Cost-effectiveness of interventions to promote physical activity: a modelling study

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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 assessed the cost-effectiveness of various interventions to promote physical activity. The authors concluded that pedometers and the mass media campaign were the most cost-effective strategies, but a single package of all six interventions could lead to substantial benefits in population health at a cost saving or affordable costs to the health sector. The study was based on valid methodology and was extensively presented, especially in an online appendix. The authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of various interventions, ranging from individualised counselling to broad population health approaches, intended to promote physical activity to reduce the risk of chronic diseases.

Interventions
Six interventions were compared against the current practice for physical activity.

In general practitioner (GP) prescription, patients who visited their general practice were screened and inactive patients received a physical activity prescription from the GP and follow-up phone calls from an exercise physiologist.
In GP referral, screening questionnaires were mailed to patients on the GP patient list and inactive patients were invited to attend a series of counselling sessions with an exercise physiologist at their local general practice.
In the mass media campaign, physical activity was promoted for six weeks via mass media, distribution of promotional materials, and community events and activities.
In TravelSmart, an active transport programme targeted households with tailored information and merchandise as an incentive or reward for reducing the use of cars for transport.
In pedometers, a community programme encouraged the use of pedometers as a motivational tool to increase physical activity.
In internet advice, participants were recruited via mass media to access physical activity information and advice on the internet via a website and/or email.

A package in which all six interventions were combined was also considered.

Location/setting
Australia/primary care and community.

Methods
Analytical approach:
The economic evaluation was based on a state-transition model with a lifetime horizon. The authors stated that the perspective of the health sector was adopted.

Effectiveness data:
The clinical evidence came from a review of the literature in various electronic databases, grey literature, and bibliographies of relevant studies and reviews. These sources were supplemented with information supplied by relevant experts. The exclusion criteria were explicitly reported. The studies selected had various designs, patient characteristics,
etc. For example, the efficacy of GP prescription was taken from a randomised controlled trial (RCT) conducted in New Zealand, while the efficacy of the mass media campaign was obtained from a quasi-experimental study. Estimates from multiple studies were combined using a meta-analytic approach, when possible. When heterogeneous studies were found, for example with different outcome measures reported, the source with the most robust effectiveness estimate and the greatest applicability to the Australian setting was selected. The key clinical endpoint was the treatment efficacy, which was often derived from RCTs.

**Monetary benefit and utility valuations:**
The disability weights were derived from Australian sources and were associated with chronic diseases (ischaemic heart disease, ischaemic stroke, type 2 diabetes, breast cancer, and colon cancer) or other factors (obesity and falls).

**Measure of benefit:**
Disability-adjusted life-years (DALYs) were the summary benefit measure and were discounted at an annual rate of 3%.

**Cost data:**
The economic analysis included those costs borne by the government and patients (including travel and time costs, but excluding time costs associated with patient changes in physical activity). The government costs included those of the programme, but not its start-up, and diseases (breast and colon cancer, ischaemic heart disease, ischaemic stroke, and type 2 diabetes). The resource use data were derived from published sources, most of which were official Australian sources, as follows: the Medicare Benefits Schedule, Salary Surveys, labour force statistics, the New South Wales Health campaign, the Australian Institute of Health and Welfare Disease Costs and Impact Study 2001, and published cost-effectiveness studies. All costs were in Australian dollars (AUD) and were discounted at 3% per annum. The price year was 2003.

**Analysis of uncertainty:**
A Monte Carlo simulation was carried out to examine the global issue of uncertainty in the model inputs, using probability distributions for all parameters. A one-way sensitivity analysis was also undertaken to assess the sustainability of the intervention health effects over time.

**Results**
In the 2003 Australian population, in comparison with current care, the DALYs averted were 20,000 with pedometers, 23,000 with mass media, 9,300 with TravelSmart, 7,100 with GP prescription, 1,900 with GP referral, and 740 with internet advice.

The net costs of the interventions (in million) over current care were a saving of AUD 420 with pedometers, a saving of AUD 430 with mass media, AUD 190 with TravelSmart, AUD 81 with GP prescription, AUD 140 with GP referral, and AUD 3 with internet advice.

Pedometers and mass media interventions were dominant as they were both cost saving and more effective than usual care. The incremental cost per DALY averted was AUD 18,000 with TravelSmart, AUD 11,000 with GP prescription, AUD 75,000 with GP referral, and AUD 2,000 with internet advice.

All interventions, except for GP referral, had a high probability of being below the threshold of AUD 50,000 per DALY averted. The probabilistic sensitivity analysis showed that all the interventions had between 74% and 100% probability of being cost-effective at AUD 50,000 per DALY averted, except for GP referral, which had only a 13% probability.

When all six interventions were combined in a single package, the current pattern of care was dominated and the best sequence of the interventions was: pedometers, mass media, internet advice, GP prescription, TravelSmart, and GP referral. The sensitivity analysis showed that at high levels of decay for the intervention effect, the total package was no longer cost-saving, but remained effective and below the cost-effectiveness threshold of AUD 50,000 per DALY.

**Authors' conclusions**
The authors concluded that pedometers and the mass media campaign were the most cost-effective strategies, but a package of all six interventions could lead to substantial benefits for population health at a cost saving or affordable costs to the health sector. They stated that future clinical trials should use a consistent measure of physical activity behaviour to improve the confidence in the magnitude of the health effect.

**CRD commentary**

**Interventions:**
The selection of the interventions was based on a literature review of studies with adult populations. This approach appears to have been valid for identifying all the comparators relevant for the Australian setting. A strategy that included a combination of all interventions was also considered. The background comparator was appropriate as it represented the current situation in Australia.

**Effectiveness/benefits:**
Most of the clinical inputs came from a literature review and the key details were reported in an online appendix. Other data, especially those from country-specific sources, appear to have been based on the authors’ knowledge of available sources. Extensive details on the intervention effect and the target population were reported and the authors justified their selection of the primary sources of data. In general, the clinical side of the study was well reported in the appendix. The authors justified their selection of DALYs as the summary benefit measure, and explained the reasons for not using quality-adjusted life-years.

**Costs:**
The economic analysis included a wide range of costs, which were borne by the health sector and by patients, although the authors stated that a public sector perspective was taken. Most of the details on unit costs and resource quantities were presented in the appendix. In general, country-specific sources were used although some data were derived from previous economic evaluations carried out in other countries. Probability distributions were assigned to the cost estimates to take into account the potential uncertainty underlying these inputs. The price year and the use of discounting were reported.

**Analysis and results:**
The costs and benefits were extensively presented and combined in an incremental approach, which showed the dominance of some strategies. The issue of uncertainty was appropriately investigated with a comprehensive approach based on a probabilistic analysis. A few key inputs were varied individually in a deterministic analysis. The details of the decision model were reported and the authors acknowledged some limitations of their analysis. For some interventions, the effectiveness data were derived from an individual trial, while it would have been more appropriate to combine data from multiple sources in a meta-analysis. Some interventions were implemented for less than one year, which was the assumed duration for each programme. It was likely that only motivated people participated in the trials, which could have biased the effectiveness of some interventions such as the pedometers. Some sources of data were of low quality, which increased the uncertainty in the results.

**Concluding remarks:**
The study was based on valid methodology and was extensively presented, especially in the online appendix. The authors' conclusions appear to be valid.

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