Raising taxes to reduce smoking prevalence in the US: a simulation of the anticipated health and economic impacts
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study examined the cost-effectiveness of raising the excise taxes on cigarettes for the entire US population. The authors concluded that a policy of raising taxes on cigarettes reduced smoking prevalence resulting in better clinical outcomes, improved tax revenue, and significant savings in medical care costs. The methodology was not reported in detail and had a few limitations, but the authors' conclusions are likely to be valid given the large differences in costs and effects in favour of the intervention.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study examined the cost-effectiveness of raising the excise taxes on cigarettes in the entire US population of never smokers, current smokers, and former smokers.

Interventions
Various rates of tax-induced cigarette price increases were considered and compared with the current price (status quo).

Location/setting
USA/community.

Methods
Analytical approach:
This economic evaluation was based on a dynamic computer simulation model, which projected the smoking behaviour of the US population with and without tax increase over a 21-year time horizon (from 2004 to 2025). The authors did not explicitly report the perspective.

Effectiveness data:
The clinical data came from a selection of known, relevant sources such as the US Census bureau, the Behavioural Risk Factor Surveillance System (BRFSS) and Teenage Attitudes and Practice Survey, the Tobacco Use Supplement of the Current Population Survey, and the National Health Interview Survey. The details on these sources and the methods used to extract the primary data and then combine them were not reported. The key clinical input was the change in smoking prevalence, which was stratified by age groups, that resulted from price increases (price elasticity). This was calculated on the basis of individual level data from the BRFSS and other factors that are generally associated with the consumption of cigarettes.

Monetary benefit and utility valuations:
The utility values were derived from two published studies reporting the quality of life associated with smoking in adults (using the Quality of Well Being scale) and youth (using data from the National Health Interview Survey).

Measure of benefit:
Life-years (LYs) and quality-adjusted life-years (QALYs) were the summary benefit measures. The adult smoking prevalence was also reported as a key model output.
Cost data:
Two broad cost categories were considered: smoking-related medical costs (by age, gender, and smoking status), and tax revenues associated with cigarette price increases. The economic data were derived from the Medical Expenditure Panel Survey and a published study, which used cost estimates from the National Health Interview Survey, the National Nursing Home Survey, the National Medical Care Utilization and Expenditure Survey, and Medicare. A breakdown of cost items was not reported. All costs were in US dollars ($) and the price year was not explicitly reported.

Analysis of uncertainty:
The issue of uncertainty was investigated with respect to variations in price elasticity (±50%) and cigarette price (from 0 to 100%).

Results
The cumulative 20-year gain in QALYs in the entire US population, ranged from 7.22 million with a 20% price increase, to 24.92 million with a 100% increase. The gain in LYS ranged from 3.79 million with a 20% price increase, to 14.13 with a 100% increase.

The cumulative total savings ranged from $373.68 billion ($194.98 billion in tax revenue and $178.7 billion in medical care costs averted) with a 20% tax increase to $1,382 billion ($782.39 billion in tax revenue and $600 billion in medical care costs averted) with a 100% tax increase.

The sensitivity analysis revealed the impact of price elasticity on the costs and benefits. For example, in the scenario of a 60% tax increase, a reduction of 25% in price elasticity would result in a loss of 2 million LYS and 3.42 million QALYs, with a reduction of $103.81 billion in cost savings. An increase of 25% in price elasticity would result in a gain of 1.80 million LYS and 3.02 million QALYs, with an increase of $90.62 billion in cost savings.

Authors’ conclusions
The authors concluded that a policy of raising taxes on cigarettes reduced smoking prevalence, which resulted in better clinical outcomes, improved tax revenue, and significant savings in medical care costs.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The current status quo was compared against various levels of tax increase. Other interventions aimed at reducing smoking prevalence were not investigated, as they were beyond the scope of this analysis.

Effectiveness/benefits:
The methodology used to derive the clinical data was not transparently reported. In general, national databases were appropriate sources of data given the population-based approach of this study. The methodology used to extract the data and to combine them was not described. Some information on the derivation of the utility valuations was provided, but more detailed reporting on the sources of utility values would have been useful for judging the validity of these estimates. Both LYS and QALYs are validated benefit measures, which were appropriate for these interventions. They also allow comparisons with the benefits of other health care interventions.

Costs:
The authors did not state explicitly which perspective was adopted, but it appears to have been that of the government. Only macro-categories of costs were reported, and single items were not presented. The costs were derived from previous studies, the methodologies of which were not reported. This reduces the transparency of the economic data. The price year was not reported and the use of discounting, which was relevant given the long-term horizon, was not reported. In general, the economic analysis was not extensively reported.

Analysis and results:
The results were clearly presented. A synthesis of the costs and benefits was not required given the superior economic and clinical profile of tax increases over the status quo. The issue of uncertainty was not extensively explored; the authors only considered variations in price elasticity, which was a key driver of the model. Other inputs might have had
a crucial impact on the findings. The authors provided extensive details on the dynamic model.

Concluding remarks:
The methodology was not reported in detail and had a few limitations, but the authors’ conclusions are likely to be valid given the large differences in costs and effects in favour of the intervention.

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