

Cost-Effectiveness of E-Cigarettes for Smoking Cessation Among Medicaid Users

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OBJECTIVE

E-cigarettes have been increasingly used in the United States (US) by smokers as an unofficial smoking cessation aid.¹ However, e-cigarettes are not approved by the US Food and Drug Administration (FDA) and therefore not covered by Medicaid. In the last couple decades, smoking rates have steadily declined for Americans but remained high and relatively unchanged for Medicaid users.²

We estimated the cost-effectiveness of providing e-cigarettes (compared to nicotine replacement therapy [NRT]) as a smoking cessation aid for smokers as a covered benefit under Medicaid.

Key Model Assumptions

- > Hypothetical cohort of 1000 smokers per intervention
- > Payer perspective
- > Lifetime horizon
- > Smokers given interventions only once
- > Effectiveness data from randomized controlled trial (RCT) comparing NRT (9.9%) to e-cigarettes (11.8%) at one year³
- > Background quit rate of 2.5%⁴
- > In the first 10 years after treatment, relapse rate is 10%⁵
- > After 10 years of cessation, relapse rate stabilizes and is 0%^{6,7}
- > US willingness-to-pay (WTP) threshold of \$100,000 to \$150,000 per quality-adjusted life year (QALY) gained⁸⁻¹⁰
- > Probabilities and expenditures obtained at US national level were representative of California and of Medicaid users

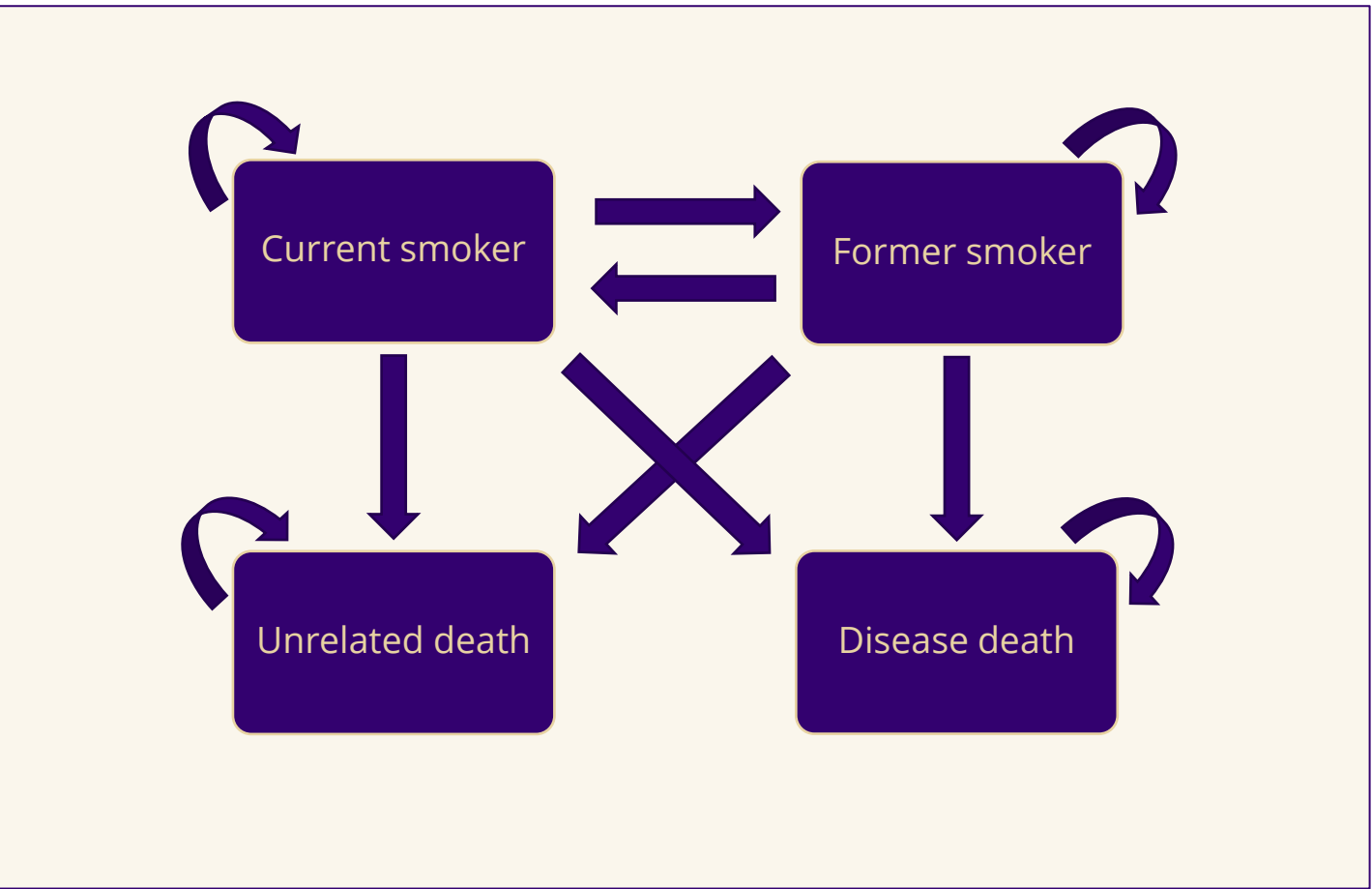


Figure 1. Markov model health state transition model

METHODS

To model smoking cessation, a Markov model was constructed to capture quitting, relapse, and long-term health consequences. Smokers were followed through a series of four mutually exclusive and exhaustive health states from age 25 until death from smoking-related causes or unrelated causes. Two cessation interventions were compared:

- > NRT and behavioral counselling
- > E-cigarettes and behavioral counselling

We evaluated lifetime costs and health outcomes. Costs were reported in 2020 USD and adjusted for inflation. Health outcomes were reported in QALYs gained. Per US cost-effectiveness guidelines, costs and health outcomes were discounted at 3% annually.

Data for transition probabilities, costs, and outcomes came from state-level and national-level surveys, previous economic evaluations, and empirical studies. Deterministic and probabilistic sensitivity analyses were conducted to evaluate the impact of uncertainty on model results.

RESULTS

E-cigarettes are more effective and would result in slightly increased costs (\$457.43/quitter).

- > One-way sensitivity analysis confirmed the robustness of results to most changes
- > Results most sensitive to smoking-related healthcare costs
- > Cost-effectiveness acceptability curve (CEAC) generated from 1000 Monte Carlo simulations shows that given a WTP threshold of \$50,000 USD/QALY, e-cigarettes are 98% cost-effective

Table 1. Base-case incremental cost-effectiveness results

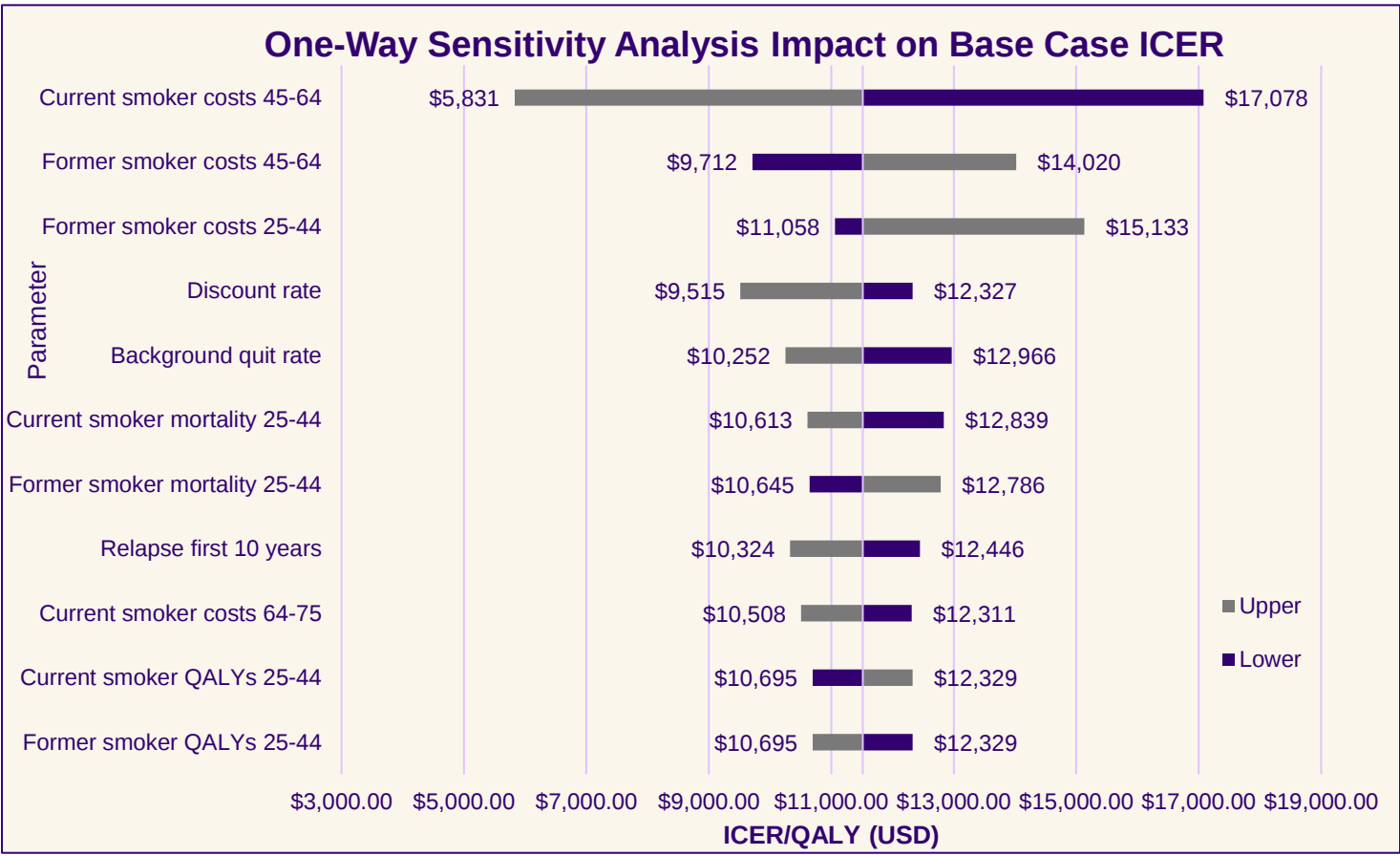
	Total life years lived	Total QALYs	Total costs	Cost per quitter	Incremental cost per life year gained	Incremental cost per QALY gained
E-cigarette + CSH	22.44	18.92	\$122,572			
NRT + CSH	22.43	18.88	\$122,151			
Difference	0.01	0.04	\$420.84	\$457.43	\$61,962	\$11,454

CSH = California Smoker's Hotline counselling; NRT = nicotine replacement therapy; QALY = quality adjusted life year
All results discounted at 3% and adjusted for inflation.
Results reported per person.

LIMITATIONS

- > Higher healthcare costs used for former smokers reflect costs incurred for recent quitters, resulting in overestimation
- > Memoryless feature of Markov models renders model unable to follow how long individuals have been in the former smoker state to accurately assign varying healthcare costs based on time abstinent
- > Representativeness of data used in model likely underestimated healthcare costs and mortality for Medicaid smokers
- > Uncertainties surrounding heterogeneity

Figure 2. One-way sensitivity analysis



CONCLUSIONS

Results showed e-cigarettes were more effective but slightly more costly than NRT, though well below US WTP thresholds. However, the FDA has concerns surrounding the long-term safety of e-cigarettes.

- > Lack of Medicaid coverage for e-cigarettes could widen the already disproportionate gap between smokers dependent on Medicaid and Americans who can afford to pay out of pocket
- > Coverage of e-cigarettes as a smoking cessation aid under Medicaid could result in long-term cost-savings for Medicaid programs
- > Given the high costs of care and long-term effects of smoking, further research on the long-term safety of e-cigarettes is urgently needed

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