National Institute for Health and Clinical Excellence Public Health Intervention Guidance Physical activity – Brief advice for adults in primary care: Economic Analysis

Review of economic evidence

Submitted for review by PHIAC on 24th August 2012

(Commissioned by NICE Centre for Public Health Excellence to support update of PH2)

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Contribution of Authors

TJ led the development and running of searches with assistance from NA and JFR. NA and JFR were reviewers. NA and TJ wrote the first draft and JFR edited drafts. JFR had overall responsibility for delivery to NICE.

Acknowledgements

This report was commissioned by the Centre for Public Health Excellence on behalf of the National Institute for Health and Clinical Excellence. The views expressed in the report are those of the authors and not necessarily those of the Centre for Public Health Excellence or the National Institute for Health and Clinical Excellence.

Declaration of interests

Authors declare *no co*nflicts of interest.

Executive Summary

Aim

To conduct a rapid systematic review of economic evidence on brief advice for adults in primary care to determine: a) what types of brief advice are cost effective in promoting physical activity and whether method of delivery, type of advice or person delivering the advice influences cost effectiveness; b) what type of local infrastructure and systems support cost effective delivery of brief advice on physical activity in primary care.

Methods

The search for evidence was based on 10 electronic databases, additional papers supplied by the NICE and effectiveness review teams, a call for evidence distributed by NICE, a Google Scholar search of citations and a search of 6 organisational websites. A 10% sample of abstracts were double reviewed and all data extracted into templates was double reviewed independently prior to agreement.

Main Findings

Three papers were identified for full review, two based on a UK and one on an Australian population. The only overlap with previous economic literature influencing public health guidance in this area was the cost-effectiveness model developed for the previous NICE guidance.

Moderate, but limited evidence from three studies (one model-based (Matrix 2006 [+]), 1 trial-based (Pringle et al 2010 [-]) and 1 audit-based analysis (Boëhler et al 2011 [+])) suggest that brief advice on physical activity in primary care is more cost effective than usual care. The evidence should be interpreted with caution as the evidence base on effectiveness base was weak and did not fully explore uncertainty. Therefore, a de novo modeling of the cost effectiveness of brief advice is needed to improve knowledge on its efficiency.

One piece of moderate evidence (Boëhler et al 2011 [+]) was found on one aspect of the cost-effectiveness of local infrastructure and systems (opportunistic versus disease register based screening) to support the delivery of brief advice on physical activity in primary care. This showed that screening using disease registers cost an additional £887 per person attending a 3 month follow up appointment to convert one ‘sedentary’ adult to being ‘active. However, the effectiveness data on which this was based was extremely poor quality.

Abbreviations

CA	Cost analysis
CEA	Cost-effectiveness analysis
CHD	Coronary Heart Disease
CMO	Chief Medical Officer
CPHE	Centre for Public Health Excellence
CUA	Cost-utility analysis
DCMS	Department of Culture Media and Sport
DH	Department of Health
EMIS	Egton Medical Information System
EQ-5D	EuroQol Quality of Life Questionnaire (5 Dimension version)
GP	General Practice
GPPAQ	General Practice Physical Activity Questionnaire
HERG	Health Economics Research Group
JFR	Julia Fox-Rushby
LEAP	Local Exercise Action Pilot
MET	Median Metabolic Equivalent
MPA	Moderate Physical Activity
NA	Nana Anokye
NCCHTA	National Co-ordinating Centre for Health Technology Assessment
NHS EED	National Health Service Economic Evaluation Database
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
OECD	Organisation for Economic Co-operation and Development
OHE HEED	Office of Health Economics Health Economic Evaluations Database
ONS	Office of National Statistics
PH2	Public Health Guidance No 2
PHICEB	Public Health Interventions Cost Effectiveness Database

QALY	Quality Adjusted Life Year
ScHARR	School of Health and Health Related Research
TJ	Teresa Jones
UK	United Kingdom
WHO	World Health Organisation

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1. Introduction

1.1. Background

Physical inactivity is a major public health concern in England. It is associated with about 20 health conditions including coronary heart disease, cancer, diabetes, and stroke (DH 2005, DH 2009, DCMS, 2008) and is rated among the top ten leading causes of death in high-income countries (WHO, 2004). It may also lead to reduced psychological wellbeing and social interaction (DH, 2009) as well as increased absenteeism within the working population (NICE, 2008). In addition to physical inactivity being associated with disease and ill-health, there is evidence that physical activity could also be a successful treatment for illness, for example as psychotherapy or medication in treating clinical depression (Lawlor and Hopler, 2001).

In England, physical inactivity is estimated to cost the economy around £8.3 billion annually, of which between £1 billion and £1.8 billion is associated with the treatment of physical inactivity related diseases (DH, 2010). Only 39% of men and 29% of women in England reported levels of physical activity that met criteria, as defined by guidance from the Chief Medical Officer, to be considered 'physically active'. However, accelerometer data suggests that only 6% of men and 4% of women meet recommended levels of physical activity (Craig et al 2009).

Physical activity itself is multi-faceted and includes a wide range of activities such as sports and exercise, housework, as well as occupational activity (WHO 2011). In 2006 NICE produced guidance with supporting documents on economic analysis (NICE 2006; MATRIX 2006a, and 2006b) of a small number of commonly used approaches to increasing physical activity; brief interventions in primary care, exercise referral schemes, pedometers and community-based exercise programmes for walking and cycling. Following a review in 2009, NICE decided to update the 'brief advice in primary care' recommendations and to supplement this with recommendations on the role of infrastructure and systems in the facilitation of brief advice in primary care (NICE 2011) as well as consider mental wellbeing as an outcome.

The updated guidance will supersede recommendations 1–4 from NICE public health guidance 2 on ’Four commonly used methods to increase physical activity’ which covered recommendations to primary care practitioners to: identify inactive adults and advise 30 minutes of moderate activity 5 days a week; use of General Practice Physical Activity Questionnaire (GPPAQ) for monitoring; account for individual circumstances and agree individual-specific goals; monitor of strategies to promote physical activity locally; and cover the hard to reach and disadvantaged communities.

The updated guidance is due for publication in April 2013 and, in addition to aiming at guiding good practice among primary care practitioners and the general public, this guidance is expected to support at least six policy documents (NICE 2011) including; 'Healthy lives, healthy people: our strategy for public health in England' (DH 2010); Improving outcomes: a strategy for cancer' (DH 2011a); ‘Let’s get moving. Commissioning guidance: A new physical activity care pathway for the NHS’ (DH 2009a); 'No health without mental health: a cross-government mental health outcomes strategy for people of all ages' (DH 2011); ‘Start active, stay active: a report on physical activity from the four home countries' Chief Medical Officers’ (Department of Health 2011b); and The ‘public health responsibility deal’ (Department of Health 2011c).

Identifying and reviewing the economic evidence on the cost-effectiveness of brief advice interventions will allow up to date knowledge on the efficiency of alternative approaches to delivering brief advice and the role of infrastructure and systems in the facilitation of brief advice in primary care to be critically reviewed. In addition, current approaches for evaluation would be reviewed to reflect on their relevance to future economic modeling as well reveal methodological challenges in the literature.

In light of this, a systematic literature review was conducted to examine the relevant economic evidence on brief advice for adults in primary care and address the following key questions:

- Question 1**:** What types of brief advice are cost effective in promoting physical activity in primary care? Does the method of delivery, type of advice and person delivering the advice influence the cost effectiveness of the intervention?
- Question 2**:** What type of local infrastructure and systems support cost effective delivery of brief advice on physical activity in primary care?

1.2. Operational definitions (as defined in the final scope from NICE)

- Brief advice: brief advice comprises verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It could be opportunistic and can typically take from less than a minute to up to 20 minutes. It can vary from basic advice to a more extended, individually-focused discussion. The advice might be delivered in a GP surgery, health centre or other primary care setting. It may also be delivered by primary care professionals in other settings (for example, a residential home). People who may give this advice include: community nurses, GPs, heath visitors, pharmacists, physiotherapists, exercise professionals or health trainers[1].

- Local infrastructure and systems that facilitate the delivery of brief advice in primary care settings. These might include:
    - structured arrangements such as scheduled annual health checks
    - opportunistic discussion about physical activity during a GP appointment
    - 'triggers' in computerized patient records
    - incentive schemes for professionals such as the 'Quality and outcomes framework'

2. Methodology

2.1. Search for evidence

The search for evidence for the economic analysis component of the review was developed and reviewed through discussions with the effectiveness review team (ScHARR) and NICE. The agreed method, described in the protocol (Appendix A), involved formal searches of selected databases supplemented with evidence gathered from numerous other sources, listed below.

a. Databases

A database search strategy for MEDLINE and EMBASE was developed using the search strategy for the effectiveness component of the review devised by ScHARR and agreed

[1] Further discussion with NICE during the development of this work indicated that brief advice would be delivered in a single rather than multiple score sessions. However, it could involve 'follow up' and an addition to brief advice, with the brief advice still deliverable in one session. It was also agreed that it would not involve referral or direction to a single activity or physical activity programme.

by NICE. Search terms to identify papers relevant to the economic evaluation review were added. These terms were derived from the NHS EED cost effectiveness search filters for Medline and Embase (Glanville et al, 2009) which were based on a few key indexing terms and text searches of abstracts.

Glanville et al (2009) found the NHS EED search filters for economic evaluations to be highly sensitive (Medline 0.999, Embase 0.997 from a maximum of 1.000) and to have good precision (Medline 0.040, Embase 0.029 from a maximum of 1.000). We expanded this strategy slightly by including a few additional words from the search strategy developed for NICE (2006) to the text searches of abstracts.

Search strategies for additional databases specific to the economic evidence review were developed based on the terms included in the Medline and Embase strategies but adapted to suit the search engines of each individual database. Where appropriate e.g. for less sophisticated search engines or for relatively small databases, the strategies for the economic evaluation and barriers reviews were combined. All search strategies are listed in Appendix B.

Searches were limited to papers reported in the English language and from 1990 to March/April 2012. Publications identified by the database searches were transferred to an EndNote database when possible[2] and duplicates were removed automatically to enable efficient management.

b. Other sources of evidence

1. Any papers about cost or economic evaluation considered potentially relevant by the effectiveness review team whilst conducting the effectiveness review were included.
2. Any papers put forward by NICE were included.
3. A 'Call for Evidence' was distributed by NICE to stakeholders and any publications that were put forward were included. The output from and response to the 'Call for Evidence' is provided in Appendix C.

[2] Out of 1520 records identified from the database searches, 499 were sourced from databases without an available automatic transfer to Endnote facility. Please refer to Appendix B, page 53 for further details of record handling.

4. All papers fully reviewed were subject to citation searches themselves, using Google Scholar citation searches.
5. Following discussion and agreement with NICE, a set of websites were searched for evidence: Department of Health; Welsh Assembly; British Heart Foundation National Centre for Physical Activity; Health England; Matrix; National Obesity Observatory; Partner for prevention; Scottish Government. Search engines for these websites varied widely in sophistication and therefore search terms were adapted accordingly (See Appendix D).

2.2. Selection strategy

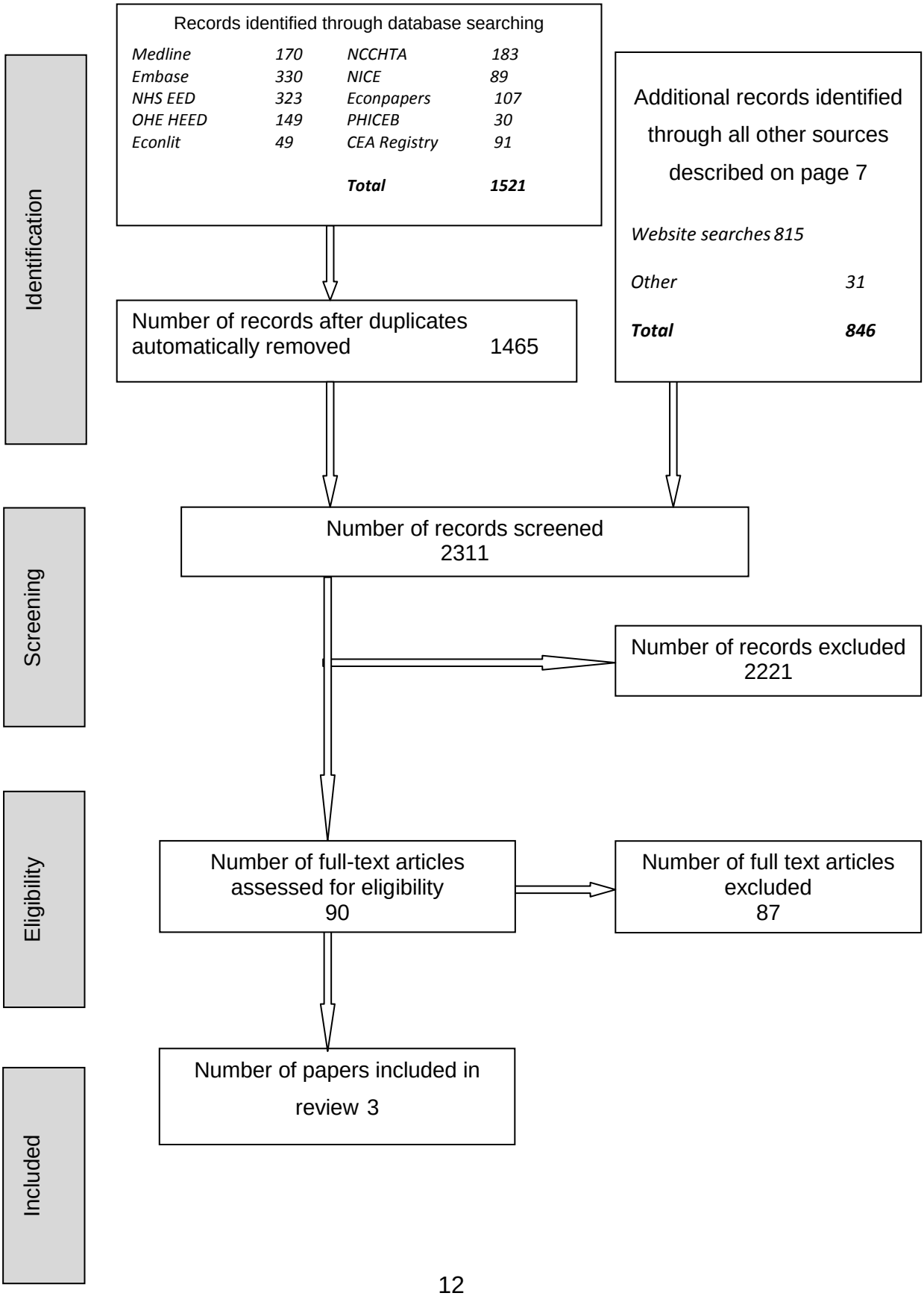
The following selection criteria were applied to papers:

Inclusion criteria: 'Full' economic evaluations (that consider costs and health/non-health consequences) of relevant types of intervention or scheme, and high quality costing studies conducted in the UK or OECD countries;

Exclusion criteria: Burden of disease and non-comparative costing papers, or other papers which do not involve assessing the cost and related benefits/effectiveness of relevant interventions.

Screening of papers was conducted in two stages. First, titles and/or abstracts were screened. Papers that clearly did not meet the inclusion criteria were excluded. Full papers were requested for the remaining sample, including those for papers whose abstracts provided insufficient detail for rejection. Papers retrieved were further assessed for inclusion in the review. Screening of all abstracts was undertaken by one reviewer (NA) and 10% sample by a second reviewer (JFR). Both reviewers considered all full papers selected. Disagreements were resolved by discussion between reviewers. Prior to full review, the output of the screening process was approved by NICE. Figure 1 provides an audit trail of papers reviewed.

Figure 1: Audit of the search for evidence for the economic evaluation review



2.3. Data extraction and management, quality assessment and synthesis

Two reviewers (NA & JFR) independently extracted data from each paper selected for full review. Any discrepancies were solved by discussion. Data extraction (see Appendix E for data extraction form) of the included studies included:

- background information (aim of study, year of publication, country of origin, source of funding);
- sample / intervention characteristics (sample: condition, definition of sedentariness, socio-economic demographic characteristics, sample size. Intervention and control: design, setting, location, duration, exercise programme linked to);
- methods/analysis and results (form of economic evaluation, perspective and time horizon of analysis, outcomes/costs measured and sources of data, discount rate, year of costing, currency, modeling approach used, type of sensitivity analysis, variables tested and findings from sensitivity analysis, other secondary analysis undertaken, main results for costs, outcomes and ICERs);
- challenges (author stated limitations and strengths, strengths and gaps identified by reviewers)
- If the review was not a modeling paper, a series of questions addressed the usefulness of the paper for modeling (re model structure, transition probabilities, resource use, costs data, outcomes/effects, utility values);
- Quality appraisal in terms of applicability and study limitations and an overall grading. Quality criteria were based on NICE public health guidance (2009) which recommends that studies are categorised according to study type and methodological rigour and quality (categories ++, + or -) and an assessment of whether any limitations are perceived as very serious, potentially serious or only likely to have a minor impact on conclusions about cost-effectiveness.

The outcome of the full review of papers selected is presented descriptively as: a summary table per study, along with a commentary on the methods employed; an overview and indication of potential directions for modelling; a series of evidence statements according to NICE recommendations (NICE 2009); and a detailed tabular summary in Appendix H, set out according to recommendations in NICE CPHE methods manual (2009).

3. Results

3.1. Identification and selection of studies

A number of studies were excluded on the basis that they: (a) did not meet the definition of brief advice (n=58), or/and (b) used a population group that is not relevant to this research context (e.g. OECD country, having pre-existing medical conditions such as osteoarthritis) (n=29), (c) was not an economic evaluation e.g. a commentary (n=4)[3]. See Appendix F for the list of these interventions. A number of the papers excluded appeared to include brief advice but they were not selected for full review because:

(a) The brief advice was too intensive[4],

(b) The brief advice covered other lifestyle behaviour, or

(c) The impact of the brief advice element of interventions could not be disentangled from either the effects of other health promotion activities, for example where an outcome only considered cholesterol reduction and a programme had recommended changes to diet and physical activity or other aspects of a physical activity intervention e.g. where brief advice was part of a much larger package of care. The list of these papers excluded (n=17) is provided in Appendix G.

Three studies were identified for full review. These included two model-based evaluations (Pringle et al 2010; Matrix 2006), and one audit-based economic evaluation of brief advice in primary care to promote physical activity (Boëhler et al 2011). Two studies were based on effectiveness data from UK populations (Boëhler et al 2011; Pringle et al 2010), with the third from an Australian population (Matrix 2006).

One study related to local infrastructure and systems to support delivery of brief advice in primary care was found (Boëhler et al 2011) which provided some evidence on the cost and on the cost-effectiveness of opportunistic screening versus screening by a disease register.

[3] The numbers don't add to 90 here because of multiple reasons for exclusion.
[4] Based on discussions with NICE, interventions that included a series of counselling sessions spanning for example a year or a couple of months were considered too intensive.

3.2. Summary of individual papers

Model-based evaluations

Review of Matrix (2006)

Overview

As shown in Table 1, this study modelled the cost-effectiveness of primary care based interventions designed to promote physical activity, including six brief interventions. It provided part of the basis for the 2006 NICE guidance on brief interventions. Of the brief interventions considered, only the intervention evaluated by Smith et al (2000) constitutes 'brief advice' (see details in Appendix H). Therefore this review only considers the modelling of this intervention.

Smith et al (2000) evaluated the effectiveness of two relevant interventions: (a) written prescription (stage based advice) by a GP during consultation (intervention 1); and (b) then further randomised to either no further intervention or mailed stage based pamphlet after two weeks (intervention 2). The comparator was usual care at general practice.

A cost utility analysis was conducted using a decision analytic model to examine the cost effectiveness of interventions. The model considers a cohort of individuals who enter the model in a sedentary state. The individuals are exposed to an intervention (brief advice) which is assumed to affect their likelihood of becoming physically active. Physical activity is assumed to have a long-term effect on an individual's likelihood of developing a number of chronic conditions.

Chronic conditions included in the model were selected on the basis that there was evidence of a strong causal relationship between physical activity and evidence on the magnitude of effect of physical activity on the incidence of these conditions. Conditions included in the analysis were coronary heart disease, stroke, type 2 diabetes mellitus and colon cancer. Estimates of the relative risk of developing each of these conditions, depending on physical activity status, were derived from published sources. The conditions are assumed to be independent of one another and individuals are permitted to only experience one condition within the confines of the model. Estimates of mortality rates and life years lost associated with each condition were derived from published sources and derived by assuming an average age of onset for each condition, dependent on the age of the population under

consideration. Utilities and unit costs associated with each condition were also derived from multiple published sources.

Table 1: Evidence table for Matrix (2006)

Study details	
Author(s):	MATRIX
Year:	2006
Aim of study:	To determine the cost-effectiveness of 4 types of intervention aimed at increasing physical activity levels: brief interventions; pedometers; exercise referral schemes; walking and cycling programmes in the community. Data constraints however allowed the economic evaluation to be conducted for only brief interventions and pedometers. Of the interventions investigated, Smith (2000) most closely evaluates a 'pure' brief advice intervention and it is the focus of this review (see Appendix H for details)
Type of economic analysis:	Cost utility analysis
Economic perspective:	NHS and personal social services perspective
Quality score (++, +, -):	+
Applicability:	Partly applicable
Population and setting	
Source population(s):	The modelling was conducted from a UK (NHS) context. While the effectiveness estimate came from an intervention conducted in Sydney region (Australia). The intervention was based on a sample of adults (25 to 65 years). The minority were non-English speakers (16%) and 50% had educational attainment up to 10 years.
Setting:	Primary care
Data sources:	Harvard cost-effectiveness analysis registry Literature reviews British Heart Foundation database Diabetes UK database National dataset (i.e. HSE 1996) Office for National Statistics (ONS) database
Intervention/comparator	
Intervention(s) description:	Participants received one of two interventions: (a) written prescription (stage based advice) by a GP during consultation (intervention 1); or, (b) written prescription plus mailed stage based pamphlet after two weeks (intervention 2). Follow up measurements were conducted at baseline, 6–10 weeks and seven to eight months
Comparator/control(s) description:	Usual care at general practice
Sample sizes:	Total n=1142 Intervention n= Intervention 1 (380); Intervention 2 (376) Control n=386
Outcomes and methods of analysis	

Primary outcomes:	Physically active: Achieved an increase in time spent physically active of 60 minutes (measured through patient recall; questionnaire was validated)
Secondary outcomes:	QALY's (via EQ-5D scores to determine the loss in quality of life avoided by avoiding health states i.e. CHD, stroke, type II diabetes and colon cancer combined with impact of activity levels on participants change of experiencing CHD, stroke, diabetes and colon cancer).Treatment cost savings to NHS.
Time horizon:	Lifetime
Discount rates:	3.5%
Modelling method:	Decision tree model
Results	
Primary analysis:	(i) 3% of participants achieved an increase in time spent physically activity active of 60 minutes (ii) QALY gained per person : 0.23 (intervention 1); and 0.07 (intervention 2) (iii) Cost of intervention 1 & 2 was £37 per person; £29 per person respectively. Cost per person/year for treating type II diabetes (£3,006); CHD (£1,414), and stroke (£2,053). Total cost saving per person : £469 (intervention 1); and £137 (intervention 2) (iv) Cost of getting one person to increase physical activity level was £761(for intervention 1) and £2,039 (for intervention 2). Cost per QALY gained: £159 (intervention 1); and £425 (intervention 2). Cost saving per QALY gained: £1,877 (intervention 1); and £1,611(intervention 2)
Secondary analysis:	Sensitivity analysis showed that the intervention remains cost-effective regardless of assumptions tested
Notes	
Limitations identified by author:	The assumptions surrounding the parameters for the model may have underestimated or overestimated the cost per QALY gained estimates; The key assumptions were (more details in Appendix H): (i) 50% of participants maintain their physical activity levels long enough to benefit from the health states associated with those physical activity levels. (ii) Physical activity is the only risk factor that influences the health states (iii) It is unlikely that chance of experiencing health states is independent (iv) Negative effects of physical activity are not considered (iv) Excludes the positive effect of physical activity on other health outcomes e.g. mental health
Limitations identified by review team:	(i) Insufficient exploration of uncertainty around estimates despite the huge assumptions used in the model. (ii)No explicit recognition of time in modelling
Evidence gaps and/or recommendations for future research:	(i) Research to produce more effectiveness data plus decay rate associated physical activity as result of the intervention. (ii) Incorporation of broader outcomes associated with physical activity (data permitting) (iii) More rigorous analysis of uncertainty (iv) Development of Markov model
Source of funding:	NICE

Outcomes are reported both as cost per person who moves from a sedentary state to a physically active state (i.e. achieved an increase in time spent physically active of 60 minutes) as well as in the form of cost per QALY. The cost of moving an individual from a sedentary state to a physically active state was £761 (for intervention 1) and £2,039 (for intervention 2. The cost per QALY gained compared to the control group was £159 (intervention 1); and £425 (intervention 2). The cost saving per QALY gained was £1,877 (intervention 1); and £1,611 (intervention 2).

Further analyses considered the potential savings that might accrue from reductions in future healthcare resource consumption as a result of being physically active. This analysis generated even more favourable cost effectiveness ratios that in most cases were dominant (that is brief advice is cheaper and more effective than the control). However, it should be noted that when the brief advice option was compared with other types of brief interventions (by exercise prescription), it was itself dominated.

One-way sensitivity analysis explored changes in persistence with exercise (decay rates), intervention costs and effectiveness. The authors report that the cost-effectiveness of intervention is not sensitive to scenarios considered in the analysis.

Commentary on Matrix (2006)

This modelling study attempts to estimate the longer-term impacts of physical activity focusing on a small number of conditions, excluding other conditions such as musculoskeletal disease and respiratory illness. The authors acknowledge the incomplete coverage of conditions as a limitation. This limitation could be justified on the basis of a lack of robust evidence on the long-term relationship between physical activity and the excluded conditions. Nonetheless, the effects of physical activity on those outcomes could have been demonstrated though reporting in natural units in, for example, a cost-consequence approach with stated caveats.

The model adopts a simple approach to the long-term effectiveness of interventions designed to promote physical activity, and assumes that around 50% of individuals fail to adhere to any intervention for a long enough period to experience reductions in the risk of future events. Although this rate was explored in the sensitivity analysis, the exploration was not in depth and further attempts are warranted to estimate the degree to which behaviour change is lasting as this could lead to a significant effect on the cost effectiveness of interventions.

Other simplifications in the model include the approach to estimating life years lost, the assumption of independence of the conditions considered and the assumption that individuals experience only one of the conditions. These assumptions are unlikely to apply in real-life, particularly the assumption that CHD, stroke and diabetes are unrelated. However, as with any model, it is relatively easy to take issue with simplifications and assumptions which have been adopted due to the absence of data. In many of these instances, there are relatively few options for improving the model until further long-term evidence becomes available.

One consideration for future research might be whether the simple decision analytic approach to modelling is warranted in this indication. Given that an individual's behaviour may change over time, an explicit recognition of time in modelling the cost effectiveness of brief advice may be useful, although once again this may be limited by the available evidence.

Finally concerns can also be raised about the ability to generalise result from this study to a UK setting, as the intervention informing the analysis was set in Australia.

Review of Pringle et al. (2010)

Overview

Table 2 provides a description of Pringle et al. (2010) which assessed the costs and cost-effectiveness of seven community-based interventions designed to increase moderate physical activity (MPA) as well as establish potential cost savings to the NHS with explanations for variations in cost. The broad categories of interventions examined were: campaigns, exercise classes, exercise referral, motivational interviews, outdoor activity, peer-mentoring, and training of physical activity leaders. Among these, only motivational interviews are relevant to the scope of this review and, within that category, only one intervention was related to brief advice (i.e. Advice for health workers on moderate physical activity for older adults/community) as the remainder appear to be series of advice (i.e. motivational interviews).

The study comprised a cost analysis conducted alongside a before versus during/after research design and hence no control group was considered. Costs of the intervention were derived in a bottom-up manner using quarterly interviews with intervention managers (n = 9) between 2004–2006. This included inputs and time commitments of staff. The average cost

per month of the brief advice intervention was £1,216 and the cost per participant attending the intervention was £819.

Table 2: Evidence table for Pringle et al (2010)

Study details	
Author(s):	Pringle et al
Year:	2010
Aim of study:	'This study measured change in moderate physical activity (MPA) in seven community-based intervention types, costs and cost-effectiveness of the interventions, and possible explanations for cost variation'. (this review focuses on one intervention: 'Advice by health workers on moderate physical activity for older adults/community' as most closely evaluates a 'pure' brief advice intervention'
Type of economic analysis:	Cost analysis. Although cost- effectiveness analysis (cost per completer improving MPA) and cost-utility analysis (cost per QALY; NHS cost savings) were also conducted, no findings were reported for the intervention under focus here
Economic perspective:	NHS
Quality score (++, +, -):	-
Applicability:	Partly applicable
Population and setting	
Source population(s):	The study was conducted from UK (NHS) context. The sample aged 10-65 years plus (living in high need areas) was predominately: female (62.5%), White British (87.5%), Managerial and professional socio-economic status (63.1%).
Setting:	Community-based
Data sources:	Interviews Literature reviews British Heart Foundation database Diabetes UK database National dataset (i.e. HSE 2006) Office for National Statistics (ONS) database
Intervention/comparator	
Intervention(s) description:	'Advice by health workers on moderate physical activity for older adults/community'. Although not clear from the study, the main project report –DH 2007 indicates the duration of the intervention was 2 years
Comparator/control(s) description:	A pretest-posttest design, hence no control group
Sample sizes:	Total n=46 Intervention n= n/a Control n=n/a
Outcomes and methods of analysis	
Primary outcomes:	MPA change (median metabolic equivalent (MET)-minutes/week): This was assessed with a subjective measure (though validated) via completed modified versions of interview administered/diary-based questionnaires. Adults (18+ years) completed the short form International Physical Activity Questionnaire.
Secondary outcomes:	QALY's (via EQ-5D scores to determine the loss in quality of life avoided by avoiding health states i.e. CHD, stroke, type II diabetes

	and colon cancer combined with impact of activity levels on participants change of experiencing CHD, stroke, diabetes and colon cancer). Treatment cost savings to NHS.
Time horizon:	Lifetime (CUA), unclear (CEA), average monthly cost over 2 year period (CA)
Discount rates:	3.5%
Modelling method:	Decision tree model
Results	
Primary analysis:	(i) 86% of completers who were sedentary or lightly-active at pre-intervention achieved MPA guidelines post-intervention (results were reported for the broader category of intervention (i.e. motivational interviews) that the intervention under focus was part of). (ii) Average cost per month of implementing the intervention was £1,216; cost per participant attending intervention was £819. (iii) Whilst no such results was reported for the intervention under focus results for broader category of intervention (i.e. motivational interviews) shows that the cost per completer improving MPA as between £260 and £1,253, cost per QALY was £47 to £229 and NHS cost savings per completer was £3,036 to £3,286.
Secondary analysis:	Findings of sensitivity analysis were consistent with baseline analysis (i.e. intervention was cost effective)
Notes	
Limitations identified by author:	Key limitations were (see Appendix H for details): (i) A pre- and post-intervention design used to measure the effect of intervention types raises the possibility that changes in MPA may be due to factors other than the intervention. (ii) Low sample sizes (only 10% provided pre and post data) (iii) Variations in the sample sizes of completers versus engagers and high attrition rates in both attendance and data (iv) A number of assumptions made in estimating the long-term health effects of changes in physical activity levels. For example, it was assumed that 50 per cent of those who achieved increases in MPA maintain this increase.
Limitations identified by review team:	(i) Insufficient exploration of uncertainty around estimates despite the huge assumptions used in the model (ii) No explicit recognition of time in modelling
Evidence gaps and/or recommendations for future research:	(i) Present methods for dealing with missing data and indicate methods of sample selection (ii) Ensure statistical testing of effectiveness data (iii) Research to investigate variations in cost-effectiveness by different delivery mechanisms of similar interventions as this may be useful in designing most efficient interventions (iv) More robust designs to get effectiveness estimate such as RCT (v) Cost effectiveness analysis that compares intervention to relevant groups such as usual care
Source of funding:	Department of Health, Natural England and Sport England

Physical activity data were collected through questionnaires administered during sessions or through post, diaries, focus groups and semi structured interviews. Data were collected for a typical week prior to the intervention beginning (baseline activity) and for a series of typical weeks, which were averaged, during the intervention (intervention activity). Data used for the modelling including relative risks estimates and utilities were derived through literature reviews and national datasets (i.e. Health Survey for England 1996). Costs of treating health states were collected mainly from charity organisations (e.g. Diabetes UK; Cancer Research UK). Evidence on costs was synthesised with evidence on effectiveness and costs averted to generate cost effectiveness estimates and cost per QALY using the modelling approach of Matrix (2006) described earlier.

Although cost-effectiveness analysis (cost per completer improving MPA) and cost-utility analysis (cost per QALY) were conducted, along with an estimation of NHS cost savings as a result of reduced risk for coronary heart disease, type II diabetes, stroke and colon cancer, no findings were reported for the intervention of interest here. The results for the broader category of intervention (i.e. motivational interviews) shows that the cost per completer improving MPA was between £260 - £1,253, cost per QALY was £47 - £229 and NHS cost savings per completer were £3,036 - £3,286.

One-way sensitivity analyses were conducted to explore parameter uncertainty around values of relative risk, cost of treatment of health states; and decay rates associated with physical activity levels. Findings of sensitivity analysis were consistent with base-case results (i.e. community interventions to increase physical activity as a whole were cost-effective).

Commentary on Pringle et al 2010

This study was part of the national evaluation of Local Exercise Action Pilot (LEAP) in 9 Primary Care Trusts in areas of high need in the UK and provides a valuable source of economic evidence on community interventions generally as well as brief advice. Nevertheless, there are methodological weaknesses that present major challenges to accepting the evidence on cost-effectiveness, many of which are acknowledged by the authors. First, aside from validity issues associated with the before vs during/after design used, there was an extremely high level of attrition, with only 10% of the participants providing data for two comparative time points. The potential for selection bias is marked, as those participants providing complete data may have tended to have more interest in physical activity. Whilst there exist standard approaches to deal with missing data (e.g.

imputation) and selection bias (i.e. Heckman type estimators), these were not applied in this study. An attempt to address the latter was restricted to a cross tabulation of the physical activity behaviour but it did not control for confounders.

A further challenge relates to the outcome measures considered in the analysis. Whilst the wide range of strategies used to collect physical activity data ensured wider coverage of participants, pragmatic problems limited data quality. Where physical activity data was collected by physical activity leaders, data collection were neither blinded nor systematic - as they did not see data collection as part of their remit (DH, 2006). In addition, there were instances of self-report inaccuracies, particularly for older adults, and concerns raised about the burden of data collection on, and data protection by, respondents (DH, 2006).

The collection of cost data, particularly for the interventions, was undoubtedly a challenging and time consuming process and the costing is therefore commendable even though it was retrospectively rather than prospectively collected. It appears to have been a comprehensive and resource intensive process. Indeed some deliverers of the interventions reported burn-out at some sites given the relatively high number of contacts made for data collection (not only for costing) and this may itself have affected the data (DH, 2006). The breadth of intervention costing required for the LEAP project perhaps explains why a public sector perspective was not adopted in this case. However, these community based programmes could well have had costs falling on several sectors and these are not accounted for. The incorporation of wider effects (e.g. also costs to participants) at least in sensitivity analysis, may have provided a richer source of information for healthcare planners as previous studies (e.g. Anokye et al 2011) have been shown as such costs to affect physical activity levels and ultimately cost- effectiveness of exercise interventions (Pavey et al 2011).

Audit-based evaluation

Review of Boëhler et al (2011)

Overview

Boëhler et al (2011) examined the costs of implementing a physical activity care pathway, the pilot for 'Let's Get Moving', to the NHS and compared two recruitment strategies (opportunistic screening vs use of disease registries) (see Table 3). It also provides an 'illustrative' cost of changing physical activity behaviour. The intervention was delivered by a trained professional, either as an extension of the screening consultation (time permitting) or booked as a separate appointment. The intervention aimed to support patients to change

their behaviour by giving advice, setting activity goals, and 'signposting' patients to local physical activity opportunities. The signposting options included local authority leisure services, private clubs, sports and dance, pedometer schemes, outdoor activities and exercise referral schemes. Those who did not want to take up exercise opportunities were offered a British Heart Foundation booklet on physical activity.

Table 3: Evidence table for Boëhler et al (2011)

Study details	
Author(s):	Boëhler et al
Year:	2011
Aim of study:	'To compare costs falling on the UK National Health Service (NHS) of implementing the physical activity care pathway using two different recruitment strategies and provides initial insights into the cost of changing physical activity behaviour.'
Type of economic analysis:	Cost analysis and an 'illustrative' cost effectiveness analysis
Economic perspective:	NHS
Quality score (++, +, -):	+
Applicability:	Partly applicable
Population and setting	
Source population(s):	The study was conducted from UK (NHS) context. Sample aged 16-74 years (living in London) having no contra-indications to exercise where it was appropriate to discuss physical activity in the context of a consultation.
Setting:	Primary care facilities
Data sources:	Interviews Literature Administrative databases for audit purposes (collected via templates delivered through the Egton Medical Information System (EMIS) or similar software systems and down loaded using MIQUEST). Department of Health
Intervention/comparator	
Intervention(s) description:	Brief advice was delivered by the trained professional either as an extension of the screening consultation (time permitting) or booked as a separate appointment. The intervention aimed to support patients to change their behaviour by giving advice, setting activity goals, and 'signposting' patients to local physical activity opportunities. The signposting options included local authority leisure services, private clubs, sports and dance, pedometer schemes, outdoor activities and exercise referral schemes. People were followed up at 3 months. This follow up appointment provided an opportunity to assess and reinforce the patients' change in lifestyle and to review the patients' activity goals schemes. This programme was designed as a direct response to NICE 2006

	guidance on brief interventions for physical activity.
Comparator/control(s) description:	The, uncontrolled, comparison made was between 2 methods of recruitment. All other aspects remained the same.
Sample sizes:	Total n: n=411 for individual cost data and n=70 at baseline and n=46 at 3 months to assess for impact on behaviour Intervention n= n/a Control n=n/a
Outcomes and methods of analysis	
Primary outcomes:	Change in physical activity behaviour (specified in practice as increase in time spent on moderate intensity activity to 150 minutes per week). Physical activity levels were assessed in a semi-structured interview administered by health professionals using the GPPAQ (General Practice Physical Activity Questionnaire).
Secondary outcomes:	n/a
Time horizon:	Individual patients were followed up to 3 months from baseline
Discount rates:	n/a
Modelling method:	n/a
Results	
Primary analysis:	(i) Cost per patient completing the Physical Activity Care Pathway (PACP) was significantly higher at disease register practices (£190.80 (SD 39) vs. £53.20 (SD 7.8)). This pattern also held across each part of the pathway, although it only reached statistical significance for the screening consultation. (ii) Total cost of delivering brief advice in 4 centres was £18,231, which covered 411 screened patients of whom 75 provided follow-up data at 12 weeks. Practice training and set-up advice was the largest cost contributor (£11,349). From the total cost of delivery, £8,852 (49%) occurred at opportunistic sites and £9,379 (51%) at disease register practices. (iii) An incremental cost of £886.50 to increase self reported physical activity levels to 150 minutes of moderate intensity activity per week was observed when comparing disease register screening with opportunistic patient recruitment.
Secondary analysis:	(i) The sensitivity analysis on cost showed that the impact of changing one factor had varying impacts on the cost per patient by method of delivery. Using the national 'roll out' cost for the booklet has the largest impact on reducing costs for opportunistic screening and that ensuring patient consultations are delivered by health care assistants leads to the greatest cost reduction for disease register sites. (ii) Probability sensitivity analysis: All estimates fell within the north-west and north-east quadrant of the cost effectiveness plane with large number of estimates scattered on the vertical axis – depicting great uncertainty around the case results
Notes	
Limitations identified by author:	Key limitations were (see Appendix H for details): (i) Self-selection bias due to recruitment strategies (ii) Lacked a comparison group to observe patients who did not undergo the intervention (iii) Profile of surgeries nationally may not match those of the pilot sample (iv) No patient costs accounted for (iv) Low numbers of participants to assess effectiveness

	(v) Lack of measurement beyond 3 months
Limitations identified by review team:	(i) Weak evidence base mainly due to low sample sizes. (ii) Not accounting for long-term outcomes or impact on QALYs (iii) No distinction in patient profile between screening methods
Evidence gaps and/or recommendations for future research:	(i) Further research is needed to provide more robust estimates of intervention effectiveness and efficiency, and to assess the link between behavioural change and changes in quality adjusted life years (QALYs). (ii) Objective measures of physical activity (iii) Inclusion of patient cost of participation in physical activity in analysis (iv) Need to evaluate the Lets Get Moving programme in practice.
Source of funding:	Department of Health

All patient level data were collected as part of an audit where information arose and was input during the consultation process using the Egton Medical Information System (EMIS). Audit data were collected using GPPAQ and other questions (e.g. person responsible for contacting patients and time taken), and the flow of patients was monitored through the screening, delivery, implementation to follow up at 3 months. Patient level data was down loaded using MIQUEST. Outcomes of the intervention were specified as self-reported change in physical activity by comparing data at baseline and 3 months.

The time-driven variant of activity based cost analysis and 'illustrative' cost-effectiveness analysis were conducted from the health service perspective. Costs included salaries, practice overheads, capital costs, cost of support booklet for participants, cost of practitioner training, cost of contacting participants. Centre level resource use data was collected through a face to face survey of practice managers with telephone follow-up and contact with the Department of Health. All patient level resource use data was extracted using MIQUEST. Unit costs were based on national tarriffs.

The cost per patient completing the pathway was found to be significantly higher at disease register practices (£190.80 (SD 39) compared with opportunistic centres £53.20 (SD 7.8)). This pattern occured in all stages of the pathway, though it only reached statistical significance (at 95%) at the screening consultation stage. An incremental cost of £886.50 to a self-reported increase in physical activity levels to 150 minutes of moderate intensity activity per week was observed when comparing disease register screening with opportunistic patient recruitment.

Deterministic sensitivity analysis examined five assumptions and probabilistic analysis examined the degree of uncertainty in the difference of differences analysis of outcomes. One deterministic sensitivity analysis was argued to resemble a cost-minimisation analysis and this led to dramatic reduction in average costs (to £11.76 and £35.64 per patient completing a 3 month appointment for opportunistic screening and disease register screening, with a difference of £23.88). The findings however, suggest there is great uncertainty around the base-case results, with all estimates from the probabilistic sensitivity analysis falling within the north-west and north-east quadrant of the cost effectiveness plane and a large number of estimates scattered on the vertical axis (due to the large quantity of missing data).

Commentary on Boëhler et al (2011)

The intervention was designed as a direct response to NICE 2006 guidance on brief interventions for physical activity and is a useful addition to the evidence base on the cost effectiveness of brief advice. Of particular note is the detailed patient level cost data. The main limitation of the study relates to the audit-based effectiveness data, which is acknowledged by authors. The effectiveness data was not robust given the low sample sizes, inadequate follow-up, drop out of two centres and lack of control in comparison. Although a conservative estimate of zero change in physical activity behaviour was used to replace the missing data (due to attrition at follow-up), a more rigorous imputation method based on, for example, individual characteristics collected at baseline, may have provided a more realistic and accurate estimate. However, we acknowledge the small numbers may have precluded this option. Another major drawback of the study is the relatively short time horizon for follow-up. Estimation of long-term outcomes is important as it allows a verification of the main differences among the alternative options with respect to costs and outcomes and it is important that such an analysis account for the different profiles of patients accessing services through the two screening options. However, the high attrition at follow up observed in this study possibly reflect the challenges in conducting long-term studies designed to change behaviour. Finally, cost borne by participants was not captured.

3.3. Cost-effectiveness of brief advice and the infrastructure that supports it

As shown in Table 4, both Pringle (2011) and Matrix (2006) found brief advice to be cost-effective. While Boëhler et al (2011) showed that the cost per participant was similar to that in Pringle (2011), they did not model the long term impact on QALYs. The findings from all three papers were generally robust to the sensitivity analyses conducted.
Although the influence of method of delivery on the cost/QALY of brief advice was not investigated in the literature, findings from Boëhler et al (2010) are useful in considering the role of the recruitment strategy. Boëhler et al (2010) found that recruiting people to a brief advice intervention through disease registers compared with opportunistic screening resulted in an incremental cost per person attending a 3 month follow-up appointment of £886.50 to increase self-reported levels of activity from existing (sedentary) levels to 150 minutes of moderate intensity per week.

The impact of the type of advice might also be inferred from Matrix (2006) who found cost per QALY gained to be £159 for stage based advice by a GP during consultation; and £425 for stage based advice plus a booklet (mailed 2 weeks after). Further analysis (via sensitivity analysis) to assess the impact of using different types of staff to deliver brief advice (assuming effectiveness was constant) found that replacing GP time with nurses or health care assistants made the interventions marginally more cost effective. Using nurses resulted in a cost per QALY of approximately £90 to £160 whilst replacing nurses and GP time with health care assistants led to a cost per QALY of approximately £60 to £140.

Whilst the evidence on brief advice largely suggests that it is a cost effective use of healthcare resources, this has to be treated with caution because it is based on a weak effectiveness base and has not been explored uncertainty thoroughly. Only Boëhler et al (2011) used a probabilistic sensitivity analysis with the others using one-way sensitivity analysis.

Table 4: Results of economic evaluation

	Pringle et al. 2010	Boëhler et al. 2011	Matrix 2006
ICER/ Other	(i) Average cost per month of implementing the intervention was £1,216; cost per participant attending intervention was £819. (ii) No ICER was reported for brief advice per se but the results of similar intervention (i.e. motivational interviews) shows that the cost per completer improving MPA as between £2,659 and £2,789 Cost per QALY was £47 to £229 and NHS cost savings per completer was £3,036 to £3,286	An incremental cost of £886.50 to increase self reported physical activity levels to 150 minutes of moderate intensity activity per week was observed when comparing disease register screening with opportunistic patient recruitment.	Cost per QALY gained was: £159 for stage based advice by a GP during consultation ;and £425 for stage based advice plus a mailed booklet 2 weeks after
Currency base	2003 UK £	2007 UK £	2005 UK £

3.4. Quality assessment

Table 5 describes the quality grades given to the studies and the main reasons behind the grades. The studies were found to be distributed across 2 levels of quality. The main deficiencies in quality were in relation to the weak evidence base and insufficient exploration of uncertainty around input parameters.

Table 5: Quality assessment

	Pringle et al. 2010	Boëhler et al 2011	Matrix 2006
Quality of evidence	-	+	+
Reasons	(i) Weak evidence base mainly due to validity issues around the study design, high attrition rate, potential measurement errors and high probability of self-selection. (ii) Insufficient exploration of uncertainty around estimates despite the huge assumptions used in the	(i) Weak evidence base mainly due to low sample sizes. (ii) No accounting for long-term outcomes of QALYs (iii) No distinction in patient profile between screening options	(i) Insufficient exploration of uncertainty around estimates despite the huge assumptions used in the model (ii) No explicit recognition of time in modelling

	Pringle et al. 2010	Boëhler et al 2011	Matrix 2006
	model (iii) No explicit recognition of time in modelling.		

4. Discussion

The literature search identified three economic evaluations for review. The literature search was comprehensive, systematic, current and agreed with NICE, but it is recognised that the restriction of the literature search to English Language publications may have excluded some relevant literature. We also recognise the difference in literature covered in this review compared with an earlier review (Matrix 2006b) which informed the original public health guidance (PH2). Table 6 therefore sets out the differences in methods between this review and the previous review of economic evaluations of brief interventions. The main differences are in the definitions of intervention, search strategy, and criteria for including papers.

Table 6: Differences between Matrix (2006) and this review

	Matrix (2006b)	Current review
Definition of intervention	Brief interventions in primary care were defined as **any intervention** *(our bold)* involving verbal advice, encouragement, negotiation or discussion with the overall aim of increasing physical activity. The intervention should also be delivered in a primary care setting by a health or exercise professional, with or without written or other support or follow-up'.	'Brief advice comprises verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It could be opportunistic and can typically take from less than a minute to up to 20 minutes. It can vary from basic advice to a more extended, individually-focused discussion. The advice might be delivered in a GP surgery, health centre or other primary care setting. It may also be delivered by primary care professionals in other settings (for example, a residential home). People who may give this advice include: community nurses, GPs, heath visitors, pharmacists, physiotherapists, exercise professionals or health trainers'.
Databases searched	NHSEED; HEED	Search covered both databases used Matrix (2006b) and additional databases as well as other sources (see details in methods section)
Inclusion criterion	Included only papers that	No restriction was placed on

	Matrix (2006b)	Current review
	investigated brief interventions aimed at 'improving physical activity, where the change in physical activity is defined as meeting the Chief Medical Officer (CMOs) guidelines of 30 minutes of moderate exercise five times a week'	definition of physical activity outcome

The implications of these differences are two-fold: First, the current review is likely to identify studies from a broader set of literature given the relatively more extensive literature search and narrower physical activity definition used by Matrix (2006). Secondly, the current study identified the papers reviewed by Matrix (2006), those papers (Finkelstein et al 2002; Lindgren et al 2003; Johannesson et al 1991) were not selected for final review because their interventions were more than brief advice on physical activity and it was difficult to isolate the effect of the brief advice on physical activity component of the intervention (see further details in Appendix G).This decision was discussed and agreed with CPHE.

There is little economic evidence to inform resource allocation on whether brief advice should be used to promote physical activity and the local infrastructure and systems support to cost-effective delivery of brief advice on physical activity in primary care. This conclusion is corroborated by the findings of similar previous systematic reviews (e.g. Matrix 2006b).

One of the main reasons for the scarcity of evidence is that it was not possible to disentangle the effectiveness (and hence efficiency) of brief advice interventions from either more intensive counseling, exercise delivery programmes (n=7) or from other lifestyle advice (n=10). The problem of disentangling was a function of study design as well as choice of outcome measures. None of these excluded papers was UK based as they originated from New Zealand (n=4), US (n=4), Australia (n=3), Sweden (n=3), Netherlands (n=2) and Italy (n=1). The majority used cost utility analysis (n=10) with the remainder using either cost effectiveness (n=5) or cost benefit analysis (n=2). Their analysis, which was either trial based (n=9) or Markov type model based (n=8), mainly concluded that the interventions compared with usual care were cost-effective.

Currently there is only evidence that the type of people delivering the intervention affects costs, but there is no evidence of any difference in impact. There is also only very limited and poor quality evidence that more costly screening with disease registers accesses people

more likely to change behavior. The studies that do exist suggest brief advice, given by either GPs or other health workers and with or without written material is cost-effective, although the paucity of the evidence on effectiveness and concerns about its rigour coupled with inadequate exploration of uncertainty points to the need for further evaluation. Whilst modelling studies can go some way to exploring this, ultimately these issues can only be resolved through better evidence of effectiveness derived from randomised controlled trials or other well-designed observational studies. As such, any criticism of the economic evidence should be considered in light of the evidence on effectiveness that is available at the time of the analysis.

Each of the studies reviewed has its merits and make a valuable contribution to the limited evidence base on the cost effectiveness of brief advice. The audit-based study benefitted from detailed and robust estimates of patient-based resource use and costs of the interventions. Any weaknesses inherent in this analyses is largely a result of the limitations of using an uncontrolled audit process to assess effectiveness and the high attrition rates. The economic modelling studies reviewed overcome the issue of the short-time horizon inherent in the audit-based analysis. These studies allowed for an estimate of the longer term costs and benefits of physical activity, taking into account the effects on a number of long-term conditions which are known to be associated with physical inactivity. The weaknesses associated with the models arise partly due to an absence of good evidence on the effectiveness of brief advice as well as other key relationships (e.g. between physical inactivity and long-term conditions, long-term effectiveness of interventions, adherence to interventions). In the absence of such data it might be that these simple models are sufficient for decision-making. However, it would be good to see the impact of a more detailed exploration of the nature of uncertainty and to judge the impact of accounting for a time.

Summary Evidence Statements

1. Moderate, but limited evidence from three studies: one model-based (Matrix 2006 [+]), 1 trial-based (Pringle et al 2010 [-]) and 1 audit-based analysis (Boëhler et al 2011 [+]) suggest that brief advice on physical activity in primary care is more cost effective than usual care. The evidence should, however, be interpreted with caution as the three studies were based on a weak effectiveness base and did not fully explore uncertainty. Therefore, a de novo modeling of the cost effectiveness of brief advice is needed to improve knowledge on its efficiency.

2. One piece of moderate evidence (Boëhler et al 2011 [+]) was found, on one aspect of the cost-effectiveness of local infrastructure and systems (opportunistic versus disease register based screening) to support the delivery of brief advice on physical activity in primary care. This showed that screening using disease registers cost an additional £887 per person attending a 3 month follow up appointment to convert one ‘sedentary’ adult to being ‘active. However, the effectiveness data on which this was based was extremely poor quality.

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Appendix A: Physical activity – Brief advice for adults in primary care: Economic Analysis

1. GROUPS THAT WILL BE COVERED

A focus only on interventions targeted at adults aged 18 and over deemed appropriate for brief advice interventions including: a) healthy/at risk populations; a) individuals with a disease known to benefit from physical activity.

2. GROUPS THAT WILL NOT BE COVERED

Individuals aged below 18 years.

INTERVENTIONS THAT WILL BE COVERED

3.1 Brief advice to promote physical activity in adults aged 19 and over. Brief advice comprises: verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It could be opportunistic and can typically take from less than a minute to up to 20 minutes. It can vary from basic advice to a more extended, individually-focused discussion. The advice might be delivered in a GP surgery, health centre or other primary care setting. It may also be delivered by primary care professionals in other settings (for example, a residential home). People who may give this advice include: community nurses, GPs, heath visitors, pharmacists, physiotherapists, exercise professionals or health trainers.

3.2 Infrastructure and systems that facilitate and increase the delivery and uptake of brief advice, which could include:

structured arrangements such as scheduled annual health checks

opportunistic discussion about physical activity during a GP appointment.

triggers in computerised patient records.

incentive schemes for professionals such as Quality Outcomes Framework

4. INTERVENTIONS THAT WILL NOT BE COVERED

Other physical activity related interventions including exercise referral schemes offering an assessment of need, development of a tailored physical activity programme, monitoring and follow-up; schemes that encourage physical activity – for example, walking and cycling schemes; and advice given in the context of specific conditions (e.g. tertiary prevention).

5. OVERVIEW OF PROJECT

This review will examine the relevant economic evidence on brief advice for adults in primary care and address the following key questions:

Question 1**:** What types of brief advice are cost effective in promoting physical activity in primary care? Does the method of delivery, type of advice and person delivering the advice influence the cost effectiveness of the intervention?

Question 2**:** What type of local infrastructure and systems support cost effective delivery of brief advice on physical activity in primary care?

Question 3**:** What are the economic barriers to, and facilitators for, the delivery of brief advice on physical activity in primary care?

Question 4**:** What are the economic barriers to, and facilitators for, the uptake of brief advice?

6. REVIEW QUESTIONS

The review questions for economic evaluations will aim to extract the data that include author(s), year of publication, intervention, alternative to the intervention, patient population, perspective of the analysis, study design, analytic horizon, time period of implementation, all measures of benefit uses, effectiveness data sources, and other cost elements, cost data sources, year of costs, time horizon, adjustment for inflation, discount rate, baseline results, variables used in and results of sensitivity analysis, and authors' conclusions. Studies will be appraised against recognised appraisal criteria for economic evaluations (CPHE Methods manual 2009) and where appropriate, models (Phillips et al 2004).

The review questions for papers selected for the review of economic barriers and facilitators will however cover author(s), year of publication, intervention, alternative to the intervention, patient population, study design, variables, method of analysis, results, and authors' conclusions.

Two reviewers will independently extract data into a group data extraction form if there are less than 20 papers. We will refer to a third review (JL) if in disagreement.

7. METHODS

7.1 Search terms

1. We will apply cost effectiveness terms based on NHS EED search filters (Glanville 2009) for both Medline and Embase with added keywords from the search strategy developed for NICE (2006). The NHS EED search filters were found by Glanville (2009) to be highly sensitive (Medline 0.999, Embase 0.997 from a maximum of 1.000) and with good precision (Medline 0.040, Embase 0.029 from a maximum of 1.000). We incorporated the additional keywords that were used in the strategy developed for NICE (2006). As Glanville (2009) had reported that the use of indexing terms specific to economic evaluations has been found not to achieve high levels of sensitivity and precision, we have not used the extra MeSH terms used in the NICE (2006) strategy. We consider that expanding the search to include the additional MeSH terms from the NICE (2006) strategy is unlikely to result in finding more, relevant papers but would result in a considerably larger body of papers to sift through.

The search strategy for the economic barriers is based on past search strategies and studies around demand for physical activity (Anokye 2010; Harland et al 1999) in conjunction with the final search strategy developed by the effectiveness review team for the effectiveness review.

Both the economic evaluations and the economic barriers and facilitators search strategies will be combined with the final versions of the effectiveness searches as provided by the effectiveness review team as follows:

Effectiveness search terms AND Economic evaluations search terms,

Effectiveness search terms AND Economic barriers search terms

Economic evaluations

Search strategy for Ovid Medline -Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present

economics/

exp "costs and cost analysis"/

economics, dental/

exp "economics, hospital"/

economics, medical/

economics, nursing/

economics, pharmaceutical/

(economic$ or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic$).ti,ab.

(expenditure$ not energy).ti,ab.

value adj2 money.ti,ab.

budget$.ti,ab.

(fiscal or funding or financial or finance).ti,ab

or/1-12

((energy or oxygen) adj cost).ti,ab.

(metabolic adj cost).ti,ab.

((energy or oxygen) adj expenditure).ti,ab.

or/14-16

13 not 17

letter.pt.

editorial.pt.

historical article.pt.

or/19-21

18 not 22

Animals/

Humans/

24 not (24 and 25)

23 not 26

Economic barriers

((economic$ or socio?economic$ or cost$ or price$ or pricing$ or budget$ or money or cash or expen$ or financ$ or valu$ or voucher$ or gift$ or time or fiscal or monet$) adj5 (demand$ or preferenc$ or choice$ or determin$ or factor$ or correlate$ or facilitator$ or barrier$ or

hindrance$ or hinder$ or block$ or obstacle$ or restrict$ or restrain$ or inhibit$ or impede$ or delay$ or constrain$ or refus$ or incentive$ or access)).ti,ab..

NHS EED

Both the search for economic evaluations and economic facilitators/barriers in NHS EED is based on the physical activity terms used in the effectiveness search strategy.

Physical activit* OR fitness OR sport* OR leisure*.ti

We will review the search strategy developed for effectiveness and consider how best to apply these terms to the additional economic-focussed datasets. The search strategy will not account for potential health outcomes of brief advice interventions as the aim is to capture the economic evaluation or economic barriers/facilitators studies on brief advice interventions regardless of health outcomes considered.

Additional papers will come from up to 5 further methods in agreement with NICE and as resources allow:

1. Any papers about cost, economic evaluation or economic barriers/facilitators identified by the effectiveness review team following their review of the following databases: ASSIA, CINAHL, British Nursing Index, Cochrane Library (including DARE, CENTRAL, HTA and CDSR), HMIC, Science Citation Index, Social Science Citation Index, Sociological Abstracts, PsycINFO, Social Policy and Practice, Sport Discuss, and the EPPI Centre Databases (Bibliomap, DoPHER, TRoPHI and Obesity and Sedentary behaviour studies at http://eppi.ioe.ac.uk/).

The protocol and selection strategies set out here for the economic work will be shared with the effectiveness reviewers. The effectiveness reviewers have said they will send us the full reference and either link to abstract or the abstract to the paper found and that they will err on the side of caution (i.e. inclusion).

2. Where the NICE team identify areas (with an associated and justified reasoning relevant to the proposed research) that are felt to be underdeveloped in the cost effectiveness and economics searches conducted, the Brunel team will consider these areas further or provide the NICE team with a rationale as to why they are not necessary, within resources.

3. We will discuss and consider evidence submitted by 30th March by stakeholders through 'Call for Evidence' in agreement with NICE.

4. We will undertake additional techniques such as citation searches on up to five prioritised references that will be agreed with NICE to verify that the database searches are comprehensive. For these citation searches we will use a citation tool such as "cited by" in Google Scholar and any additional references identified via this method will be added to Endnote.

5. We will search a list of websites for specific organisations if appropriate and feasible e.g. Health England, MATRIX, Partners for Prevention, National Obesity Observatory, the BHF National Centre for Physical Activity and Health (see http://www.bhfactive.org.uk/search/index.html), the Department of Health, the Scottish government and the Welsh Assembly government

We will seek approval and sign off from the NICE team regarding the final list of Bibliographic Database, Suggested Websites and Evaluations and Grey Literature to be searched. NICE may be provided with alternative suggestions from PHIAC and stakeholders. Where such suggestions are felt to be viable options Brunel will consider these.

7.2 Databases

In addition to the databases agreed for the effectiveness review that we have access to, we will search the following economic-focussed databases:

Econlit :http://www.ebscohost.com/academic/econlit

NHS EED: http://www.crd.york.ac.uk/CRDWeb/AboutNHSEED.asp

OHE HEED : http://onlinelibrary.wiley.com/

NCCHTA: http://www.hta.ac.uk/

NICE publications: http://www.nice.org.uk/

EconPapers : http://econpapers.repec.org/

Public Health Interventions Cost Effectiveness Database: http://www.yhpho.org.uk/phiced/

CEA Registry at Harvard University: https://research.tufts-nemc.org/cear4/The searches will be limited to studies reported in the English language, human studies and from 1990 to current in order to retrieve a relevant and manageable set of results. Search results will be downloaded into Endnote database and duplicates removed. A trail of the search process will be kept, with all searches, number of hits and number of relevant references identified recorded.

7.3 Selection strategy

In addition to the inclusion and exclusion criteria agreed for the effectiveness reviews, the following criteria will be applied for the economic evaluations.

Inclusion criteria: 'Full' economic evaluations (that consider costs and health/non-health consequences) of relevant types of intervention or scheme, and high quality costing studies conducted in the UK or OECD countries.

Exclusion criteria: Burden of disease and non-comparative costing studies, or other studies which do not involve assessing the cost and related benefits/effectiveness of relevant interventions.

In addition to the inclusion and exclusion criteria agreed for the effectiveness reviews, for the economic barriers and facilitators review, we will include the following range of study designs:

Systematic reviews

Meta-analysis

Primary studies with controlled or uncontrolled designs

Econometric estimations

We will include studies with:

Quantitative estimates of the statistical association (e.g correlation or regression coefficient) between uptake/adherence to brief advice interventions and economic variables such as prices, income, employment status, demographics, money/time costs, taste and preferences.

Qualitative data (e.g. focus groups and interviews with brief intervention participants) about the economic factors relating to uptake and adherence to brief interventions .

We will exclude studies that clearly do not meet the inclusion criteria, and retrieve all possible relevant citations as full text copies for assessment for inclusion in the review. Disagreements will be resolved by discussion between review authors, or arbitration by a third person. Brunel will use a PRISMA study flow chart to summarise the number of papers included and excluded at each stage and each study excluded at the full paper screening will be described in the excluded studies table along with the reason for exclusion

Screening will be undertaken by one reviewer and a 10% sample checked by a second reviewer. If an abstract provides insufficient detail for rejection, the full text will be sought. All screening of searches conducted at Brunel will be supervised and quality assured by a senior Brunel staff member. Brunel will download all titles and abstracts identified by the agreed electronic searches conducted by Brunel to the reference management database Endnote, and remove duplicates.

7.4 Synthesis

The outcome of this review will be a tabular summary set out according to recommendations in NICE (2009). An overview and indication of potential directions for any modelling will also be provided. Results will also be provided in a series of evidence statements according to the CPHE Methods manual (NICE 2009).

Appendix B: Literature search strategies

Literature search strategies

MEDLINE

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

1 patient education as topic/ (63551)

2 health education/ (48771)

3 health literacy/ (648)

4 directive counseling/ or counseling/ (25881)

5 pamphlets/ (2829)

6 (patient$ education or health education or health literacy).ti,ab. (30640)

7 (patient$ adj2 (counselling or counseling or advice)).ti,ab. (5036)

8 (patient$ adj2 (leaflet$ or flyer$ or information or pamphlet$ or booklet$ or poster$)).ti,ab. (16485)

9 ((brief or opportunist$ or concise or short or direct or lifestyle or written or oral or verbal or personali?ed or individuali?ed) adj2 (advice or counselling or counseling or negotiation$ or guidance or discussion$ or encouragement or intervention$ or program$ or meeting$ or session$)).ti,ab. (17519)

10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 (181534)

11 exp exercise/ or Sports/ or physical fitness/ or fitness centers/ (121978)

12 exp running/ or Swimming/ or walking/ or baseball/ or basketball/ or bicycling/ or boxing/ or football/ or golf/ or gymnastics/ or hockey/ or yoga/ or Tai Ji/ or dancing/ or gardening/ or hobbies/ or leisure activities/ (60003)

13 (Physical activit$ or exercise$ or fitness).ti,ab. (227330)

14 ((promot$ or uptake$ or encourag$ or increas$ or start$ or adher$) adj2 (physical activit$ or aerobics or circuits or swimming or aqua or tai chi or tai ji or jogging or running or bicycling or biking or yoga or pilates or football or walk$ or sport$ or gym$ or dancing or gardening)).ti,ab. (9479)

15 ((barrier$ or hinder$ or block$ or obstacle$ or restrict$ or restrain$ or inhibit$ or impede$ or delay$ or constrain$ or hindrance or refus$) adj2 (physical activit$ or aerobics or circuits or swimming or aqua or tai chi or tai ji or jogging or running or bicycling or biking or yoga or pilates or football or walk$ or sport$ or gym$ or dancing or gardening)).ti,ab. (2205)

16 ((sport$ or fitness or leisure) adj2 (centre$ or center$ or facilit$)).ti,ab. (694)

17 ((promot$ or uptake$ or encourag$ or increas$ or start$ or adher$) adj2 stair$).ti,ab. (128)

18 (Keep$ fit or fitness class$ or brisk walk$).ti,ab. (433)

19 ((Fitness or sport$ or keep fit) adj2 (class$ or session$ or lesson$)).ti,ab. (337)

20 ((decreas$ or reduc$ or discourag$) adj2 (sedentary or deskbound)).ti,ab. (277)

21 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 (303803)

22 Primary Health Care/ (46568)

23 Primary prevention/ (12383)

24 Physicians, Family/ or general practitioners/ or physicians primary care/ (15293)

25 exp general Practice/ (59413)

26 primary care nursing/ (34)

27 Public health nursing/ (9398)

28 Family nursing/ (862)

29 Physician-Patient Relations/ (54664)

30 (practice nurse$ or primary care or gp$ or general practitioner$ or family physician$ or health visitor$ or pharmacist$ or health trainer$ or primary healthcare or primary health care).ti,ab. (214247)

31 (gp$ adj2 (surger$ or care or service$ or centre$ or clinic$ or facilit$)).ti,ab. (1664)

32 ((family or general or physician$ or doctor$) adj practice$).ti,ab. (38341)

33 exp Medical records systems, computerized/ (20492)

34 Quality indicators, health care/ (8024)

35 (annual health check$ or patient record$ or quality outcome$ framework or qof or infrastructure or information system$ or validated questionnaire$ or care pathway$).ti,ab. (37066)

36 GPPAQ.ti,ab. (0)

37 General Practice Physical Activity Questionnaire$.ti,ab. (0)

38 or/22-37 (401254)

39 10 and 21 and 38 (1595)

40 limit 39 to (english language and humans and yr="1990 -Current") (1351)

41 economics/ (26190)

42 exp "costs and cost analysis"/ (161766)

43 economics, dental/ (1835)

44 exp "economics, hospital"/ (17708)

45 economics, medical/ (8428)

46 economics, nursing/ (3854)

47 economics, pharmaceutical/ (2301)

48 (economic$ or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic$).ti,ab. (380227)

49 (expenditure$ not energy).ti,ab. (15549)

50 (value adj2 money).ti,ab. (785)

51 budget$.ti,ab. (16496)

52 (fiscal or funding or financial or finance).ti,ab. (67151)

53 or/41-52 (537791)

54 ((energy or oxygen) adj cost).ti,ab. (2539)

55 (metabolic adj cost).ti,ab. (671)

56 ((energy or oxygen) adj expenditure).ti,ab. (14366)

57 or/54-56 (16924)

58 53 not 57 (533900)

59 letter.pt. (751510)

60 editorial.pt. (301510)

61 historical article.pt. (280448)

62 or/59-61 (1320199)

63 58 not 62 (506419)

64 Animals/ (4882464)

65 Humans/ (12119502)

66 64 not (64 and 65) (3590935)

67 63 not 66 (480193)

68 40 and 67 (170)

Database Name	Medline
Database host	OVID
Database coverage dates	1946-current
Subtopic of search	Economic evaluation
Searcher	T Jones
Search date	16/03/2012
Search strategy checked by	Paul Levay
Number of records retrieved	170
Name of Endnote library	NICE Physical Activity.enl
Number of records loaded into Endnote	170
Reference numbers of records in Endnote library	1-170
Number of records after de-duplication in Endnote library	169

EMBASE

ProQuest Dialog Embase & Embase Alert

mjemb.Exact("patient education")

mjemb.Exact("health education")

mjemb.Exact("health literacy")

mjemb.Exact("counseling")

mjemb.Exact("publication")

AB,TI(patient* education or health education or health literacy)

AB,TI(patient* NEAR/2 (counselling or counseling or advice))

AB,TI(patient* NEAR/2 (leaflet* or flyer* or information or pamphlet* or booklet* or poster*))

AB,TI((brief or opportunist* or concise or short or direct or lifestyle or written or oral or verbal or personali?ed or individuali?ed) NEAR/2 (advice or counselling or counseling or negotiation* or guidance or discussion* or encouragement or intervention* or program* or meeting* or session*))

S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9

MJEMB.EXACT.EXPLODE("exercise") or MJEMB.EXACT.EXPLODE("sport") or MJEMB.EXACT.EXPLODE("fitness") or MJEMB.EXACT.EXPLODE("health center")

MJEMB.EXACT(running or swimming or walking or baseball or basketball or bicycle or boxing or football or "physical education" or yoga or "Tai Chi" or dancing or gardening or leisure)

AB,TI(Physical activit* or exercise* or fitness)

AB,TI((promot* or uptake* or encourag* or increas* or start* or adher*) NEAR/2 ("physical activit*" or aerobics or circuits or swimming or aqua or "tai chi" or "tai ji" or jogging or running or bicycling or biking or yoga or pilates or football or walk* or sport* or gym* or dancing or gardening))

AB,TI((barrier* or hinder* or block* or obstacle* or restrict* or restrain* or inhibit* or impede* or delay* or constrain* or hindrance or refus*) NEAR/2 ("physical activit*" or aerobics or circuits or swimming or aqua or "tai chi" or "tai ji" or jogging or running or bicycling or biking or yoga or pilates or football or walk* or sport* or gym* or dancing or gardening))

AB,TI((sport* or fitness or leisure) NEAR/2 (centre* or center* or facilit*))

AB,TI((promot* or uptake* or encourag* or increas* or start* or adher*) NEAR/2 stair*)

AB,TI("Keep* fit" or "fitness class*" or "brisk walk*")

AB,TI((Fitness or sport*) NEAR/2 (class* or session* or lesson*))

AB,TI((decreas* or reduc* or discourag*) NEAR/2 (sedentary or deskbound))

S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20

mjemb.Exact(primary health care)

mjemb.Exact(primary prevention)

mjemb.Exact("general practitioner" or "primary medical care")

mjemb.Exact("doctor patient relation")

mjemb.Exact("general practice")

mjemb.Exact("community health nursing")

mjemb.Exact("family nursing")

mjemb.Exact("professional practice")

mjemb.Exact(pharmacy)

AB,TI("practice nurse*" or "primary care" or "primary healthcare" or "primary health care" or gp* or "general practitioner*" or "family physician*" or "health visitor*" or pharmacist* or "health trainer*")

AB,TI((family or general or physician* or doctor*) NEAR/ practice*)

mjemb.Exact("electronic medical record")

mjemb.Exact("health care quality")

AB,TI("annual health check*" or "patient record*" or "quality outcome* framework" or qof or infrastructure or "information system*" or "validated questionnaire*" or "care pathway*" or GPPAQ)

S22 or S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35

S10 and S21 and S36

(S10 and S21 and S36) AND la.exact("ENG")

EMB.EXACT("health economics")

EMB.EXACT.EXPLODE("economic evaluation")

EMB.EXACT.EXPLODE("health care cost")

EMB.EXACT.EXPLODE("pharmacoeconomics")

S39 or S40 or S41 or S42

AB,TI(economic* or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic)

AB,TI(expenditure* not energy)

AB,TI(value NEAR/2 money)

AB,TI(budget*)

AB,TI(fiscal or funding or financial or finance)

S44 or S45 or S46 or S47 or S48

S43 or S49

DTYPE(letter)

DTYPE(editorial)

DTYPE(note)

S51 or S52 or S53

S50 not S54

AB,TI(metabolic NEAR cost)

AB,TI((energy or oxygen) NEAR cost)

AB,TI((energy or oxygen) NEAR expenditure)

S56 or S57 or S58

S55 not S59

EMB.EXACT.EXPLODE("animal")

EMB.EXACT.EXPLODE("animal experiment")

EMB.EXACT.EXPLODE("nonhuman")

AB,SU,TI(rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep)

S61 or S62 or S63 or S64

EMB.EXACT.EXPLODE("human")

EMB.EXACT.EXPLODE("human experiment")

S66 or S67

S65 not (S65 and S68)

S60 not S69

S38 and S70

S71 AND pd(19900101-20121231)

Database Name	Embase and Embase Alert
Database host	ProQuest Dialog
Database coverage dates	1947- current
Subtopic of search	Economic evaluation
Searcher	T Jones
Search date	19/04/2012
Search strategy checked by	P Levay
Number of records retrieved	330
Name of Endnote library	NICE Physical Activity.enl
Number of records loaded into Endnote	330
Reference numbers of records in Endnote	419-748

library	
Number of records after de-duplication in Endnote library	329

NHS EED

All dates

(physical activity) or (physical activities) or leisure or sport or sports or fitness or exercise or exercising

and

(patient education) or (patients education) or (health education) or (health literacy) or advice or counselling or counseling or negotiation or negotiations or guidance or discussion or discussions or encouragement or intervention or interventions or program or programme or programs or programmes or meeting or meetings or session or sessions

and

(practice nurse) or (practice nurses) or (primary care) or (primary healthcare) or (primary health care) or gp or (general practitioner) or (general practitioners) or (family physician) or (family physicians) or (health visitor) or (health visitors) or pharmacist or pharmacists or (health trainer) or (health trainers) or ((family or general or physician or doctor or physicians or doctors) and (practice or practices)) or (annual health check) or (patient record) or (quality outcome framework) or (annual health checks) or (patient records) or (quality outcomes framework) or qof or infrastructure or (information system) or (validated questionnaire) or (care pathway) or (information systems) or (validated questionnaires) or (care pathways) or GPPAQ

Database Name	*NHS EED*
Database host	NIHR Centre for Reviews and Dissemination
Database coverage dates	All dates to date of search
Subtopic of search	Economic evaluation and barriers
Searcher	THJones
Search date	10/05/2012
Search strategy checked by	N Anokye

Number of records retrieved	323
Name of Endnote library	NICE Physical Activity.enl
Number of records loaded into Endnote	323
Reference numbers of records in Endnote library	831-1153
Number of records after de-duplication in Endnote library	323

OHE HEED search strategy

Abstract search, all dates

(physical activity) or (physical activities) OR sport OR sports OR leisure OR exercise OR exercises OR fitness

Database Name	*OHE EED*
Database host	Wiley Online Library
Database coverage dates	All dates
Subtopic of search	Economic evaluation and barriers
Searcher	T Jones
Search date	18/05/2012
Search strategy checked by	N Anokye
Number of records retrieved	149
Name of Endnote library	NICE Physical Activity.enl
Number of records loaded into Endnote	149
Reference numbers of records in Endnote library	1821-1970
Number of records after de-duplication in Endnote library	149

Econlit

("physical activit*" or leisure* or sport* or fitness* or exercis*) 17061 records found

The papers identified were transferred to Endnote where further search terms were added:

and ("patient education" or "patients' education" or "health education" or "health literacy" or advice or counselling or counseling or negotiation or guidance or discussion or encouragement or intervention or program or meeting or session) and ("practice nurse" or "primary care" or "primary healthcare" or "primary health care" or gp or "general practitioner" or "family physician" or "health visitor" or pharmacist or "health trainer" or "family practice" or "general practice" or "physician practice" or "physicians' practice" or "doctor practice" or "doctors' practice" or "annual health check*" or "patient record" or "quality outcome framework" or "quality outcomes framework" or qof or infrastructure or "information system" or "validated questionnaire" or "care pathway" or GPPAQ) 49 records found

Database Name	Econlit
Database host	Econlit fro AEA members accessed via Vivisimo Search Software
Database coverage dates	1886-current
Subtopic of search	Economic evaluation
Searcher	T Jones
Search date	24/04/2012
Search strategy checked by	N Anokye
Number of records retrieved	49
Name of Endnote library	NICE Physical Activity.enl
Number of records loaded into Endnote	49
Reference numbers of records in Endnote library	1772-1820
Number of records after de-duplication in Endnote library	49

For some of the databases that were searched no efficient method of transferring the papers identified to an EndNote (or similar) database for management was available to us, therefore the papers identified from these searches were printed for review if possible or, in the case of Econpapers where a printed list of identified references was not available to us, the papers were individually studied on-line for the first review stage. The papers identified from these databases were therefore not included in the automatic deletion of duplicates step that

had been applied to the databases listed above thus inflating the apparent total number of individual papers identified. The searches of these databases are detailed below.

CEA Registry Harvard

Search strategy: “physical activity”, leisure, sport, exercise, fitness. All terms searched individually using the ‘simple search’.

a. Search term “physical activity” 14 results
b. Leisure - None found
c. Sport 17 results
e. Exercise 59 results
f. Fitness 1 results

Search conducted 26/03/2012 identified 91 papers (T Jones)

Econpapers

("physical activit*" or leisure* or sport* or fitness* or exercis*) and ("patient* education" or "health education" or "health literacy" or advice or counselling or counseling or negotiation* or guidance or discussion* or encouragement or intervention* or program* or meeting* or session*) and ("practice nurse*" or "primary care" or "primary healthcare" or "primary health care" or gp* or "general practitioner*" or "family physician*" or "health visitor*" or pharmacist* or "health trainer*" or ((family or general or physician* or doctor*) and practice*) or "annual health check*" or "patient record*" or "quality outcome* framework" or qof or infrastructure or "information system*" or "validated questionnaire*" or "care pathway*" or GPPAQ)

Search conducted 24/04/2012 identified 107 papers (T Jones)

b. Search strategy - Economic barriers

Limits: JEL-code I, Health, Education, and Welfare among working papers and articles

((physical activit*) or sport* or fitness* or exercis*) and (demand* OR preferenc* OR determin* OR factor* OR correlate* OR facilitator* OR barrier* OR hindrance* OR hinder* OR block* OR obstacle* OR restrain* OR inhibit* OR impede* OR delay* OR constrain* OR refus* OR incentive*)

Search conducted 24/04/2012 identified 235 papers (T Jones)

NICE publications

Search terms “Physical activity” applied separately to each section of the database

a. (Health Development Agency) Number of papers found = 62
b. (Health Development Agency) Number of papers found = 1
c. (Health Development Agency) Number of papers found = 26

Search conducted 27/03/2012 identified 89 papers (T Jones)

NCCHTA

Carried out as: Site search, 30/04/2012. Results indexed by relevance

Your search for ((physical activit*) or leisure or sport* or fitness or exercis*) and ((patient education*) or (health education) or (health literacy) or advice or counselling or counseling or negotiation* or guidance or discussion* or encouragement or intervention* or program* or meeting* or session*) and ((practice nurse*) or (primary care) or (primary healthcare) or (primary health care) or gp or physician* or (health visitor*) or pharmacist* or (health trainer*) or (family practice*) or (general practic*) or doctor* or (annual health check*) or (patient record*) or (quality outcome framework) or qof or (care pathway*) or GPPAQ) matched 183 Documents

.

Public health Interventions Cost effectiveness database

Search strategy - PH Area of “Physical activity”, Target Group of “Adults”

Results - Economic evaluations and Economic barriers

Search conducted 30/04/2012 identified 30 papers (T Jones)

Appendix C: Call for Evidence

Stakeholder Organisation	**Evidence Submission** **(Details of evidence that relates to the questions. Please specify which question you are referring to)**	**Full Reference (published work*) OR description of work (unpublished/ongoing work)** **(*E.g. Author, date of publication, full title of paper/report and where can a copy be obtained from)**	**Remarks**
Department of Health	1. The commissioning guidance and associated documents on the Let's Get Moving physical activity care pathway. There is also a formal write up of the feasibility study for the programme.	All documents can be found at the following web link: http://www.dh.gov.uk/health/2012/03/lets-get-moving/	The economic evaluation study was selected: Boëhler et al (2011).The cost of changing physical activity behaviour: evidence from a 'physical activity pathway' in the primary care setting. BMC Public Health 2011, 11:370. Data extraction was supplemented by reference to Bull FC, Milton K: A process evaluation of a "physical activity pathway" in the primary care setting. BMC Public Health 2010, 10:463
National Obesity Observatory	We have published a review of 'brief interventions. Although it relates primarily to obesity prevention and treatment, it contains much material of relevance to this issue.	The review is at http://www.noo.org.uk/gsf.php5?f=10181&fv=10702	This is review-level briefing paper that did not consider the economics of brief advice interventions but rather the effectiveness of brief interventions for weight management

Stakeholder Organisation	Evidence Submission (Details of evidence that relates to the questions. Please specify which question you are referring to)	Full Reference (published work*) OR description of work (unpublished/ongoing work) (*E.g. Author, date of publication, full title of paper/report and where can a copy be obtained from)	Remarks
Royal College of General Practitioners	Physical activity /population	Wanner M et al. Allez Hop, a nationwide programme for the promotion of physical activity in Switzerland: what is the evidence for a population impact after one decade of implementation? Br J Sports Med2011;45:1202-07 http://bjsm.bmj.com/content/45/15/1202.abstract	This is not an economic evaluation
Royal College of General Practitioners	Information about the benefits of physical activity (but emphasized the need for research to identify ways of implementing it, in the wider population).	Sport and Exercise Medicine: A Fresh Approach available http://cjsmblog.com/2012/02/15/sport-and-exercise-medicine-a-fresh-approach-guest-blog-by-dr-richard-weiler/	This is not an economic evaluation
Royal College of	Effect of exercise referral schemes in	Pavey et al. Effect of exercise referral	This is not an economic evaluation study

Stakeholder Organisation	Evidence Submission (Details of evidence that relates to the questions. Please specify which question you are referring to)	Full Reference (published work*) OR description of work (unpublished/ongoing work) (*E.g. Author, date of publication, full title of paper/report and where can a copy be obtained from)	Remarks
General Practitioners	primary care	schemes in primary care on physical activity and improving health outcomes: systematic review and meta-analysis. BMJ 2011;343:d6462 doi.	per se and the economic evaluation done as part of the project was on exercise referral scheme.
Royal College of General Practitioners	Physical activity promotion based in primary care	Orrow G, Kinmouth A and Sutton S. Effectiveness of physical activity promotion based in primary care: systematic review and meta-analysis of randomised controlled trials http://www.bmj.com/content/344/bmj.e1389	This is a review study and not an economic evaluation
Royal College of General Practitioners	Physical activity in primary care setting	Chalder M et al. A pragmatic randomised controlled trial to evaluate the cost-effectiveness of a physical activity intervention as a treatment for depression: the treating	This is not brief advice

Stakeholder Organisation	Evidence Submission (Details of evidence that relates to the questions. Please specify which question you are referring to)	Full Reference (published work*) OR description of work (unpublished/ongoing work) (*E.g. Author, date of publication, full title of paper/report and where can a copy be obtained from)	Remarks
		depression with physical activity (TREAD) trial. Health Technology Assessment 2012; Vol. 16: No. 10	
Royal College of General Practitioners	Prescribing exercise in primary care	Khan, K, Weiler R and Blair S. Prescribing exercise in primary care. BMJ 2011;343 d4141doi:10.1136/BMJ.d4141	This is not an economic evaluation

Appendix D: Web site search strategies

Department of Health

The following search terms were used:
"physical activit*" or leisure* or sport* or fitness* or exercis*

Search conducted 1/05/2012 identified 141 papers (N Anokye)

Welsh Assembly Government

The following search terms were used:
'physical activity'

Limits: research and publications

Search conducted 1/05/2012 identified 30 papers (N Anokye)

British Heart Foundation National Centre for Physical Activity and Health

The following search terms were used:
'physical activity'.

Search conducted 1/05/2012 identified 176 papers (N Anokye).

HEALTH ENGLAND

As the website did not offer a search engine, papers were identified by looking at all available publications.

Search conducted 12/04/12 identified 13 papers (N Anokye)

MATRIX

As the website did not offer a search engine, papers were identified by looking at all available publications.

Search conducted 12/04/12 identified 42 papers (N Anokye)

National obesity observatory

("physical activit*" or leisure* or sport* or fitness* or exercis*) and ("patient* education" or "health education" or "health literacy" or advice or counselling or counseling or negotiation*

or guidance or discussion* or encouragement or intervention* or program* or meeting* or session*) and ("practice nurse*" or "primary care" or "primary healthcare" or "primary health care" or gp* or "general practitioner*" or "family physician*" or "health visitor*" or pharmacist* or "health trainer*" or ((family or general or physician* or doctor*) and practice*) or "annual health check*" or “patient record*” or “quality outcome* framework” or qof or infrastructure or “information system*” or “validated questionnaire*” or “care pathway*” or GPPAQ)

Search conducted 1/05/12 identified 334 papers (N Anokye)

Partner for prevention

As the website did not offer a search engine, papers were identified by looking at all available publications.

Search conducted 30/04/12 identified 19 papers (N Anokye)

Scottish Government

The following search terms were used:
Subject of ‘sport’,
Limit: publications
nurse OR care OR gp OR practice OR practitioner OR physician OR health OR pharmacist OR doctor OR patient

Search conducted 10/05/12 identified 60 papers (N Anokye)

Appendix E: Data extraction form for economic evaluation

BLOCK 1: BACKGROUND INFORMATION OF STUDY	
Reference number	
Reviewed by	
Date of review	
Title	
Author(s)	
Aim of study	
Year of publication	
Origin of study (country, including developer or developing; public of private health system)	
Source of funding for study (gov (NHS), voluntary/charity, pharmaceutical) *Note anything about role of funders*	

BLOCK 2: SAMPLE/INTERVENTION	
Characteristics of patients	
Diagnosed condition	
Definition of ‘sedentariness’	

Gender	
Age	
Ethnicity	
Other details given	
Sample size Total n = Intervention n = Control n =	
Description of intervention	
Design (what delivered, by whom)	
Setting (e.g. primary school, community centre etc)	
Location (urban / rural)	
Duration (how often, how long for)	
Exercise program	
Description of comparator/control group	
Design (what delivered, by whom)	
Setting (e.g. primary school, community centre etc)	
Location (urban / rural)	
Duration (how often, how long for)	

BLOCK 3: ANALYSIS/RESULTS	
Scope	
Form of economic evaluation	
Perspective of analysis	
Time horizon of analysis	
Outcomes	
What primary outcome was reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	
What secondary outcomes were reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	
Data sources for primary outcome measure	
Data sources for secondary outcome measures	
Time horizon over which outcomes a) measured and b)	

estimated or predicted	
Discount rate	
Costs	
What costs were reported?	
Data sources for costs measures	
Discount rate?	
Time horizon over which costs a) measured and b) estimated or predicted	
Year of costing	
Currency	
Modelling approach used (if used, assess with questions in Block 6) IF the study is deemed applicable)	
Sensitivity analysis	
Type of sensitivity analysis	
What variables were used in sensitivity analysis?	
Findings from sensitivity analysis	
Details of any other secondary analysis undertaken	
Main results	
Outcomes	

Costs	
ICERs	
Other summary statistics	

BLOCK 4: CHALLENGES	
Author-stated limitations	
Author-stated strengths	
Strengths identified by review team	
Evidence gaps and/or recommendations for future research	

If this intervention(s) were to be modelled, what of this paper could be useful? (only to be completed IF intervention and study is considered useful and did not involve modeling *(complete after Block 5)*

Aspects	**Yes**	**No**	**Any comments**
Model structure			
Transition probabilities/risks etc			
Resource use			
Cost data			
Outcomes/effects			

Utility values			
Other			

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
APPLICABILITY (relevance to specific topic review questions and the NICE reference case)						
1.1 Is the study population appropriate for the topic being evaluated?						
1.2 Are the interventions appropriate for the topic being evaluated?						
1.3 Is the system in which the study was conducted sufficiently similar to the current UK context?						
1.4 Was/were the perspective(s) clearly stated and what were they?						
1.5 Are all direct health effects on individuals included, and are all other effects included where they are material?						
1.6 Are all future costs and outcomes discounted appropriately?						
1.7 Is the value of health effects expressed in terms of QALYs?						
1.8 Are costs and outcomes from other sectors fully and appropriately measured and valued?						
OVERALL JUDGMENT (circle one)	Directly applicable		Party applicable		Not applicable	
Other comments on applicability						
STUDY LIMITATIONS regarding methodology						

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
(for completion only once declared the study is sufficiently applicable)						
2.1 Does the model structure adequately reflect the nature of the topic under evaluation?						
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?						
2.3 Are all important and relevant outcomes included?						
2.4 Are the estimates of baseline outcomes from the best available source?						
2.5 Are the estimates of relative 'treatment' effects from the best available source?						
2.6 Are all important and relevant costs included?						
2.7 Are the estimates of resource use from the best available source?						
2.8 Are the unit costs of resources from the best available source?						
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?						
2.10 Are all important parameters whose values are uncertain subjected to appropriate sensitivity analysis?						
2.11 Is there any potential conflict of interest?						
OVERALL ASSESSMENT (circle one)	Minor limitations				Potentially serious limitations	Very serious limitations
Other comments on limitations						

BLOCK 6: OVERALL GRADING(based on block 5)

BLOCK 6: OVERALL GRADING(based on block 5)	
Quality score: (++, +, −)	
Applicability	

Appendix F: Excluded papers

Paper	Reason(s) for exclusion
Wright et al (2005).Individual Active Treatment Combined With Group Exercise for Acute and Subacute Low Back Pain. SPINE Volume 30, Number 11, pp 1235–1241	Not brief advice: The advice was in relation to back pain Irrelevant sample: Adults off-work or on light-duties and having episodes of back pain
Isaacs et al (2007).Exercise Evaluation Randomised Trial (EXERT): a randomised trial comparing GP referral for leisure centre-based exercise, community-based walking and advice only. Health Technology Assessment 2007;11(10):1–184	Not brief advice: This is an exercise referral scheme
Lamb et al (2010). A multi-centred randomised controlled trial of a primary care-based cognitive behavioural programme for low back pain. The Back Skills Training (BeST) trial. Health Technology Assessment. ;14(41):1–281	Not brief advice: this was group treatment based on 'a simple cognitive behavioural formulation that was tailored for Low Back Pain, and designed to target unhelpful beliefs about pain and activity, and promote engagement in leisure, physical and occupational activity' (page ix) Irrelevant patient group: Adults with subacute and chronic low back pain
Carr et al (2011). An evidence synthesis of qualitative and quantitative research on component intervention techniques, effectiveness, cost-effectiveness, equity and acceptability of different versions of health-related lifestyle advisor role in improving health. Health Technology Assessment 2011;15(9):1–284	Review study
Klaber et al (1999) Randomised controlled trial of exercise for low back pain: clinical outcomes, costs, and preferences. BMJ Vol.319; 3 19:279-83	Not brief advice: Intervention was exercise classes Irrelevant patient group: Adults with low back pain
Richter et al (2011). Impact of inclusion criteria in health economic assessments. Applied Health Economics and Health Policy. 9(3), 139-148	Not brief advice: This is an exercise referral scheme
Torres-Carbajo et al (2005). Efficacy and effectiveness of an exercise program as community support for schizophrenic patients. American Journal of Recreation Therapy.4;3	Not brief advice: Supervised exercise sessions Irrelevant patient group: adults with schizophrenia
Erikkson et al (2010)Quality of Life and Cost-effectiveness of a 3-Year Trial of Lifestyle Intervention in Primary Health Care. Arch. Intern. Med. Vol. 170 (No. 16),	Not brief advice: Supervised exercise training with advice on nutrition
Garret et al (2011)Are physical activity interventions in primary care and the community cost effective? British Journal of General Practice. DOI:10:3399	Review study
Geraets et al (2006). Cost-effectiveness of a graded exercise therapy program for patients with chronic shoulder complaints. International Journal of Technology Assessment in Health Care, 22:1 (2006), 76–83.	Not brief advice: An exercise therapy program Irrelevant patient group: Adults suffering with shoulder complaints
Johnson et al (2007). Active Exercise, Education, and Cognitive Behavioural Therapy for Persistent Disabling Low Back Pain .A Randomized Controlled Trial. SPINE Volume 32, Number 15, pp 1578–1585	Not brief advice: Supervised exercise therapy Irrelevant patient group: Adults with low back pain

Paper	Reason(s) for exclusion
Babazono et al (2011). Do Interventions to Prevent Lifestyle-Related Diseases Reduce Healthcare Expenditures? A Randomized Controlled Clinical Trial. J Epidemiology 2011;21(1):75-80	Not brief advice: Health support method with no hint of advice on exercise indicated
Dang (2011). Diabetes: Monitoring and counselling patients with pre-diabetes and type 2 diabetes.	General educational/discussion/commentary paper on management of diabetes that is a course material for a course for pharmacists
Dubin et al (2010). The trajectory of chronic pain: Can a community-based exercise/education programs often the ride? Pain Res Manage Vol 15 No 6	Not brief advice: Educational program on management of pain Irrelevant patient group: Adults with back pain
Handley et al (2008). Cost-Effectiveness of Automated Telephone Self-Management Support With Nurse Care Management Among Patients With Diabetes. Ann Fam Med 2008;6:512-518. DOI: 10.1370/	Not brief advice: A multi-component intervention that includes automated examination and education of patients, plus counselling to help them manage their diabetes.
Schnelle et al (2003).Does an Exercise and Incontinence Intervention Save Healthcare Costs in a Nursing Home Population? JAGS 51:161–168, 2003	Irrelevant patient group: Older adults (mean age: 87 years) identified as incontinent
Bruggen et al (2007). Lifestyle Interventions Are Cost-Effective in People With Different Levels of Diabetes Risk. Diabetes Care, Vol.30, No.1.	Not brief advice: Community based and lifestyle interventions with no indication of a brief advice.
Juhakoski et al (2011). A pragmatic randomized controlled study of the effectiveness and cost consequences of exercise therapy in hip osteoarthritis. Clinical Rehabilitation 2011; 25: 370–383	Not brief advice: Supervised exercise sessions Irrelevant patient group: Adults with radiologically hip osteoarthritis
Hurley et al (2007). Economic Evaluation of a Rehabilitation Program Integrating Exercise, Self-Management, and Active Coping Strategies for Chronic Knee Pain. Arthritis & Rheumatism (Arthritis Care & Research) Vol. 57, No. 7, October 15, 2007, pp 1220–1229	Not brief advice: Supervised exercise therapy with an advice component (that appears focus on coping strategies for knee pain) Irrelevant patient group: Adults with severe knee pain
Vries et al (2002). Intermittent Claudication: Cost-effectiveness of Revascularization versus Exercise Therapy. Radiology 2002; 222:25–36	Not brief advice: Evaluated percutaneous transluminal angioplasty and not exercise. Results were compared against exercise alone.
Sevick et al (2000). Cost-Effectiveness of Lifestyle and Structured Exercise Interventions in Sedentary Adults. Results of Project ACTIVE. Am J Prev Med 2000;19(1)	Not brief advice: More of behavioural skills taught programme that covered behaviour modification in relation to lifestyle plus general skills such as self-management skills and problem solving.
Retel et al (2011).A cost-effectiveness analysis of a preventive exercise program for patients with advanced head and neck cancer treated with concomitant chemo-radiotherapy. BMC Cancer 2011, 11:475	Not brief advice: This is about swallowing and not physical activity
Thomas et al (2005).Cost-Effectiveness of a Two-Year Home Exercise Program for the Treatment of Knee Pain. Arthritis & Rheumatism (Arthritis Care & Research) Vol. 53, No. 3, June 15, 2005, pp 388–394	Not brief advice: Exercise training program Irrelevant patient group: Adults with knee pain
Pronk et al (2008). Cost-effectiveness of endovascular revascularization compared to supervised hospital-based exercise training in patients with intermittent claudication: A randomized controlled trial. J Vasc Surg 2008;48:1472-80.	Not brief advice: Supervised exercise training program
Sevick et al (1999). Cost-effectiveness of aerobic and resistance exercise in seniors with knee osteoarthritis. Medicine & Science in Sports and Exercise.	Not brief advice: Supervised exercise training program Irrelevant patient group: Adults with knee osteoarthritis.

Paper	Reason(s) for exclusion
Peterson et al (2008).Cost-Effectiveness Analysis of a Statewide Media Campaign to Promote Adolescent Physical Activity. Health Promotion Practice. Vol. 9, No. 4, 426-433	Not brief advice: Mass media program Irrelevant patient group: 10-19 years
Nieminsto et al (2005). Cost-effectiveness of Combined Manipulation, Stabilizing Exercises, and Physician Consultation Compared to Physician Consultation Alone for Chronic Low Back Pain: A Prospective Randomized Trial With 2-Year Follow-up. SPINE Volume 30, Number 10, pp 1109–1115	Not brief advice: Exercise training therapy to mange back pain Irrelevant patient group: Adults with chronic low back pain
Kettunen et al (2007). Knee arthroscopy and exercise versus exercise only for chronic patellofemoral pain syndrome: a randomized controlled trial. BMC Medicine 2007, 5:38	Not brief advice: The evaluated component was knee arthroscopy and not the exercise program as both control and intervention groups had the same exercise program component. Even so, the exercise program was not brief advice. Irrelevant patient group: Adults with patellofemoral pain syndrome
Vestergaard et al (2005).Exercise intervention of 65+ year old mean and women: functional ability and healthcare costs. Aging Clinical Exp Res Vol.18, No.3	Not brief advice: Exercise training sessions
Wheat et al (1996). Addressing a neglected coronary heart disease risk factor in an HMO: exercise counselling and fitness testing at group health cooperative. HMO practice Vol. 10, No.3	Not an economic evaluation study
Tubergen et al (2002). Cost effectiveness of combined Spa-Exercise Therapy in Ankylosing Spondylitis: A Randomised Controlled Trial. Arthritis Care & Research. Vol.47; No.5; 459-67	Not brief advice : A spa therapy Irrelevant patient group: Adults with ankylosing spondylitis
Patrick et al (2001). Economic Evaluation of Aquatic Exercise for Persons With Osteoarthritis. Medical Care. Vol. 39. No.5 413-24	Not brief advice : Supervised aquatic classes Irrelevant patient group: Adults with osteoarthiritis
Munro et al (2004). Cost effectiveness of a community based exercise programme in over 65 year olds: cluster randomised trial. J Epidemiol Community Health; 58:1004–1010. doi: 10.1136/jech.2003.014225	Not brief advice : Supervised exercise classes
Coupe et al (2007).The cost effectiveness of behavioral graded activity in patients with osteoarthritis of hip and/or knee. Ann Rheum Dis. 66(2): 215–221	Not brief advice : Exercise training Irrelevant patient group: Adults with osteoarthiritis
Chen et al (2008).Health services utilization and cost utility analysis of a walking program for residential community elderly. Nursing Econ. ;26(4):263-9.	Not OECD country: Taiwan Not brief advice : Supervised exercise
Bulthuis et al (2008).Cost-Effectiveness of Intensive Exercise Therapy Directly Following Hospital Discharge in Patients With Arthritis: Results of a Randomized Controlled Clinical Trial. Arthritis & Rheumatism (Arthritis Care & Research) Vol. 59, No. 2, pp 247–254	Not brief advice : An exercise therapy with a education segment that focused on management of arthritis and not exercise Irrelevant patient group: Adults with flare in disease activity or needing an elective knee or hip replacement
Robertson et al (2001).Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls: Controlled trial in multiple centres. BMJ Volume 322	Not brief advice : A supervised exercise program

Paper	Reason(s) for exclusion
Munro et al (1997). Physical activity for the over-65s: could it be a cost-effective exercisefor the NHS? J Public Health Med. 19(4):397-402.	Not a brief advice: Exercise classes
McCrone et al (2004).Cost- Effectiveness of cognitive behavioural therapy, graded exercise and usual care for patients with chronic fatigue in primary care. Psychol Med. ;34(6):991-9.	Not brief advice : Exercise training Irrelevant patient group: Adults with chronic fatigue
Sogaard et al (2008). Cost-effectiveness evaluation of an RCT in rehabilitation after lumbar spinal fusion: a low-cost, behavioural approach is cost-effective over individual exercise therapy. Eur Spine J. 2008 February; 17(2): 262–271.	Not brief advice : Rehabilitation programme Irrelevant patient group: Adults with chronic back pain
UK Beam Trial Team (2004). United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. BMJ. ; 329(7479): 1377.	Not a brief advice: Exercise classes Irrelevant patient group: Adults with low back pain
Gusi et al (2008). Cost-utility of a walking programme for moderately depressed, obese, or overweight elderly women in primary care: a randomised controlled trial BMC Public Health 8*:*231	Not a brief advice: Exercise referral scheme
Richardson and Hawkins (2006). Cost-effectiveness of a supplementary class-based exercise program in the treatment of knee osteoarthritis. International Journal of Technology Assessment in Health Care ,22 : pp 84-89	Not a brief advice: Exercise classes Irrelevant patient group: Adults with knee osteoarthiritis
Whitehurst et al (2011). Cost-Effectiveness of Acupuncture Care as an Adjunct to Exercise- Based Physical Therapy for Osteoarthritis of the Knee. Physical Therapy May 2011vol. 91 no. 5 630-641	Not a brief advice: Acupuncture care Irrelevant patient group: Adults with knee osteoarthritis
Van den Hout et al (2005).Cost-Utility and Cost-Effectiveness Analyses of a Long-Term, High-Intensity Exercise Program Compared With Conventional Physical Therapy in Patients With Rheumatoid Arthritis. Arthritis & Rheumatism (Arthritis Care & Research)Vol. 53, No. 1,pp 39 – 47	Not a brief advice: Supervised exercise classes Irrelevant patient group: Adults with rheumatoid arthritis
Tan et al (2010).Cost-utility of exercise therapy in adolescents and young adults suffering from the patellofemoral pain syndrome. Scandinavian Journal of Medicine & Science in Sports. Volume 20, Issue 4, pages 568–579,	Not a brief advice: Exercise referral scheme with information on pain syndrome Irrelevant patient group: Adults with patellofemoral pain syndrome
Reed et al (2010). Economic Evaluation of the HF-ACTION Randomized Controlled Trial: An Exercise Training Study of Patients With Chronic Heart Failure. Circ Cardiovasc Qual Outcomes.3(4): 374–381.	Not a brief advice: Supervised exercise training Irrelevant patient group: Adults with left ventricular ejection fraction of 35% or less and class II to IV symptoms
Kuhr et al (2011).Cost-effectiveness of supervised exercise therapy in heart failure patients. Value Health 14(5 Suppl 1):S100-7	Not a brief advice: Supervised exercise therapy Not OECD country: Brazil
Gusi and Tomas-Carus (2008). Cost-utility of an 8-month aquatic training for women with fibromyalgia: a randomized controlled trial. Arthritis Research & Therapy, 10:R24 (doi:10.1186/ar2377)	Not a brief advice: Supervised exercise training therapy Irrelevant patient group: Adults with fibromylagia

Paper	Reason(s) for exclusion
Annemans et al (2007). Health economic evaluation of controlled and maintained physical exercise in the prevention of cardiovascular and other prosperity diseases. European Journal of Cardiovascular Prevention and Rehabilitation; 14(6): 815-824	Not a brief advice : Exercise sessions
McCarthy et al (2004).Supplementation of a home-based exercise programme with a class-based programme for people with osteoarthritis of the knees: a randomised controlled trial and health economic analysis. Health Technology Assessment 2004; Vol. 8: No. 46	Not a brief advice : Exercise training supplemented with classes and advice on arthritis Irrelevant patient group: Adults with knee osteoarthritis
Health England (2009). Prioritising investments in preventive health. Health England	Not brief advice: About strategies to prioritize interventions
Dangour et al (2011). Effect of a Nutrition Supplement and Physical Activity Program on Pneumonia and Walking Capacity in Chilean Older People: A Factorial Cluster Randomized Trial. PLoS Med 8(4): e1001023. doi:10.1371/journal.pmed.1001023	Not brief advice: Supervised exercise classes
Amarasinghe (2010). Cost-effectiveness implications of GP intervention to promote physical activity: evidence from Perth, Australia. Cost Effectiveness and Resource Allocation 2010, 8:10	Not brief advice: Subsidy program
Van Asselt (2011). Cost-effectiveness of Exercise Therapy in Patients with Intermittent Claudication: Supervised Exercise Therapy versus a 'Go Home and Walk' Advice. Eur J Vasc Endovasc Surg (2011) 41, 97e103	Irrelevant patient group: Adults with intermittent claudication
Sevick et al (2008). Cost-Effectiveness of Exercise and Diet in Overweight and Obese Adults with Knee Osteoarthritis. Medicine &Science in Sports & Exercise. Jun;41(6):1167-74.	Not brief advice: Supervised exercise training Irrelevant patient group: Adults with knee osteoarthritis.
Hersey et al (2012). The efficacy and cost-effectiveness of a community weight management intervention: A randomized controlled trial of the health weight management demonstration. Preventive Medicine 54 (2012) 42–49	Not brief advice: An internet based interactive program on diet and exercise
Wu et al(2011). Economic Analysis of Physical Activity Interventions. Am J Prev Med 2011;40(2):149 –158)	Not brief advice: Interventions covered: mass media campaign; motivational signs/messages/posters or adding music to stairwell at bank settings or shopping malls to encourage stairs use; pedometer based methods
Haines et al (2010). Multimodal exercise improves quality of life of women being treated for breast cancer, but at what cost? Randomized trial with economic evaluation. Breast Cancer Res Treat (2010) 124:163–175	Not brief advice: Mass media programme Irrelevant patient group: Patients with breast cancer
Hollinghurst et al (2008). Randomised controlled trial of Alexander technique lessons, exercise, and massage (ATEAM) for chronic and recurrent back pain: economic evaluation. BMJ 2008;337:a2656	Irrelevant patient group: Patients with chronic or recurrent low back pain
Morris et al (2011). Function After Spinal Treatment, Exercise, and Rehabilitation. SPINE Volume 36, Number 21, pp 1807–1814	Not brief advice: An educational booklet is based on recovery from back pain operation
Ackermann et al (2006). An Evaluation of Cost Sharing to Finance a Diet and Physical Activity Intervention to Prevent Diabetes. Diabetes Care, Volume 29, Number 6, June 2006	Not brief advice: exercise classes

Paper	Reason(s) for exclusion
Lee et al (2007). A Non-randomised Controlled Trial of the Clinical and Cost Effectiveness of a Supervised Exercise Programme for Claudication. Eur J Vasc Endovasc Surg 33, 202e207 (2007)	Irrelevant patient group: Patients with claudication
Henchoz eta l (2010). Cost-utility of a three-month exercise programme vs usual care following multidisciplinary rehabilitation for chronic low back pain. J Rehabil Med 2010; 42: 846–852	Not brief advice: Supervised exercise sessions Irrelevant patient group: Patients with low back pain
Stevens et al (1998). Cost-effectiveness of a primary care based physical activity intervention in 45–74 year old men and women: a randomised controlled trial. Br J Sports Med;32:236-241 doi:10.1136/bjsm.32.3.236	Not brief advice: Exercise referral scheme
Cecchini et al (2010). Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. The Lancet Vol 376	Not brief advice. No hint of advice on exercise; it was a weight loss programme with outcomes measures as fat, cholesterol, blood pressure, and BMI.
Murray et al (2003). Effectiveness and cost of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular-risk. The Lancet, Volume 361, Issue 9359, Pages 717 - 725, 1 March 2003	Not brief advice: Blood pressure related interventions focusing on salt intake, cholesterol, and mass media campaigns.
Icks et al (2000)Clinical and cost-effectiveness of primary prevention of Type 2 diabetes in a 'real world' routine healthcare setting: model based on the KORA Survey 2000. *Diabetic Medicine* 24, 473–480	Not brief advice: Exercise classes or /and medication
Trueman et al (2010). Long-term cost-effectiveness of weight management in primary care. Int J Clin Pract. 2010 May;64(6):775-83. Epub 2010 Mar 29.	Not brief advice: Screening, medication, prescribed eating plans etc
Dzator et al (2004) A randomized trial of interactive group sessions achieved greater improvements in nutrition and physical activity at a tiny increase in cost. Journal of Clinical Epidemiology 57 (2004) 610–619	Not brief advice: Classes on exercise, nutrition and other lifestyle behaviour such as alcohol, smoking, stress management.

Appendix G: Overview of excluded papers that evaluated an intervention that had included an element of brief advice

Paper	Intervention	Patient population	Remarks
Sevick et al (2007). Cost-effectiveness of alternative approaches for motivating activity in sedentary adults: Results of Project STRIDE. Preventive Medicine 45 (2007) 54–61	Participants were randomized to one of three groups: (1) telephone-based intervention [Phone]; (2) print-based intervention [Print]; or (3) contact control..... Counselling messages aimed to enhance the participant's perceived capability to engage in and sustain physical activity, and were tailored to the participant's motivational stage. Surveys were scanned by a computer expert system, and feedback forms were generated containing theory-based counselling messages individualized to the participants' situation, based on their responses. Feedback was communicated to participants via mail or telephone with contacts occurring 14 times over 12 months. Phone participants were contacted directly by a health educator. Print participants were mailed the feedback reports generated by the computer expert system. The contact control group received mailings unrelated to physical activity on the same schedule as Phone and Print participants, as well as a packet of health information at the beginning of the study.	Healthy but sedentary US adults ages 18 to 65 years	This was intensive counselling and the effect and costs of initial brief advice was not identifiable and possible to disentangle.
Van der Bruggen et al (2009). Cost-Effectiveness of Lifestyle Modification in Diabetic Patients. Diabetes Care 32:1453–1458, 2009	Counselling for Physical Activity (CPA): a 2-year structured counselling intervention to promote physical activity evaluated at 24 months. Further information via the original effectiveness study (Loreto et al 2003) revealed the intervention as: The intervention group received an additional 30 min of structured counseling recommending physical activity. In the intervention group, the initial counseling session	Dutch people with type 2 diabetes	This was intensive counselling and the effect and costs of initial brief advice was not identifiable and possible to disentangle.

Paper	Intervention	Patient population	Remarks
	was followed, 1 month later, by a telephone call at home and, every 3 months, by an appointment of ~15 min in the Outpatient Diabetes Clinic. The telephone call was made by the same physician who conducted the initial counseling to determine whether the patient was performing the physical activity as programmed. If the patient referred to problems or obstacles to physical activity, the phone call was prolonged to ~15 min to reinforce the points discussed in the initial counseling session.		
Cobiac et al (2009). Cost-Effectiveness of Interventions to Promote Physical Activity: A Modelling Study. PLoS Med 6(7): e1000110. doi:10.1371/journal.pmed.1000110	GP referral to exercise physiologist: Screening questionnaires are mailed to all patients on the GP patient list; inactive patients are invited to attend a series of counselling sessions (3 series: individualized physical activity advice, reinforced at three and six months) with an exercise physiologist at their local general practice.	Sedentary Australian adults aged 60 years plus	This was intensive counseling and the effect and costs of initial brief advice was not identifiable and possible to disentangle.
Lindgren et al (2003) Cost-effectiveness of primary prevention of coronary heart disease through risk factor intervention in 60-year-old men from the countyof Stockholm—a stochastic model of exercise and dietary advice. Preventive Medicine 36 (2003) 403–409	Participants were randomized to dietary advice, exercise, dietary advice and exercise, or a control group…. After randomization, they received advice on diet and/or exercise from the physician. Patients in the exercise groups were asked to maintain a prepared activity log and were given the opportunity exercise groups.	Swede men aged 35–60 years	The intervention had 3 components: a brief advice, keeping an activity log, exercise groups. 54% of participants in the exercise alone group joined the exercise groups. Although the cost of running the exercise groups can be disentangled (as that cost is given as well as the total cost of the whole intervention) the effect cannot be disentangled. Nonetheless, the cost/effect of keeping the activity log and brief advice cannot be disentangled.

Paper	Intervention	Patient population	Remarks
Johannesson et al (1991). Cost-benefit analysis of non-pharmacological treatment of hypertension. Journal of Internal Medicine: 230; 307-12	There two groups. Each patient saw a nurse monthly, and a doctor 6 month intervals, and was provided with equipment for home BP measurement. The only difference between the 2 groups was that a treatment programme that included dietary advice, , relaxation, stress management, and physical activity was administered to one of the groups.	Adults aged 30-69 years on antihypertensive drug therapy.	Difficult to disentangle the different components from physical activity (assuming it constituted brief advice given there was dietary advice)
The Diabetes Prevention Program Research Group (2003). Within-Trial Cost-Effectiveness of Lifestyle Intervention or Metformin for the Primary Prevention of Type 2 Diabetes. Diabetes Care.; 26(9): 2518–2523	1. A 16-lesson curriculum and subsequent individual sessions (usually monthly) and group sessions with case managers were designed to reinforce the behavioural changes via changes in diet and physical activity. 2. A medication interventions (metformin and placebo) were initiated at a dose of 850 mg taken orally once a day. Standard lifestyle recommendations were provided through written information and an annual 20- to 30-min individual session that emphasized the importance of a healthy lifestyle	Participants with impaired glucose tolerance who were at least 25 years of age and who had a BMI of 24 kg/m2 or higher (22 kg/m2 in Asian Americans).	Not brief advice but exercise/diet classes, or/and medication intervention. Assuming the classes included an element of brief advice still presents the problem with disentangling the effect of the initial brief advice from the rest of the individual classes and group sessions.
Tento et al (2002). Lifestyle intervention by group care prevents deterioration of Type II diabetes: a 4-year randomized controlled clinical trial. Diabetologia (2002) 45:1231–1239	Educational sessions held by physicians and an educationist acting as facilitators. The programme included: the burden of overweight, choosing food, meal planning, physical exercise, checking and improving metabolic control, smoke cessation, assuming medication and preventing complications. This curriculum, divided into four sessions, was repeated in years 1-2 and then spread over seven sessions in years 3-4 to avoid excessive repetition and allow in-depth discussion and learning.	Adults aged 61 years with type II diabetes	This appears to be classes on a plethora of topics including smoking cessation, medication, exercise, and aspects of meal planning, choosing food etc. If we were to treat the classes as advice sessions, it is difficult to disentangle the effect of the brief advice on physical activity.
Fosters et al (2011). Cost – effectiveness of diet and exercise interventions to reduce overweight and obesity. International Journal of Obesity. 35, 1071-78	1. Group-based and individual meetings with dieticians and exercise psychologists to emphasise consumption of foods with low-fat intake and participation in exercise. Participants also kept diaries on exercise and food intake 2.Diet only intervention that emphasises consumption of foods with low-fat intake	Overweight and obese adults (20 years and above)	Both diet and exercise intervention composed with diary keeping and meetings. Unclear if the meetings are assumed to be advisory, even so, they were on both diet and exercise and hence difficult to isolate the effect of advice on exercise. More so, the

Paper	Intervention	Patient population	Remarks
			effect of the diary keeping.
Dalziel et al (2006). Cost utility analysis of physical activity counselling in general practice. Australian and New Zealand Journal of Public Health. Vol.. 30 No. 1	The intervention involves written physical activity advice developed collaboratively with the patient in the general practice setting. The advice is followed by telephone support by an exercise specialist on three occasions over the following three months to each intervention patient and who also sent written material including newsletters.	Sedentary adults aged between 40 and 79 years	initial brief advice was not identifiable and not possible to disentangle the effect and cost for it
Elley et al (2004). Cost-effectiveness of physical activity counselling in general practice. *N.Z.Med.J.* 117 (1207):U1216,	Study participants from intervention practices prompted the general practitioner or nurse to give verbal advice to increase physical activity with activity goals written on a Green Prescription. Patients from control practices received usual care. The Green Prescription was then faxed to exercise specialists in Sports Foundations who provided telephone support on three occasions over the following three months to each intervention patient and sent written material including newsletters.	Sedentary adults aged between 40 and 79 years	initial brief advice was not identifiable and not possible to disentangle the effect and cost for it

Paper	Intervention	Patient population	Remarks
Elley et al (2011). Cost-effectiveness of exercise on prescription with telephone support among women in general practice over 2 years. Br J Sports Med;45:1223–1229	The intervention was 10 min of brief advice and a written exercise prescription given by a primary healthcare nurse, with telephone support for 9 months (average five calls lasting 15 min each) from an exercise facilitator from a regional sports trusts and a half-hour face-to-face session with the nurse at 6 months.	Sedentary woman aged between 40 and 74 years	This was brief advice followed by later telephone support for 9 months as well as a 30 min session at 6 months with a nurse and the effect and costs of initial brief advice was not identifiable and possible to disentangle Although the direct costs are separated for the nurse and the exercise facilitator; the indirect cost is not separable by the components. The effect was not separable at all.
Segal et al (1998). Cost-effectiveness of the primary prevention of non-insulin dependent diabetes mellitus. Health promotional International. Vol.13. No.3	Healthy lifestyle advice, by specially recruited primary care physicians, supported by printed material .	45-69 year olds	This is a lifestyle advice and it's not clear from the paper which lifestyle behaviour(s) were the focus of the advice. It is probable they include diet and physical activity given the focus of the paper was on the prevention of diabetes. Assuming it includes physical activity, it would still be difficult to disentangle the impact of physical activity component.
Finkelstein et al (2002). Cost-effectiveness of a cardiovascular disease risk reduction program aimed at financially vulnerable women: The Massachusetts WISEWOMAN project	Intervention included CVD screening, lifestyle counselling session, further counselling on improving physical activity and nutrition	Adult women (aged 50 years or older) who are financially disadvantaged	The intervention is more than brief advice on physical activity and it is difficult to isolate the effect of the brief advice on physical activity component of the intervention.

Paper	Intervention	Patient population	Remarks
Rome et al (2010) Willingness to pay for health improvements of physical activity on prescription. Scandinavian Journal of Public Health, 2010; 38: 151–159	Physical activity on prescription intervention that included two exercise sessions a week in a group on a moderate-intensity level, education about physical activity and motivational counselling and additionally exercised once a week on their own.	Swedish adults (20-80 years)	This involves more than just brief advice as it includes group exercise session, and education. Therefore cannot disentangle the counselling component from the results.
Roux et al (2008). Cost Effectiveness of Community-Based Physical Activity Interventions. Am J Prev Med 2008;35(6):578–588)	Intensive lifestyle-modification program for adults at high risk of developing type 2 diabetes, involving exercise testing, written information, and individual counseling sessions; a 16-lesson curriculum covering diet, exercise, and behavior modification; individual and group exercise sessions; and in person visits and phone calls to participants.	Adults at risk of developing type 2 diabetes	Involves methods other than counselling e.g. exercise testing. Methods geared towards both diet and exercise behaviour change. Intensive intervention
Dalziel and Segal (2007). Time to give nutrition interventions a higher profile: cost-effectiveness of 10 nutrition interventions. Health Promotion International, Vol. 22 No. 4	Dietician group: 6 counseling sessions within 12 months; initial consultation 45 min, 15 min for follow-up; sessions focused on good nutrition and exercise with individualized advice provided; Doctor plus dietician group: above plus GP record flagged with progress measurements; initial consultation with general practitioner plus two other visits in 12 months of 5 min each	Adults at risk of obesity	These were intensive counseling sessions that focused on both exercise and diet; with the primary outcome as weight loss. Thus the study will be added to the pot of studies with issues with disentangling.
Van Keulen et al (2010). Cost-effectiveness of tailored print communication, telephone motivational interviewing, and a combination of the two: results of an economic evaluation alongside the Vitalum randomised controlled trial. International Journal of Behavioural Nutrition and Physical Activity. 7.64. 2010.	(1)Tailored print communication group received four printed, tailored letters; the first was approximately 4 pages and addressed physical activity, the second and fourth were about 5 pages and focused on fruit and vegetables, and the third was around 3 pages and dealt again with physical activity. (2)Participants in the telephone motivational interviewing group received four telephone calls based on motivational interviewing. Participants chose the order of the conversation topics in the first and third interviews; if physical activity was preferred in the first interview, fruit and vegetable consumption was discussed in the second, and vice	Mean age of the sample was 57.15 years (SD = 7.13), half of the participants (52%) were classified as hypertensive.	The motivational interviews covers both exercise and diet hence making it difficult to disentangle the effect of the interview related to exercise alone

Paper	Intervention	Patient population	Remarks
	versa. (3)combination of both 1 and 2		

Appendix H: Completed data extraction forms for the reviewed papers

BLOCK 1: BACKGROUND INFORMATION OF STUDY	
Reference number	EE01
Reviewed by	NA
Date of review	13/05/12
Title	Modelling the cost-effectiveness of physical activity interventions
Author(s)	MATRIX
Aim of study	To determine the cost-effectiveness of 4 types of intervention aimed at increasing physical activity levels: brief interventions; pedometers; exercise referral schemes; walking and cycling programmes in the community. Data constraints however allowed the economic evaluation to be conducted for only brief interventions and pedometers. All 6 brief interventions modelled include some element of 'brief advice'. However, the effectiveness of the programmes evaluated can't only be attributed to the brief advice component. Taking each contributor to effectiveness evidence: - Swinburn 1998 and Harland (1999) specifically did not evaluate the effectiveness of brief advice as brief advice was the control arm; Harland et al (1999) evaluated giving up to 6 counselling sessions as well as leisure centre vouchers and Swinburn (1998) giving a written prescription for exercise - Petrella (2003) evaluated a step test, patient counselling as well as 3 follow up appointments against a comparator of 'general advice' (which might be closest to the brief advice option and therefore not evaluated) - Elley (2003), Smith (2000), and Hillsdon (2002) all evaluated brief interventions against usual care. The additions beyond brief advice were: 3 phone calls by an exercise specialist (Elley, 2003); 6 follow up phone calls between 2-34 weeks (Hilldson 2002) and receipt (or not) of a written pamphlet (Smith 2000) - Of these interventions, Smith (2000) most closely evaluates a 'pure' brief advice intervention
Year of publication	2006
Origin of study (country, including developer or developing; public of	UK; NHS

private health system)	
Source of funding for study (gov (NHS), voluntary/charity, pharmaceutical) *Note anything about role of funders*	NICE

BLOCK 2: SAMPLE/INTERVENTION	
Characteristics of patients	
Diagnosed condition	Whilst the modelling study indicated sedentary population, the original intervention (Smith et al 200) covered both inactive (58%) and active people
Definition of 'sedentariness'	Not meeting the recommended level of participation (Doing less than 5*30 min of moderate intensity exercise/ 3*20 min of vigorous intensity exercise per week)
Gender	Male; Female (60%)
Age	25 and 65 years old
Ethnicity	16% non-English Speakers
Other details given	50% had educational attainment up to 10 years 'The model was run for the only population groups for which the effectiveness studies collected data" "Little is known of the demographic characteristics of the participants….. However, it is likely that they include few vulnerable groups most at risk of the health states that physical activity is designed to prevent. Furthermore, these vulnerable groups are likely to need more intensive interventions than the participants in the studies and are likely to have a higher rate of relapse" (p4)
Sample size Total n = Intervention n = Control n =	1142 Intervention 1 (n=380); Intervention 2 (n=376) 386
Description of intervention	

Design (what delivered, by whom)	Participants received one of two interventions: (a)written prescription (stage based advice) by a GP during consultation (intervention 1); and (b)randomised to either no further intervention or mailed stage based pamphlet after two weeks(intervention 2).
Setting (e.g. primary school, community centre etc)	Primary care
Location (urban / rural)	Sydney region (urban)
Duration (how often, how long for)	It was a one- time advice (with intervention 2 getting booklets 2 weeks later). Follow up measurements were conducted at baseline, 6–10 weeks and seven to eight months
Exercise program	Advice on exercise by GP (possibly plus booklets)
Description of comparator/control group	
Design (what delivered, by whom)	Usual care at general practice
Setting (e.g. primary school, community centre etc)	Primary care
Location (urban / rural)	Sydney region (urban)
Duration (how often, how long for)	Usual care (measurements similar to intervention)

BLOCK 3: ANALYSIS/RESULTS	
Scope	
Form of economic evaluation	Cost utility analysis through decision tree modelling
Perspective of analysis	NHS and personal social services perspective
Time horizon of analysis	lifetime
Outcomes	
What primary outcome was reported (how were they specified in practice)?	Physically active: Achieved an increase in time spent physically active of 60 minutes (measured through through patient recall; questionnaire was validated)

(note whether these were validated or not and whether objective or subjective)	
What secondary outcomes were reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	QALY's (via EQ-5D scores to determine the loss in quality of life avoided by avoiding health states i.e. CHD, stroke, type II diabetes and colon cancer combined with impact of activity levels on participants change of experiencing CHD, stroke, diabetes and colon cancer). Treatment cost savings to NHS.
Data sources for primary outcome measure	1. Literature reviews 2. Assumptions (e.g. a 50% drop off in the physical activity outcomes identified, physical activity outcomes identified are maintained over a period sufficient to ensure that the health benefits associated with that level of activity are attained).
Data sources for secondary outcome measures	1. Harvard cost-effectiveness analysis registry 2. Literature reviews 3. British Heart Foundation database 4. Diabetes UK database 5. National dataset (i.e. HSE 1996) 6. Office for National Statistics (ONS) database
Time horizon over which outcomes a) measured and b) estimated or predicted	lifetime
Discount rate	3.5%
Costs	
What costs were reported?	1. Cost of treating health states 2. Costs of intervention: cost of GP time-training; cost of GP time-intervention; phone follow ups; phone interviewer's time; cost of mailers and brochures 3. Cost savings: total health care costs saved due to health states avoided
Data sources for costs measures	1. Literature review 2. Yorkshire and Humberside Public Health Authority 3. Diabetes UK database 4. Department of Health **5.** Various tariffs

	6. A range of assumptions: • where the person undertaking the intervention is not specified, it is assumed to be delivered by a practice nurse (£28/hour); • where the person undertaking follow-up telephone calls and investigations is not specified, it is assumed to be a heath assistant (£18/hour); • the input of a exercise specialist and GP trainer is valued using the hour rate of a physiotherapist (£44); • it is assumed that vouchers for one episode of exercise activities, such as swimming, are worth £5;
Discount rate?	3.5%
Time horizon over which costs a) measured and b) estimated or predicted	Lifetime
Year of costing	2005
Currency	UK pounds sterling
Modelling approach used (if used, assess with questions in Block 6) IF the study is deemed applicable)	Decision tree model
Sensitivity analysis	
Type of sensitivity analysis	One-way deterministic sensitivity analysis
What variables were used in sensitivity analysis?	1. Effects of different levels of relative risks on cost per QALY gained. The relative risk factor for each of the four health states was assumed to be identical and then varied between 1.0 and 2.0 2. Drop-off rates in physical activity (from 0-100%) 3. NHS staff used to deliver intervention 4. A range of annual treatment costs from £50 to £5,000
Findings from sensitivity analysis	The intervention remains cost-effective regardless of assumptions tested
Details of any other secondary analysis undertaken	n/a
Main results	
Outcomes	3% of participants achieved an increase in time spent physically activity active of 60 minutes QALY gained per person : 0.23 (intervention 1); and 0.07 (intervention 2)
Costs	1. Cost of intervention 1 & 2 was £37 per person; £29 per person respectively 2. Cost per person/year for treating type II diabetes (£3,006); CHD (£1,414), and stroke (£2,053) 3. Total cost saving per person : £469 (intervention 1); and £137 (intervention 2)
ICERs	1. Cost of getting one person to increase physical activity level was £761(for intervention 1) and £2,039 (for intervention 2)

	2. Cost per QALY gained: £159 (intervention 1); and £425 (intervention 2) 3. Cost saving per QALY gained: £1,877 (intervention 1); and £1,611(intervention 2)
Other summary statistics	n/a

BLOCK 4: CHALLENGES	
Author-stated limitations	The assumptions surrounding the parameters for the model may have underestimated or overestimated the cost per QALY gained estimates; The assumptions were: 1. 50% of participants maintain their physical activity levels long enough to benefit from the health states associated with those physical activity levels. 2. Physical activity is the only risk factor that influences the health states 3. It is unlikely that chance of experiencing health states is independent 4. Does not consider the costs to the health service of increased longevity as a result of interventions 5. Negative effects of physical activity are not considered 6. Excludes the positive effect of physical activity on other health outcomes e.g. mental health 7. Costs of treating colon cancer was not identified 8. Taking costs from effectiveness studies only results in underestimates (p13) 9. No accounting for impact on inequalities 10. The effect of the following assumptions is difficult to predict (although results suggest that the results are not sensitive) • The model uses the average annual cost of treating health states. This assumes that, had the participants suffered health states in the absence of the intervention, they would have had the same cost distribution as those suffering from the health state in the nation as a whole; • participants' baseline risk of suffering health states and the change in risk accompanying improvements in physical activity are the same as the participants in the relative risk studies used to estimate the impact of physical activity on health; • QALY for colon cancer is the same as that for cancer; • Age of onset of the four health states modeled.
Author-stated strengths	NA
Strengths identified by review team	1.Extensive data search for data to populate future models 2. Analyzed different variants of physical activity interventions and compared their cost effectiveness
Evidence gaps and/or recommendations for future	1. Research to produce more effectiveness data plus decay rate associated physical activity as result of the interventions

research	2. Incorporation of broader outcomes associated with physical activity (data permitting) 3. More rigorous analysis of uncertainty 4. Development of Markov model

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
APPLICABILITY (relevance to specific topic review questions and the NICE reference case)						
1.1 Is the study population appropriate for the topic being evaluated?		✓				Missing ages below 40 years
1.2 Are the interventions appropriate for the topic being evaluated?	✓					
1.3 Is the system in which the study was conducted sufficiently similar to the current UK context?		✓				Costs data from UK and effectiveness data from Australia
1.4 Was/were the perspective(s) clearly stated and what were they?	✓					
1.5 Are all direct health effects on individuals included, and are all other effects included where they are material?		✓				Other outcomes related to disease conditions such as musculoskeletal and mental health (and disbenefits e.g.falls) were not accounted for due to data constraints. Nonetheless, given the positive impact of physical activity on such conditions, their inclusion would not have altered the decision making on these interventions as they were already

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
						cost-effective
1.6 Are all future costs and outcomes discounted appropriately?	✓					
1.7 Is the value of health effects expressed in terms of QALYs?	✓					
1.8 Are costs and outcomes from other sectors fully and appropriately measured and valued?			✓			Impact of exercise on other sectors not accounted e.g. productivity
OVERALL JUDGMENT (circle one)	Directly applicable Not applicable		**<u>Party applicable</u>**			
Other comments on applicability						
STUDY LIMITATIONS regarding methodology *(for completion only once declared the study is sufficiently applicable)*						
2.1 Does the model structure adequately reflect the nature of the topic under evaluation?			✓			Model structure is not time-based (e.g. Markov model) and hence could not adequately account for decay rates of physical activity
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?	✓					
2.3 Are all important and relevant outcomes included?		✓				Missing adverse benefits. Missing short-term benefits. Limited number of impacts of exercise by disease. However, doubtful robust information is available

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
						on this.
2.4 Are the estimates of baseline outcomes from the best available source?	✓					
2.5 Are the estimates of relative 'treatment' effects from the best available source?	✓					
2.6 Are all important and relevant costs included?		✓				Missing costs related to adverse events. Missing costs to participants.
2.7 Are the estimates of resource use from the best available source?	✓					
2.8 Are the unit costs of resources from the best available source?	✓					
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?	✓					
2.10 Are all important parameters whose values are uncertain subjected to appropriate sensitivity analysis?			✓			The sensitivity analysis was not comprehensive and appears to be one-way and excluded probabilistic sensitivity analysis
2.11 Is there any potential conflict of interest?			✓			
OVERALL ASSESSMENT (circle one)	Minor limitations **Potentially serious limitations** Very serious limitations					
Other comments on limitations	(i)Insufficient exploration of uncertainty around estimates despite the huge assumptions used in the model (ii) No explicit recognition of time in modelling					

BLOCK 6: OVERALL GRADING(based on block 5)	
Quality score: (++, +, −)	+
Applicability	**Partially applicable**

BLOCK 1: BACKGROUND INFORMATION OF STUDY	
Reference number	EE02
Reviewed by	NA & JFR
Date of review	15/05/12
Title	"Cost-effectiveness of interventions to improve moderate physical activity: A study in nine UK sites
Author(s)	Pringle et al
Aim of study	'This study measured change in moderate physical activity (MPA) in seven community-based intervention types, costs and cost-effectiveness of the interventions, and possible explanations for cost variation'. A set of interventions were examined: 1. Advice for health workers on moderate physical activity for older adults/community 2. Motivational interviews for young people/Asian young people in community 3. Motivational interviews for older adults including Black and Minority ethnic in community 4. Motivational interviews for adults in primary care settings 5. Motivational interviews phone call for adults/older adults attending classes/community Intervention 1 is the focus of this review because it is potentially a brief advice (as it is an advice) whilst the rest appear to be series of advice (i.e. motivational interviews).
Year of publication	2010
Origin of study (country, including developer or developing; public of private health system)	9 Primary Care Trusts in the UK

Source of funding for study (gov (NHS), voluntary/charity, pharmaceutical) *Note anything about role of funders*	Department of Health, Natural England and Sport England.

BLOCK 2: SAMPLE/INTERVENTION	
Characteristics of patients	
Diagnosed condition	Not meeting moderate physical activity(MPA) guidelines (at least 30 minutes five times a week for adults and for at least 60 minutes each day for young people) in areas of high need
Definition of 'sedentariness'	Those not meeting the recommendations for physical activity
Gender	Males and Females (predominately Females; 62.5%)
Age	10-65 years plus
Ethnicity	White British (87.5%), Black (12.5%)
Other details given	Managerial and professional socio-economic status (63.1%); semi-routine and routine socio-economic status (36.9%)
Sample size Total n = Intervention n = Control n =	46 (for relevant intervention on advice) A pretest-posttest design, hence no control group
Description of intervention	
Design (what delivered, by whom)	Advice by health workers on MPA for older adults/community
Setting (e.g. primary school, community centre etc)	Community-based
Location (urban / rural)	Whilst the geography of the areas (in terms of urbanization) was not reported, authors stated the interventions took place in areas of high health need
Duration (how often, how long for)	Such data was not reported, the main project report-DH, 2007 indicates that duration of these interventions was 2 years

	.
Exercise program	Advice on MPA
Description of comparator/control group	
Design (what delivered, by whom)	Same group of people,1 week before the intervention
Setting (e.g. primary school, community centre etc)	Same setting
Location (urban / rural)	n/a
Duration (how often, how long for)	n/a

BLOCK 3: METHODS/RESULTS	
Scope	
Form of economic evaluation	Cost analysis. Although cost- effectiveness analysis (cost per completer improving MPA) and cost-utility analysis (cost per QALY; NHS cost savings) were also conducted, no findings were reported for the intervention under focus here
Perspective of analysis	NHS
Time horizon of analysis	Lifetime (CUA), unclear (CEA), average monthly cost over 2 year period(CA)
Outcomes	
What primary outcome was reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	MPA change (median metabolic equivalent (MET)-minutes/week): This was assessed with a subjective measure (though validated) via completed modified versions of interview administered/diary-based questionnaires. Adults (18+ years) completed the short form International Physical Activity Questionnaire.
What secondary outcomes were reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or*	QALY's (via EQ-5D scores to determine the loss in quality of life avoided by avoiding health states i.e. CHD, stroke, type II diabetes and colon cancer combined with impact of activity levels on participants change of experiencing CHD, stroke, diabetes and colon cancer). Treatment cost savings to NHS.

subjective)	
Data sources for primary outcome measure	Self-reports of frequency, intensity and duration collected via diary and questionnaire. Data collected for a typical week prior to the intervention beginning (baseline activity) and for a series of typical weeks, which were averaged, during the intervention (intervention activity).
Data sources for secondary outcome measures	Literature reviews; Office of National Statistics; British Heart Foundation; Yorkshire and Humberside PHO; Health Survey for England 2006
Time horizon over which outcomes a) measured and b) estimated or predicted	MPA change(unclear); QALY & future cost savings to NHS: lifetime of intervention participants
Discount rate	Not reported
Costs	
What costs were reported?	Cost of implementing intervention: including: personnel, training, premises, transport, equipment, publicity and other running costs Costs of treating health states
Data sources for costs measures	Cost of implementing intervention: Quarterly interviews with intervention managers (n = 9), undertaken between 2004–2006, Costs of treating health states: Diabetes UK; Cancer Research UK; Health Survey for England 2003: Department of Health.
Discount rate?	3.5%
Time horizon over which costs a) measured and b) estimated or predicted	Cost of implementing intervention over a 2 year period: monthly Costs of treating health states: annual treatment costs were collected and extrapolated over lifetime within the model
Year of costing	2003
Currency	British pounds sterling
Modelling approach used (if used, assess with questions in Block 6)	Decision tree model

IF the study is deemed applicable)	
Sensitivity analysis	
Type of sensitivity analysis	One way sensitivity analysis
What variables were used in sensitivity analysis?	values of relative risk, cost of treatment of health states; proportion of participants maintaining physical activity levels
Findings from sensitivity analysis	Findings of sensitivity analysis was consistent with baseline analysis (ie intervention was cost effective)
Details of any other secondary analysis undertaken	n/a
Main results	
Outcomes	86% of completers who were sedentary or lightly-active at pre-intervention achieved MPA guidelines post-intervention (results were reported for the broader category of intervention (i.e. motivational interviews) that the intervention under focus was part of).
Costs	Average cost per month of implementing the intervention was £1,216; cost per participant attending intervention was £819.
ICERs	Whilst no such results was reported for the intervention under focus results for broader category of intervention (i.e. motivational interviews) shows that the cost per completer improving MPA as between £2,659 and £2,789 Cost per QALY was £47 to £229 and NHS cost savings per completer was £3,036 to £3,286
Other summary statistics	n/a

BLOCK 4: CHALLENGES	
Author-stated limitations	1. A pre- and post-intervention design used to measure the effect of intervention types raises the possibility that changes in MPA may be due to factors other than the intervention. 2. Low sample sizes (only 10% provided pre and post data) 3. Variations in the sample sizes of completers versus engagers and high attrition rates in both attendance and data 4. The low number of completers relative to those who engaged interventions highlights the need to adopt strategies that maximize both the quality and quantity of data 5. All effectiveness data was based on self-report (from participants and providers) These above reasons lead to concerns about self-selection bias 6. No covariates were controlled for, which is a particular issue in the presence of self-selection bias 7. Effectiveness was assessed only as a 'snap shot' over short periods of time 8. The data may have been affected by seasonal variations 9. A number of assumptions made in estimating the long-term health effects of changes in physical activity levels. For example, it was assumed that 50 per cent of those who achieved increases in MPA maintain this increase. 10. The estimates of change in MPA are assessed from self-reports, and changes in MPA are only assessed for completers. Nothing is said about those who engaged, but who did not complete the intervention. 11. A separate community survey did not show evidence of effectiveness (although there were concerns about the timing and relevance of data collection)
Author-stated strengths	1. A mixed method approach that complimented a comprehensive CEA, 2.prospective recording of costs, 3.MPA evaluation across a range of intervention types located in areas of high health need, 4. Validated self report and the use of screened data for completers. 5. Even with such a low completion rate (*n* = 1,051), the interventions in this study were cost-effective
Strengths identified by review team	1.UK study looking at the evaluation of 'live' local exercise interventions 2.Policy relevant study as the outcome measure was reported as a policy relevant indicator (meeting the recommended level of physical activity) 3. Analysed different variants of physical activity interventions and compared their cost effectiveness 4.Conducting both cost effectiveness and cost utility analysis
Evidence gaps and/or recommendations for future research	1. Present methods for dealing with missing data and indicate methods of sample selection 2. Ensure statistical testing of effectiveness data 3. Research to investigate variations in cost-effectiveness by different delivery mechanisms of similar interventions as this may be useful in designing most efficient interventions 4. More robust designs to get effectiveness estimate such as RCT 5. Cost effectiveness analysis that compares intervention to relevant groups such as usual care

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
APPLICABILITY (relevance to specific topic review questions and the NICE reference case)						
1.1 Is the study population appropriate for the topic being evaluated?				✓		
1.2 Are the interventions appropriate for the topic being evaluated?		✓				As per design the study did not consider a relevant control group such as usual care in the primary care/community settings
1.3 Is the system in which the study was conducted sufficiently similar to the current UK context?	✓					
1.4 Was/were the perspective(s) clearly stated and what were they?	✓					
1.5 Are all direct health effects on individuals included, and are all other effects included where they are material?		✓				Other outcomes related to disease conditions such as musculoskeletal and mental health (and disbenefits) were not accounted for due to data constraints. Nonetheless, given the positive impact of physical activity on such conditions, their inclusion would not have altered the decision making on these interventions as they were already cost-effective.
1.6 Are all future costs and outcomes discounted appropriately?	✓					
1.7 Is the value of health effects expressed in terms of QALYs?		✓				Although QALYs were expressed for other interventions, it was not for the intervention under focus here.
1.8 Are costs and outcomes from other sectors fully and appropriately measured			✓			Impact of exercise on other

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
and valued?						sectors are not accounted for e.g. increases productivity were excluded
OVERALL JUDGMENT (circle one)	Directly applicable			**Party applicable**		Not applicable
Other comments on applicability						
STUDY LIMITATIONS regarding methodology *(for completion only once declared the study is sufficiently applicable)*						
2.1 Does the model structure adequately reflect the nature of the topic under evaluation?			✓			Model structure is not time-based (i.e. Markov model) and thus effects of decay rate of physical activity was not sufficiently accounted for
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?				✓		Not clear how long the intervention was
2.3 Are all important and relevant outcomes included?		✓				Outcomes related to disease conditions such as Musculoskeletal and mental health were not accounted for due to data constraints. Nonetheless, given the positive impact of physical activity on such conditions, their inclusion would not have altered the decision making on these interventions as they were already cost-effective
2.4 Are the estimates of baseline outcomes from the best available source?			✓			Validity issues with study design- prettest and posttest intervention design

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
2.5 Are the estimates of relative 'treatment' effects from the best available source?			✓			Validity issues with study design- prettest and posttest intervention design
2.6 Are all important and relevant costs included?		✓				Cost data was collected retrospectively from recall hence potential issues with accuracy
2.7 Are the estimates of resource use from the best available source?	✓					
2.8 Are the unit costs of resources from the best available source?	✓					
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?			✓			Interventions were not compared against each other. Analysis was restricted to within studies and across.
2.10 Are all important parameters whose values are uncertain subjected to appropriate sensitivity analysis?			✓			Sensitivity analysis was not comprehensive and appears to be one-way and excluded probabilistic sentivity analysis
2.11 Is there any potential conflict of interest?			✓			
OVERALL ASSESSMENT (circle one)	Minor limitations			Potentially serious limitations		**Very serious limitations**
Other comments on limitations	This is particularly due to: (a) the derivation of the effectiveness data may suffer from validity issues (b) the insufficient investigation of the uncertainty surrounding the parameters					

BLOCK 6: OVERALL GRADING(based on block 5)	
Quality score:	**-**

BLOCK 6: OVERALL GRADING(based on block 5)	
(++, +, −)	
Applicability	**partially**

More details can be found in an accompanying publication (Pringle et al. The national evaluation of LEAP: Final report on the national evaluation of the Local Exercise Action Pilots. Department of Health. 2006)

BLOCK 1: BACKGROUND INFORMATION OF STUDY	
Reference number	EE03
Reviewed by	NA & JFR
Date of review	16/05/12
Title	The cost of changing physical activity behaviour: evidence from a “physical activity pathway” in the primary care setting
Author(s)	Boëhler et al
Aim of study	To compare costs falling on the UK National Health Service (NHS) of implementing the physical activity care pathway using two different recruitment strategies and provides initial insights into the cost of changing physical activity behaviour.
Year of publication	2011
Origin of study (country, including developer or developing; public of private health system)	England, NHS
Source of funding for study (gov (NHS), voluntary/charity, pharmaceutical) *Note anything about role of funders*	Department of Health.

BLOCK 2: SAMPLE/INTERVENTION

Characteristics of patients	
Diagnosed condition	insufficiently active
Definition of 'sedentariness'	insufficiently active, i.e. failing to meet the current UK physical activity recommendation
Gender	Not reported
Age	16-74 years
Ethnicity	Not reported
Other details given	Having no contra-indications to exercise and that it was appropriate to discuss physical activity in the context of the consultation.
Sample size Total n = Intervention n = Control n =	411 for individual cost data and n=70 at baseline and n=46 at 3 months to assess for impact on behaviour There was no control group. Tthe study compared data from the costs of 2 different strategies of recruitment for brief interventions: (a) opportunistic recruitment (n = 2), which required health professionals to consider the eligibility of every patient for the intervention during routine practice, (b) disease register recruitment (n = 2), which involved contacting patients on the hypertension disease register, via a letter, phone call or text message, to invite them to take part.
Description of intervention	
Design (what delivered, by whom)	Intervention (brief intervention) was delivered by the trained professional either as an extension of the screening consultation (time permitting) or booked as a separate appointment. The intervention aimed to support patients to change their behaviour by giving advice, setting activity goals, and 'signposting' patients to local physical activity opportunities. The signposting options included local authority leisure services, private clubs, sports and dance, pedometer schemes, outdoor activities and exercise referral schemes. People were followed up at 3 months. This follow up appointment provided an opportunity to assess and reinforce the patients' change in lifestyle and to review the patients' activity goals schemes. This programme was designed as a direct response to NICE 2006 guidance on brief interventions for physical activity.
Setting (e.g. primary school, community centre etc)	4 primary care facilities
Location (urban / rural)	Urban (London)
Duration (how often, how long for)	The intervention and follow-up lasted upto 3 months per patient
Exercise program	Advice based on motivational interviews to encourage uptake of exercise. After this patients were signposted to local exercise opportunities.
Description of comparator/control group	

Design (what delivered, by whom)	The, uncontrolled, comparison made was between 2 methods of recruitment. All other aspects remained the same.
Setting (e.g. primary school, community centre etc)	n/a
Location (urban / rural)	n/a
Duration (how often, how long for)	n/a

BLOCK 3: ANALYSIS/RESULTS	
Scope	
Form of economic evaluation	Cost analysis and an 'illustrative' effectiveness analysis
Perspective of analysis	NHS
Time horizon of analysis	Individual patients were followed upto 3 months from baseline
Outcomes	
What primary outcome was reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	Change in physical activity behaviour (specified in practice as increase in time spent on moderate intensity activity to 150 minutes per week). Physical activity levels were assessed in a semi-structureds interview administered by health professionals using the GPPAQ (General Practice Physical Activity Questionnaire). Two questions were asked at baseline and follow-up occasions: 1. 'In the past week, on how many days have you accumulated at least 30 minutes of moderate intensity physical activity such as brisk walking, cycling, sport, exercise, and active recreation. Do not include physical activity that may be part of your job or usual role activities.' 2. 'How much time in total do you estimate you spent participating in moderate intensity physical activity last week?' To account for potential selection bias resulting in time-invariant differences between both treatment groups, behavioural change was estimated using a regression based 'difference in differences' using self reported time spent on physical activity in the week prior to the baseline assessment and the week prior to the three month follow-up.
What secondary outcomes were reported (how were they specified in practice)? *(note whether these were validated or not and whether objective or subjective)*	n/a

Data sources for primary outcome measure	questionnaire
Data sources for secondary outcome measures	n/a
Time horizon over which outcomes a) measured and b) estimated or predicted	3 months from original appointment per patient. Costs measured in centres over a period of one year.
Discount rate	n/a
Costs	
What costs were reported?	salaries, practice overheads, capital costs, cost of support booklet for participants, cost of practitioner training, cost of contacting participants. Descriptive statistics show the distribution of cost per patient completing the PACP for both delivery models and each stage of the intervention process (screening, intervention, delivery, completion). Two sample t-tests, adjusting for clustering, tested whether consultation time and cost per patient differed significantly between opportunistic and disease registry sites.
Data sources for costs measures	literature (i.e. Curtis 2007), Department of Health, royal mail price finder, administrative databases for audit purposes (collected via templates delivered through the Egton Medical Information System (EMIS) or similar software systems and down loaded using MIQUEST). face to face and telephone interviews with practice managers, The costing method used a time driven variant of activity based costing.
Discount rate?	Not applicable as cost was occurred over the intervention period that was less than a year
Time horizon over which costs a) measured and b) estimated or predicted	Intervention duration
Year of costing	2007
Currency	UK pounds sterling
Modelling approach used (if used, assess with questions in Block 6) IF the study is deemed applicable)	n/a
Sensitivity analysis	
Type of sensitivity analysis	Scenario, one-way and probabilistic

What variables were used in sensitivity analysis?	1. Reach of intervention: assuming a national roll out of the PACP with pilot level costs except with the cost of the 'Let's Get Moving' resource booklet reduced from £12.91 to £0.32 per pack; 2. Deliverer of consultations: an assumption that all patient consultations could be delivered by healthcare assistants as opposed to GP's or nurses; 3. Deliverer of support activities: an assumption that all support activities could be delivered by receptionists (NHS pay band two); 4. The simultaneous change of all the above factors; and 5. In addition to the assumptions of scenario 4 - assuming an equal time to deliver patient consultations within each delivery model. 6. Probabilistic sensitivity analysis focussed on costs and physical activity data.
Findings from sensitivity analysis	1. The sensitivity analysis on cost showed that the impact of changing one factor had varying impacts on the cost per patient by method of delivery. Using the national 'roll out' cost for the booklet has the largest impact on reducing costs for opportunistic screening and that ensuring patient consultations are delivered by health care assistants leads to the greatest cost reduction for disease register sites. 2. Asking receptionists to deliver all support services has least impact on cost reduction in either mode of recruitment. 3. The scenario analyses show that altering all three individual cost reductions would lead to a 78% cost saving at opportunistic sites and a 58% cost saving at disease register sites. This cost savings does not alter the conclusion that opportunistic screening is significantly less costly than using disease registers to screen and enter patients into the intervention 4. Probability sensitivity analysis: All estimates fell within the north-west and north-east quadrant of the cost effectiveness plane with large number of estimates scattered on the vertical axis – depicting great uncertainty around the case results 5. The cost savings never change the conclusion that opportunistic screening is significantly less costly than using disease registers to screen and enter patients into the PACP. This conclusion is robust even when controlling for differences in the mean time of delivering patient consultations (decreasing time by 56% and 68% in the two disease register centres) between participating practices
Details of any other secondary analysis undertaken	Two sample t-tests, adjusting for clustered data, were repeated after each analysis to test whether differences in mean costs across delivery models were significant.
Main results	
Outcomes	Of 411 screened patients of whom 75 attended a follow-up appointment data at 12 weeks (and 46 provided data). Self reported behavioural change in opportunistic centres between baseline and three month follow-up amounts to 9.8 (SE: 8.2) minutes per week, whilst patients in disease register centres reported an increase in physical activity levels by 91.1 (SE: 15.1) minutes in the week prior to the follow-up appointment. The difference in differences in physical activity levels between both recruitment arms is 81.3 (SE: 17.2) minutes of self reported moderate intensity physical activity.

Costs	1. The total cost for delivering the intervention in the four centres was £18,231, which covered 411 screened patients of whom 75 provided follow-up data at 12 weeks. Practice training and set-up advice was the largest cost contributor (£11,349). From the total cost of delivery, £8,852 (49%) occurred at opportunistic sites and £9,379 (51%) at disease register practices. 2. The mean consultation time was significantly higher at disease register practices compared with centres using opportunistic screening (77.6 min (SD 13.8) vs. 28.2 min (SD: 1.9)). This pattern held for each part of the pathway, although the only difference in mean times that reached statistical significance was for the delivery of the brief intervention. 3. The cost per patient completing the PACP was also significantly higher at disease register practices (£190.80 (SD 39) vs. £53.20 (SD 7.8)). This pattern also held across each part of the pathway, although it only reached statistical significance for the screening consultation. 4. Resource booklet was responsible for 40.6% of total cost at opportunistic sites and 23.9% at disease register centres.
ICERs	An incremental cost of £886.50 to increase self reported physical activity levels to 150 minutes of moderate intensity activity per week was observed when comparing disease register screening with opportunistic patient recruitment.
Other summary statistics	

BLOCK 4: CHALLENGES	
Author-stated limitations	1.Self-selection bias due to recruitment strategies 2. Lacked a comparison group to observe patients who did not undergo the intervention 3. The low number of participating sites and exclusion of 2/6 centres 4. Profile of surgeries nationally may not match those of the pilot sample 4.No patient costs accounted for 5.Use of health professional logging of self report physical activity data 6. Low numbers of participants to assess effectiveness 7. Lack of measurement beyond 3 months
Author-stated strengths	1. Collection and use of individual patient level cost data 2. Relatively large difference in mean cost of £24 per completing patient remained statistically significant even after a series of stringent scenario analyses
Strengths identified by review team	1.Good methods of collection and utilisation cost data (individual level data)

	2. Use of policy relevant physical activity indicator
Evidence gaps and/or recommendations for future research	1. Further research is needed to provide more robust estimates of intervention effectiveness and efficiency, and to assess the link between behavioural change and changes in quality adjusted life years (QALYs). 2.Objective measures of physical activity 3.Inclusion of patient cost of participation in physical activity in analysis 4. Need to evaluate the Lets Get Moving programme in practice.

If this intervention(s) were to be modelled, what **aspects** of this paper could be useful? (only to be completed IF intervention and study is considered useful *(complete after Block 5)*

Aspects	**Yes**	**No**	**Any comments**
Model structure		✓	Study did not involve modelling
Transition probabilities/risks etc		✓	
Resource use	✓		Comprehensive capturing of resource use particularly around staffing
Cost data	✓		Individual level data provided at each stage of intervention process
Outcomes/effects	✓		Policy relevant outcome (specification of effectiveness estimate was specified in line with the recommended level of participation in physical activity)
Utility values		✓	It was not a cost utility analysis
Other		✓	

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
APPLICABILITY (relevance to specific topic review questions and the NICE reference case)						
1.1 Is the study population appropriate for the topic being evaluated?	✓					
1.2 Are the interventions appropriate for the topic being evaluated?	✓					
1.3 Is the system in which the study was conducted sufficiently similar to the current UK context?	✓					
1.4 Was/were the perspective(s) clearly stated and what were they?	✓					
1.5 Are all direct health effects on individuals included, and are all other effects included where they are material?			✓			Data constraints could only allow a cost effectiveness analysis and not cost utility analysis involving the consideration of the health effects of physical activity changes
1.6 Are all future costs and outcomes discounted appropriately?					✓	Study focussed on comparing costs/outcomes of different recruitment strategies for an intervention. The cost/outcomes was incurred within less than a year and hence discounting was not relevant

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
1.7 Is the value of health effects expressed in terms of QALYs?			✓			
1.8 Are costs and outcomes from other sectors fully and appropriately measured and valued?			✓			No patients' costs accounted for. No costs of the actual physical activity itself accounted for (and no idea of what physical activity was actually undertaken)
OVERALL JUDGMENT (circle one)	Directly applicable		**Party applicable**		Not applicable	
Other comments on applicability						
STUDY LIMITATIONS regarding methodology *(for completion only once declared the study is sufficiently applicable)*						
2.1 Does the model structure adequately reflect the nature of the topic under evaluation?					✓	
2.2 Is the time horizon sufficiently long to reflect all important differences in costs and outcomes?			✓			No data at 6 months checkup supplied. No data on costs beyond 3 months
2.3 Are all important and relevant outcomes included?		✓				Data constraints could only allow a cost effectiveness analysis and not cost utility analysis which involves the consideration of the health effects of physical activity

BLOCK 5: QUALITY APPRAISAL FOR ECONOMIC EVALUATION	Yes	Partly	No	Not clear	Not applicable	Comments
						changes
2.4 Are the estimates of baseline outcomes from the best available source?		✓				No health outcome data recorded
2.5 Are the estimates of relative 'treatment' effects from the best available source?		✓				It was an audit – no baseline data exists as such as it was not an evaluation
2.6 Are all important and relevant costs included?		✓				Participants costs that may be considered influential in assessing the efficiency of a recruitment strategy to intervention was not collected
2.7 Are the estimates of resource use from the best available source?	✓					
2.8 Are the unit costs of resources from the best available source?	✓					
2.9 Is an appropriate incremental analysis presented or can it be calculated from the data?	✓					
2.10 Are all important parameters whose values are uncertain subjected to appropriate sensitivity analysis?	✓					
2.11 Is there any potential conflict of interest?		✓				
OVERALL ASSESSMENT (circle one)	Minor limitations				**Potentially serious limitations**	Very serious limitations
Other comments on limitations	(i) Main limitations stem from the study being an audit rather than evaluation. In particular the outcome data is very weak. (ii) Not accounting for long-term outcomes					

BLOCK 6: OVERALL GRADING(based on block 5)	
Quality score: (++, +, −)	+
Applicability	partially

*More details can be found in an accompanying publication (Bull FC, Milton K: A process evaluation of a “physical activity pathway” in the primary care setting. BMC Public Health 2010, 10:463.)