Real-World Cost-Effectiveness of Publicly Reimbursed Multi-Gene Panel Sequencing to Inform Therapeutic Decisions for Advanced Non-Small Cell Lung Cancer in British Columbia, Canada

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Background

- Multi-gene panel sequencing streamlines treatment selection for advanced non-small cell lung cancer (NSCLC). Implementation continues to be uneven across jurisdictions, in part due to uncertain clinical and economic impacts.
- This study determined the population-level cost-effectiveness of publicly reimbursed multi-gene panel sequencing compared to single-gene EGFR testing for advanced NSCLC.

Methods

- In British Columbia (BC), Canada, the public healthcare system reimbursed a multi-gene panel in September 2016.
- Our population-based retrospective study design used comprehensive patient-level cancer control and linked administrative health databases. We considered adult BC residents with an advanced lung cancer diagnosis between September 2016 and December 2018.
- Using a machine learning approach, we conducted 1:1 genetic algorithm matching of recipients receiving multi-gene panel sequencing to controls receiving single-gene testing, maximizing balance on observed demographic and clinical characteristics.
- Following matching, we estimated mean three-year survival time and costs (public healthcare payer perspective; 2021 CAD) and calculated the incremental net monetary benefit (INMB) for life-years gained (LYG) at conventional willingness-to-pay thresholds using inverse probability of censoring weighted linear regression and nonparametric bootstrapping.

Results

- We matched 858 panel-eligible advanced NSCLC patients to controls, achieving balance for the 16 included covariates.
- Average test turnaround times were 18.6 days for multi-gene panel sequencing and 7.0 days for single-gene testing.
- After matching, mean Δ costs were $3,529 (95%CI: -$4,268, $10,942) and mean Δ LYG were 0.08 (95%CI: - 0.04, 0.18).
- The INMB was $523 (95%CI: -$6,256, $7,023) at $50,000/LYG, with a 57.5% probability of being cost-effective, and $4,575 (95%CI: -$5,468, $14,064) at $100,000/LYG, with an 84.0% probability of being cost-effective.

Using population-level **real-world data**, we found **multi-gene panels** in advanced NSCLC were **cost-effective at higher thresholds**, even with differences in **survival and costs** that were **not statistically significant** compared to **single-gene** testing

Figure 1. Balance of Characteristics between Patients Receiving Single-gene or Multi-gene Panel Testing, Before and After Matching.

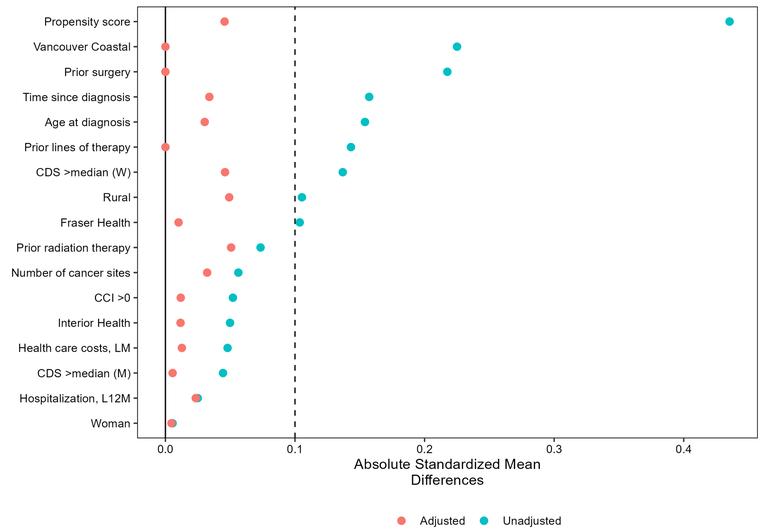
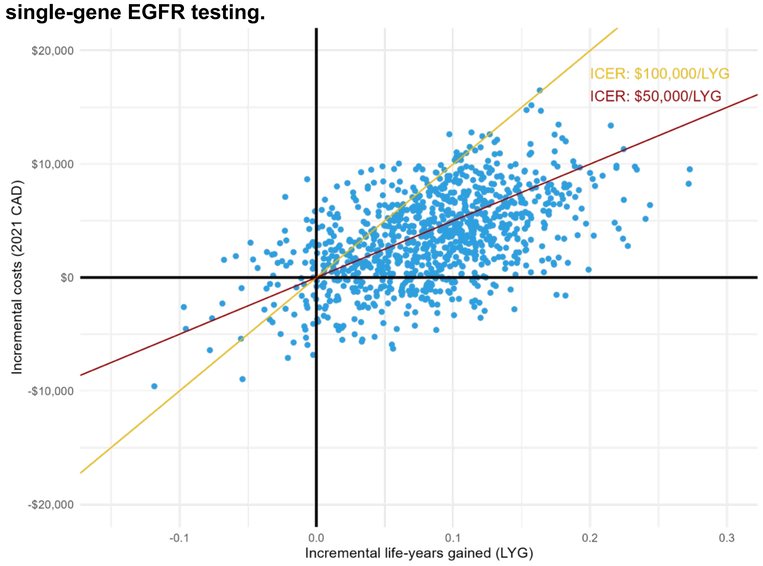


Figure 2. Cost-effectiveness plane for multi-gene panel testing compared to single-gene EGFR testing.



Conclusion

- We used machine learning-based quasi-experimental methods to identify a well-balanced counterfactual.
- We found a high probability that panel-based testing in advanced NSCLC would be cost-effective at higher thresholds, even with differences in survival and costs that were not statistically significant compared to single-gene EGFR testing.

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