Should we invest in environmental interventions to encourage physical activity in England?  
An economic appraisal  
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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 evaluated the cost-effectiveness of environmental interventions, to promote physical activity, in sedentary adults, using three analytic methods. The authors concluded that the three methods provided consistent support for the cost-effectiveness of the intervention to promote walking and cycling, but the evidence was limited. The study summarised three economic evaluations, and this appears to have hindered reporting. As a result, it is unclear if the authors' conclusions are appropriate.

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

Study objective
This study used three analytic methods to evaluate the cost-effectiveness of environmental interventions, to promote physical activity, in sedentary adults.

Interventions
For all three analyses, the intervention was the construction of a walking and cycling trail, and this was compared with no intervention.

Location/setting
UK/public health.

Methods
Analytical approach:
Two cost-utility decision models were produced, and one cost-benefit analysis was undertaken. The authors stated that the cost-utility models took a UK NHS perspective, and the cost-benefit analysis took a societal perspective. The first cost-utility model had a 10-year time horizon, and the second had a 30-year time horizon. The cost-benefit analysis was for one year.

Effectiveness data:
In cost-utility model one, effectiveness was the increase in physical activity, which was from a published study. Increases in physical activity were linked to the risks of coronary heart disease, stroke and type 2 diabetes, based on published algorithms. It was assumed that an increase in activity generated the health benefits of 120 minutes of moderate intensity activity per week. In the second model, effectiveness was assumed to be at least one 30-minute unit increase in physical activity per month, based on the same published study used for cost-utility model one. Each unit increase was converted to an EQ-5D health utility score by regression, using data from the Health Survey for England (HSE). Long-term QALY gains were estimated on the assumption that a 30-minute increase in physical activity was sustained over the 30 years of the model. In the cost-benefit analysis, it was assumed that the average cycle trip was 3.9km, and there were 50 trips per new user per year. This was based on information from the Department for Transport.

Monetary benefit and utility valuations:
In the second cost-utility model, the utility values were from the HSE 2004, which used EQ-5D scores. The cost-benefit analysis transformed the health benefits, short-term absence benefits, and travel time benefits into monetary values.
Discounting was applied to the benefits at 3.5% annually, for the two cost-utility models.

Measure of benefit:
In the cost-utility analyses the primary measure of benefit was quality-adjusted life-years (QALYs). The cost-benefit analysis measured benefit in monetary terms, and as a cost-benefit ratio.

Cost data:
In model one, intervention costs and treatment costs for chronic heart disease, stroke and type 2 diabetes were estimated from published literature, and converted into a cost per person per year, using Office for National Statistics (ONS) 2007 population estimates. All costs were updated to 2007 UK £. In the second model, capital and maintenance costs for the cycle trails were included, based on the same published US study that was used for model one. All costs were in 2006 UK £. The cost-benefit analysis included capital and maintenance costs for the trails, and they were reported in 2006 UK £. Discounting was applied to the costs at 3.5% annually, in the two cost-utility models.

Analysis of uncertainty:
For cost-utility model one, deterministic sensitivity analyses were conducted around the intervention effectiveness, activity intensity (moderate or vigorous), and QALY estimates. Cost-utility model one and cost-utility model two assessed alternative proportions of the costs attributable to encouraging sedentary individuals to increase physical activity. Cost-utility model two also varied the number of sessions of physical activity undertaken due to the environmental intervention.

Results
The estimates of benefit varied between 0.042 QALYs and 0.227 QALYs over a 10-year time horizon, in model one, depending on the source of data. In model two, they varied between 0.078 and 0.391 over 30 years, depending on the number of sessions per week.

The incremental cost-effectiveness ratios, for the cost-utility analyses, varied between £94 per QALY gained to £9,439 per QALY gained, depending on the assumptions.

In the cost-benefit analysis, the total monetary value of the benefits was estimated to be £2.60 per person per kilometre travelled. The total costs were £0.22 per person per kilometre. This produced a cost-benefit ratio of one unit of cost to 11.36 units of benefits. Most (65.92%) of the benefits accrued were due to health gains.

Authors' conclusions
The authors concluded that the three methods of evaluation provided consistent support for the cost-effectiveness of environmental interventions to promote walking and cycling, but the evidence was limited.

CRD commentary
Interventions:
The intervention was not described in detail. It was not clear if the population, and walking and cycling infrastructure, in the primary effectiveness study, which was conducted in rural West Virginia, USA, were similar to those in the UK.

Effectiveness/benefits:
The full inputs for the cost-utility models were not presented, but might be available in a report published for this study (see Other Publications of Related Interest). How increased exercise was translated into increased QALYs was not clearly explained. The model structures and utility scores for the cost-utility analyses were not reported, the amount of increased activity from the interventions was not reported. It was not clear how well the assumptions of sustained increased activity were supported by the referenced study, as the effectiveness data were not described. Only the benefit outcomes were reported; only aggregate QALYs, and the monetary value of benefits in the cost-benefit analysis, were given. It was unclear how the monetary values for benefits were derived as the valuations were not cited. In cost-utility model two, additional sessions of physical activity had equal QALY benefit to the first session, so it appears that the model was a very simple regression equation. If this was the case, then the equation should have been reported. An assumption of diminishing marginal returns was more likely, and could have been tested in a sensitivity analysis.

Costs:
The price year was inconsistent between evaluations, varying between 2006 and 2007. It was not clear whether the costs were accrued immediately, for building the multi-purpose trail, or whether they were amortised over any period of the analyses. It was also not clear how the costs were converted from US $, in the US studies. It was not clear that these costs were generalisable to the UK.

Analysis and results:
The cost-effectiveness results for model one were only presented in a graph, and it was not clear which scenario was the main analysis, otherwise, the results were adequately reported. The sensitivity analyses appear to have used appropriate ranges for the parameters, and should reflect uncertainty appropriately. The authors stated that their study may have more uncertainty due to the quality of the effectiveness data, and potential limitations of self-reported data. Given these reservations, a probabilistic sensitivity analysis may have been appropriate, and could have provided valuable information on the total effect of parameter uncertainty.

Concluding remarks:
This study summarised three economic evaluations, and this appears to have hindered reporting. As a result, it is unclear if the authors' conclusions are appropriate.

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