A mass media programme to prevent smoking among adolescents: costs and cost effectiveness


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 use of a 4-year mass media programme, consisting of 36 television and 17 radio features targeted at adolescent students, plus a school curriculum programme for the prevention of cigarette smoking among adolescents. The school curriculum programme was taught by regular classroom teachers and comprised four lessons annually per grade for grades 5 to 9, i.e. students aged 10 to 15 years, and three lessons annually for grade 10, i.e. students aged 15 to 16 years.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The targeted population consisted of students in grades 5 to 7, i.e. aged 10 to 13 years, which continued to be exposed to the programme through grades 8 to 10, i.e. 13 to 16 years.

Setting
The setting was community. The economic study was carried out in Montana, New York and Vermont, USA.

Dates to which data relate
The effectiveness data were gathered in 1989 and 1991. Resource use corresponded to the period 1986 to 1989. The price year was 1996.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was performed retrospectively using the same study sample as that for the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. The school programme alone was carried out in two communities with a population of 2,851 adolescents: 1,327 girls and 1,521 boys, plus some missing observations for gender. The combined media and school campaign was performed in two communities with a population of 2,335 adolescents: 1,151 girls and 1,166 boys, plus some missing observations for gender. The total number of students potentially exposed to the media programme, in the two combined-programme communities, was estimated to be
18,600 for the 3-year cohort when using an area-of-dominant-influence table. No further information on baseline characteristics was given, although the details of the effectiveness study are stated to have been published elsewhere (see Other Publications of Related Interest below).

Study design
This was a non-randomised study with concurrent controls, carried out in four communities. The duration of the follow-up was 2 years. No loss to follow-up was reported. The surveys on the students were performed on the baseline, each year during the implementation of the intervention (1986 to 1989) and 2 years after its completion. The efficacy of the media programme was measured through surveys performed at the end of the 4-year programme, when the target cohort were in grades 8 to 10, and at the 2-year follow-up, when the target cohort were in grades 10 to 12 and aged 15 to 18 years.

Analysis of effectiveness
The health outcome measure was the prevalence of weekly smoking among the targeted students in grades 10 to 12. Surveys to assess smoking prevalence were performed on all students who were exposed to the intervention for the entire period, and also on those who were transferred to study schools with potentially less exposure to the programme. Differences in smoking prevalence at baseline between the media and school programme group and comparator group were assessed, but details were reported elsewhere (see Other Publications of Related Interest below).

Effectiveness results
Results for the prevalence of weekly smoking, 2 years after completion of the intervention, were presented.

For the targeted students in grades 10 to 12, the values were 20.4% (95% CI based on simple random sampling: 18.7 - 22.0) for the media and school programme, compared with 25.9% (95% CI: 24.3 - 27.6) for the school programme alone, i.e. a difference of 5.5% (95% CI: 3.2 - 7.8).

The corresponding values for the girls were 21% (95% CI: 18.7 - 23.3) for the media and school programme and 28.3% (95% CI: 25.9 - 30.6) for the school-only programme, resulting in a difference of 7.3% (95% CI: 3.9 - 10.7).

The corresponding values for the boys were 19.8% (95% CI: 17.5 - 22.1) for the media and school programme and 23.8% (95% CI: 21.7 - 25.9) for the school-only programme, resulting in a difference of 4.0% (95% CI: 0.9 - 7.1).

All the differences were found to be significant, (p<0.05).

Clinical conclusions
This study showed that the addition of the mass media campaign to the school smoking prevention curriculum was effective in reducing the prevalence of smoking among adolescents.

Modelling
A Markov model with annual cycles was used to estimate the differences in life expectancy between cohorts with similar gender ratios, but differing prevalence of cigarette smoking. In addition, a Monte Carlo simulation was used to estimate the effects of change in the efficacy of the mass media programme within its 95% confidence intervals (CIs), assuming a normal distribution of the variable.

Measure of benefits used in the economic analysis
The benefit measures used were the number of student smokers averted and the number of life-years gained, both derived using a Markov model, and mortality rates from life tables.
Direct costs
Discounting was applied to cost estimates. Quantities of resource use and cost units were not reported separately. The cost analysis covered the costs of salary and fringe benefits for research staff, consultant fees, travel, data entry and analysis for the diagnostic and formative research, and the production of the television and radio features. The perspective adopted in the cost analysis was that of organisations interested in developing and implementing a mass media campaign for the prevention of smoking. Resource use data were obtained from the study's records. The costs of broadcasting the campaign on a nationwide basis, in all 209 American markets of varying size, were estimated. The Consumer Price Index was used to adjust the cost data into the corresponding values in terms of the study fiscal year. The date of the price data was 1996. The reduction in future costs as a result of the improved health of averted smokers, and the increased future costs of care due to the increased life expectancy of nonsmokers, were not covered in the cost analysis.

Statistical analysis of costs
No statistical analysis of costs was conducted.

Indirect Costs
Indirect costs were not considered.

Currency
US dollars ($).

Sensitivity analysis
A set of one-way sensitivity analyses was performed on discount rate, average cost, years of life lost because of smoking, and prevalence of smoking. A Monte Carlo simulation was also used to estimate the effects of change in the efficacy of the mass media programme within its 95% CIs, assuming a normal distribution of the variable.

Estimated benefits used in the economic analysis
The 5.5% difference in the prevalence of weekly smoking represented 128 (95% CI: 75 - 182) cases of student smokers averted. Based on 18,600 estimated cases of potentially exposed adolescents, the number of smokers averted was 1,023 (95% CI: 595 - 1,451). The estimated life expectancy at age 20 was 58.97 and 50.17 years for female and male smokers, respectively. The corresponding values for nonsmokers were 64.03 years for women and 56.50 years for men, resulting in a loss of 5.06 and 6.33 years for female and male smokers, respectively. When the mass media smoking prevention campaign was projected to a nationwide programme for a total population of 10,402,600 students, aged 10 to 12 years and taken from 209 media markets, the estimated numbers of smokers averted was 520,130 based on a 5% programme efficacy. The discount rate was 3%.

Cost results
In terms of 1996 prices, the total broadcasting cost of the 4-year mass media programme was $183,334, while the total cost of development, production, and broadcasting was $759,436; this resulted in an average cost of $325 per student, whether partially or fully exposed. In terms of the total estimated number of potentially exposed students, the 4-year media campaign had an average cost of $41. The average cost per student for the projected national media campaign was approximately $8. The discount rate was 3%.

Synthesis of costs and benefits
The incremental cost-effectiveness ratios, relative to the comparator, were computed in terms of incremental cost per student smoker averted and incremental cost per life-year gained. The incremental cost per student smoker averted for the 4-year media campaign was $5,933 (95% CI: $4,173 - $10,126). In terms of the total estimated number of potentially exposed students, the corresponding figure was $742 (95% CI: $523 - $1,276). The corresponding value for
the projected national media campaign was approximately $160. With a 3% discount rate, the incremental cost per life-year gained was $167 (95% CI: $107 - $301) in terms of broadcast costs only, and $696 (95% CI: $445 - $1,269) in terms of the combined development and broadcast costs. The corresponding value for the projected national media campaign was approximately $137 (95% CI: $89 - $225). Sensitivity analyses highlighted the robustness of the cost-effectiveness results, even when the low estimate for the effect size was taken into consideration.

Authors' conclusions
Based on the estimates of the cost-effectiveness ratios, this mass media campaign was shown to be economically attractive in preventing the onset of smoking, and to compare favourably with other preventive and therapeutic strategies.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator was clear. You, as a user of the database, should decide if a school programme to prevent the onset of cigarette smoking is relevant in your own setting.

Validity of estimate of measure of benefit
Little data on baseline difference between the two groups (mass media plus school programme versus school programme alone) were reported, therefore it is difficult to check for possible selection bias. However, the difference in weekly smoking prevalence between the two groups was analysed statistically, in order to increase the robustness of the findings.

Validity of estimate of costs
All the relevant direct costs from the perspective adopted were included in the analysis. The issue of generalisability was well addressed by the use of sensitivity analyses of costs. Unit costs and quantities, although not reported separately, were based on actual data, thus increasing the internal validity of the study.

Other issues
The authors compared their findings with other smoking prevention or cessation interventions, for example nicotine gums, in order to investigate the relevance in terms of cost-effectiveness of the study strategy.

The mass media campaign proved to be more cost-effective, by up to three orders of magnitude, than those of several other preventive and therapeutic measures.

The issue of generalisability was properly addressed by the use of several sensitivity analyses.

The authors stated that the campaign used in this analysis differed from other campaigns aimed at preventing youth smoking as "it used theoretically-based educational objectives, targeted message development and delivery to specific audience segments, and resulted in intensive exposure to the messages throughout the period of greatest risk of smoking".

Implications of the study
Given the results of this study, i.e. estimations from the Markov model, the authors suggested that a national mass media campaign targeted at adolescents is likely to be a cost-effective strategy in the prevention of the onset of cigarette smoking.

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Other publications of related interest


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