

# Performance of Lung Cancer Screening Using the ENGAGE Framework as a Benchmark

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The 2021 US Preventive Services Task Force (USPSTF) recommends annual lung cancer screening for all eligible persons, offering practicality in implementation, yet resulting in a potentially suboptimal screening program. The extent to which performance is sacrificed for that practicality is unknown. The objective of this study is to assess and compare the performance of lung cancer screening strategies that preserve a structure in their screening frequency against the fully dynamic and analytically optimal strategy derived from the ENGAGE framework.

We conducted a comparative effectiveness study that assessed the effectiveness and efficiency of six structured lung cancer screening strategies (2021 USPSTF recommendation, biennial, and four adaptive strategies that switch screening frequency from annual/biennial to biennial/annual, respectively, at ages 60 or 65 years) on the screen eligible population per the existing lung cancer screening guidelines. Through simulations, we evaluated the effectiveness of strategies using quality-adjusted life years gained, lung cancer-specific mortality reduction, and number of screened detected early stage lung cancers, and their efficiency using the number of screenings per individual and screenings per death averted, stratified by sex and smoking history [former vs. current; light (<10 cigarettes/day) vs. moderate (10-20 cigarettes/day) vs. heavy (20+ cigarettes/day)].

Finding from this study suggest that imposing a structure on the lung cancer screening frequency affects both the effectiveness and efficiency of the overall program. Adaptive biennial-to-annual screening strategies were the best performing screening strategies for the overall screen-eligible population. The 2021 USPSTF strategy was on the frontier for some subgroups as the most effective strategy but was not efficient and was ranked as the fifth best overall strategy. Imperfect adherence levels do not affect the ranking of the policies, but the impact of imposing a screening structure worsens as the adherence levels increased.

Adaptive lung cancer screening strategies that start with biennial screening and switch to annual screening at a given age, outperform the 2021 USPSTF recommendations on lung cancer screening when both the effectiveness and efficiency of the overall screening program are considered, and thus warrant further consideration.