The Cost-Effectiveness of Early Awareness in Lung Cancer Campaigns

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o Policy Research Unit in Economic Evaluation of Health and Care Intervention (EEPRU) contract with the Department of Health.

o Asked to evaluate the cost effectiveness of a campaign to improve the early awareness of the signs and symptoms of lung cancer

o Focus on the impact of a shift in the distribution of stage at diagnosis of NSCLC
Analysis outline

Sections:

1. Construction and estimating of natural history model
2. Application of costs and HRQoL
3. Analysis of early awareness campaigns
4. Level of uncertainty
1. Natural history model

- Natural history model simulates the experience of patients with NSCLC

- Cohort representing all of England >30 years of age

- Transitions between health states are based on a set of probabilities informed by calibration methods

- Model cycle of one month to account for rapid disease development
1. Natural history schematic

- **no disease**
- **Pre-clinical**
  - Stage I & II
  - Stage IIIa
  - Stage IIIb & IV
- **Clinical**
  - Stage I & II
  - Stage IIIa
  - Stage IIIb & IV

**Key**
- Solid line - a transition that can be estimated from available data
- Dashed line - transitions that require calibration estimation
1. Calibration

- Used to inform estimates of transitions in the natural history model that are by definition unobservable.
- Our calibration makes use of clinical priors alongside observed data.
  - Annual incidence of clinical lung cancer (LUCADA)
1. Calibrated natural history

Estimated annual incidence/prevalence of pre-clinical NSCLC in England

<table>
<thead>
<tr>
<th>Age group</th>
<th>Annual incidence of new (pre-diagnosis) NSCLC</th>
<th>Prevalence of pre-diagnosis NSCLC</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Stage I &amp; II</td>
</tr>
<tr>
<td>30-54</td>
<td>2,020 (0.01)</td>
<td>5,314 (0.03)</td>
</tr>
<tr>
<td>55-59</td>
<td>2,228 (0.07)</td>
<td>5,509 (0.19)</td>
</tr>
<tr>
<td>60-64</td>
<td>3,710 (0.12)</td>
<td>11,401 (0.36)</td>
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<tr>
<td>65-69</td>
<td>3,758 (0.15)</td>
<td>13,368 (0.55)</td>
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<tr>
<td>70-74</td>
<td>3,425 (0.17)</td>
<td>14,892 (0.73)</td>
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<tr>
<td>75-79</td>
<td>2,423 (0.15)</td>
<td>13,318 (0.80)</td>
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<tr>
<td>80-84</td>
<td>1,438 (0.11)</td>
<td>10,258 (0.82)</td>
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<tr>
<td>Total</td>
<td>19,002</td>
<td>74,060</td>
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Estimated 79,238 undiagnosed cases in England, 93% early stage

The probability of monthly development between each disease state

Probability of leaving early stage disease is very low (2.11%/month)

Once disease develops it progresses quickly (44%/month)
2. Costs and HRQoL

- **Costs** - Fleming et al. 2008 (costs of diagnosis and treatment in hospital setting)
  - Several issues: transferability, age of data, only hospital data, only for one year after diagnosis

- **Health Related Quality of Life** – Sturza (2010)
  - Meta analysis of utility values for lung cancer
  - Applied as decrements, by age and gender, to QoL of general population
3. Early awareness campaigns

- What is the possible impact on the natural history model of a national campaign?

- Range of campaigns were considered:
  - NAEDI local projects (October 2010 and October 2011)
  - Early Intervention in Lung Cancer within Doncaster
  - Leeds Early Diagnosis of Lung Cancer Campaign
  - NAEDI pilot (from October 2011)
  - NAEDI national campaign (no results yet available)
3. NAEDI pilot - Midlands 2011

- Consider the shift in stage of disease as a result of the campaign, assuming reproducible nationally
- Difference-in-difference analysis on NAEDI pilot results
- Assume campaign impact is limited to period of funding
- Applied to the natural history model to consider cost-effectiveness

<table>
<thead>
<tr>
<th>Stage</th>
<th>NAEDI trusts (intervention)</th>
<th>non-NAEDI trusts (control)</th>
<th>Percentage change in relative size of staged population</th>
</tr>
</thead>
<tbody>
<tr>
<td>I and II</td>
<td></td>
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<td>Illa</td>
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<tr>
<td>IIIb &amp; IV and unstaged</td>
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<td></td>
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<tr>
<td>Total</td>
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Results unpublished due to embargo
3. Cost-effectiveness results

- Base case impact of 3 month campaign
  - 325 additional QALYs at a cost of £3.9 million
  - Incremental Cost-Effectiveness Ratio (ICER)
    - £12,192 per QALY

- Threshold scenario analyses
  1. The cost of additional ‘worried well’ patients
     - Cost-ineffective if additional cost of £2.5 million (35,800 additional GP visits)
  2. The potential for cost saving though reduced emergency admissions
     - Cost neutral if £3.9 million saving (13,000 bed days)
4. Level of uncertainty

- Strengthen the natural history model
  - Potential of prevalence estimates (UKLS)
- Impact of an early awareness campaign
  - Additional data from pilot and full campaign
- Costs associated with the disease
  - Creation of micro costing framework using existing and new datasets (e.g. LUCADA, HES, SACT)
- The role of symptoms in natural history