<td>1,676</td>
<td>3,396</td>
</tr>
<tr>
<td>Incremental from Pap smear screening every 4 years to every 3 years</td>
<td>84</td>
<td>43</td>
<td>1,957,639</td>
<td>1,760</td>
<td>3,439</td>
</tr>
<tr>
<td>Incremental from COL screening every 10 years to every 7 years</td>
<td>920</td>
<td>97</td>
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Current Total (Public and Private) Annual Screening and Treatment Expenditure

- Cancer treatment costs from the Hospital Authority PRG cost (annualised net present value of HK$180M, averaged over 30 years)

- Our own microcosting estimates, inclusive of screening plus associated travel and time costs (annualised net present value of HK$220M, averaged over 30 years)

- Annualised net present value of total HK$400M, averaged over 30 years
Generalised Cost-effectiveness League Table

With the same screening and treatment budgetary threshold of HK$400M,

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100% pap coverage every 4 years and 30% coverage of 10-yearly colonoscopy, could potentially avert 1,161 DALYs every year, compared to 471 DALYs averted under current screening patterns (*status quo*).

| Incremental from COL screening every 10 years to every 7 years | 920 | 97 | 9,480,903 | 2,680 | 3,536 |
Generalised Cost-effectiveness League Table

If this current budget is doubled to HK$800M,

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100% pap coverage every 4 years and 73% coverage of 10-yearly colonoscopy, with 2,061 DALYs saved every year

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<th>Screening Schedule</th>
<th>328</th>
<th>563</th>
<th>433,428</th>
<th>1,753</th>
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Interpretation

1. Cervical, breast and colorectal cancers were together responsible for 13,556 DALYs (in a 1:4:3 ratio respectively) in HK’s 3.4 million female population annually.

2. All status quo strategies were an inefficient deployment of scarce health dollars.

3. Current patterns of screening averted 471 DALYs every year, which could potentially be more than doubled to 1,161 DALYs under the same screening and treatment budgetary threshold of HK$400M with 100% pap coverage every 4 years and 30% coverage of 10-yearly colonoscopy.

4. With higher budgetary caps, colonoscopy screening could be scaled up to full coverage.