Cost-effectiveness Analysis and Budget Impact Analysis of Population-Based Screening for Chronic Obstructive Pulmonary Disease (COPD) in China

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BACKGROUND

High disease burden of COPD in China
- Prevalence reaches up to 13.7% among people aged over 40 years old [1]
- Bringing over 1 million deaths [2] and projected to carry over $200 billion of economic burden each year [3] in China

Cost-effectiveness of COPD screening
- Previous studies have demonstrated the long-term cost-effectiveness of COPD screening in China [4]
- Essential to evaluate the budget sustainability of COPD screening policies to provide practical insights for policymakers

OBJECTIVE

Evaluate the cost-effectiveness and budget impact of population-based COPD screening policies from 2025 to 2050 in China

METHODS

COPD microsimulation (COPD-SIM) model
- New incidence, natural history, change in smoking status, and clinical management of COPD for the **general population** aged 35-80 years in China
- Open cohort model with **100,000 individuals** at the start year, simulated from year 2025-2050
- Disease progress is based on lung function, measured by forced expiratory volume in one second (FEV_1) (**Figure 1**)
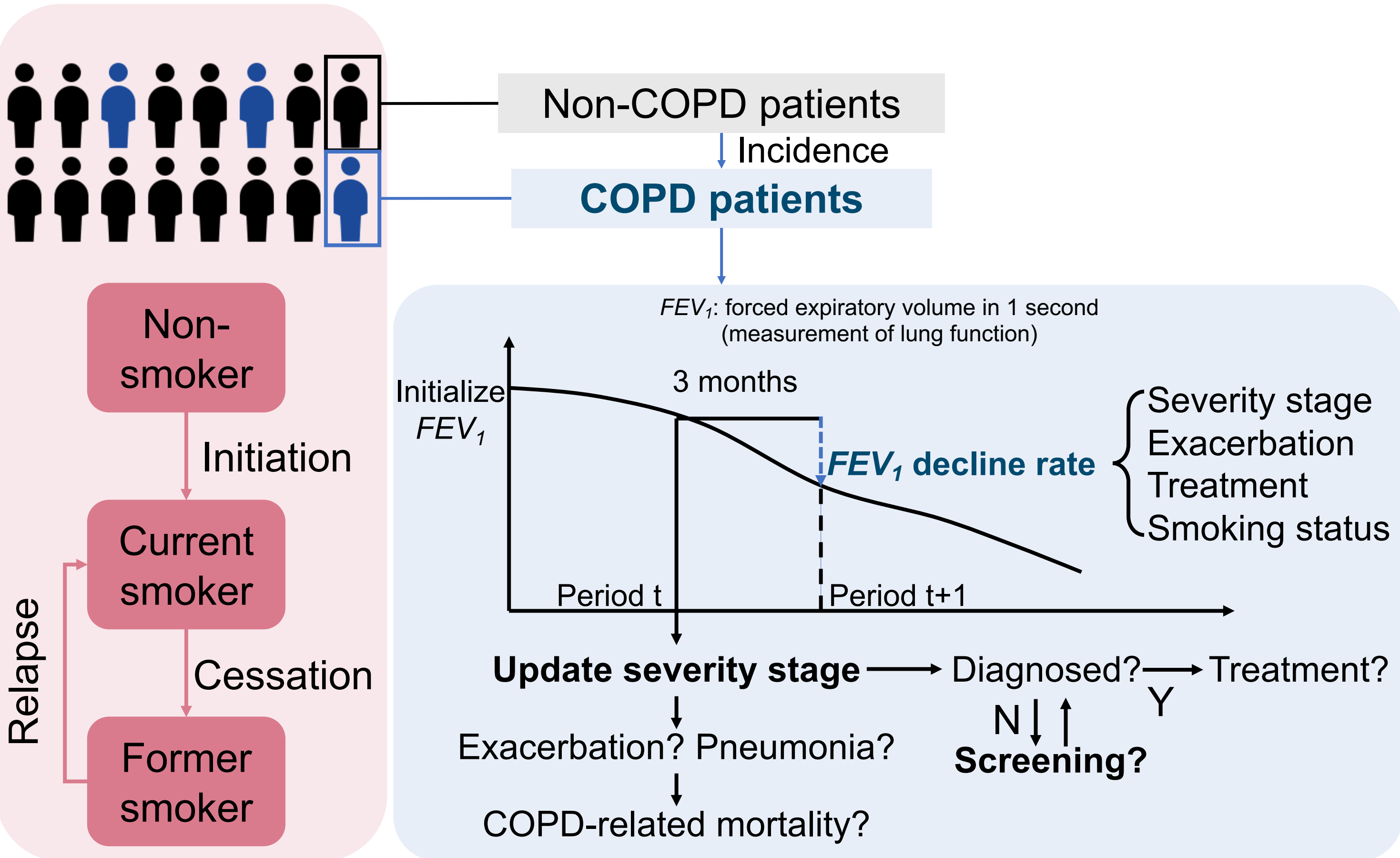

Figure 1. Schematic of the COPD-SIM model.

Screening policies
- Screening is applied as **two-step screening** (questionnaire followed by portable spirometry) or **one-step screening** (questionnaire only), conducted **annually** or **biannually** (**Figure 2**)
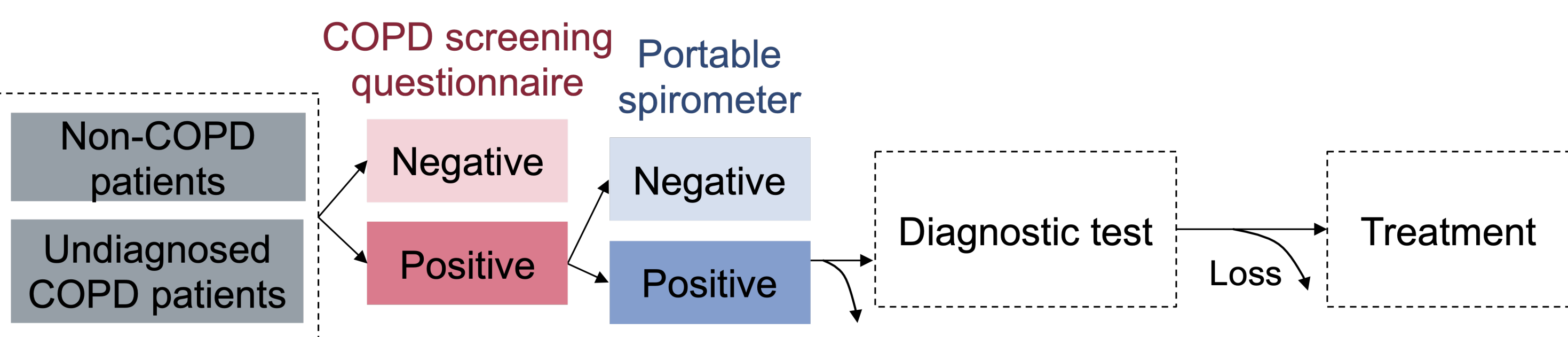

Figure 2. Process of the screening method

Model outcome
- Cost, quality-adjusted life years (QALYs), incremental cost-effectiveness ratio (ICER), budget impact

RESULTS

Cost-effectiveness
- All screening policies were cost-effective **compared to no screening**, with ICERs ranging from $11,688 to $12,506 per QALY gained (**Figure 3**)
- **Annual one-step screening** was the most cost-effective scenario
- 7.2%-10.2% of COPD-related deaths and 1.7%-2.3% of COPD exacerbations were projected to be averted under screening policies
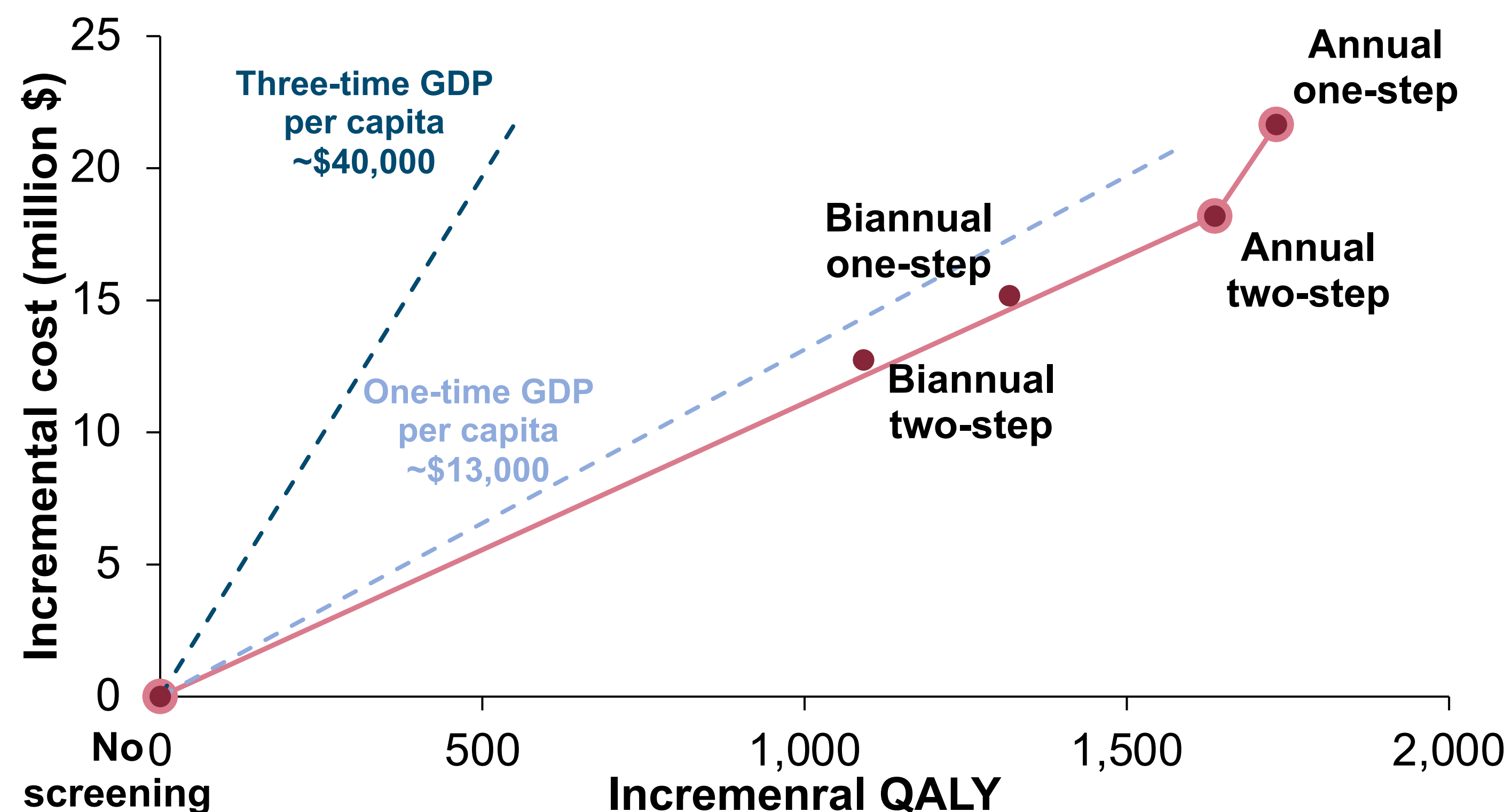

Figure 3. Cost-effectiveness and the cost-effectiveness frontier in a cohort of 100,000 individuals over 2025-2050.

Budget impact
- The total budget increase was projected to range from **$143–$242 billion** across various screening policies for 756 million eligible individuals between 2025 and 2050
- The average budget impact per year amounted to **0.06%-0.11%** of national medical care expenditure in 2022
- The annual budget grew continuously and began to plateau around 2040
- Screening and diagnosis accounted for **19%–29% of the budget increase**, with the remainder attributed to treatment costs
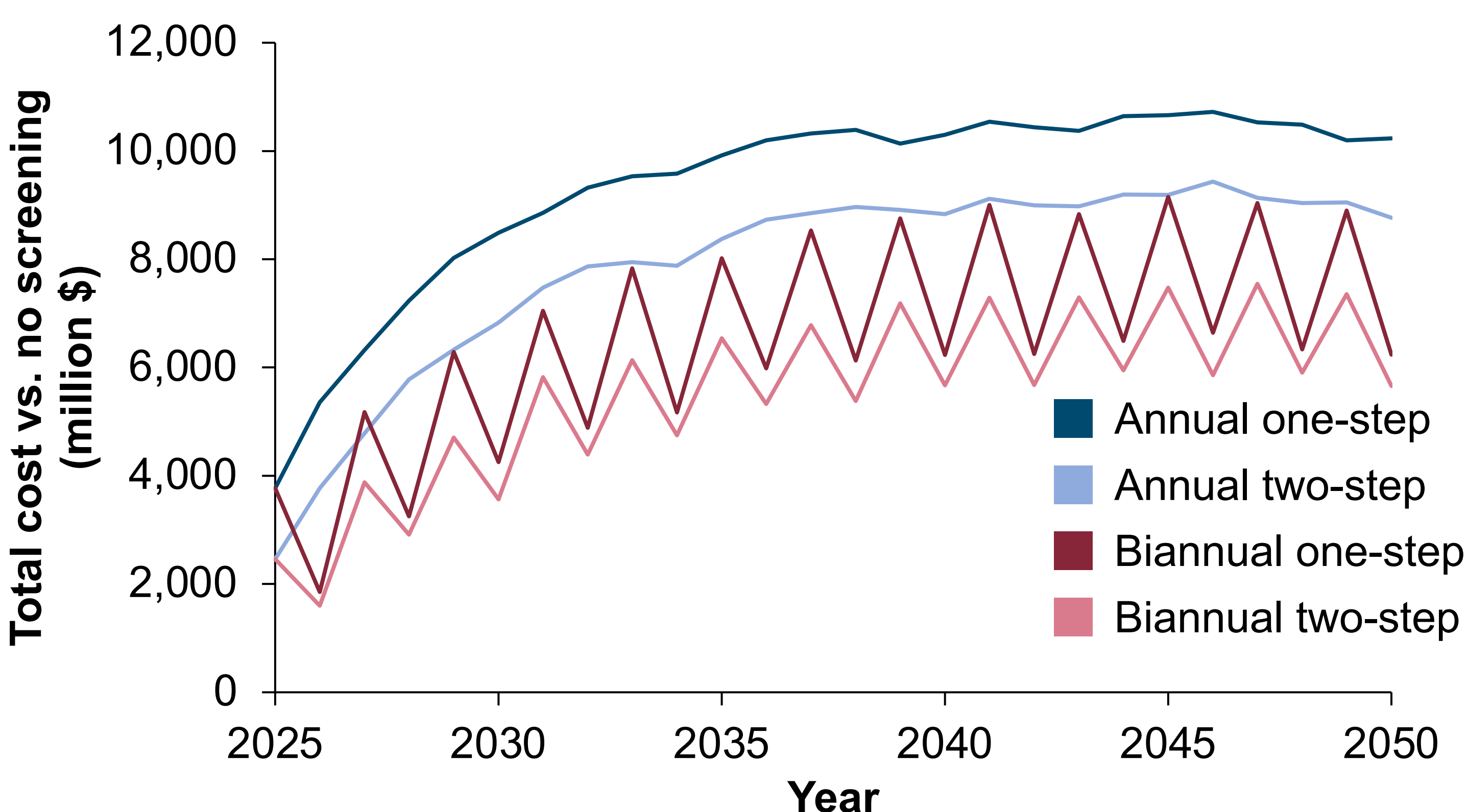

Figure 4. Budget impact analysis from 2025 to 2050 for different screening polices.

CONCLUSION
- Population-based screening for COPD, despite extra costs for healthcare payers and patients, could be cost-effective in China
- Policymakers should determine a screening policy aligned with budget constraints to optimize economic and health outcomes

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There were no conflicts of interest

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