Case study: Australia

Using an economic model to assess cost-effectiveness and build commitment to a national screening programme

Australia

Lung cancer is the most common cause of cancer death in Australia, with around 9,000 people dying from the disease each year.[1] Lung cancer costs the Australian health system $448 million every year; and that figure is expected to grow over the next decade.[2] It is therefore important that investment is focused on reducing both the community impact and economic effects of lung cancer.

As part of the Lung Cancer Screening Enquiry in 2020, Cancer Australia recommended implementing a national screening programme targeting high-risk individuals; this recommendation was based on extensive clinical evidence.[3] Cancer Australia outlined a feasible delivery model that would leverage existing infrastructure, and completed an economic evaluation to demonstrate the programme could be rolled out cost-effectively.[3]

Building a model to assess cost-effectiveness for a national programme

As part of the economic evaluation of screening, the MIcrosimulation SCreening ANalysis (MISCAN) lung model was used to calculate cost-effectiveness. The model was developed to:[4]

- simulate lung cancer trends in the population for thorough disease surveillance
- connect exposure to risk factors with observed lung cancer rates and death
- assess the effects of cancer-control measures.

MISCAN estimates and compares the benefits, drawbacks and costs of different screening scenarios (including no screening) using life histories.*[5] The model was adapted to include population data and lung cancer epidemiology in Australia, as well as the screening and assessment pathway proposed by Cancer Australia.[3] Parameters were added to the model to evaluate the effect screening has on patient and health-system costs compared with quality-adjusted life years (QALYs) gained.[3]

More than 400 screening scenarios were evaluated. The main outcomes assessed for each scenario were:[5]

- proportion of people screened
- number of low-dose computed tomography (LDCT) examinations
- reduction in lung cancer mortality
- number of prevented lung-cancer deaths

* The term 'life history' refers to significant events in an individual's life,[10] including health events (e.g. onset of a disease), demographic events (e.g. ageing), behavioural events (e.g. smoking cessation) and socioeconomic events (e.g. changes in income).

- number of life-years gained
- number of QALYs gained
- rate of overdiagnosis
- rate of false positives
- costs.

All 432 screening scenarios were analysed to determine the incremental cost-effectiveness ratio (ICER) by comparing the extra cost of each QALY gained against that of the previous scenario.[5] To address concerns around the cost of annual screening, an additional 216 biennial screening scenarios were analysed separately.[5]

The direct indicative costs (including setting up mobile screening, initial promotion and communication, and annual programme costs) were estimated to be $43.5 million in 2021, reducing to $20.8 million in 2024.[3] The base case[†] suggested that the most cost-effective national screening programme would be biennial – targeted at individuals aged 55–74 years with a minimum six-year lung cancer risk of 1.5% (using the PLCOm2012) – with an estimated ICER of $83,545 per QALY gained.[3]

Limitations of the initial assessment

The economic analysis was reviewed by the Medical Services Advisory Committee (MSAC). The MSAC requested that the financial analysis be revised to account for downstream impacts such as further investigation and treatment costs, to provide a more accurate assessment of its true impact on the Australian health budget. The MSAC suggested that an ICER closer to $20,000 per QALY might be acceptable for a revised screening programme to be recommended.[7]

Revisions to the model

In response to the MSAC's feedback, Cancer Australia provided additional information and the economic analysis was refined.[8] Cancer Australia addressed the MSAC's concerns about the validity of the economic evaluation and costs per QALY, and the model's parameter inputs were re-specified. These changes included:[8]

- implementing a 65% uptake assumption (reduced from 100%)
- adding the costs and consequences (including survival improvements) of novel treatments such as immunotherapies and targeted therapies
- adjusting fixed programme costs for the first two years.

After reviewing the comprehensive modelling, the MSAC recognised that an ICER of around $20,000 was not feasible for a national screening programme for lung cancer.[7] The base case suggested that the lowest ICER feasible for the national screening programme for lung cancer was $62,754 per QALY gained. The committee assessed this to be good value for money.[5]

The MSAC also noted that a higher base-case ICER was acceptable to address equity considerations and facilitate screening individuals with the highest risk who are from traditionally underserved communities.[8] Targeting these population groups – including people of lower socioeconomic status, people living in rural and remote settings, and

[†] The base case refers to the results from running an economic model using the most likely or preferred assumptions and input values.[6] These assumptions are based on the best evidence available or expert opinion to reflect the typical or expected situation. The base case serves as a reference point, and other scenarios (with different assumptions or values) are tested to see how much the results change when those assumptions are adjusted.[6]

Aboriginal and Torres Strait Islander peoples – improves the cost-effectiveness of the programme by increasing participation among the specified high-risk groups. Ultimately, this leads to more lung cancer cases being detected at an earlier stage, rather than a late stage.

Following this assessment, the MSAC recommended implementing a national screening programme for lung cancer targeting people aged 50–70 years who have smoked more than (or equal to) 30 pack-years, including those who had quit within the previous 10 years. The MSAC advised screening was undertaken biennially.[7] Based on this recommendation, the Australian government announced a $264 million investment to support the implementation of such a programme.[9]

The programme, commencing July 2025, will have a strong equity focus in recognition of the high risk and prevalence of lung cancer among people from traditionally underserved communities.[3 10]

> **'The programme aims to achieve better health outcomes for Australians by detecting lung cancer early and reducing lung cancer deaths. In Australia, there are significant differences in lung cancer outcomes among different population groups, highlighting the need for targeted, culturally competent approaches to help ensure fair and equitable lung cancer screening and health outcomes for all Australians.'**
> Professor Dorothy Keefe, CEO, Cancer Australia

The focus on high-risk populations will maximise impact while enhancing equity. Moving forward, the programme will be reviewed to assess its clinical effectiveness and cost-effectiveness.[8] Regular evaluation will help ensure the programme is optimised and that developments in treatment, both within Australia and internationally, are considered; this will be key to maintaining the programme's value for both people and the health system in Australia.

This case study was co-authored by Cancer Australia and the Lung Cancer Policy Network Secretariat.

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LUNG CANCER POLICY NETWORK

The Lung Cancer Policy Network is a global network of multidisciplinary experts from across the lung cancer community, which includes clinicians, researchers, patient organisations and industry partners. The Network is funded by AstraZeneca, Bristol Myers Squibb Foundation, Johnson & Johnson, MSD, Pfizer, Siemens Healthineers, GE HealthCare, Guardant Health, and Intuitive. Secretariat is provided by The Health Policy Partnership, an independent health research and policy consultancy. All Network outputs are non-promotional, evidence based and shaped by the members, who provide their time for free.