Cost Effectiveness of Mammography Screening: Today and the Future

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The general economy and the health care economy…Parkinson’s Law*

*Volume will expand to fill available capacity

**Proportion of women aged 35 or over who undergo regular mammographic screening
We used a statistical model to explain and attribute the different risks of breast cancer

Factors affecting a group of people born around the same time

- Birth cohort
  - Birth weight
  - Early lifestyle factors

Temporal effects which apply to all people at a certain point in time

- Period
  - Environment
  - Lifestyle factors

Breast cancer risk

Factors affecting breast cancer risk:

- Birth cohort:
  - Birth weight
  - Early lifestyle factors

- Period:
  - Environment
  - Lifestyle factors

- Age

Dao et al. 2011 

We observed a statistically significant difference in age-standardized rates of breast cancer per 100,000 women from 1976 to 2016.

The model predicts a continued average increase of 1.1% per year over the next 15 years.

### Observed and forecasted incidence

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Crude rate</td>
<td>28.6</td>
<td>34.5</td>
<td>46.7</td>
<td>64.6</td>
<td>-</td>
</tr>
<tr>
<td>Age adjusted rate</td>
<td>32.5</td>
<td>35.8</td>
<td>41.2</td>
<td>48.2</td>
<td>54.3</td>
</tr>
</tbody>
</table>

* *Notes: Data are based on Hong Kong’s most recently available figures in 2004 from the Hong Kong Cancer Registry.*
Age, period and cohort effects – what do they show?

Ref: Wong et al. Int J Cancer. 2007;121:1556-63

What do rising disease rates mean for population-based mass screening?

- We used a state-transition Markov Model to simulate mammography screening, diagnosis and treatment in a hypothetical cohort of local women aged 40 or older
  - undergoing mammography screening every 2 years:
    - beginning at 40 or 50 and ending at 69 or 79 years
    - without screening (controls)
- We compared their clinical outcomes in an incremental cost-effectiveness analysis
- We modeled the benefit of mammography by assuming a stage shift (i.e. cancers in screened women were more likely to be diagnosed at an earlier stage)
Decision Model Framework

Data Sources
- HK CR
- C&SD
- Meta analysis
- Observational
- Routine
- Expert

Model Inputs
- Clinical effect
- Benefits
- Quality-adjusted life years
- Cost

Decision model
- Screen every 2 years, 50 - 69 y
- Screen every 2 years, 40 - 49 y
- No screen
- Died

Well
- Breast cancer
- Ductal carcinoma in situ

Die from Breast Cancer

Die from Other causes

Stage distribution in unscreened group

Stage distribution in screened group

Well
- Breast Cancer AJCC Stage I
- Breast Cancer AJCC Stage II
- Breast Cancer AJCC Stage III
- Breast Cancer AJCC Stage IV

Ductal Carcinoma In situ
### Effects of future changes in breast cancer incidence on mammography cost effectiveness

<table>
<thead>
<tr>
<th>Year</th>
<th>ICER, HK$ / QALY saved</th>
<th>Screen age 40-69 vs no screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 (ref)</td>
<td>480,480</td>
<td>480,480</td>
</tr>
<tr>
<td>2006</td>
<td>458,640</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>433,680</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>424,320</td>
<td></td>
</tr>
</tbody>
</table>

ICER decreases because benefit of screening will increase as Br CA incidence increase.