A FLEXIBLE OPEN-SOURCE COST-EFFECTIVENESS MODEL FOR METASTATIC EGFR+ NON-SMALL CELL LUNG CANCER

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Background
- With the Open-Source Value Project (OSVP), the Innovation & Value Initiative (IVI) strives to maximize both the relevance and credibility of value assessment in the context of the United States’ decentralized decision-making environment by developing and providing access to flexible open-source decision models for value assessment.
- These interactive models have two primary objectives:
  1. To enable a new constructive dialogue regarding value assessment between stakeholders with different beliefs about relevant clinical data, modeling approaches, and value perspectives.
  2. To provide local decision-makers with credible value assessment that reflect the local setting and are based on the latest evidence while accounting for all scientific uncertainty.
- OSVP facilitates iterative development and collaboration between multiple clinical and methodological experts, and evolves as new clinical evidence and scientific insights become available.

The IVI Non-Small Cell Lung Cancer Model

Purpose
- A flexible open-source simulation model was developed that can be used to estimate the value of alternative sequential treatment strategies for patients with metastatic EGFR+ non-small cell lung cancer (NSCLC) (Figure 1).

Open-source Components
- To facilitate transparency, understanding, debate and collaboration among diverse stakeholders, the IVI-NSCLC model consists of multiple components available in the public domain (Figure 2).

Model Structure
- The IVI-NSCLC model is accessible to both technical and non-technical end-users and allows them to evaluate the impact of uncertainty in clinical evidence, alternative model structures, the decision framework of choice (i.e., cost-effectiveness analysis [CEA] or multi-criteria decision analysis [MCDA]), novel concepts of value, and perspective (healthcare or limited societal) on the estimates of value.

Figure 3: Treatment sequences of interest that can be evaluated with the IVI-NSCLC model.

The IVI-NSCLC model is an individual-level continuous-time state transition model (CTSTM) in which patients can either have stable disease, progressed disease, or have died.
- Two alternative model structures can be selected describing the development of disease over time for a sequence starting with 1L, followed by 2L and 2L treatment (Figure 3 and 4).
- Estimation of treatment effects over time beyond the available data can be modeled according to 3 alternative survival functions (Weibull, Gompertz, 2nd order fractional polynomial).

Model Output
- An overview of all model outcomes is shown in Table 1.
- Parameter uncertainty is quantified using probabilistic sensitivity analysis.

Table 1: model outcomes

<table>
<thead>
<tr>
<th>Model Outcomes</th>
<th>Source code</th>
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<tbody>
<tr>
<td>Health state probabilities, survival curves, life expectancy, horizon, sensitivity analysis</td>
<td>R source code (GitHub)</td>
</tr>
<tr>
<td>III-NSCLC R package</td>
<td></td>
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Source Data
- Key parameters for the model relate to: (i) the treatment effects of the interventions used for the different lines of treatment in terms of PFS and OS; (ii) utilities; (iii) healthcare resource use; and (iv) productivity. Estimates for these parameters were based on currently available published evidence identified by means of a systematic literature review and synthesized with (network) meta-analysis techniques where appropriate.

Conclusions
- In order for a cost-effectiveness model to remain relevant over time it needs to evolve along with the clinical evidence and scientific insights.
- The IVI-NSCLC model, and IVI’s OSVP more generally, facilitates iterative development and collaboration between multiple clinical and methodological experts with the ultimate aim of having a transparent model useful and acceptable for many stakeholders.

Disclosure
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Get started using the IVI-NSCLC Model
Want a user-friendly interface for experts or one for non-experts? Or access to the source code? Whether you are new to modeling or an expert programmer, you can easily jump into the IVI-NSCLC model.
- For online tools and interfaces: https://www.thevalueinitiative.org/ivi-nsclc-value-model/
- For the IVI-NSCLC R package, tutorial, source code, and detailed documentation: https://innovationvalueinitiative.github.io/IVI-NSCLC/

Figure 5: Example screenshot of web-based advanced user interface

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