



THE UNIVERSITY OF BRITISH COLUMBIA

Collaboration for Outcomes Research and Evaluation
Faculty of Pharmaceutical Sciences

Budget impact analysis of adopting primary care-based COPD case detection in the Canadian general population

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Background

- Chronic Obstructive Pulmonary Disease
 - 70% of Canadians with COPD are **undiagnosed**
 - 1/3 diagnosed in hospital following an exacerbation
 - Diagnosis is critical to early intervention
- Earlier detection strategies
 - Universal screening not recommended
 - *Opportunistic* primary care-based case detection offers a possible solution
- Aim: extend previous cost-effectiveness analysis of case detection programs; evaluate affordability

Methods

Intervention

Model

Design

Costing

Methods: Case detection

Intervention

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Design

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- Canadians ≥ 40 years during routine primary care visits

- Strategies:

3 sets of
eligibility
criteria

Testing technology	Eligibility criteria	Sensitivity (%)	Specificity (%)
(S1) All patients			
S1a: CDQ ≥17 points	None	91.0	49.0
S1b: Flow meter		80.0	94.0
S1c: CDQ ≥17 points + Flow meter		72.0	97.0
(S2) Symptomatic patients			
S2a: Flow meter	≥1 respiratory symptom	81.5	88.9
(S3) Smoking history			
S3a: CDQ ≥19.5 points	Past or current smoker Age ≥50 years	64.5	65.2
S3b: CDQ ≥16.5 points		87.5	38.8
S3c: Flow meter		79.9	84.4
S3d: CDQ ≥17 points + Flow meter		74.4	97.0

- Positive tests referred for outpatient diagnostic spirometry

Methods: Case detection

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2 testing
technologies:
1. CDQ
2. Flow meter
(or both!)

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- Canadians ≥ 40 years during routine primary care visits
- Strategies:

CEA findings:

- All cost-effective compared to no case detection
- S1a most efficient at \$50,000/QALY gained WTP
- S3b most efficient at \$25,000/QALY gained WTP

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- Evaluation Platform in COPD (EPIC)
- Discrete-event microsimulation model for the development and progression of COPD in Canadian population ≥ 40 years
- This analysis simulates within EPIC:
 - 8 case detection intervention scenarios
 - 1 baseline no case detection scenario (standard care)
- Whole disease model 
- Extensive internal and external validation

Modules:

- Demographics
- Smoking prevalence
- COPD occurrence
- Lung function decline
- Symptoms
- Primary care visits
- COPD diagnosis
- Treatment
- Exacerbations
- Mortality
- Medical costs
- QALYs

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Parameter	Value	Source
Perspective	Canadian healthcare system	
Time horizon	5 years (2022-2026)	
Population size	19.8 million (Canadians ≥ 40 , 2022)	Statistics Canada
Model inputs	Direct COPD healthcare costs	Health administrative data and published Canadian studies
Model output	Annual costs: • Total • Case detection • Treatment • Hospitalization	
Case detection uptake	5% $\rightarrow$ 25%	Canadian lung and colon cancer screening studies

Direct COPD healthcare costs:

- 2021 Canadian dollars (\$)
- Not discounted

- Case detection
 - Time cost: 34% of primary care visit = \$11.91
 - Testing cost: CDQ = \$0 , Flow Meter = \$18.90
 - Outpatient diagnosis: \$62.19
- Treatment (\$55.17 - \$1,185.23 per year)
 - Inhaled therapy & nicotine replacement therapy (NRT)
 - 70% adherence
- Exacerbation (\$31.68 - \$22,033.60 per event)
 - Stratified by exacerbation severity
- Background medical costs (\$147.48 - \$1,286.84 per year)
 - Stratified by COPD severity (GOLD grade)

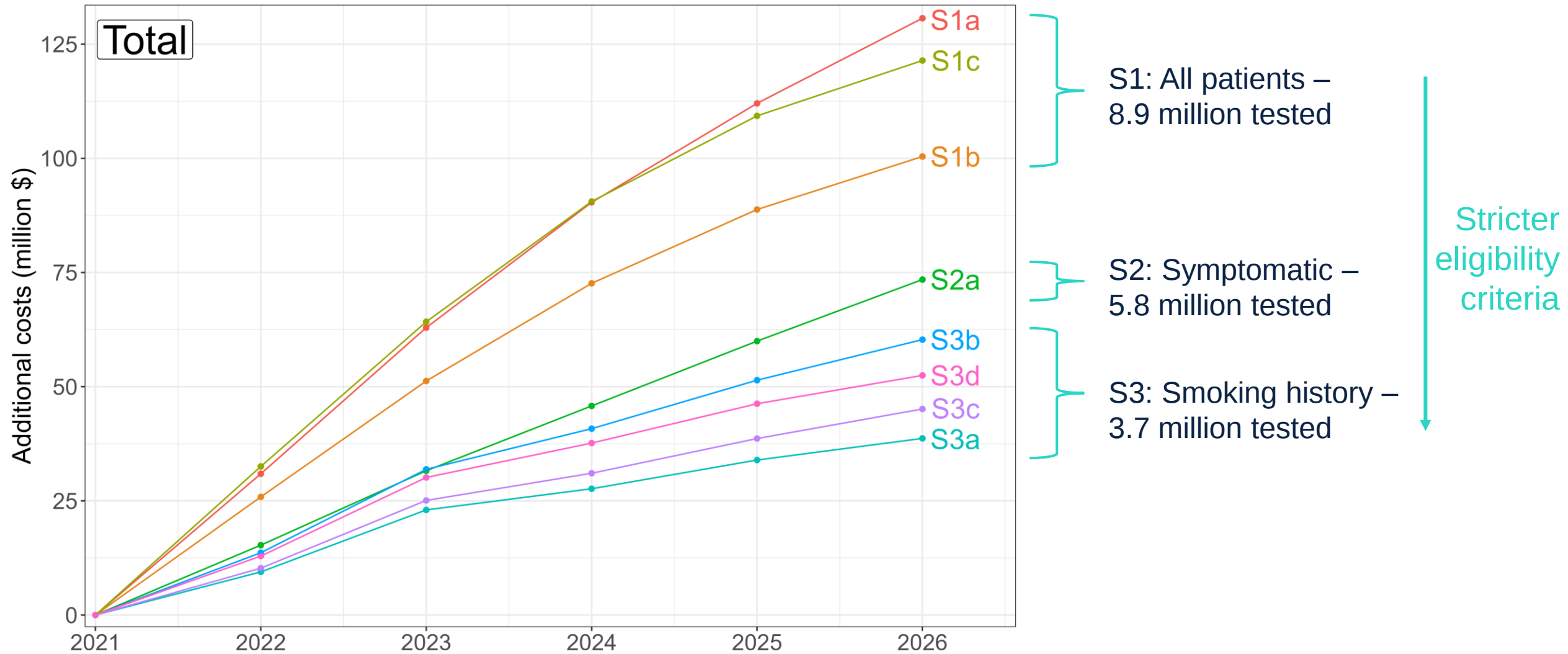
Results

Simulated Population

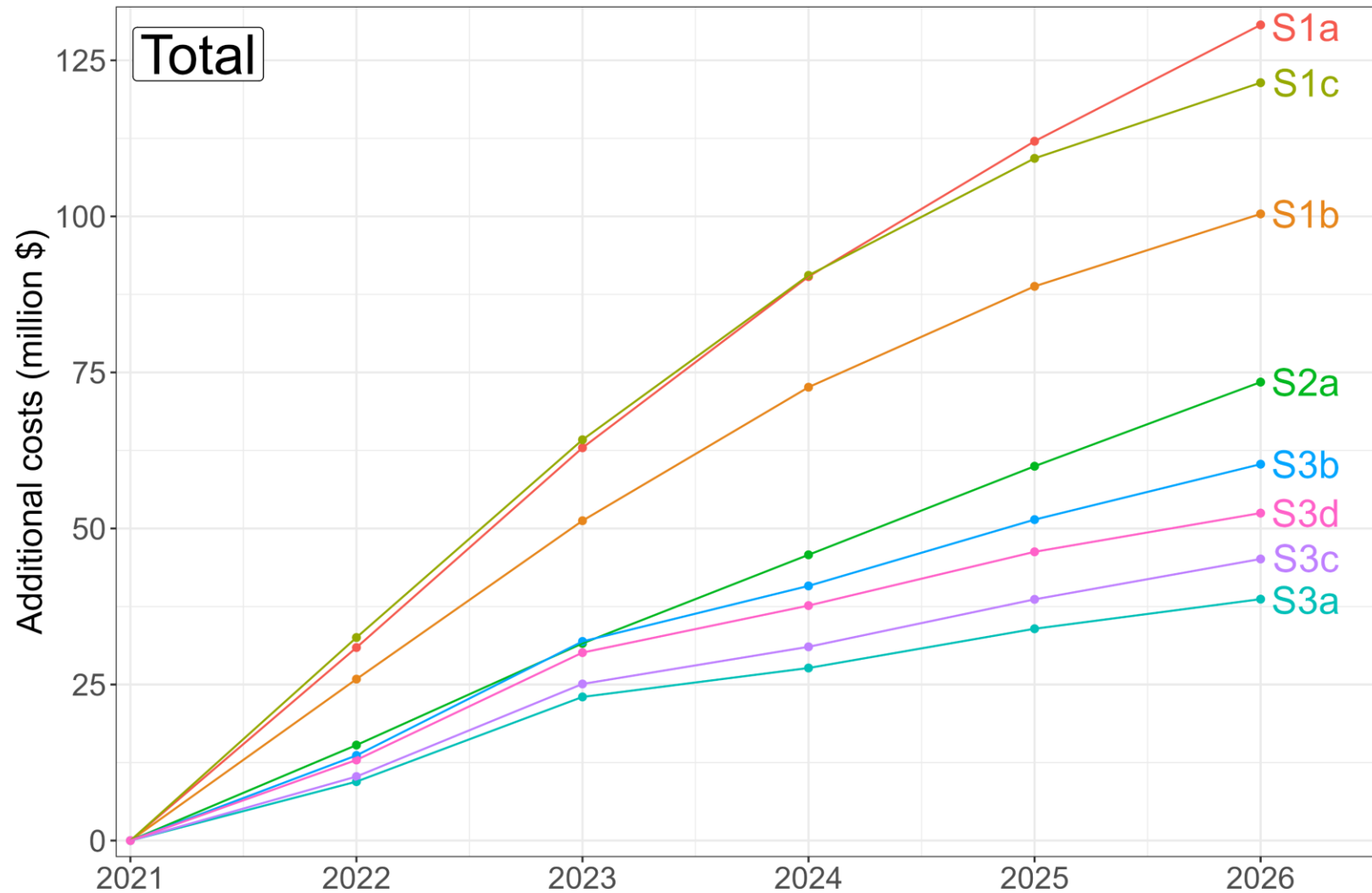
- Starting population size: 19.8 million
- Total population size: 22.1 million

	EPIC (2021 baseline)	CanCOLD
COPD prevalence	11.9%	11.2%
Proportion diagnosed	30.4%	29.7%

Results: Budget impact



Results: Budget impact



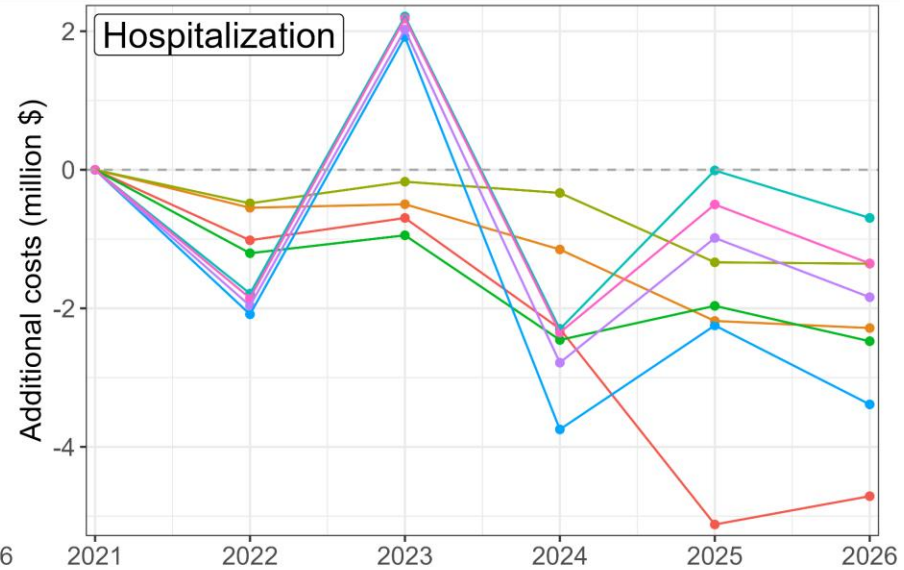
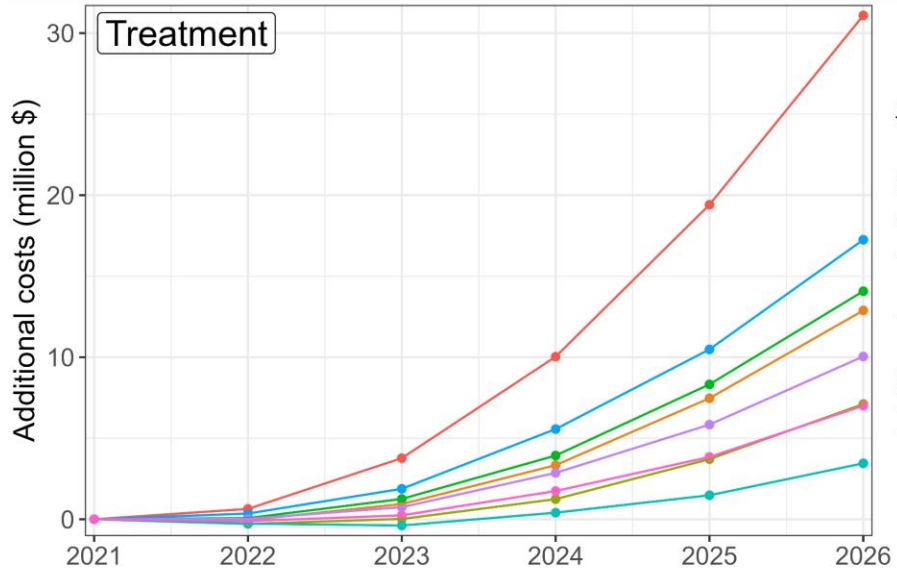
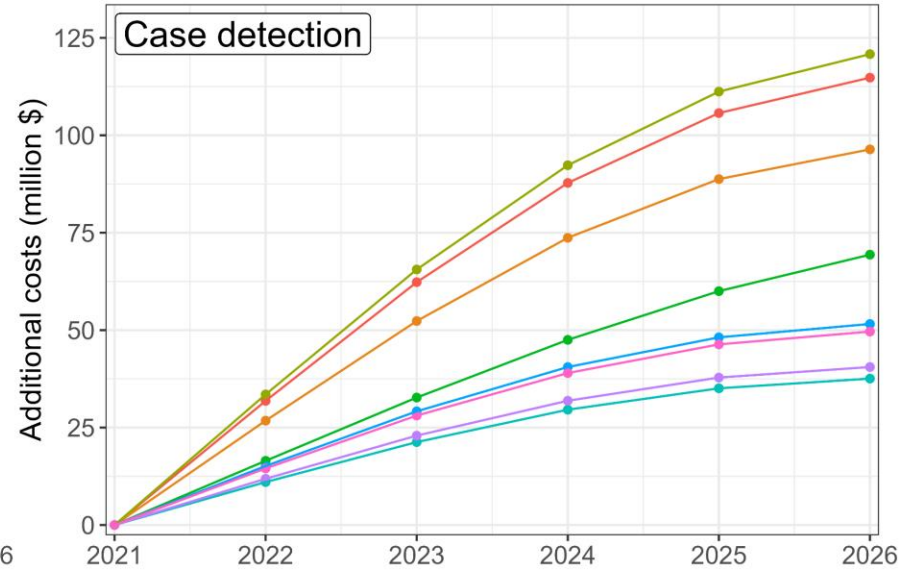
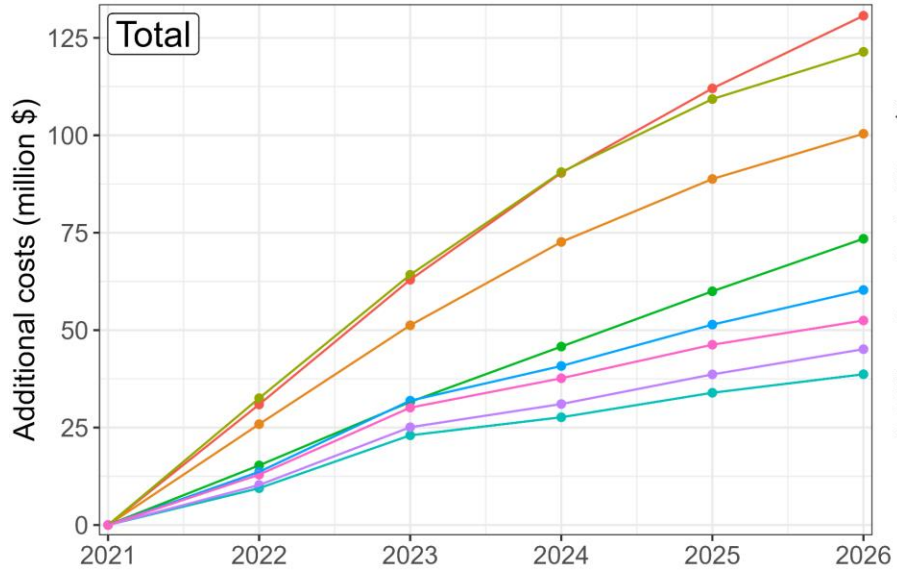
S1a - CDQ ≥ 17 points, all patients

- Most cost-effective (\$50,000/QALY)
- \$427 million over 5 years
- 4.6 million OP referrals
- COPD patients diagnosed: 30.4% $\rightarrow$ 37.8%

S3b - CDQ ≥ 16.5 points, smoking history

- Most cost-effective (\$25,000/QALY)
- \$198 million over 5 years
- 2.2 million OP referrals
- COPD patients diagnosed: 30.4% $\rightarrow$ 34.2%

Results: Subcategories

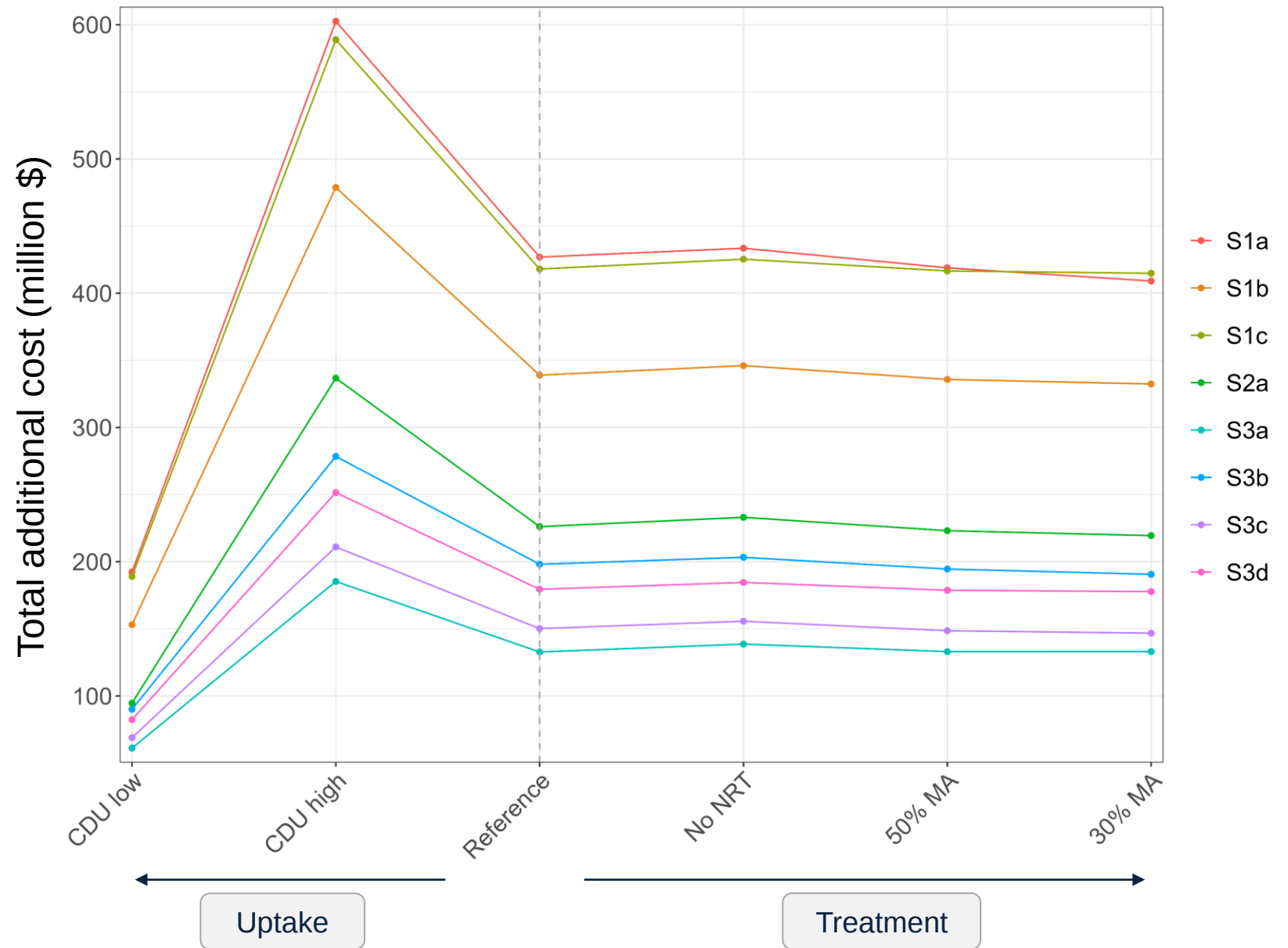


- S1a
- S1b
- S1c
- S2a
- S3a
- S3b
- S3c
- S3d

Results: Sensitivity analysis

Case detection uptake:

- Reference: 5% → 25%
- Low uptake: 2% → 10%
- High uptake: 8% → 40%



Interpretation

Case detection is an effective method for reducing the burden of undiagnosed COPD but it will require...

1. Prioritization by budget holders
2. Significant additional investment in diagnostic spirometry
3. Successful uptake in primary care



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References:

1. Sadatsafavi M, Ghanbarian S, Adibi A, Johnson K, FitzGerald JM, Flanagan W, et al. Development and Validation of the Evaluation Platform in COPD (EPIC): A Population-Based Outcomes Model of COPD for Canada. *Medical Decision Making*. 2019 Feb; 39(2): 152-167.
2. Johnson KM, Sadatsafavi M, Adibi A, Lynd L, Harrison M, Tavakoli H, et al. Cost Effectiveness of Case Detection Strategies for the Early Detection of COPD. *Applied Health Economics and Health Policy*. 2021 Mar; 19(2): 203-215.