Case study: England

Building an economic case for screening

Previous studies on cost-effectiveness

There have been various trials for lung cancer screening in England and the UK, and some have looked at cost-effectiveness.

England

- The UK Lung Cancer Screening trial (UKLS) included an economic analysis using a model developed by Professor David Whynes.[1] The analysis showed that screening could be cost-effective compared to no screening, with an incremental cost-effective ratio (ICER) of £8,466 per quality-adjusted life years (QALYs) gained for once-only computed tomography screening.[2]
- Telephone appointments determine a potential participant's suitability for an LDCT scan. These appointments assess individual risk by using the LLPv2 and PLCOm2012 risk models.[3]

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

In 2016, the National Institute for Health Research (NIHR) Health Technology Assessment Programme commissioned the Exeter Test Group and the Health Economics Group – both at the University of Exeter – to investigate the effectiveness and cost-effectiveness of lung cancer screening.[4] The Exeter natural history-based economic model of lung cancer screening (ENaBL) was created as a result. ENaBL is a complex economic model that uses a natural history component to simulate individual participants. Natural history models have been found to be more likely to appropriately address the challenges of modelling screening programmes, as the models encompass more appraisal items from the Consensus Health Economic Criteria.[5,6]

From 2020 to 2022, the NIHR and the UK National Screening Committee commissioned further development of ENaBL by updating the parameters to include a new natural history element.[4] The natural history component needed to be changed because it was found to result in stage distributions that were not well matched to those observed in existing trials and national statistics for low-dose computed tomography (LDCT), resulting in overestimation of late-stage cancers and underestimation of early-stage cancers.[4]

The model started to be updated in 2021; however, during this process, further clinical input was required to redevelop the natural history model and provide up-to-date evidence for the input parameters relating to diagnosis, staging and treatment by stage, and survival by stage for screen-detected and clinically presenting lung cancer.[4,7] The delivery of the natural history model by the Exeter Test Group and the Health Economics Group experienced some delay, primarily due to its complexity, however, the input parameters were provided on time.[7] An interim report looking only at the effect of updating the parameters of ENaBL was developed at the request of the UK National Screening

Committee (to inform recommendations on lung cancer screening in mid-2022).[4 8] Data from the National Lung Cancer Audit (NLCA) and other contemporary screening studies were used in the parameters for the updated ENaBL model.[4 8-15]

- The **NLCA** showed the impact of performance status on survival by stage, and was essential in providing data for the non-screened population and interval cancers.[7]
- The **Manchester Lung Health Check** pilot provided, in a real-world setting, data on the performance status of those whose cancers were screen-detected; this allowed a comparison with the real world of clinically presenting lung cancer provided by the NLCA.[7]
- The **Summit trial** provided the latest stage distribution.[7]
- The **Yorkshire Lung Screening Trial** provided data on time to assess eligibility by phone.[7]
- The **West London Pilot** provided data on the average cost of managing incidental findings.[7]
- The **UKLS trial** provided data on seven-year survival of screen-detected lung cancer by stage in a British cohort.[7]

Targeted lung cancer screening was recommended in draft for consultation in June 2022 based on evidence from the interim report. It was formally recommended in late September 2022.[4 16] The analysis indicated that LDCT screening would be cost-effective compared to no screening with an ICER of £1,529 per QALY gained at a willingness-to-pay threshold of £20,000 per QALY gained.[8] However, this ICER could have differed once the natural history component of the mode had been updated; this was acknowledged by the UK National Screening Committee.[8]

The final results of ENaBL were published in November 2022.[4] Nearly 50 screening strategies were compared with each other and with no screening. Each strategy differed in terms of the frequency of screening and the populations eligible for screening. The incremental QALYs gained ranged from 0.0004 to 0.0132, while the incremental costs ranged from £15 to £120 per eligible person aged 55–80 years over their lifetime. An annual strategy inviting 55- to 75-year-olds and screening those with a risk greater than 1.5% resulted in an ICER of £8,517. And a strategy of screening 55- to 80-year-olds at a predicted risk of lung cancer of ≥1.5% resulted in an ICER of £9,073. The updated ENaBL model confirms the interim report results: that targeted lung cancer screening with LDCT is cost-effective at a threshold of £20,000 per QALY. The results from the final model also provided details on which screening intervals were more cost-effective. Single-screening strategies (one-off LDCT screening) were not deemed cost-effective at a willingness to pay of £20,000 per QALY gained, whereas annual and biennial screening strategies were found to be cost-effective.[4]

Continued evaluation of the national programme

Following the UK National Screening Committee's recommendation to implement a targeted lung cancer screening programme in England, the Targeted Lung Health Check (TLHC) programme was launched; the TLHC pilot was used as its basis.[17]

The TLHC programme uses two risk-prediction models to identify high-risk participants,[18 19] which is a reason why lung cancer screening is cost-effective in the UK.[9] The recent results from the Yorkshire Lung Cancer Screening Trial support continuing to use risk model-based criteria in the national roll-out of screening.[20] However, due to the similar efficiency of the

two risk models when used in equivalent populations, these data do not support the use of one model over the other.[9 20]

Cost-effectiveness data from NHS England's TLHC programme will guide the ongoing planning and roll-out of the national programme, which since 1 February 2025 has been called the NHS Lung Cancer Screening Programme.[21] A study running from October 2023 to September 2026 is examining the uptake and cost-effectiveness of the TLHC programme.[22] The study aims to maximise screening value (in terms of both cost and impact) by ensuring access for all eligible people and analysing cost-effectiveness based on varying uptake rates across different subgroups to inform the national programme's design.[22]

This case study was co-authored by Professor David Baldwin, Professor John Field and the Lung Cancer Policy Network Secretariat.

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LUNG CANCER POLICY NETWORK

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