



**Liverpool
Public Health
Observatory**

Prevention Programmes Cost-Effectiveness Review:

Physical activity

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PROVIDING INTELLIGENCE FOR THE PUBLIC HEALTH

The cost-effectiveness review series

Background

There are significant pressures placed upon public sector organisations to ensure that money is spent wisely to ensure the best value for money for services they provide. In the health sector, there is increasing pressure to justify spending on all areas of health care and in particular on preventive programmes. As a consequence, public health is increasingly being asked for cost effectiveness evidence as justification for funding or continued funding of particular initiatives. Although evidence is available nationally for a lot of public health initiatives, this information is not available in one place. The production of a review that includes information on cost effectiveness and potential cost savings in one place will make it easier for public health to develop a business case for continued investment in preventive services.

About the series

The review series will provide a comprehensive review of the literature on evidence of the cost effectiveness and potential cost savings of preventive programmes and projects by topic area.

This is the second topic area covered by the cost effectiveness review series. It follows on from a review on physical activity. Further topic areas will be considered for inclusion as required.

Physical activity interventions

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Glossary

Cost-effectiveness analysis: Expressed as a ratio of the costs divided by the health outcomes e.g. cost per quitter

Cost utility analysis: a form of cost-effectiveness analysis which is adjusted by health state preference scores e.g. QALY

Cost savings: Providing additional healthcare benefits and an overall reduced health service cost

ICER: Incremental cost-effectiveness ratio, (e.g. cost per QALY gained ratio) - can be used to summarise the trade-off in costs and effects between different programmes, or between a programme and doing nothing

RCT: Randomised controlled trial

QALY: Quality-adjusted life year. Used in assessing the value for money of a medical intervention, based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned the value of 1.0 down to a value of 0.0 for death. One QALY is equal to a year of life in perfect health

DALY: Disability-adjusted life year: While a *QALY* is a year of perfect health gained, a *DALY* is a year of perfect health lost.

NHS EED: Economic Evaluation Database contains abstracts of health economics papers including quality assessment

(<http://www.crd.york.ac.uk/crdweb/Home.aspx?DB=NHS%20EED>)

Report highlights

Brief interventions

- Brief interventions (BI) in primary care were exceptional value for money at between £20 and £440 per QALY
- BI were more cost-effective than statins in preventing coronary health events

The environment

- Strong evidence on importance of the built environment
- Health and economic benefits of active travel outweigh the costs by up to 11 times
- Costs ranged from £90 to £25,000 per QALY

School and workplace

- A workplace health promotion consultation reviewed by NICE cost a total of £57,000 and saved £484,944 in NHS net costs.
- A workplace walking programme reviewed by NICE cost a total of £56,000 and saved £311,547

Mass media

- Mass media campaigns were the most cost-effective of six interventions compared in a cost-utility analysis
- A seven week BBC mass media campaign increased adults' chances of being physically active by nearly 17%

Physical activity

Background:

According to the Department of Health (2004), 63% of men and 76% of women across the country are not physically active enough to meet national recommendations that adults should be moderately active for at least thirty minutes, at least 5 times a week. In addition, only 70% of boys and 61% of girls aged 2 to 15 meet the recommendation of being moderately active for at least 60 minutes a day. In Liverpool, 19.8% of the population were active according to 2008/09 figures, lower than the national average of 22% (Liverpool PCT Joint Director of Public Health Annual Report 2009-10).

'Game plan' (Department for Culture, Media and Sport 2002) estimated that a 10% increase in physical activity in adults would benefit England, both directly and indirectly, by at least £500 million per year and would save approximately 6,000 lives. Of this £500 million saving, 17% is attributable to direct health costs. Therefore the direct health saving for a 10% increase in physical activity would be £85 million.

The review:

Direct NHS interventions (including brief interventions) and indirect NHS interventions (including impact of the environment on physical activity levels, school and workplace interventions and free swimming, as well as mass media campaigns), are included.

Evidence was gathered from National Institute for Health and Clinical Excellence (NICE) publications, NHS evidence library, NHS Evidence, Department of Health. A search of electronic databases was undertaken, involving the NHS Economic Evaluation database, Scopus, MEDLINE, and Cochrane databases.

Search terms used were 'physical' and 'cost' or 'cost-effectiveness', from 1995 onwards, until September 2010. Only those studies that gave details of costs and cost-savings/ cost effectiveness were included. Evidence is presented in tables according to a hierarchy, with systematic and comprehensive reviews first, followed by randomised controlled trials, clinical trials and observational studies, case reports and case series, expert opinions and other relevant reports. Non-UK studies were given a lower ranking. Critical appraisals of studies featuring in the NHS Economic Evaluation Database were used where available, to assist in determining the quality of studies.

In cost-effectiveness analysis there is often considerable uncertainty associated with the findings as a result of the assumptions and parameters used, therefore a degree of caution is required when reading the results.

The sections are ordered according to the degree of evidence on their cost-effectiveness.

1. Brief interventions

Brief interventions involve opportunistic advice or discussion, ranging from basic advice to extended, individually-focused attempts to increase levels of physical activity. They are delivered by a range of primary and community care professionals (NICE, 2006).

Study	Intervention	Cost-effectiveness/ savings
1a Brief interventions in primary care		
NICE, 2006	Comparison of brief interventions in primary care, pedometers, exercise referral schemes, and walking and cycling schemes.	Brief interventions in primary care were the only intervention that NICE recommended. Physical activity brief interventions in primary care cost between £20 and £440 per QALY when compared to no intervention. This is significantly below the £30,000 threshold per QALY which NICE set to determine whether an intervention is cost-effective and can be used in the NHS. Incremental net costs per QALY gained varied from £750 to £3,150. There was insufficient evidence to say what impact job title of person carrying out the intervention, length of intervention, had on effectiveness. Also insufficient evidence on differential impact according to age/gender/socioeconomic status of person receiving the intervention (NICE, 2006). NICE assumed that brief interventions would be provided as part of 'usual practice', and that follow-up sessions 3-6 months after the initial consultation would cost £4.26 (based on a 15 minute consultation with a GP Practice Nurse), although 50% of these were likely to take place at existing consultations. Developing printed materials would cost £500 per PCT per year, plus £0.12 per person to print them (NICE, 2006a). Brief interventions could be delivered in 1 in 9 consultations, so an average PCT with a population of 131,000 would incur costs of £39,000 (NICE, 2006b).
HELP matrix Website, (Commissioned by Health England to prioritise investment in preventive health care)	Compared brief interventions with mass media campaigns	Brief interventions were the second most cost-effective intervention to reduce obesity after national mass media campaigns. Brief interventions and one motivational interview with a health visitor for people aged 40-64 cost £31 per person more than brief advice only (at 2007/08 prices), and increased chances of adults increasing number of vigorous activity sessions by 22%. They resulted in an additional 1.52 per QALY per person and health-care cost savings of £3,301 per person.
Ward et al, 2007. Systematic review cited by NICE 2007	Compared statins with brief interventions for prevention of coronary health events.	Brief interventions were more cost-effective than statins in preventing coronary health events, in both primary and secondary prevention.

Project ACTIVE Sevick et al, 2000 Randomised controlled trial in America. NHS EED abstract stated generalisability limited to similar settings. Other points in EED.	Compared lifestyle interventions with behavioural skills training	Lifestyle interventions were more cost-effective than behavioural skills training (£11 per person compared to £31). Participants also lost most weight on lifestyle interventions.
Müller - Riemenschneider et al, 2009, German systematic review	Brief interventions and telephone interventions	In adults with existing health problems in areas of socio-economic deprivation, face-to-face brief interventions (£10,005 per QALY) and telephone interventions (£24,184) were both cost-effective
Pringle et al, 2010 Cost-effectiveness analysis of 7 interventions. NHS EED abstract not available until December 2010.	Compared 7 interventions	Motivational interviews were the most cost-effective intervention, at £47 per QALY. Motivational interviews for older adults including the BME community cost £229 per QALY. Primary care weight management activities for adults cost £232 per QALY, while primary care referral of adults with diabetes to activity classes cost £257 per QALY. Post primary care classes for older adults in the community cost £257 per QALY. Primary care referral of adults and young people to one to one instruction in increasing physical activity cost £486 per QALY.

Study	Intervention	Cost-effectiveness/ savings
1b Secondary care – brief and other interventions		
Gordon et al, 2007, Australian systematic review	Behavioural interventions	Cost-effectiveness ratios were consistently low for behavioural interventions across 64 studies, less than £8,954 per QALY. Interventions targeting high-risk populations were more cost-effective.
Wake et al, 2008, Australian RCT. NHS EED abstract states authors conclusions robust.	The LEAP trial looked at secondary GP brief intervention for overweight children aged 5-9	Cost significantly more than usual care (P<.001) but at 15 months BMI and physical activity scores were not significantly different in intervention children, although diet had improved.
Ward et al, 2007. Systematic review cited by NICE (2007)	Compared statins with brief interventions for prevention of coronary health events.	Brief interventions were more cost-effective than statins in preventing coronary health events, in secondary as well as primary prevention.

2. The environment

Study	Intervention	Cost-effectiveness/ savings
Beale et al, 2007 for NICE	Rapid review of cost-benefit studies. Identified 8 studies on walking and cycling, including walking trails and cycling infrastructure (ways available to cyclists, e.g. cycle paths etc).	Long-term health and economic benefits of active travel (walking and cycling) outweigh the costs by up to 11 times. Only 1 study looked at cost-effectiveness. The rest looked at cost-benefit ratios, and the range of these was very wide, from 1.35 to 32.5. Standardised cost-benefit ratios were 1:11 for cycling infrastructure. The cost-effectiveness study assessed the incremental cost-effectiveness ratio for urban trails which ranged from £90 to £25,000 per QALY (Beale et al, 2007a)
Macdonald, 2007 Report to Cycling England	Cycling	20% increase in cycling by 2015 would save £107 million by reducing premature deaths, £52 million from lower NHS costs and £87 million due to fewer absences from work
NICE 2008 Costing report	Looks at the cost of implementing NICE guidance on physical activity and the environment (NICE, 2008a) which recommended; <ul style="list-style-type: none"> a) Increase active travel through planning b) Develop and maintain safe public spaces c) Ensure staircases are designed to encourage their use d) Ensure primary school playgrounds encourage varied, active play 	<ul style="list-style-type: none"> a) More research is needed, but it can be assumed that the benefits of prioritising the needs of active travellers would far outweigh the cost. Toolkit for costing provision of cycling lanes is provided at www.dft.gov.uk/pgr/sustainable/cycling. Many measures to promote active travel are already being encouraged through existing legislation. One report (Christie et al, 2003) found that restoring the rural walking network to an acceptable standard for use would cost £69.2 million, with annual maintenance costs of £18.5 million. b) The Urban Parks Forum (2001) estimates each local authority would need to increase spending on parks by £265,000 to maintain them satisfactorily. Substantial investment also needed for restoration. c) Incremental costs of planning new and refurbished buildings to reflect this recommendation are assumed to be quite low. d) Many measures to encourage active play are already being encouraged through existing legislation. Using Government initiative Zonepark scheme (developing 600 primary schools) as a guide, average cost of re-designing a school playground would be £16,000

3. School and workplace interventions, exercise referral, pedometers and free swimming

Study	Intervention	Cost-effectiveness/ savings
3a School-based interventions and other interventions for children and young people		
<p>NICE 2009 Review of ways to promote physical activity for children and young people. NHS EED abstract states intervention used by Wang was effective in girls only. Subsequent analyses were based on females. Authors did not take all direct and indirect costs of obesity into consideration. Other methodological issues listed on EED.</p>	<p>External reports were provided for Nice on economic evidence (Buchanan et al, 2008) and cost-effectiveness analysis (Fordham et al, 2008)</p>	<p>Buchanan et al (2008) found only 2 eligible studies. One, a systematic review (Goldfield et al, 2001) found that family-based behavioural treatment was more cost-effective when provided in groups, when compared to group plus individual treatment. The second study (Wang et al, 2003) was a cluster randomised controlled trial, Planet Health. The curriculum-based intervention aimed to reduce obesity in 11-14 year olds and aimed to decrease TV viewing and consumption of high-fat foods, and increase fruit and vegetable intake and activity levels. Cost-effectiveness analysis showed that the intervention cost £21,312, saved 4.13 QALYs, averting £10,053 in medical costs. Cost-benefit analysis showed a net benefit of £4,628, although efficacy studies found the intervention was only effective for girls.</p> <p>Fordham et al (2008) carried out a 'case study' analysis comparing four interventions – walking bus, dance classes, free swimming and community sports. Assumptions had to be made about long-term effectiveness due to a lack of data. Walking buses (which cost £121.71 per child and £4,007 per QALY), and dance classes (which cost £57.82 per child and £27,570 per QALY) were cost-effective. Free swimming (which cost £4.50 per child and £40,462 per QALY), and community sports (which cost £15.39 per child and £71,456 per QALY) were not cost-effective. Pringle et al (2010) found that free swimming was cost-effective, at £103 per QALY.</p>
HELP	School-curriculum based intervention for middle school pupils	Intervention to decrease TV viewing, increase fruit and vegetable intake and increase physical activity levels. Cost £24 more than normal curriculum. It was effective only for females, decreasing their chances of becoming overweight adults by 1.87%. It resulted in an additional 0.013 QALYs per person and health care cost savings of £16.20 per person (2007/8).
Wang et al 2008. NHS EED abstract states the after-school intervention wasn't described, which limits generalisability. Cost-effectiveness based on a subjective measure (body fat). Other points on EED.	Elementary (primary) school children in after-school care were given healthy snacks and an environment conducive to activity.	Cost per capita over 128 days for the intervention was £524 per child more than usual after-school care. Intervention reduced body fat by 0.76% in children who attended more than 40% of the sessions.

Brown et al, 2008, American study. NHS EED abstract states study well conducted.	Curriculum and family-based programme plus physical activity	Looked at 916 8-11 year olds, 93% Hispanic. Cost £36,056 and saved £91,832 in medical care costs and lost productivity days averted. Incremental cost per QALY gained was £737 compared with no intervention.
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Study	Intervention	Cost-effectiveness/savings
3b Exercise and diet interventions and worksite programme		
NICE, 2007 CG43 Obesity. Section 6: Health Economics	NICE state that there is little evidence of non-pharmacological interventions (diet, physical activity and behavioural treatment) in tackling obesity. This review identified 2 relevant studies looking at exercise and diet programmes	Pritchard et al (1997) was an exercise and dietary worksite programme for overweight middle-aged men. It involved 19 contacts from a healthcare professional and participants lost an average of 2.9kg in 12 months (£183.45 per kg lost). Anderssen et al (1996) looked at a programme where participants in the intervention group received 158 sessions of up to an hour with a qualified instructor, plus dietary advice. Participants lost an average of 2kg at 12 months, at a cost of £368.50 per kg lost.
NICE, 2008 included; Workplace interventions Bending et al (2008)	Bending et al (2008) economic analysis identified 4 studies (Purath, Aittasala, Chyou & Østerås). The key findings of these 4 studies are shown below	
Purath et al (2004)	Health promotion consultation	One 30 minute health promotion consultation, followed by a 30 minute follow-up telephone consultation by an occupational health nurse, cost £57 per employee (a total of £57,000) and achieved a £484,944 net NHS cost saving (lifetime NHS costs averted) with QALY gains of 0.12 at 95% confidence interval.
Aittasalo et al (2004)	Physical activity counselling	Two 30 minute physical activity counselling sessions, and 2 fitness tests. Cost £136.19 per employee (a total of £136,188), and achieved a net NHS cost saving of £292,388, with QALY gains of 0.11 at 95% confidence interval.
Chyou et al (2006)	Walking programme	Walking programme run by occupational health nurses cost £56 per employee (total of £56,000), and achieved a £311,547 net NHS cost saving, with QALY gains of 0.08 at 95% confidence interval.
Østerås et al, 2006	Counselling and fitness programme	Intervention costs of £267 per person, no further details were available.
Lu et al, 2008 Large-scale	Online physical activity programme for 51,383	Cash incentive of £96 for employees doing at least 20 minutes, three days a week for 10 out of 12 consecutive

American cost study	IBM employees. Employees logged physical activity online.	weeks. Average annual health care costs increased by £187 less for participants than non-participants (P=0.09).
Study	Intervention	Cost-effectiveness/savings
3c Exercise referral schemes		
Dr Foster, 2005 Research commissioned by NICE 2006	Exercise referral schemes	NICE (2006) did not find sufficient evidence to recommend, although 91% of PCTs provided exercise on prescription (Dr Foster 2005). Average investment per scheme is £100,000 (ranging from £77,000 to £133,000).
Pringle, 2010 NHS EED abstract not available until December 2010.	UK cost-effectiveness analysis of 7 interventions	Primary care activity classes cost £509 per QALY. Activity classes for young people in the community cost £94 per QALY. Activity classes for older adults in the community cost £92 per QALY. Free swimming classes for young people in the community cost £94 per QALY.
Rome et al, 2009, Randomised controlled trial in Sweden	Physical Activity on Prescription (PAP) programme compared to written information only	525 sedentary adults with lifestyle-related health problems. Intervention exercise twice a week, education and counselling. Control group received written information only. Intention-to-treat programme costs £563 intervention group, £264 control. No differences between groups so written information only more cost-effective.
Windle et al, 2010 UK meta-analysis of high-quality reports	Interventions for over 65s	Community based walking programmes cost £7,300 per QALY. Community based exercise programmes cost £12,100 per QALY. Minimum of two 45 minute sessions per week is most effective.
Dalziel et al, 2006. NHS EED states no abstract will be written as generalisability to NHS limited.	Analysis of the New Zealand Green Prescription Programme	878 inactive patients presenting to GPs were given advice and a written prescription to increase their physical activity levels. Programme cost £965 per QALY.
Lingren et al, 2007, Assessment of the economic consequences of the Finnish Diabetes Prevention Study. NHS EED states all patients in trial Caucasian and aged 60 plus - may limit generalisability. Other points on EED	Intensive lifestyle programme which aimed to prevent Type 2 diabetes in a high-risk population. Study involved a third of all 60 year olds in the county of Stockholm, Sweden, with impaired glucose tolerance, and BMI >25.	Intervention included circuit training and individual exercise sessions, plus visits to doctor and nutritionist. Cost per QALY gained was £2,010 based on 2003 prices. Herman et al (2005) found similar results in an at-risk population: interventions focusing on diet and exercise cost £956 per QALY, as did Jacobs-van der Bruggen et al (2007), where diet and exercise interventions for the general population cost £2,635 when assuming maximum intervention effects.

Vos et al, 2010 Australian cost-effectiveness analysis	GP referral to exercise psychologist. Exercise on prescription	Cost-effective at median cost of £12,884 per healthy year of life restored. Cost-effective at £5,829 per healthy year of life restored.
Cobiac et al (2009) Australian cost-utility analysis. NHS EED abstract states methodology and conclusions valid.	Compared 6 interventions to increase physical activity	GP physical activity prescriptions combined with phone calls from an exercise psychologist (incremental cost £6,651 per healthy year of life restored).
Wirral PCT (2010) Wirral lifestyle and weight management programme (LWMP) Preliminary cost-effectiveness analysis	Free NHS weight management programme, accessed following a health check with GP or practice nurse.	Intensive 12 week lifestyle programme for individuals with BMI>30, or BMI>28 with at least 2 co-morbidities. Includes both group and one-to-one sessions. Averts 38 coronary heart disease deaths, and provides an additional 13.2 QALYs to the Wirral population per year. Net costs (taking into account health care costs saved) were £179,040 for 2007-8. Net cost of £13,564 per QALY gained.

Study	Intervention	Cost-effectiveness/ savings
3d Pedometers		
NICE, 2006	Four commonly used methods to increase physical activity	Insufficient evidence found by NICE to recommend use of pedometers.
Cobiac, 2009, Australian cost-utility analysis (see Cobiac above)	Compared 6 interventions to increase physical activity	Use of pedometers was the second most cost-effective method of 6 compared (see above), with 20,000 years of healthy life restored compared with current care. The net cost of this intervention was a saving of £254.
Vos et al, 2010 Australian cost-effectiveness analysis	Pedometers	Found to be cost-saving. Restored 20,000 healthy life years at a lifetime cost of just over £33 million.

Study	Intervention	Cost-effectiveness/ savings
3e Free swimming		
Government and Public Sector, 2010	Government Free Swimming Programme. Local Authorities received funding to offer free swimming to under 16s and over 60s.	Generated 115,000 net additional swimmers in under 16s at a cost of £172 per additional swimmer, and a cost of £3.55 for each additional swim. Benefit to cost ratio was 0.82 for under 16s. In over 60s, the programme generated an additional 23,000 swimmers, at a cost of £535 per additional swimmer, and a cost of £8.23 per additional

	Launched April 2009 in 261 out of 326 Local Authorities.	swim. Benefit to cost ratio was 0.53. The authors recommended Local Authorities should continue to offer free swimming, targeting swimmers in deprived areas or non-swimmers.
Pringle et al, 2010 UK cost-effectiveness analysis. NHS EED abstract available Dec 2010.	Free Swimming	Pringle et al (2010) found that free swimming was cost-effective, at £103 per QALY.
Fordham et al, 2008 UK cost-effectiveness analysis.	Free swimming	Free swimming cost £4.50 per child and £40,462 per QALY.

4. Mass media campaigns

Study	Intervention	Cost-effectiveness/ savings
HELP matrix	National mass media campaigns	National mass media campaigns were the most cost-effective intervention to reduce obesity. A seven week health education campaign undertaken by the BBC across BBC TV channels and a website cost £73.60 per person. Adults chances of being physically active were increased by 16.9%, which would result in an additional 0.736 QALYs per person, and health care cost savings of £2,494 per person (based on 2007/08 prices).
Cobiac, 2009, Australian cost-utility analysis (see Cobiac above).	Compared 6 interventions to increase physical activity, including mass media campaigns	Mass media campaigns were the most cost-effective intervention of the 6 compared, and restored 23,000 healthy life years. Net costs were a saving of £260. The interventions included pedometers (see section above), GP referral to an exercise psychologist (£45,350 per DALY averted), TravelSmart active travel programme (£10,884 per DALY averted), and internet advice (£1,209 per DALY averted). All the interventions apart from GP referral had between 74% and 100% probability of being cost-effective at £30,204 per DALY averted.
Vos et al, 2010 Australian cost-effectiveness analysis	Mass media campaigns	Cost-saving. Saved 23,000 lifetime DALYs at a lifetime cost of almost £8 million.

Conclusion

In conclusion, there is clear evidence for the effectiveness of brief interventions in increasing levels of physical activity. Evidence, including that provided by NICE, is also very strong on the importance of the environment on increasing levels of physical activity, particularly the benefits of active travel such as walking and cycling. There is emerging evidence that mass media campaigns and physical activity on prescription are effective. There is also emerging evidence to support the use of other measures such as free swimming and mass media campaigns.

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Website commissioned by Health England to prioritise investment in preventive health care
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Liverpool Public Health Observatory was founded in the autumn of 1990 as a research centre providing intelligence for public health for the five primary care trusts (PCTs) on Merseyside: Liverpool, St.Helens and Halton, Knowsley, Sefton and Wirral. It receives its core funding from these PCTs.

The Observatory is situated within the University of Liverpool's Division of Public Health. It is an independent unit. It is not part of the network of regional public health observatories that were established ten years later, in 2000.

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