Closing the youth access gap: the projected health benefits and cost savings of a national policy to raise the legal smoking age to 21 in the United States

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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.

Health technology
The study compared three possible scenarios of changing the minimum legal purchase age (MLPA) of cigarettes from 18 to 21 against no change in MLPA (status quo condition).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
As this was a modelling study, the target population comprised the US population of the year 2003. No further inclusion or exclusion criteria were reported.

Setting
Although not explicitly stated, the setting appears to have been the community. The economic study was carried out in the USA.

Dates to which data relate
The demographic and effectiveness data were derived from sources published between 1991 and 2004. The publication year of one reference was not mentioned. The resource use data and cost data were derived from sources published between 1992 and 2003. All costs were reported for the price year 2003.

Source of effectiveness data
The effectiveness data were derived from a review and synthesis of published studies.

Modelling
The author used a dynamic simulation model to evaluate state and national policies, implemented to decrease tobacco usage, in terms of their costs and effectiveness. Details of the model were reported in three published studies (Tengs et al. 2005, Tengs et al. 2004 and Ahmad et al. (in press), see ‘Other Publications of Related Interest’ below for bibliographic details). The time horizon of the model was 50 years. The model compared three scenarios of MLPA change with the status quo condition. The three scenarios compared were youth initiation shift, universal initiation shift and decrease in smoking initiation probability (as a result of a change in MLPA).

Youth initiation shift: the initiation probability distribution was moved to the right to match the legal smoking age from 18 to 21. Under this scenario, an 18-year old person would incur the same probability as a 15-year old person in the United States.
status quo scenario, while those aged 21 years or older would have the same smoking initiation probability as the status quo scenario.

Universal initiation shift: initiation probabilities shift for all ages by 3 years and reach the same maximum as in the status quo scenario.

A change in MLPA would result in a decrease in the age- and gender-specific smoking initiation probability by a fixed percentage (10%, 30% and 50%) for all individuals aged younger than 21 years.

It was reported that cessation and relapse probabilities were not altered in any of the scenarios. It was reported that three smoking status categories (never smokers, current smokers and former smokers) were used to simulate smoking behaviour. Never smokers were those who had smoked less than 100 cigarettes in their lifetime. Current smokers were those who had smoked 100 or more cigarettes in their lifetime and had smoked during the last 30 days. Former smokers were those who had smoked 100 or more cigarettes in their lifetime but not in the last 30 days. The model was standardised against external estimates of total population size (by gender and size), current adult smoker prevalence, and life expectancy (by age, gender and smoking status).

Outcomes assessed in the review
The main parameter used in the model was the smoking prevalence in the status quo scenario, according to age. The other parameters used in the model were not reported explicitly in full detail. Some of the parameters reported to have been used in the model were:

the age and gender distribution of the population;

the smoking status of the population (depending of the policy implemented);

changes in the population due to births, deaths, aging, net migration and changes in smoking status over the 50-year period;

the fertility probability, according to a woman's age;

mortality probabilities, according to age, gender and smoking status;

the probability of smoking take-up (transition from never to current smoker);

the probability of smoking cessation (transition from current to former smoker); and

the relapse probability (transition from former to current smoker), according to age and gender.

Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
It appears that no methods were used to assess the validity of the primary studies.
Number of primary studies included
The author used 14 studies as sources of effectiveness data.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
It appears that differences between the primary studies were not investigated.

Results of the review
Smoking prevalence in the status quo scenario was:

20% in the age group 14 to 17 years,

26.9% in the age group 18 to 20 years, and

21.8% in the age group above 21 years.

The total adult smoking prevalence (for individuals aged 18 years and older) was 22.1%.

No further results were reported.

Measure of benefits used in the economic analysis
The author used life-years and health utility (QALYs) as measures of benefit in the economic analysis. These were derived directly from the model. Quality of life data according to age, gender and smoking status from the Quality of Well Being scale were based on estimates derived through personal communication from R.M. Kaplan in 1999.

The costs and benefits were not combined. In effect, a cost-consequences analysis was performed.

The health benefits were discounted at an annual rate of 3%.

Direct costs
The following costs were used in the analysis:

costs to the government for inflicting vendor compliance with the MLPA (including salaries and benefits for adult inspectors, supervisors and underage shoppers, expenses for record keeping, liability insurance costs, legal fees and overheads for office space equipment and supplies);

costs incurred by vendors for checking identities to verify the age of prospective cigarette buyers (average time to do an identity check multiplied by the average hourly wage for cashiers);

medical costs for youth and adults (including Medicare, Medicaid, out-of-pocket direct medical costs and private insurance medical costs).

The costs and the quantities were not reported separately. Resource use was derived using data from the literature and author's assumptions. The cost estimates were derived from official published sources. As the time horizon of the model was 50 years, discounting was appropriately carried out. All costs were adequately adjusted and reported for the price year 2003.

Statistical analysis of costs
It appears that the costs have been treated deterministically.

**Indirect Costs**
No indirect costs were included in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
A one-way sensitivity analysis was carried out in which 10- and 20-year time horizons were assumed.

**Estimated benefits used in the economic analysis**
An incremental analysis was performed.

Compared with the status quo scenario, the youth initiation shift scenario resulted in 4.38 million incremental life-years and 12.96 million incremental QALYs.

Compared with the status quo scenario, the universal shift scenario resulted in 0.56 million incremental life-years and 3.44 million incremental QALYs.

Compared with the status quo scenario, the 10% decreased probability scenario resulted in 0.75 million incremental life-years and 2.15 million incremental QALYs. The 30% decreased probability scenario resulted in 2.33 million incremental life-years and 6.65 million incremental QALYs, and the 50% decreased probability scenario resulted in 4.02 million incremental life-years and 11.47 million incremental QALYs.

**Cost results**
The total costs were:

$29,325,330 million for the status quo scenario,

$29,113,677 million for the youth initiation shift scenario,

$29,319,995 million for the universal shift scenario,

$29,291,627 million for the 10% decreased probability scenario,

$29,216,188 million for the 30% decreased probability scenario, and

$29,135,140 million for the 50% decreased probability scenario.

An incremental cost analysis demonstrated that, compared with the status quo scenario:

the youth initiation shift scenario would result in total cost-savings of $211,653 million,

the universal shift scenario would result in total cost-savings of $5,335 million,

the 10% decreased probability scenario would result in total cost-savings of $33,703 million,

the 30% decreased probability scenario would result in total cost-savings of $109,142 million, and

the 50% decreased probability scenario would result in cost-savings of $190,190 million.
Synthesis of costs and benefits
The cost and benefits were not combined.

Authors' conclusions
"In every simulated scenario, raising the smoking age would generate health benefits and cost savings to society for years to come."

CRD COMMENTARY - Selection of comparators
A justification was provided for the comparators used. You should decide if this is a valid health policy in your own setting.

Validity of estimate of measure of effectiveness
No systematic review was undertaken. Although this is common practice with models, it does not always ensure that the best data available are used in the model. Details of the model were not discussed in the current study and the author appears to have used data from the available studies selectively. The results of the review, in relation to the model parameters were not discussed. Some effectiveness estimates were based on expert opinion or author's assumptions, and the methods used to derive these estimates of effectiveness were not reported. No sensitivity analyses were conducted to improve the internal validity of the study and the generalisability of the results.

Validity of estimate of measure of benefit
The measures of benefit used in the economic analysis were the life-years and QALYs. These were derived directly from the model. The costs and benefits were not combined, therefore, in effect, a cost-consequences analysis was performed.

Validity of estimate of costs
A societal perspective was adopted in the economic analysis. As such, it appears that all the relevant categories of costs were included in the analysis. However, the costs and the quantities of resources used were not reported, which makes it impossible to know which aspects of costs were included in each category. In addition, it does not enable the analysis to be easily reworked for other settings. The quantities of resources used were based on author's assumptions, but no justification for the assumptions was given. The cost data were derived from official published sources. However, the costs were treated deterministically and no sensitivity analysis on the costs or quantities was carried out. This may introduce uncertainty into the results and limits the interpretation of the study findings. Discounting, inflation adjustments and the price year were appropriately reported.

Other issues
The author did not compare the findings with those from other studies, so it is not known how far the results agree with other published results. The issue of generalisability of the results to other settings was not directly addressed. The author does not appear to have presented the results selectively, but a distinction between genders was not reported. The study population comprised the whole US population and this was reflected in the author's conclusions.

The author reported several limitations to the study, mainly related to the model assumptions. First, the time horizon of the model (50 years) is considered to be quite a long time, thus introducing high uncertainty into the predictions made. Second, owing to a lack of data, it was assumed that smoking prevalence remains constant in the status quo scenario. However, this assumption does not reflect real life since smoking prevalence has been dropping during the last years. In addition, it was assumed that treatment effectiveness, medical technology, treatment costs and relative medical costs of smokers versus non-smokers remains stable throughout the study period. This is a strong assumption since in a 50-year time horizon all these parameters may be subject to changes. Third, the model did not take the impact of a possible development of a black market, which will give teenagers access to cigarettes, into account.
Implications of the study
The author did not make explicit recommendations for changes in policy or practice, or suggest areas for further research. However, the discussion highlighted areas where more research information is needed.

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Bibliographic details
Ahmad S. Closing the youth access gap: the projected health benefits and cost savings of a national policy to raise the legal smoking age to 21 in the United States. 2005; 75: 74-84

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16298230

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10.1016/j.healthpol.2005.02.004

Other publications of related interest


Ahmad S. Increasing excise taxes on cigarettes in California: a dynamic simulation of health and economic impacts. Preventive Medicine, in press.

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Age Factors; Commerce /legislation & jurisprudence; Cost Control; Health Policy; Humans; Models, Econometric; Smoking /epidemiology /legislation & jurisprudence; United States /epidemiology

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