



Cost-Effectiveness Analysis of Nivolumab Compared to Pembrolizumab in Previously Untreated Locally Advanced or Metastatic Non-Small Cell Lung Cancer Patients

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Introduction

Lung cancer has caused large clinical and economic burdens for the U.S. healthcare system.

No head-to-head clinical trials or comparative effectiveness available for within ICI group comparisons.

Pembrolizumab and nivolumab share extremely similar clinical results and the cost-effectiveness results are conflicting.

Healthcare resource is limited so not all medications can be reimbursed. Decision making with similar medications needs evidence supports.

The objective of this analysis is to assess the cost-effectiveness of pembrolizumab versus nivolumab in advanced or metastatic NSCLC patients from a third-party payer's perspective.

Methods

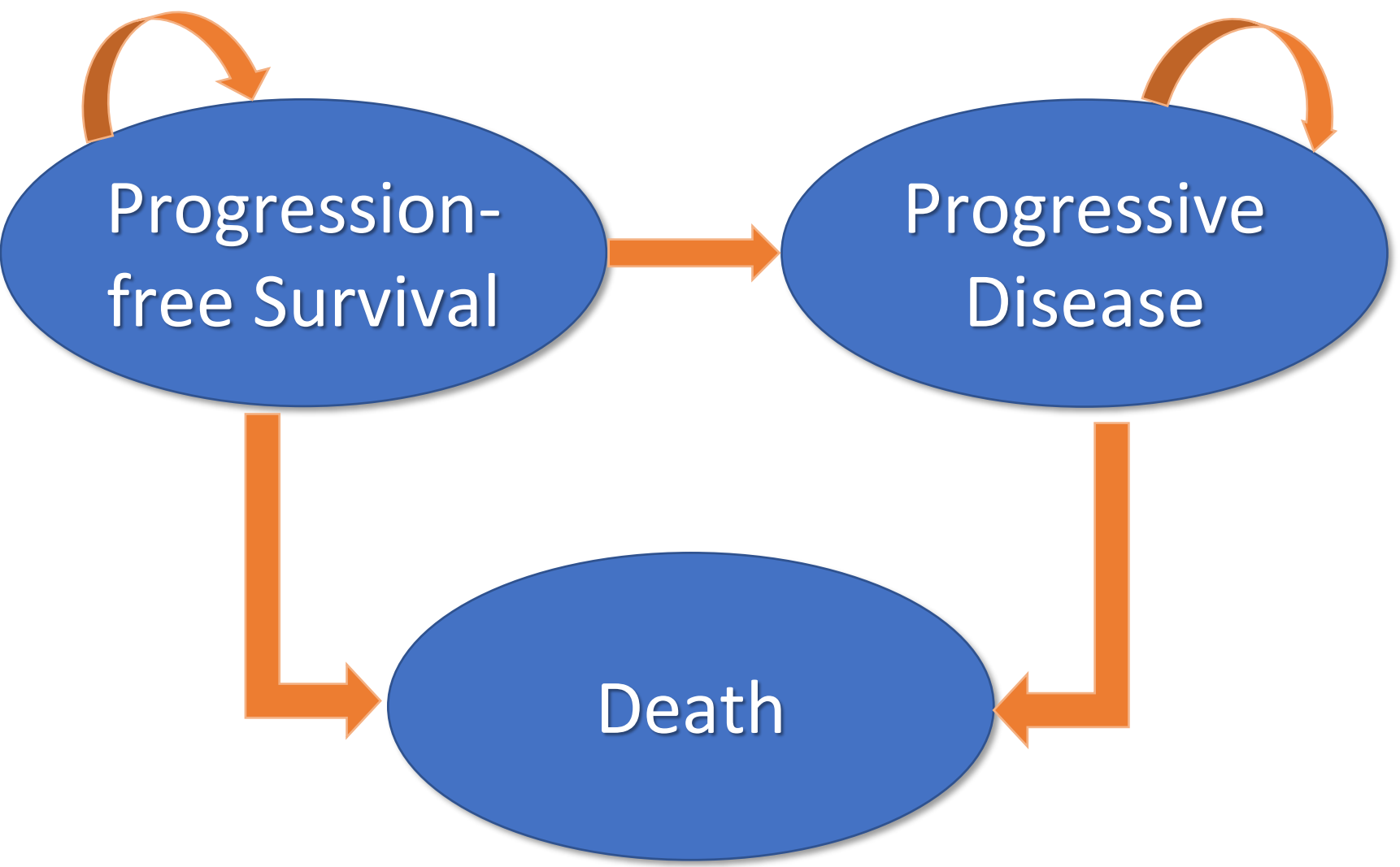


Figure 1. The model

Model Design

- We developed a three-state transition model based on the phase III KEYNOTE-042¹ trial.
- Cycle length was 3 weeks with a 10-year time horizon.
- Transition probabilities for pembrolizumab were obtained following individual patient data (IPD) reconstruction of the survival curves of the KEYNOTE-042¹ trial and parametric model fitting.
- The hazard ratios comparing pembrolizumab and nivolumab were obtained from on network meta-analysis² and used as factors to derived transition probabilities for nivolumab.
 - Nivolumab VS. Pembrolizumab: HRPFS=0.98, HROS=1.03

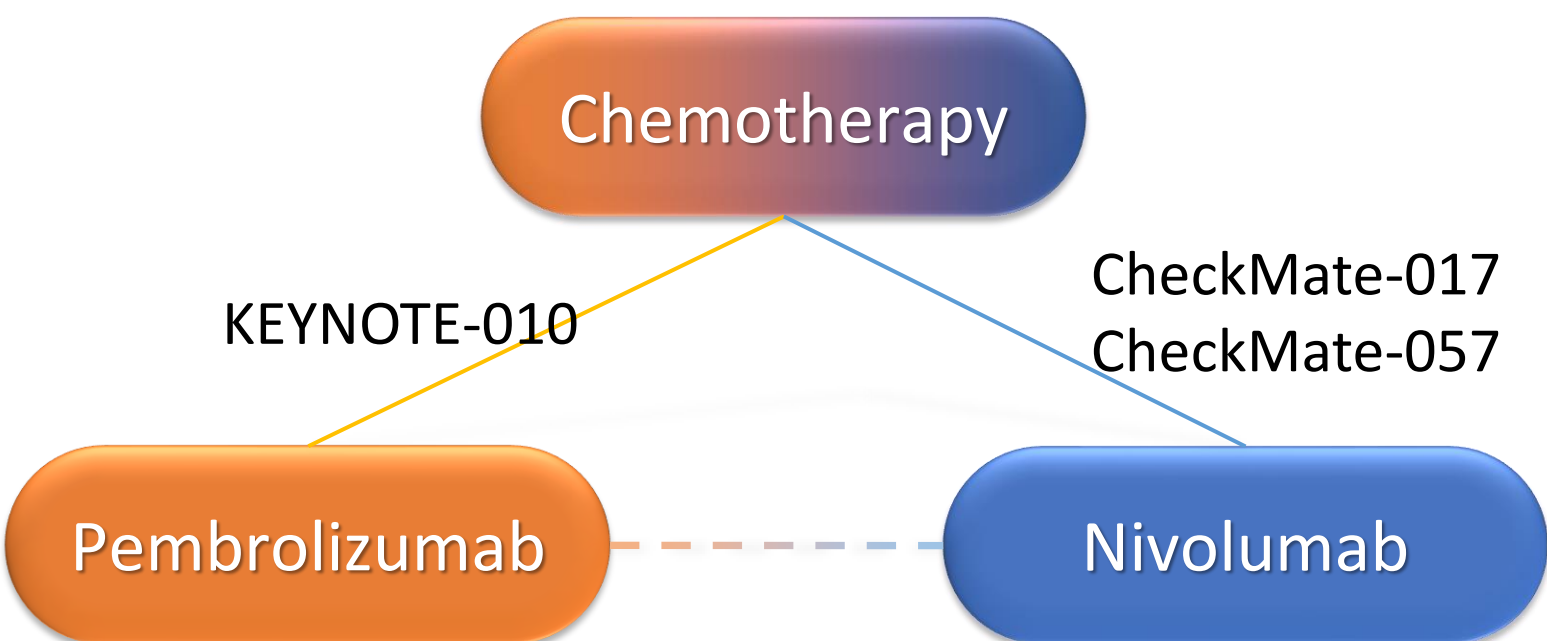


Figure 2. Network Meta-analysis

Methods (Cont.)

Data Sources

- Utilities³ of NSCLC states were obtained from a real-world utility survey study.
- Direct medical costs were obtained from publicly available sources.
- A 3% annual discount rate for cost and outcomes was used for adjustment.

Base Case Analysis

- The incremental cost-effectiveness ratio (ICER) and net monetary benefit (NMB) was estimated for pembrolizumab versus nivolumab.

Sensitivity Analysis

- One-way was conducted by adjusting the parameters for $\pm 10\%$.
- Probabilistic sensitivity analyses were conducted using Monte Carlos simulations for 3,000 times. Appropriate distributions were used for corresponding parameters.

| Parameter | Distribution |
|----------------------|--------------|
| Survival Probability | Cholesky |
| Utility | Beta |
| Costs | Gamma |
| HR | Normal |

Discussions & Conclusions

- Pembrolizumab is not cost-effective compared to nivolumab at a WTP of \$150,000 per QALY.
- Sensitivity analysis showed that pembrolizumab has a trend of being cost-effective over nivolumab.
- However, due to the extreme similarity of the clinical effectiveness of the two medications, the results are prone to weak robustness of the model.
- There are some limitations that may be improved in future analysis:

Data Source:

- Utility data were estimated from non-US population
- Costs estimation beyond first-line/PFS state not precise due to data availability
- Obtain data from real-world databases

Further analysis:

- cost-minimization analysis, budget impact analysis

Reference

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- Choudaid C, Agulnik J, Goker E, Herder GJ, Lester JF, Vansteenkiste J, Finnen HW, Lungershausen J, Eriksson J, Kim K, Mitchell PL. Health-related quality of life and utility in patients with advanced non-small-cell lung cancer: a prospective cross-sectional patient survey in a real-world setting. Journal of thoracic oncology. 2013 Aug 1;8(8):997-1003.

Results

Base Case Scenario

- ICER = \$358,127/Quality Adjusted Life Year (QALY) in previously untreated NSCLC patients on pembrolizumab compared to those on nivolumab.
 - Pembrolizumab: 0.97 QALY at a cost of \$263,480
 - Nivolumab: 0.96 QALY at a cost of \$259,835
- NMB was estimated to be \$-2,118 at a willingness to pay(WTP) threshold of \$150,000/QALY.

Sensitivity Analysis

One-way Sensitivity Analysis (Figure 3)

- One-way sensitivity analysis has shown that the model is most sensitive to the **acquisition costs** for both medications and PFS hazard ratio with the ICER ranging from \$-1,402,502 to \$2,118,756 per QALY.

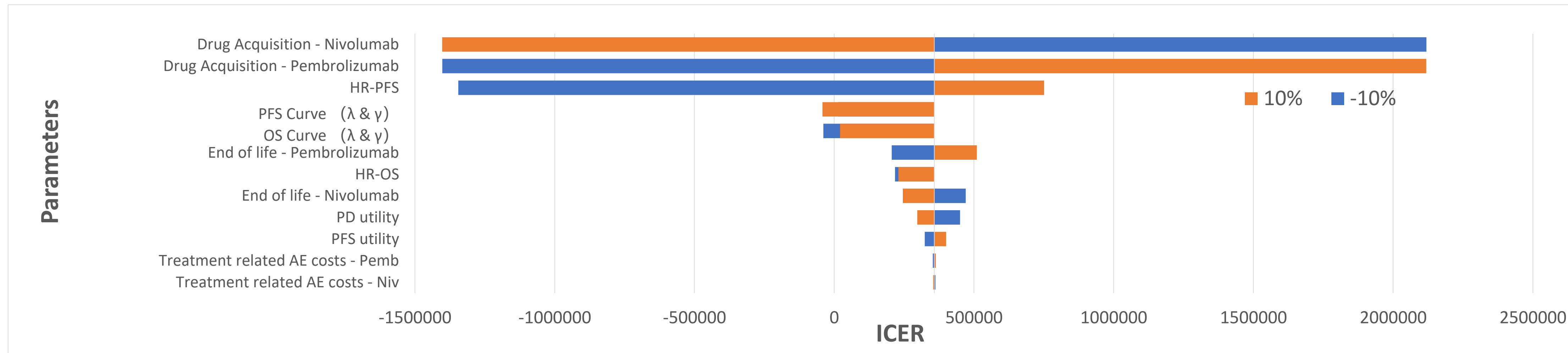


Figure 3. One-Way Sensitivity Analysis

Probabilistic Sensitivity Analysis (PSA) (Figure 4)

- PSA has shown that in just a little over half (54%) of the situations that pembrolizumab is cost-effective than nivolumab at a WTP threshold of \$150,000/QALY. (Figure 4A)
- Pembrolizumab may have the largest acceptability over nivolumab at a WTP of \$300,000/QALY. (Figure 4B)

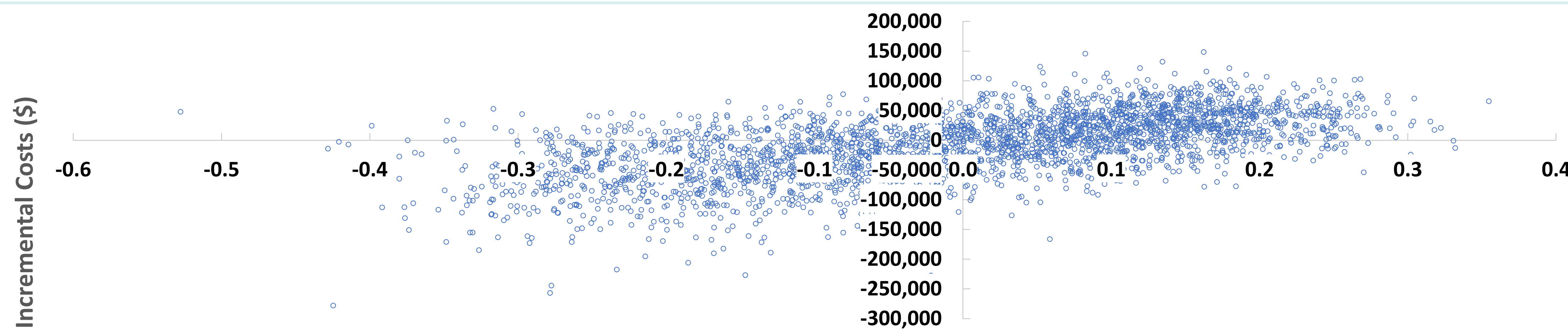


Figure 4A. Monte Carlo Stimulation

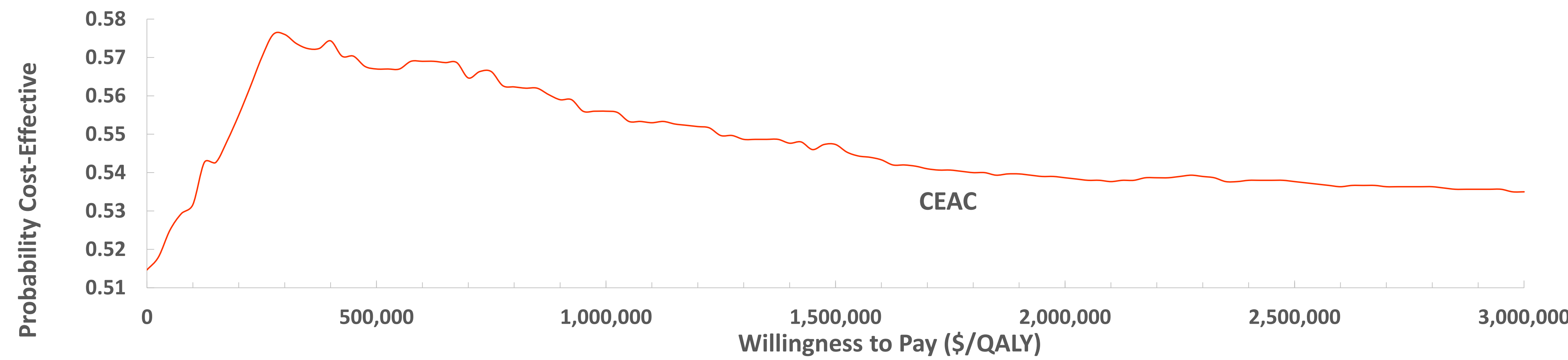


Figure 4B. Cost-Effectiveness Acceptability Curve (CEAC)