

Potential Health and Economic Outcomes of a Blood-Based Genomic Test as a Prescreen for Lung Cancer in the US Medicare Population

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How could a blood-based genomic test improve outcomes in a Medicare lung cancer screening-eligible population?

BACKGROUND

- Annual screening for lung cancer by low-dose computed tomography (LDCT) reduces mortality.^{1,2}
- Despite no cost-share for covered individuals, limited availability and frequent 'false alarm' findings have impeded widespread adoption,^{3,4} diminishing potential population health gains.

Here, we examine a model of the clinical and economic effects of introducing an accessible blood-based genomic test (BGT) used as a prescreen to support more rapid and refined uptake of LDCT screening within the US Medicare population.

METHODS

- Multiple Monte Carlo simulations were performed in a hypothetical cohort of 6-million Medicare lung cancer screening-eligible individuals to compare clinical outcomes over a 5-year period for the following scenarios:

- NO BLOOD-BASED GENOMIC TEST:** The rate of primary LDCT screening increases from 5.9% at baseline to 9.3% by year 5 based on real-world estimates.
- BLOOD-BASED GENOMIC TEST:** The rate of primary LDCT screening increases from 5.9% at baseline to 9.3% by year 5. The rate of BGT use is 10% each year; 100% of BGT(+) cases and 0% of BGT(-) cases proceed to LDCT screening.

- The BGT was set to 85% sensitivity and 50% specificity for lung cancer.

MODEL ASSUMPTIONS

- Model assumptions were derived from SEER⁵ and published clinical trials of LDCT screening,¹ the CISNET Smoking History Generator for population smoking patterns,⁶ and published lung cancer treatment costs.⁷

- All individuals were Medicare beneficiaries.
- Individuals met the lung cancer screening eligibility criteria recommended in 2021 by the US Preventive Services Task Force⁸: adults 50-80 years old; smoking history of ≥20 pack-years; currently smoke or quit within the past 15 years.

- Annual probability of having a non-screen-detected cancer was set at 75%.

- Other model assumptions are shown in the tables.

OUTCOMES

- 5-year impact of the use of a BGT on:
 - Number of lung cancer deaths
 - Number of LDCT false-positives
 - Number needed to screen to detect a cancer
 - Stage distribution of lung cancers
 - Cancer treatment costs

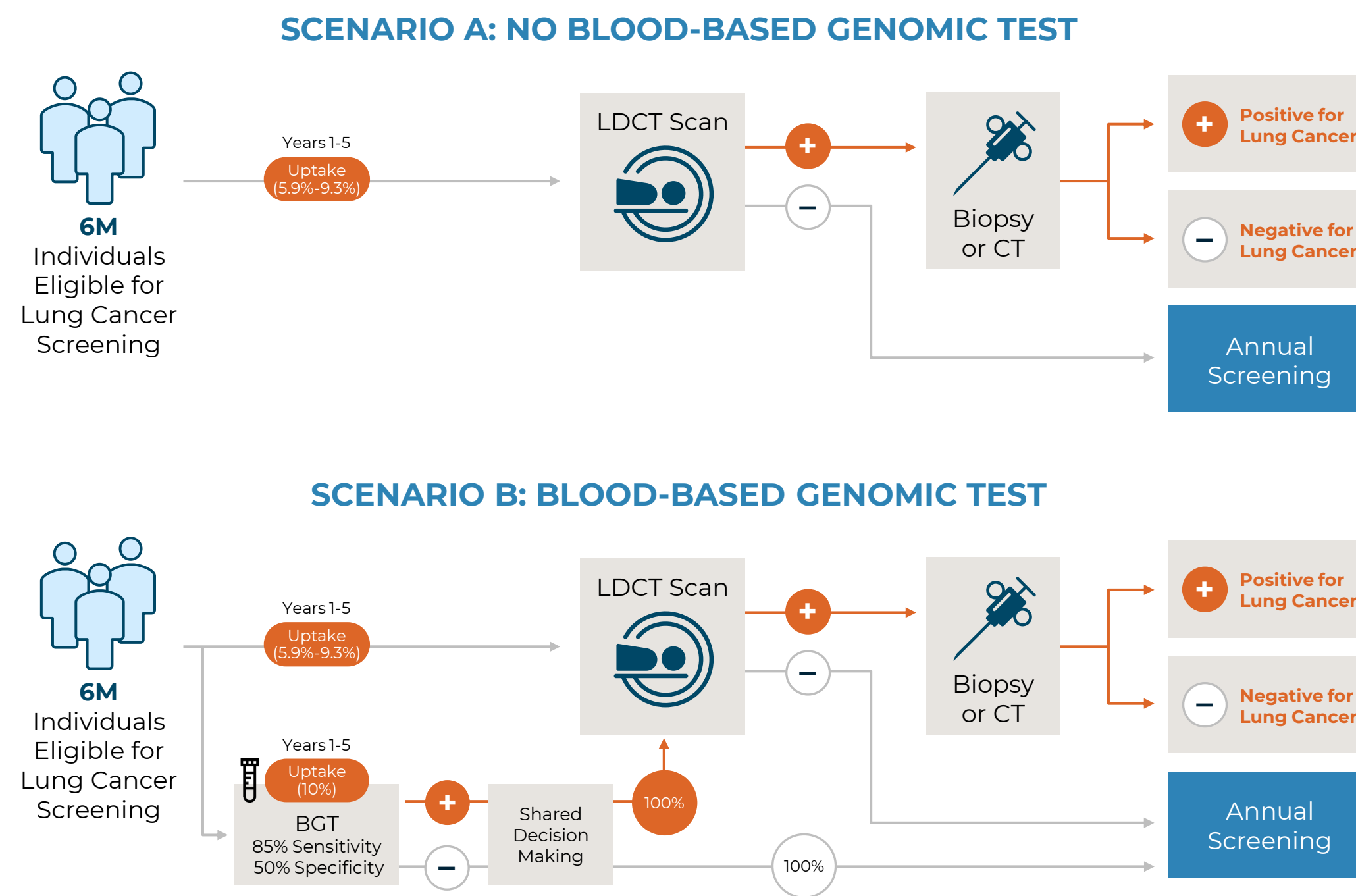
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MODEL ASSUMPTIONS

Screening Uptake	Year 1	Year 2	Year 3	Year 4	Year 5
A. LDCT (No Genomic Test) ³	5.9%	6.8%	7.6%	8.5%	9.3%
B. Genomic Test (100/0)	10%	10%	10%	10%	10%
LDCT if Test(+)	100%	100%	100%	100%	100%
LDCT if Test(-)	0%	0%	0%	0%	0%

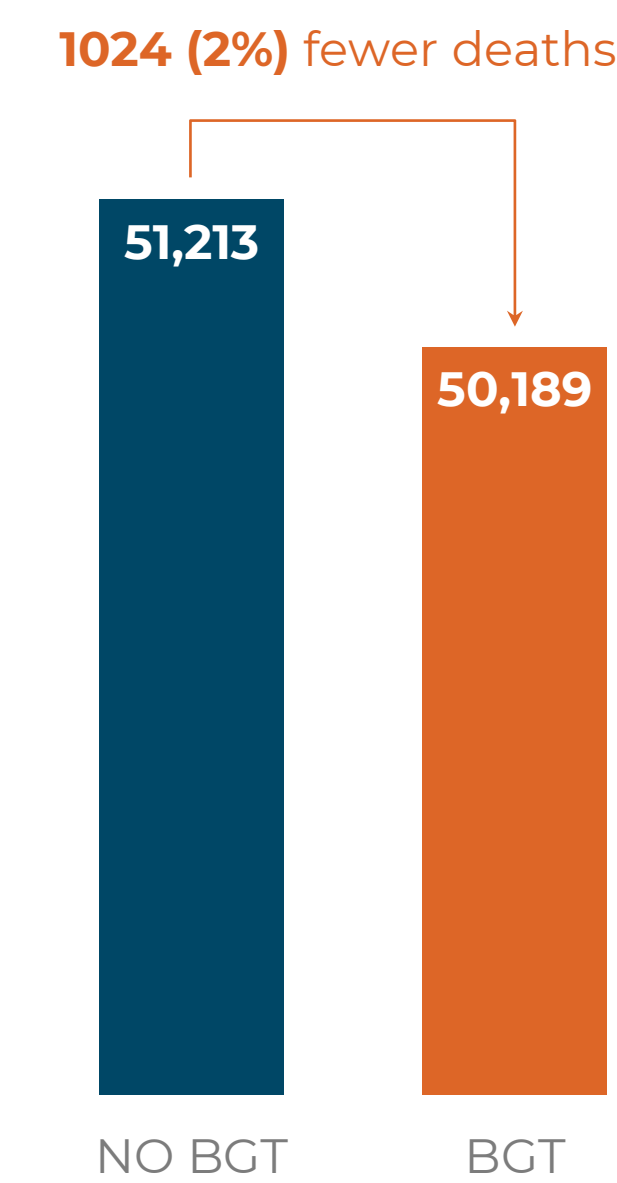
Screening Test Characteristics	Blood-Based Genomic Test	LDCT ⁹
True-positive rate	85%	93%
False-positive rate	50%	24%
Positive predictive value	1.0%	2.4%
Negative predictive value	99.8%	99.9%

Stage Distribution at Detection ¹	Stage I	Stage II	Stage III	Stage IV
Screen detected at 1st screen	63.0%	7.2%	17.0%	12.8%
Screen detected at 2nd screen	63.0%	7.2%	17.0%	12.8%
Screen detected at 3rd screen	63.0%	7.2%	17.0%	12.8%
Not screen detected	22.8%	4.7%	24.6%	47.9%

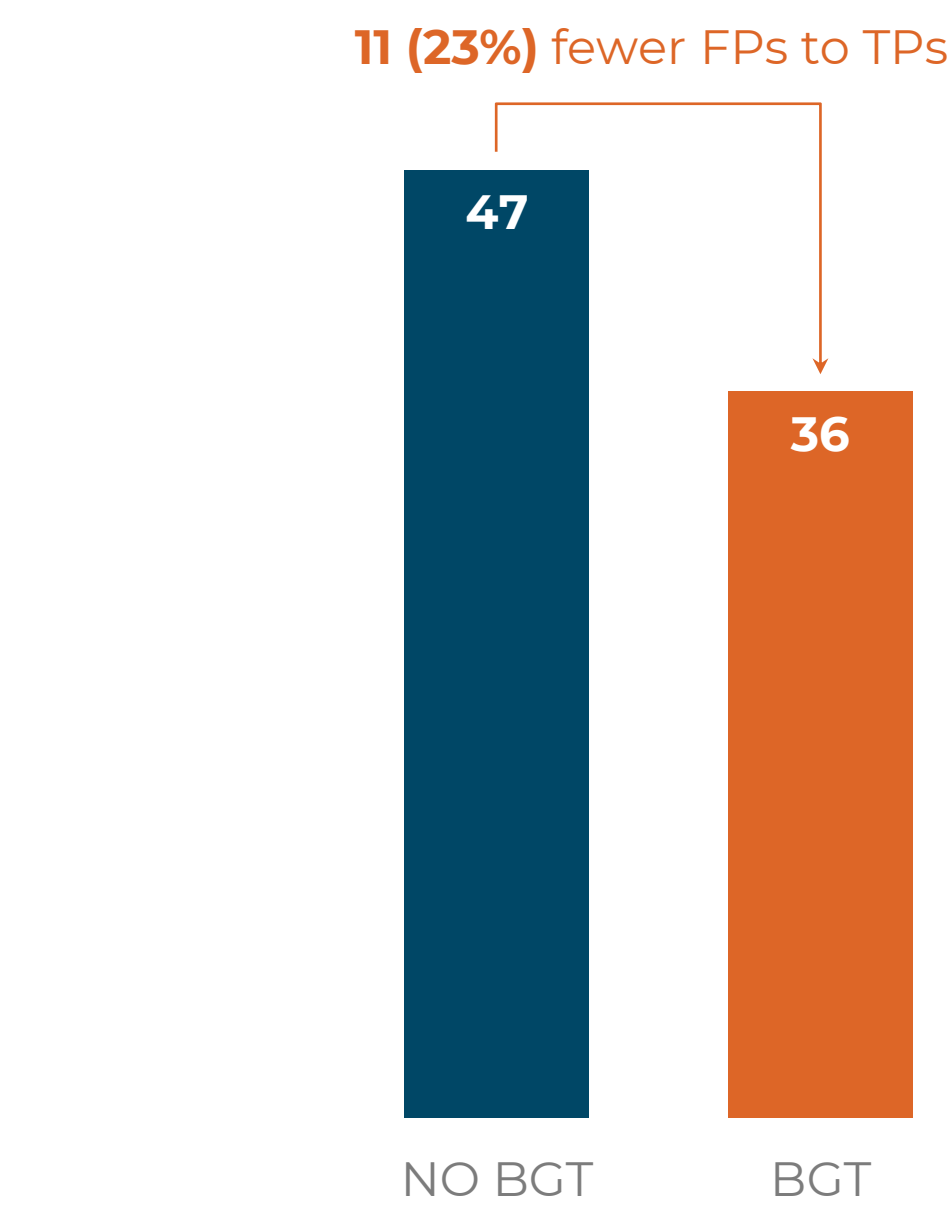
Cancer Costs by Stage at Diagnosis (monthly) ⁷	Initial Phase ^a	Continuing Phase	Terminal Phase ^b
Stage 1	\$2,226	\$2,111	\$18,795
Stage 2	\$2,226	\$2,111	\$18,795
Stage 3	\$7,964	\$4,502	\$18,795
Stage 4	\$9,740	\$6,431	\$18,795

^aInitial phase is the first 6 months after diagnosis; ^bTerminal phase is the final 6 months before death

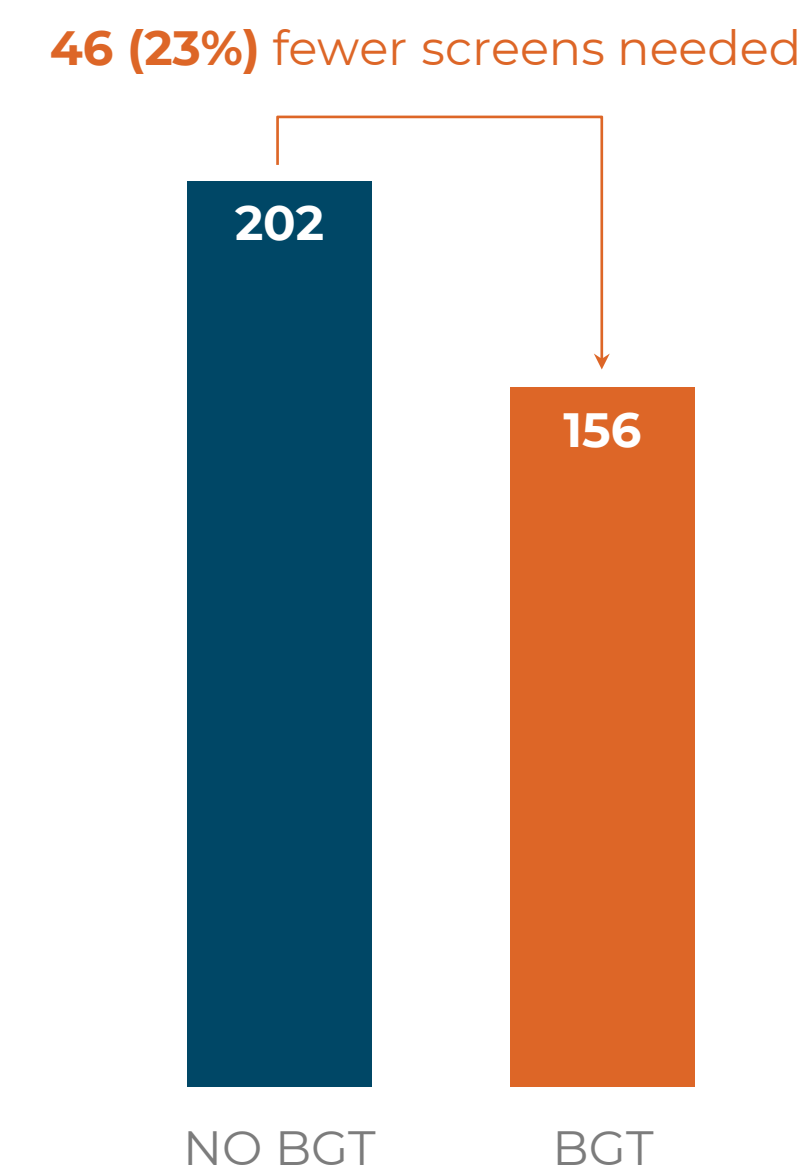
LUNG CANCER DEATHS



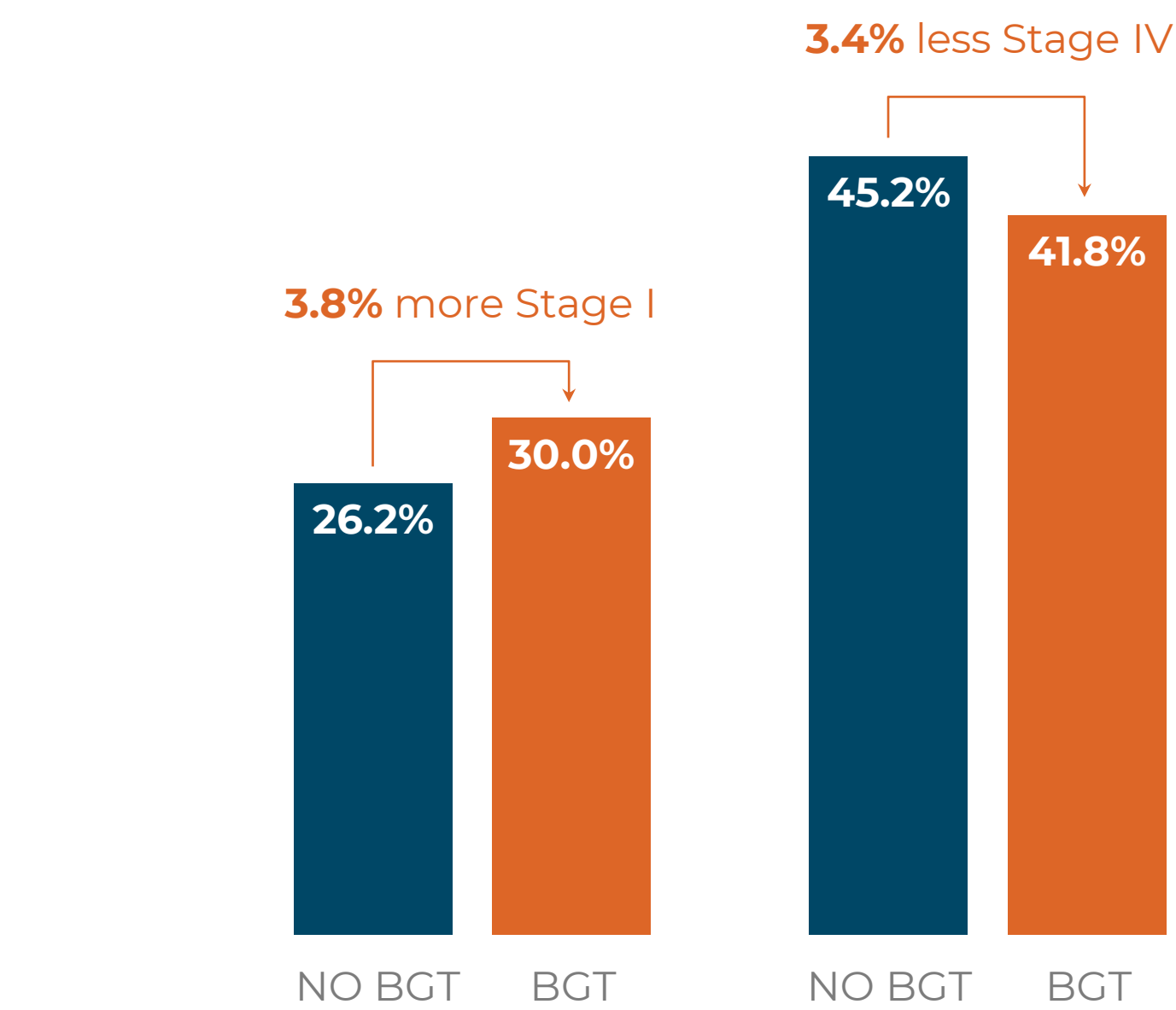
LDCT FALSE-POSITIVE TO TRUE-POSITIVE RATE



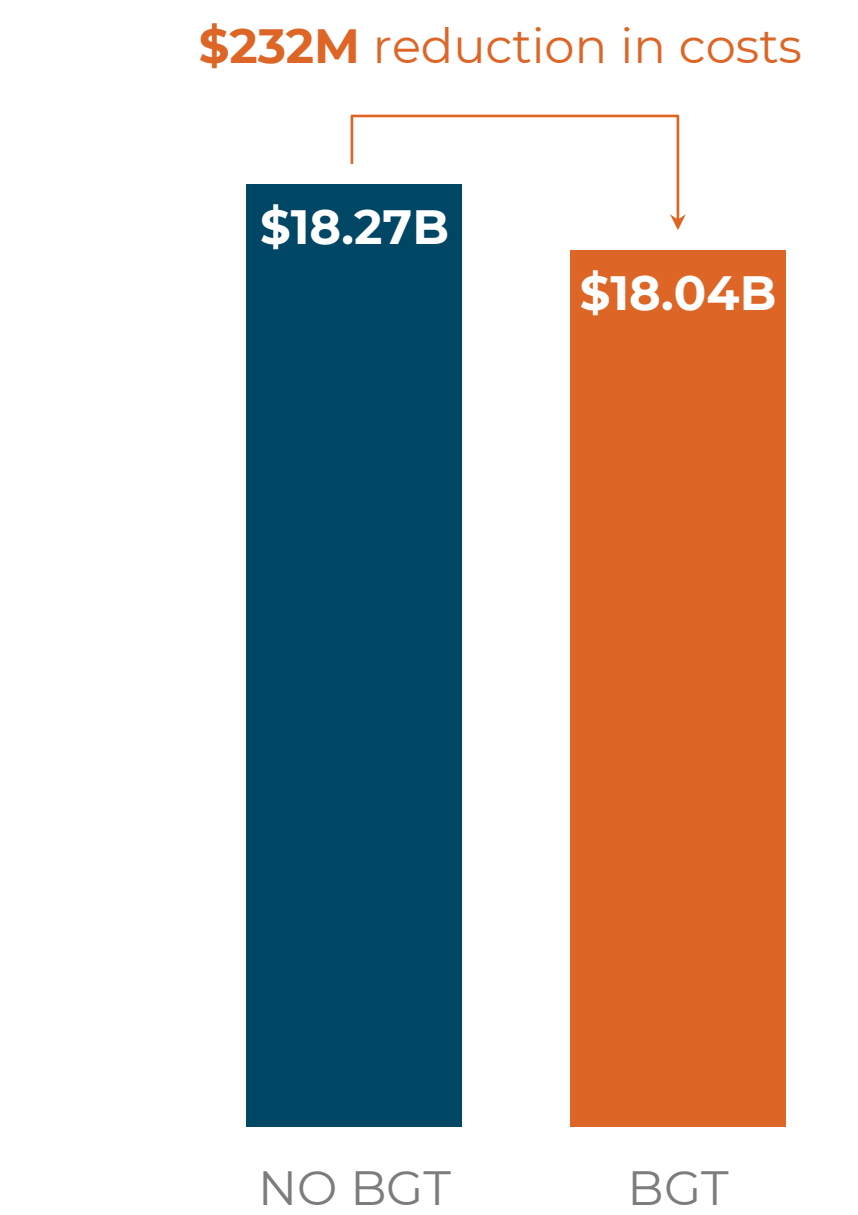
NUMBER NEEDED TO SCREEN



PERCENT OF STAGE I AND STAGE IV CANCERS AT DETECTION



CANCER TREATMENT COSTS (USD\$)



In this simulation, a blood-based genomic test designed to improve uptake and efficiency of lung cancer screening showed substantial population-level health gains while reducing lung cancer treatment costs.