Real-World Policy Effects of Implementing Multi-Gene Panel Sequencing for Advanced Cancers in British Columbia, Canada: An Interrupted Time Series Analysis

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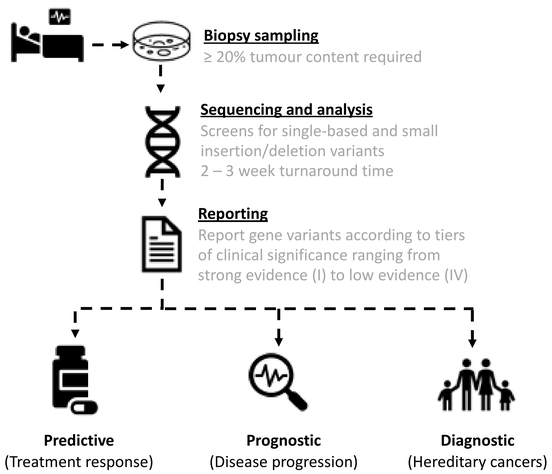
Background

Multi-gene panel sequencing may improve population health through identifying actionable therapeutic targets. Owing to uncertain clinical and economic impacts, health system uptake remains limited.

We estimate the real-world population mortality and health system expenditures impacts of cancer control policy implementing a 54-gene panel for advanced cancer care in British Columbia (BC), Canada, a province of 5.4 million people.

We focus on two exemplar indications where panel testing replaced single gene testing and results either guided treatment selection or de-escalation: **advanced non-small cell lung cancer (NSCLC) and metastatic colorectal cancer.**

Figure 1: Overview of sequencing process and results



Methods

In September 2016, BC's public healthcare system reimbursed multi-gene panel sequencing at a cost of $1,200 per patient.

Using population-based administrative data, we identified patients diagnosed with either advanced NSCLC or metastatic colorectal cancer in BC who accessed single gene or panel testing between 2014 and 2018. We followed patients for up to 2 years and measured **monthly mortality rates and mean monthly healthcare costs**.

Using interrupted time series analysis, we estimated the immediate and gradual outcomes changes stemming from the policy change. Final models included ARIMA regressions of costs and GLS Poisson regressions of mortality.

Q: What are the real-world impacts of publicly reimbursing multi-gene panels for advanced cancer care?

Using **interrupted time series analysis**, we find increased healthcare spending on **expensive cancer therapies** regardless of therapeutic intent for **multi-gene testing,** with no evidence of changing mortality rates.

Results

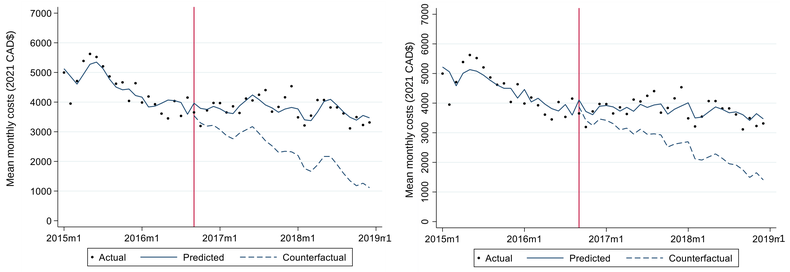
Over the period, 3,502 patients with advanced NSCLC and 1,330 with metastatic colorectal cancer were study eligible.

Average uptake of multi-gene panels among tested patients ranged from 50% in advanced NSCLC to 84% in metastatic colorectal cancer, with gradual increases observed over time

In NSCLC, mean healthcare costs initially fell by $542 (95% CI: $303, $781), but savings were offset within 14 months by persistent increases in costs of $40 per month (95% CI: $26, $54). In colorectal cancer, multi-gene panel implementation led to increasing mean per-patient healthcare costs of $61 per month (95% CI: $8, $113).

Figure 2: Mean monthly per-patient healthcare costs

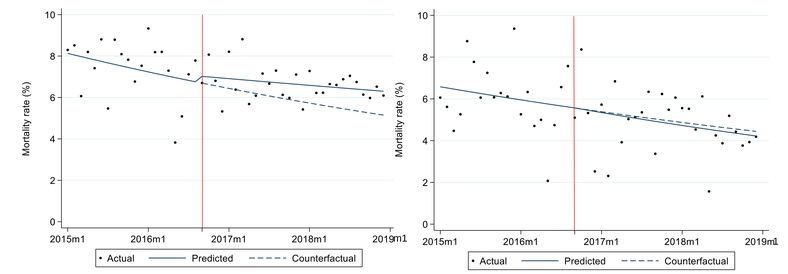
(A) Advanced NSCLC **(B) Metastatic Colorectal Cancer**



In both indications, greater systemic therapy costs drove overall costs, stemming from increasing access to expensive therapies. We failed to detect concurrent changes in mortality rates.

Figure 3: Mean monthly mortality rates

(A) Advanced NSCLC **(B) Metastatic Colorectal Cancer**



Conclusion

Individualizing patient care has population impacts for patients and healthcare systems. Implementing multi-gene panel sequencing in BC drove increases in healthcare costs for treating advanced cancers through increasing access to expensive systemic therapies. Population-level mortality did not justify higher spending.

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Access to data provided by the Data Steward(s) is subject to approval, but can be requested for research projects through the Data Steward(s) or their designated service providers. All inferences, opinions, and conclusions drawn in this publication are those of the authors, and do not reflect the opinions or policies of the Data Steward(s).

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