

# COMPREHENSIVE GENOMIC PROFILING FOR NON-SMALL CELL LUNG CANCER (NSCLC): A HEALTH AND BUDGET IMPACT ANALYSIS

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## BACKGROUND & OBJECTIVE

- NSCLC is the leading cause of cancer-related mortality in Canada.<sup>1</sup>
- Use of targeted therapies in the treatment of NSCLC is predicated on genomic profiling.
- The current Canadian genomic testing landscape for NSCLC comprises single-gene and multigene hotspot panels that examine selected regions of the genome.<sup>2,3</sup>
- Comprehensive genomic profiling (CGP), a broader testing method, utilizes next-generation sequencing to detect known and novel variants across four main classes of genomic alterations.<sup>2</sup>
- CGP may offer improved detection rates, while minimizing tissue requirements and turnaround time relative to conventional testing methods.<sup>2</sup>
- The objective of this analysis was to assess health and budget impact of adopting CGP for NSCLC in Canada.

## METHODS

- A health and budget impact model was developed to assess the implications of replacing some or all of current testing in NSCLC with CGP (cost per test \$6,194), leading to variations in tests received, detection of targeted mutations, and resulting test costs and life expectancy (Figure 1)
- The impact of listing CGP tests, FoundationOne CDx and FoundationOne Liquid, was estimated over a three-year time horizon from a Canadian societal perspective.
- Conventional testing strategies were reflected in two reference scenarios:
  - A series of single-gene tests only (Reference scenario 1), and
  - Reflex single-gene testing followed by hotspot panel for negative results (Reference scenario 2).
- Four adoption scenarios for CGP testing were considered with a 50% uptake; in all scenarios FoundationOne Liquid is assumed to be used for those with insufficient tissue availability or upon failure of therapy for second-line testing:
  - Replacing all current testing modalities,
  - Replacing hotspot panel testing only,
  - Using after negative single-gene and hotspot testing, and
  - Only FoundationOne use is FoundationOne Liquid in individuals with insufficient tissue for conventional testing.
- Turnaround times, based on clinical experience, were assumed as follows:
  - Single-gene testing: < 14 days,
  - NGS panel: ≤ 14 days,
  - CGP: 11 to 14 days.
- Detection rates for conventional tests and CGP were taken from the published literature literature (Table 1) (Refs 1-8)
- Operating costs of laboratories reviewed and as well as testing material costs, relevant non-material costs were incorporated in the model.
  - Total materials costs for IHC tests were \$52,000, NGS were \$1,274,000. Total non-material costs were \$674,371, based on a total of 1690 tests annually (Table 2)

Figure 1. Budget impact model overview

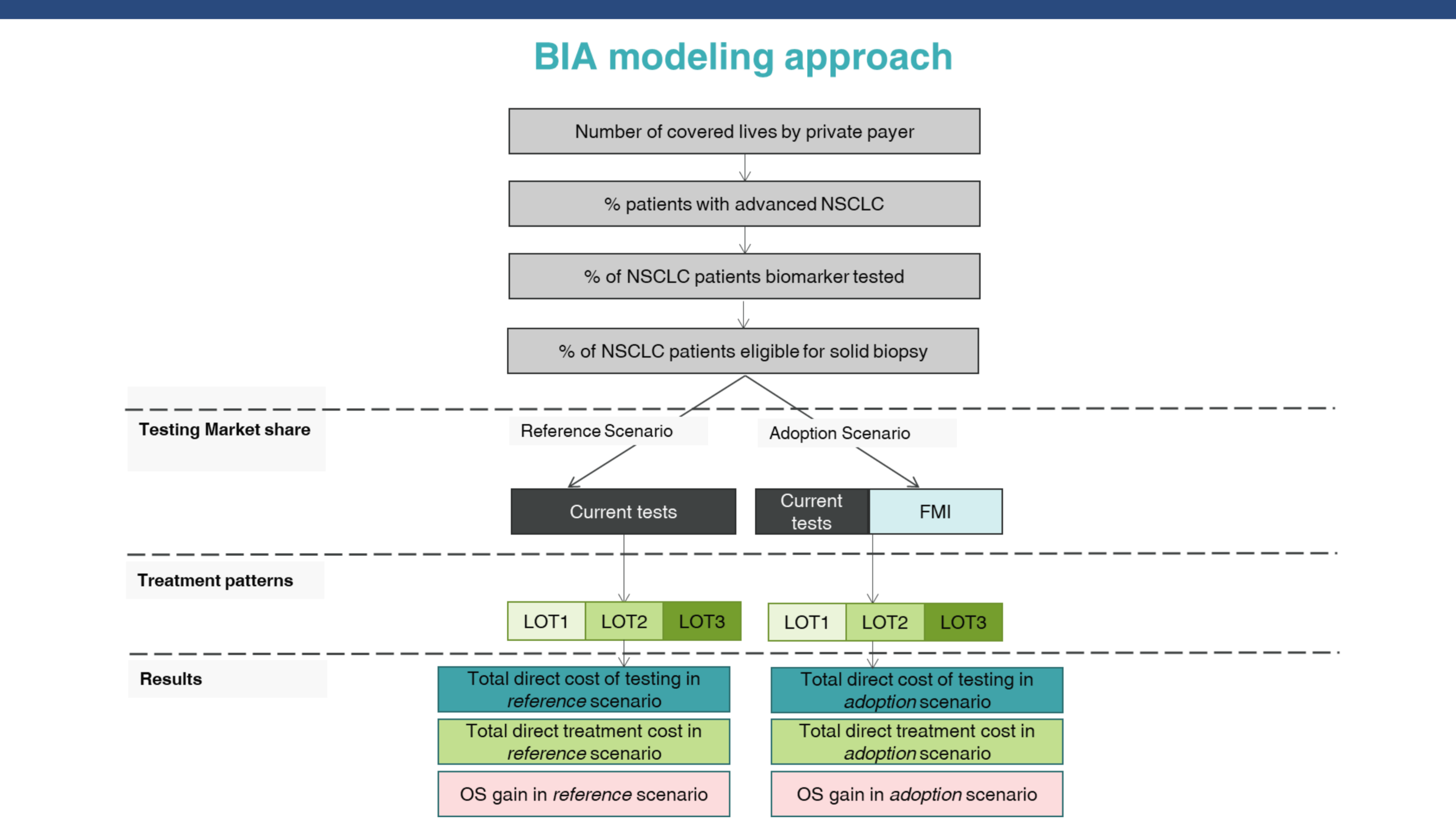


Table 1. Detection rates for individual alterations and biomarkers in conventional tests vs. Foundation Medicine

Test	Conventional	Foundation Medicine
ALK(4, 5)	2.1%	2.9%
PD-L1(6)	30.2%	
EGFR(1, 7, 8)	11.9%	14.0%
KRAS(1, 8)	17.5%	22.4%
BRAF(1, 8, 10)	1.4%	4.0%
ROS1(1, 8)	0.7%	1.0%
HER2(1, 8)	2.1%	4.2%
MET(1, 8)	2.6%	5.8%
RET(1, 8)	0.7%	1.7%

\*Note that PD-L1 expression are tested with IHC assays, and would be used in conjunction with Foundation Medicine testing

Table 2. Summarized estimation of costs per test, based on input from British Columbia<sup>11</sup>

	OPERATIONAL COST - MATERIALS ONLY	ALL OTHER COSTS	NUMBER OF TESTS ANNUALLY	ESTIMATED COST PER TEST
IHC	\$52,000.00	\$ 674,371.42	390	\$ 652.08
NGS	\$1,274,000.00		1300	\$ 1,918.75

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## RESULTS

- When CGP was assumed to replace all conventional testing (adoption scenario 1), budget impact per-person-per-year was (table 3, figure 2):
  - \$0.87 in Reference 1, and
  - \$0.71 in Reference 2,
  - There was a three-year gain of 680.9 life-years and 3,831 working days over the full cohort in both reference scenarios.
- Scenarios with less use of CGP were associated with lower cost but fewer health benefits:
  - \$0.56 in Reference scenario 2, but health benefits are reduced by over 50% (adoption scenario 3)
  - \$0.10 if Foundation is used, but the health benefits are reduced by over 70% (adoption scenario 4)

Figure 2. Overview of treatment and impact associated with Foundation Medicine, across use scenarios of FoundationOne CDx. FoundationOne Liquid is used across all scenarios

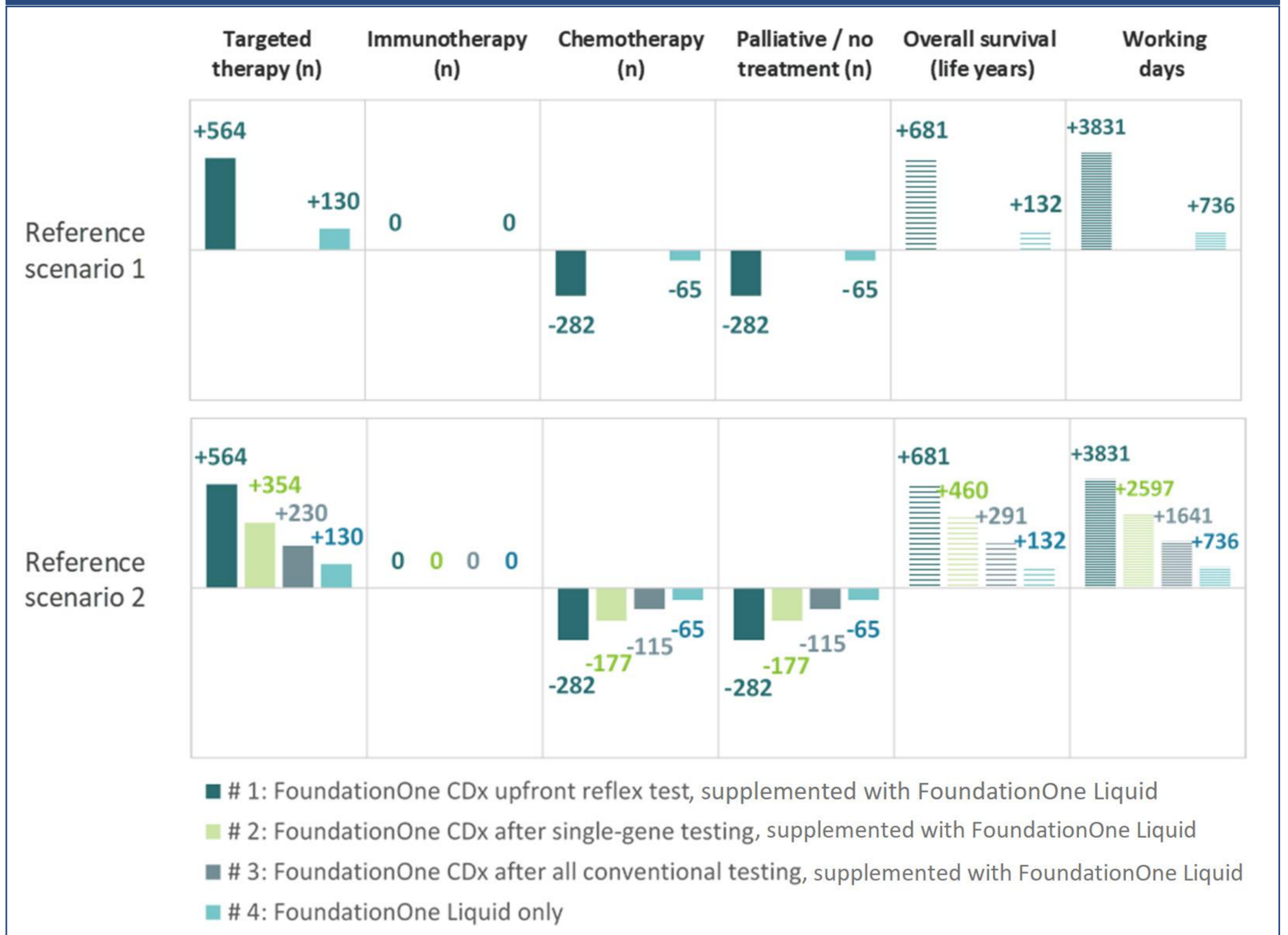


Table 3. Health and budget impact by reference and adoption scenarios (50% uptake for Foundation Medicine testing)

	Reference scenario 1: Single-gene testing only				Reference scenario 2: Single-gene testing plus hotspot panel			
	Overall	Year 1	Year 2	Year 3	Overall	Year 1	Year 2	Year 3
Reference Scenario costs (\$ million)	343.3	61.0	114.5	167.8	356.9	65.5	119.0	172.3
<b>Adoption scenario 1: FoundationOne CDx replacing all reflex test, supplemented with FoundationOne Liquid</b>								
Incremental budget impact (\$ million)	37.1	12.4	12.3	12.3	30.3	10.1	10.1	10.1
Incremental budget impact PMPY (\$)	0.87	0.87	0.87	0.87	0.71	0.71	0.71	0.71
Incremental OS (years)	680.9	54.9	273.2	352.8	680.9	54.9	273.2	352.8
Incremental working days	3,831	784	1,524	1,524	3,831	784	1,524	1,524
NNT to gain 1 life-year		174 patients				174 patients		
<b>Adoption scenario 2: FoundationOne CDx replacing panel, supplemented with FoundationOne Liquid</b>								
Incremental budget impact (\$ million)					28.7	9.6	9.5	9.5
Incremental budget impact PMPY (\$)				n/a	0.67	0.68	0.67	0.67
Incremental OS (years)					460.0	34.5	180.6	245.0
Incremental working days					2,597	492	1,053	1,053
NNT to gain 1 life-year					250 patients			
<b>Adoption scenario 3: FoundationOne CDx after negative reflex + panel, supplemented with FoundationOne Liquid</b>								
Incremental budget impact (\$ million)					23.6	7.9	7.9	7.9
Incremental budget impact PMPY (\$)				n/a	0.56	0.56	0.55	0.55
Incremental OS (years)					291.0	22.4	115.1	153.5
Incremental working days					1,641	320	661	661
NNT to gain 1 life-year					399 patients			
<b>Adoption scenario 4: FoundationOne Liquid only</b>								
Incremental budget impact (\$ million)	4.4	1.5	1.5	1.5	4.4	1.5	1.5	1.5
Incremental budget impact PMPY (\$)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Incremental OS (years)	132.1	12.7	56.1	63.3	132.1	12.7	56.1	63.3
Incremental working days	736	181	277	277	736	181	277	277
NNT to gain 1 life-year		968 patients				968 patients		

ICER = incremental cost-effectiveness ratio; NNT = number needed to treat; OS = overall survival; PMPY = per member per year

## LIMITATIONS

- A number of assumptions were made in the development of the model including detection rates, the anticipated uptake of Foundation Medicine testing, as well as the relationship between test modality, turnaround time, and clinical outcomes. These may be refined over time as data continues to accrue regarding the efficacy of testing modalities.

## CONCLUSIONS

- Across scenarios, CGP was associated with additional life years and productivity, at an incremental cost.
- The health benefits of CGP increase with strategies reflecting more widespread usage.