Community, school and workplace initiatives to encourage individuals to use the outdoor environment for physical activity

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Contents

Executive Summary

Aims
- The aim of this review is to identify and review evidence of the effectiveness of initiatives and interventions delivered in the *community, school, or workplace setting* which have been designed to encourage individuals to use their local *outdoor environment* to increase their *physical activity*, and to identify and describe similar initiatives currently being delivered in Scotland.

Methods
- We conducted a rapid review using systematic methods. The study involved two elements, an Evidence Review and the compilation of a Database of Current Activity in Scotland. For the Evidence Review, we searched for systematic reviews, primary studies and grey literature reports. Studies were assessed for relevance and rated for quality. For the Database of Current Activity, we used a mixed methods approach combining online searches, email and telephone contact.

- The Database of Current Activity is not included as it is a snapshot carried out during the writing of this report and it is unlikely that it will be regularly updated. If however you would like a copy of the database please email Graeme Scobie (graeme.scobie@nhs.net) at NHS Health Scotland for a copy.

Types of evidence retrieved and included
- Twenty one systematic reviews, 46 primary studies and 43 grey literature evaluations were relevant and were included in the review. Studies were heterogeneous in design and quality. Interventions were categorised into seven groups:

  - **Active travel intervention** (including community interventions targeting whole populations, targeted behaviour change programmes in the community, school active travel initiatives and walking buses, workplace active travel campaigns and workplace schemes to reward or disincentivise particular types of travel).

  - **Modifications to the physical environment** (including creation/improvement of paths and trails and cycle infrastructure, restrictions on car use, other modifications to urban infrastructure and park improvements).

  - **Organisational change interventions** (including improving school playgrounds and playground equipment, introducing play facilitators in school playgrounds, increasing opportunities for physical activity in the school day, opening school playgrounds out of hours, and improvements to workplace facilities).

  - **Walking groups and programmes** (including walking groups/programmes with a health focus or for specific target groups, such as the inactive, primary care populations, older people or new mothers),

walking groups/programmes for the general population, and workplace walking programmes).

- **Cycling promotion** (including community cycling initiatives, school cycling promotion campaigns and workplace cycling initiatives).

- **Campaigns and events** (including community-wide physical activity campaigns, themed 'Days'/'Weeks', 'Challenge' events in communities and workplaces, and mass participation events in communities and schools.

- **Outdoor experience** (including conservation and 'Green Gym', therapeutic experience of nature, other woodland activities, gardening and allotments, adventure/achievement schemes, Forest Schools/outdoor schools and unstructured play/wild places).

- For each type of intervention, we summarised the strength of the evidence using the following definitions:

Strength of evidence definitions used in the review:

Support: The best available evidence of effectiveness comes from studies which take before and after measures and which use a control/comparison group (e.g. RCTs, controlled before and after studies), of which the majority report positive effects.

Moderate support: The best available evidence of effectiveness comes from studies which take before and after measures but do not involve a control/comparison group (e.g. uncontrolled before and after studies), of which the majority report positive effects.

? **Insufficient evidence:** The best available evidence of effectiveness comes from studies which take 'after-only' measures (e.g. post-intervention surveys) OR there is too little evidence to make an assessment.

✗ **No support:** The majority of the best available evidence suggests the intervention is ineffective.

Findings
Active travel interventions
- The review found moderate support for active travel interventions in the community which involve targeted approaches (for example, which target those who are already motivated to or preparing to adopt more active travel, or which provide information and support tailored to individuals or

households). Interventions involving targeting (for example, for those already interested in changing their modes of travel) appear to be more effective than those which are aimed at a whole population.

- In the school setting, the review found moderate support for walking buses, an approach which has been reasonably well tested in the UK. There is also moderate support for multi-faceted school travel initiatives involving elements such as education, information, safe routes to school, cycle promotion, travel diaries, activities for parents and so on.

- In the workplace setting, we found moderate support for workplace travel campaigns, which tend to be similarly multi-faceted, involving for example, information, materials and improvements to facilities. We found insufficient evidence to support the use of employee rewards or disincentives to encourage more active modes of commuting.

Modifications to the physical environment
- The review found moderate support for the idea that improving or creating trails and paths can increase their usage and impact on levels of walking and cycling. The review also finds evidence to support the creation of cycling infrastructure.

- There is moderate support for restricting car use through physical measures (e.g. speed bumps, road closing) as a means of encouraging greater cycling and walking, and also for modifications to urban infrastructure which make public spaces more attractive for pedestrians.

- The review found insufficient evidence of effectiveness for renovations to public parks (only two studies, reporting inconsistent results).

Organisational change interventions
- The review provides support for modest playground improvements (for example, coloured paint markings) and for providing additional playground equipment as strategies for encouraging active play. These are relatively simple and low cost replicable interventions. However, effectiveness has not been measured over the longer-term, and it is possible that such interventions may have a novelty effect which wears off over time. The review also found support for introducing play facilitators to encourage children to engage in active play and games, although this strategy may be less effective with girls than with boys.

- We found no support for increasing the number of outdoor activity breaks in the school day, and insufficient evidence for making school playgrounds available out of hours. Taken together, the evidence suggests that simply increasing the amount of time children spend in the school playground is not effective unless the playground experience is enhanced either with improved markings and better equipment or with facilitators to encourage active play.

- The review found support for improvements to workplace facilities such as changing facilities and bicycle storage. However, interventions tend to be

multi-faceted, involving several different elements, and it is not possible to identify the contribution of specific elements.

Walking groups and programmes
- The review finds support for walking groups and programmes which are aimed at general populations within a community and for ones which are targeted specifically at inactive populations, primary care populations and older populations. The review also finds support for walking groups and programmes implemented in workplaces.

- There is insufficient evidence of walking programmes targeted specifically at recent mothers.

Cycling promotion
- The review finds insufficient evidence for cycling promotion campaigns (excluding active travel and infrastructure interventions, which are examined in Sections 5 and 6) in the community and in workplaces, but moderate support for cycling promotion campaigns in schools. More research is needed in this area.

Campaigns and events
- The review found support for multi-faceted community-wide campaigns, with some studies measuring impact over several years. The interventions examined above are complex multi-faceted interventions, and this poses challenges for both sustainability and replicability. While the elements in an intervention can in theory be specified and replicated elsewhere, it may be the process by which they are implemented which is key to success.

- The review found insufficient evidence that themed 'days' and 'weeks' can have an impact on routine physical activity levels, although such events can be effective in stimulating participation and short-term increases in physical activity. The review found insufficient evidence to support challenge events in either community or workplace settings, and insufficient evidence to support mass participation events.

Outdoor experience
- The review found insufficient evidence to support any of the outdoor experience interventions examined. This reflects the fact that outdoor experience interventions have been less well evaluated in terms of impact on physical activity than other types of intervention examined in this review. The bulk of the studies in this area are process evaluations and/or are focused on other benefits, such as wellbeing, learning and mental health. More research is needed to establish how effective these sorts of interventions might be in terms of increasing physical activity.

- Beyond this, there is evidence to suggest that such interventions are appreciated by and acceptable to participants, and are perceived by implementers and others as having the potential to deliver a wide range of benefits, not restricted to physical activity. Some of the interventions examined in the review seem to have the potential to engage vulnerable and

marginalised groups who might otherwise have little contact with the natural environment.

Key learning for research commissioners
- More robust evaluation is needed to assess the potential impact on physical activity of 'outdoor experience' interventions such as conservation, therapeutic experience of nature and Forest Schools.

- Studies should consider long-term impact and where possible should incorporate objective methods of assessing physical activity.

- Evaluations should measure reach and uptake among groups most in need of support and encouragement to become physically active, and should analyse whether interventions produce differential effects among key subgroups, including girls and BME groups.

1. Introduction

This review was commissioned on behalf of the National Physical Activity Research and Evaluation group (NPARE) by NHS Health Scotland. Its aims are:

a) To identify the evidence of effectiveness from initiatives and interventions delivered in the community, school, workplace or other setting which have been designed to encourage individuals to use their local outdoor environment as a setting to increase their physical activity whether through play, learning, volunteering or walking and cycling for relaxation and/or exercise. This will cover initiatives and interventions from the UK and other countries.

b) To identify similar initiatives currently being delivered in Scotland which are based on the identified best evidence from above (and also those not evidence based).

The output from this research will be of particular benefit to groups or organisations who have a responsibility to provide opportunities for, or the promotion of, physical activity and other activities in their particular environment. It will help build an evidence base to support NPARE member organisations in delivering the most effective initiatives to encourage participation in and use of the local environment.

1.1 The potential role of the outdoor environment in supporting physical activity

Physical activity has an important role to play in making the Scottish population healthier. Raising levels of physical activity is of relevance to a number of national outcomes, indicators and targets outlined in the Scottish Government's *National Performance Framework* (2007). The Scottish Government's physical activity strategy *Let's Make Scotland More Active* (Scottish Executive Physical Activity Task Force, 2003) set minimum recommended levels of physical activity for children and adults, and targets for achievement by 2022. Walking, cycling, play and other leisure pursuits in the outdoor environment are types of physical activity that can contribute to these recommended levels.

Other Scottish Government policy papers, such as the *Equally Well* report on health inequalities (2008), the *Healthy Eating, Active Living* action plan (2008) and *Scotland's National Transport Strategy* (Scottish Executive, 2006) recognise the role that walking, cycling, play and visiting the outdoor environment can have in increasing physical activity levels.

The outdoor environment is now seen as a key setting for the promotion of physical activity as well as for promoting good mental health and wellbeing. Recent research on green space and general health has shown a positive association, although the exact mechanisms which generate these positive effects are not entirely clear at present (Croucher, Myers and Bretherton, 2008). Although some studies show that green spaces are valued as places for exercise, for many people this is not the primary value placed on them. Many people visit the green outdoors as a place to

relax, reduce stress and get away from noisy and polluting environments. However, for children and elderly individuals, close proximity to green spaces such as parks can have an affect on the overall level of their physical activity (Bell, Hamilton, Montarzino *et al.*, 2008).

A recently published five year review of the physical activity strategy (Beattie, Allison, Bull *et al.*, 2009) highlighted that the creation and adaptation of environments that encourage and support physical activity offers the greatest potential to get the nation active and that interventions that enhance the built environment can impact on large sections of the population.

For example, Scottish Natural Heritage (SNH) has recently published its policy statement *Developing the Contribution of the Natural Heritage to a Healthier Scotland* (2009). Similarly the Forestry Commission Scotland (FCS) has recently published its *Woods for Health Strategy* (2009), both of which highlight the importance of the outdoor environment for health benefits. Similarly, a review for the Royal Society for the Protection of Birds (Bird, 2004) emphasises both the health and economic benefits of access to green space and wildlife-rich environments.

Scotland's environment provides many opportunities for individuals to participate in many types of physical activity, whether for leisure activity, active travel, learning, volunteering or purely for enjoyment. We know that people in different groups use the outdoor environment in particular ways: ethnicity, gender and lifestage have all been shown to be variables. We also know that there are particular sections of the population who are less active than the general population and have the most to gain from this kind of initiative. The review will therefore highlight any evidence for key subgroups such as low socio-economic status (SES) groups, minority ethnic communities, the elderly and people with low levels of physical activity.

Existing evidence
Recent Guidance from NICE (2008) on the promotion of physical activity and the environment reviewed the evidence around five key areas:
- transport review
- urban planning and design
- natural environment
- policy
- building design.

Some of the key messages from the reviews highlighted:
- there is some evidence that interventions to change the urban structure at the street level can lead to increased levels of pedestrian activity at least in the short term and also increase the number of children out in these areas in the long term
- the evidence also tends to suggest that other outcomes such as perception of safety and fear of crime and perception of attractiveness, pollution (air and noise) can be favourably changed as a result of street-level urban change interventions
- the evidence also suggests that the composition of the built environment at the community level may have a positive impact upon levels of walking and cycling. Paths and trails can also lead to self-reported increases in

physical activity in the short and long term with the trail surface, length and maintenance influencing their use and individuals' attitudes towards them

- evidence based examples of changes to the environment to increase physical activity, includes for example, modification and promotion of parks, building boardwalks along foreshores, cycle tracks etc which may increase levels of self-reported physical activity, particularly in people who were previously active

- currently, there is insufficient evidence to draw any conclusions on the effect of interventions involving changes to the physical environment and design features of woodland areas on physical activity outcomes. There is, however, some evidence to suggest that building creative features along a woodland trail may increase visitor numbers.

A recent review identified a range of social marketing interventions (Gordon, McDermott, Stead *et al.*, 2006; Stead, Gordon, Angus *et al.*, 2007) which attempted to increase individuals' physical activity levels directly or as part of a wider initiative such as reducing cardiovascular disease. NHS Health Scotland is currently building on this review by commissioning research around the effectiveness of social marketing initiatives involving the outdoor environment to increase physical activity levels.

This review focuses on community, school and workplace initiatives which encourage individuals to visit and use the outdoor environment to increase their physical activity.

2. Aim and objectives

The aim of the study is to:

> Identify and review evidence of the effectiveness of initiatives and interventions delivered in the community, school, or workplace setting which have been designed to encourage individuals to use their local outdoor environment to increase their physical activity, whether through play, learning, volunteering or walking and cycling for relaxation and/or exercise, and to identify and describe similar initiatives currently being delivered in Scotland.

The study objectives are:
- to assess and report on the evidence of effectiveness of community, school and workplace initiatives and interventions from the UK and other countries that encourage people to use their local outdoor environments for physical activity, learning, and other social interactions
- to review the findings from and assess the quality of the identified evidence in terms of methodology, reporting etc
- to comment on the evidence around community, school and workplace initiatives and interventions and the promotion of physical activity, learning, and other social interactions, drawing conclusions on the key components which make them successful
- to identify initiatives being delivered in Scotland and, where possible, identify those which are evidence based
- to present the findings in a format that allows NPARE members to use evidence informed guidance in the development of future community, school and workplace initiatives
- to make recommendations on further research to address gaps in current Scottish practice against the identified principles of effective interventions.

Two linked exercises were conducted to meet the aim and objectives for the study:
- a review of effectiveness, drawing on both academic and grey literature (Evidence Review)
- a search for and description of current activity in Scotland (Database of Current Activity).

The methods used to conduct these two parts of the study are described fully in the next section.

3. Methods

3.1 Establishing which interventions are of interest

With any review, it is important to be as clear as possible about the interventions and outcomes of interest. From discussions with NHS Health Scotland and the NPARE group in the early stages of the study, it was apparent that a wide variety of different types of intervention were of potential interest to the study, particularly for the Database of Current Activity in Scotland. In order to keep the review manageable and useful to end users, it was important to reach a shared understanding regarding the focus of the review, and, where necessary, to prioritise. Early searches of literature and websites suggested that there was a very wide range of interventions and services which potentially fell within the remit of the review. For example, it was unclear whether the following types of intervention fell within or outwith the study remit:

1. Initiatives which take place outdoors and involve physical activity, but whose core purpose is not to promote physical activity (e.g. gardening, outdoor dance, conservation).

2. Services whose core business is physical activity provision in the outdoors, but which are not necessarily considered as 'interventions' and which may not necessarily have a stated aim to improve physical activity for health benefit. Examples include mountaineering clubs, rambling groups, sailing schools and outdoor sports facilities.

3. Provision and ongoing maintenance of paths, trails, cycle paths, towpaths. These may be provided as part of community-wide health promotion initiatives, or they may be provided for other reasons (e.g. tourism promotion, improvements to local infrastructure). In other words, there may not necessarily be a health promotion dimension to their provision.

4. National organisations which offer advice and case studies (for example, through website or publications) on how to promote physical activity in the outdoor environment. Although the guidance provided by such organisations may be used in community, school and workplace settings, it could be argued that the guidance itself is not a community, school or workplace intervention.

5. Activities in the outdoor environment designed to foster learning, wellbeing and other psycho-social benefits. Examples include Forest Schools and conservation and activity-based award schemes. Although the activities take place in the outdoor environment and involve some degree of physical activity, the promotion of physical activity is not necessarily an objective, or a core objective, of the initiative.

6. Pedometer initiatives (for example, providing schoolchildren or primary care patients with pedometers as a means of encouraging increased activity). Although it is likely that some or most of the increased activity which pedometers hope to encourage would take place in the outdoor environment, this is not necessarily a focus of interest to pedometers studies. For example,

some are interested in the effects of different types of feedback, while others build in deterrents and incentives in the form of television or computer use being dependant on achieving a certain level of activity.

7. School or workplace intervention to increase physical activity where no information is given on the setting in which the activity takes place. A large number of intervention studies describe the methods used to promote physical activity in schools and workplaces – information, educational materials, group sessions, individual advice and so on – but do not mention whether the activity takes place indoors or outside. If the focus of this study is on how to get people active in the outdoor environment and the value of doing so, then interventions in school and workplace settings which do not use or promote the outdoor environment are not relevant.

In the interests of manageability and to ensure that the study findings would be meaningful and useful to users, it was agreed that the study would focus on interventions with the following basic criteria:

a. *The intervention is implemented in a community, school or workplace setting (i.e. national initiatives, including nationally provided guidance and websites, would be excluded)*

b. *The intervention should have a stated intent to promote use of the outdoor environment or to improve the outdoor environment to make physical activity easier or more appealing*
OR:
c. *The intervention should seek to promote active travel within a community or to and from school or a workplace*

d. *The intervention should have a stated intent to promote or increase physical activity. This meant that activities of the sort outlined in 1-3 and 5 above would be excluded unless there was a stated physical activity objective*

We found some examples of interventions where, even though there appeared to be no stated aim to promote or increase physical activity (i.e. the aim of the intervention was something else), the *impact* on physical activity had been evaluated (this was most typically the case with interventions involving activity in the natural environment, such as conservation or adventure). We therefore added a further criterion:

e. *Even if there is no stated aim to promote or increase physical activity by the provider, the impact on physical activity has been evaluated*

As the search progressed, it became apparent that we would need to differentiate between interventions where promotion or facilitation of use of the outdoor environment for physical activity was *the sole or a core element* of the intervention, and those where it is not the main focus of an intervention and forms only a small part of the mix of intervention activities. For example, there are a large number of school-based physical activity interventions in which the main intervention element is a curriculum component, complemented by other activities such as parents' events,

information materials, fun nights or promotion of active play at break times. The latter activity, promoting active play at break times, would be relevant to our review, as it involves promoting activity in the outdoor environment. However, it would be only one element of the intervention and a relatively small part of the intervention activity mix. Similarly, a multi-faceted health promotion intervention in a workplace may include walking promotion alongside tailored brief advice or motivational interviewing, information materials, screening, lunchtime classes, healthy eating initiatives and so on. Here again, the element of the intervention promoting activity in the outdoor environment – walking promotion – forms only a small part of the overall intervention.

This raises questions about the interpretation and weight which should be given to the evidence from such interventions. Because the 'activity in the outdoor environment' element is not the main intervention component, the usefulness of the results for this particular study is limited (because it is impossible to know what contribution the outdoor activity element made to the intervention's effectiveness or ineffectiveness). Equally, any lessons generated about the feasibility or acceptability of such interventions are likely to have limited relevance to our review, because they will not just apply to the intervention element promoting use of the outdoor environment.

Following discussion with NHS Health Scotland, we therefore agreed to focus on interventions where promoting or facilitating use of the outdoor environment for physical activity was a major element in the intervention and to exclude interventions where this element was small or peripheral to the main focus. Multi-faceted, multi-component interventions were eligible providing the component(s) promoting activity in the outdoor environment were central or substantial. We therefore added a final criterion:

> f. *Activity to promote or facilitate physical activity in the outdoor environment is a central or substantial element of the intervention.*

Finally, following discussion with NHS Health Scotland, it was agreed that pedometer interventions are well covered in other reviews and studies, and were not a priority for this review as their main focus of interest is often the effect of different kinds of pedometer feedback and goalsetting strategies on steps achieved, rather than on promoting outdoor walking. They were therefore excluded from this review. However, interventions which met all our above criteria and which included pedometers *alongside other strategies* (for example, community walking programmes) were included.

The flowchart in Figure 3.1 illustrates the process for identifying relevant interventions. The same intervention criteria applied both to studies for the Evidence Review and to interventions for inclusion in the Mapping of Activity in Scotland, with the exception that interventions did not have to have been evaluated in order to be included in the Mapping.

Figure 3.1 Flowchart for assessing relevant interventions
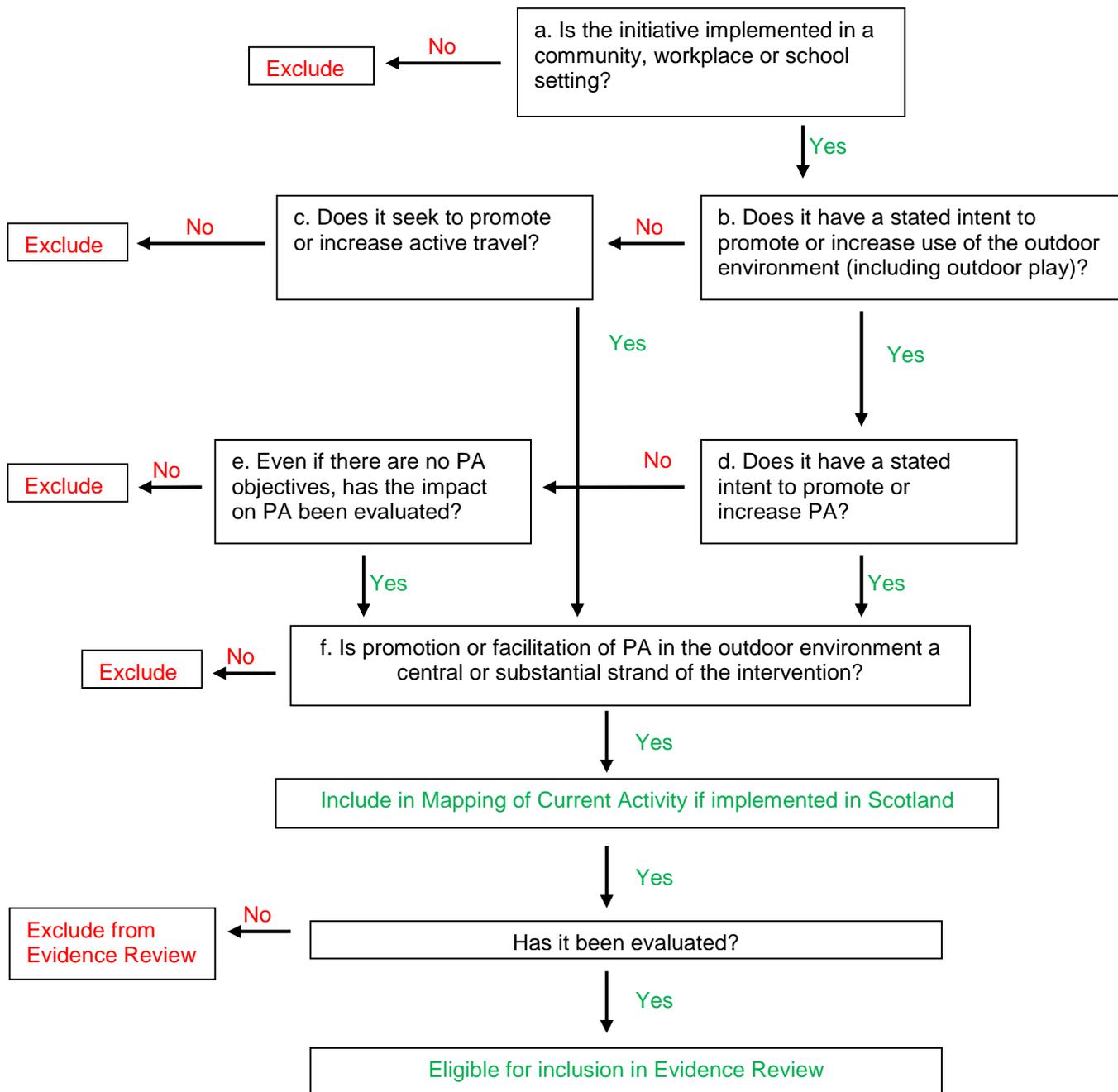
3.2 Evidence review

The timescale for the project did not allow a full scale systematic review to be conducted. We therefore conducted a rapid review using systematic methods.

3.2.1 Scope of the review

The aim of this review was to bring together all the relevant evidence in this area, including both academic and 'grey' literature (e.g. informally published or distributed, published online only). We recognised that although RCTs and other studies of outcomes provide the 'gold standard' of evidence, there are likely to be limited numbers of such studies in this area (the recent NICE evidence reviews (NICE Public

Health Collaborating Centre for Physical Activity, 2006a,b,c) found between 2 and 26 eligible studies per review). Therefore other types of study were potentially eligible for inclusion in the review. For example, qualitative studies and process evaluations can provide useful data on how people engage with interventions and initiatives and how they perceive the benefits, if any. We anticipated that much of the data gathered by organisations in this field was likely to be fairly basic (for example, visitor surveys, monitoring of usage). Although this type of data is unlikely to show evidence of impact on physical activity, it can provide important information on the reach and uptake of initiatives, and of different patterns of usage by different population subgroups.

Searching exhaustively for studies and evaluations is an extremely time consuming activity. Due to the relatively short timescale for the project, we focused on evaluating and synthesising the evidence rather than searching exhaustively for every review or study.

3.2.2 Searches
Existing reviews
A two-fold search strategy was designed. Firstly, we searched for existing reviews, particularly systematic reviews or meta-analyses of RCTs, in this area using our in-house literature collections, online searches of review repositories (e.g. Centre for Reviews & Dissemination, Cochrane Library, EPPI-Centre, NICE) and a rapid search of the Medline database. Thirty-six reviews (21 systematic reviews or meta-analyses and 15 non-systematic reviews) of interventions to promote physical activity in community, school and workplace settings were identified and assessed for relevance (see Section 4.1 for more information).

This assessment showed that although several systematic reviews have been conducted of physical activity interventions in community, school and (to a lesser extent) workplace settings, in many cases, outdoor environment has either not been a focus of concern of the review, or it is simply unclear whether the included interventions involved or took place in the outdoor environment (10 of the 36 reviews). This is particularly the case, with reviews of school-based interventions: for example, Dobbins, DeCorby, Robeson *et al.*'s (2009) Cochrane review examines curriculum programmes, exercise sessions, the provision of information materials, teacher training and activities for parents, but there is no information to indicate whether any of the interventions involved physical activity in the outdoor environment.

In other reviews, it was apparent from the information about included interventions that some of the interventions had involved the outdoor environment. For example, in Foster and Hillsdon's (2004) review of changing the environment to promote health-enhancing physical activity, the majority of included interventions involved modifications to staircases (presumably indoors), but three interventions involved improvements to workplace and community services and facilities to facilitate activity, including active travel to work.

Our strategy was therefore to make an assessment of which interventions included in the reviews involved use or promotion of the outdoor environment, based on the information included in the reviews or the abstract of the study where this was available. In reporting the findings from the reviews, we have focused only on

findings for those intervention studies which appeared to involve use or promotion of the outdoor environment, and where this was a central or main element of the intervention.

Primary studies
Our original intention had been to search only for primary studies for categories of interventions where there were no systematic reviews. However, as it was not always clear from the systematic reviews to what extent the outdoor environment had featured, we decided to search for primary studies across all categories of interventions.

Seven electronic databases covering health and social science literature were selected for searches:
1. CINAHL
2. Cochrane Library:
    • Cochrane Central Register of Controlled Trials
    • Cochrane Database of Systematic Reviews
    • Database of Abstracts of Reviews of Effects
    • Health Technology Assessment
3. ERIC (Educational Resources Information Centre)
4. IBSS (International Bibliography of the Social Sciences)
5. MEDLINE
6. PsycINFO
7. SPORTDiscus

Search strategies were developed, piloted and adapted for each of the databases. Appendix 1 contains an example of the search strategy used. As appropriate, search terms were truncated to include all forms of a 'root word' (including plurals) and paired search terms were searched by varying their proximity to each other.

This search strategy yielded 4401 papers, reports, and reviews to be examined to locate eligible primary studies. The non-UK literature was limited to studies and reviews published in peer-reviewed journals or otherwise peer-reviewed outlets (e.g. Cochrane and NICE reviews), with no such limits (other than relevance and quality criteria – see below) imposed on UK.

'Grey' literature
Pilot searches at the proposal development stage identified a list of organisations whose websites may potentially contain useful literature and reports. This included all members of NPARE plus other voluntary and third sector organisations, statutory bodies and academic research centres with an outdoor environment, physical activity, play, or volunteering remit or interest in Great Britain. The websites for all the organisations listed in Figure 3.2 were browsed for relevant publications. The websites were also searched using *Google*'s 'within site' search function with a selection of the search words described in the academic search strategy above. A general search of the Internet using similar terms also generated further literature and other organisations' websites to look at. Most of the organisations in Figure 3.2 were contacted either directly by a researcher or through a general request email circulated to delegates (and the waiting list) of SNH's *Social Marketing Scotland's Outdoors – Sharing Good Practice* event in January 2010, to identify any further

research which was not published on their websites. Over 120 reports, leaflets, strategy documents, guidelines and survey result summaries were identified for assessment for relevance.

Figure 3.2 Examples of relevant organisations for searches for evaluated initiatives and mapping

Age Concern & Help the Aged	John Muir Trust
BHF National Centre for Physical Activity and Health, Loughborough University	Living Streets
	National Parks
Black Environment Network	National Trust for Scotland
British Heart Foundation	Natural England
British Trust for Conservation Volunteers	NHS Scotland
British Waterways	OpenSpace, Edinburgh College of Art
Central Scotland Forest Trust	Paths for All
Centre for the Built Environment	Paths to Health
Changing Pace	Play Scotland & Play England
COSLA	Ramblers Association
Countryside Council for Wales	RSPB
Countryside Recreation Network	Scotland's 32 Local Authorities
CTC	Scottish Allotments & Gardens Association
Cycling Scotland	Scottish Centre for Healthy Working Lives
Department of Health	Scottish Natural Heritage
Equal Adventure	Scouts Scotland
Fairbridge	Scouts UK
Forestry Commission	SPARColl, University of Strathclyde
Girlguiding Scotland	Sport Council for Wales
Greenspace Scotland	Sport England
Grounds for Learning	Sportscotland
Health and Safety Executive	Sustrans
Healthy Settings Development Unit, University of Central Lancashire	The Scottish Government
	The Welsh Assembly Government
Inclusive Fitness	Trees for Life
Institute for Outdoor Learning	Venture Scotland
Jogscotland	Working for Health
John Muir Award	Youth Scotland

As there was likely to be considerable overlap between the search for grey literature for the Evidence Review and the Database of Current Activity when approaching organisations in Scotland (see below), the requests for grey literature examples and for information on existing initiatives were combined to avoid making repeated demands on organisations.

3.2.3 Study selection

References identified from the electronic database searches were downloaded into bibliographic software (Reference Manager® v11) and de-duplicated (n=4401). Additional primary studies (n=32) and grey literature (n=120) identified through the internet or contact with key informants were entered manually into the database increasing the total to 4553 items to be assessed.

Titles and abstracts were screened for **relevance** by three members of the research team. Each member assessed a proportion of the titles separately, with a sample of the titles (e.g. 10%) being assessed by two or more reviewers independently as a consistency check. Where there was insufficient information in the title to make an

assessment, an abstract or summary of the study was retrieved; if this was not available, the full text of the study was retrieved.

We assessed abstracts of the 4553 references firstly against the relevant intervention criteria outlined in Section 3.1 above. This yielded 398 potentially relevant studies. We then compared this list with the bibliographies of the included reviews. Where a study had already been examined in one or more reviews, we excluded it from our database of primary studies to avoid double reporting of the results.

Only studies and interventions published since 2000 were included because a recent NICE review indicates that the bulk of studies in this area have been published since 2000 (Wendel Vos *et al.*, 2005, as cited in Bauman and Bull, 2007). Because the resources and timescale did not allow for translation, only studies in the English language were included in the review. For the peer-reviewed academic literature, interventions in any country were eligible for inclusion. For the grey literature, interventions were restricted to those in the UK, in the interests of manageability. Both national and local initiatives in Scotland were eligible for inclusion, while for other countries of the UK, only national initiatives were eligible, in the interests of manageability.

A final total of 21 reviews, 46 primary studies and 44 grey literature publications were selected for inclusion.

3.2.4 Assessing for quality
The timescale did not allow us to appraise and score individual studies for quality. Instead, we categorised each study according to design, in descending order of their ability to demonstrate an impact on physical activity outcomes:

(i)   studies which take before and after measures and which use a control/comparison group (e.g. RCTs, controlled before and after studies)

(ii)   studies which take before and after measures but do not involve a control/comparison group (e.g. uncontrolled before and after studies)

(iii)   studies which take 'after-only' measures (e.g. post-intervention surveys)

(iv)   studies which do not measure physical activity outcomes but which explore the views of implementers and participants of potential barriers to particular types of physical activity outdoors and the acceptability and feasibility of particular interventions.

We indicate in the text the design of each study when reporting the findings.

3.2.5 Indicators and outcomes
The Brief for the review expressed an interest in *"the promotion of physical activity, learning, and other social interactions"*. This suggested that a broad view should be taken of the outcomes of interest, rather than a focus specifically on physical activity outcomes. However, searching for learning and social outcomes distinct from physical activity outcomes would have made the search process unmanageable and resulted in a potentially very large number of studies for assessment. We therefore

decided to search initially for physical activity outcomes and to include only studies which reported physical activity outcomes but also to report other outcomes (e.g. concerned with learning or social benefits) for those studies if they were reported. Studies which <u>only</u> reported non-physical activity benefits from contact with the outdoor environment were not included.

For all measures, we are particularly interested in the *type of population* targeted by the intervention or initiative and any *differences between population subgroups* in usage, reach, attitudes, physical activity impact and other measures. We will examine and report any differences by population subgroup, paying particular attention to:
- gender
- age (paying particular attention to children and the elderly)
- socio-economic status (paying particular attention to low SES groups)
- ethnic group.

Another key concern is the pre-existing level of activity among the target group. For example, if an initiative increases usage of an outdoor environment only among people who already have a satisfactory level of fitness but has no impact on those who are more sedentary and have most to gain from participation, it potentially perpetuates or widens inequality in physical activity levels. We therefore looked specifically at whether studies report the pre-existing levels of physical activity among participants and whether they target on that basis.

3.2.6 Data extraction, analysis and reporting
Data were extracted on the following (where reported): type of evidence (review, primary study, grey report), quality (see above), authors & year, setting/s, intervention type/s, target population, implementation issues (methods and activities, duration, quality of implementation, cost), study design and sample, indicators and outcomes measured, results and study limitations. Section 4 provides an overview of the included evidence.

3.3 Database of current activity in Scotland
The second part of the study involved compiling a database of current activity in Scotland that encourages people to use the outdoor environment for physical activity via school, workplace and community initiatives.

3.3.1 Scope of the database
It was intended that the database would illustrate the range of current activity in Scotland, including initiatives which have not (yet) been evaluated. It was recognised that the database could not include every single initiative, given the large numbers of interventions of certain types (for example, walking groups). It was therefore agreed that, in categories where large numbers of interventions existed, the database would give details of selected examples.

There was also an interest in the NPARE group in identifying good practice examples within this range of activity – i.e. initiatives based on evidence – as well as initiatives for which the evidence is less strong.

3.3.2 Search methods

We used a mixed methods approach to find examples of current activity in Scotland. We began with online searches to identify potential initiatives and information leads, and followed up these searches by contacting organisations directly (initially by email with telephone follow-up where appropriate) for further information. Much of the online searches for evaluated initiatives in the Evidence Review (described in Section 3.2.2) supplied examples of current activity in Scotland.

The limits on resources mean we cannot provide an exhaustive list of current Scottish initiatives; however the database will be as full as possible and indicative of the varying types of initiatives. We have restricted the searches to initiatives provided by organisations with a current website (or substantial online presence on another organisation's website).

As described previously, general Internet searches and specific searches of Scottish organisations' websites were run via *Google.com* and recorded. The search terms were selected from the physical activity related terms, outdoor environment related terms and settings terms used in the Evidence Review search strategy (see Appendix 1). Where information was incomplete, we contacted the organisation to request further information. The general Internet searches identified a sufficient range of third sector and voluntary organisations and initiatives to follow-up so it was not necessary to use other means such as the Scottish Charity Register.

3.3.3 Assessing interventions for relevance

All interventions uncovered in the searches were assessed against the intervention relevance criteria outlined in Section 3.1 above:

a. *The intervention is implemented in a community, school or workplace setting*

b. *The intervention should have a stated intent to promote use of the outdoor environment or to improve the outdoor environment to make physical activity easier or more appealing*

OR:

c. *The intervention should seek to promote active travel within a community or to and from school or a workplace*

d. *The intervention should have a stated intent to promote or increase physical activity*

e. *Even if there is no stated aim to promote or increase physical activity by the provider, the impact on physical activity has been evaluated*

f. *Activity to promote or facilitate physical activity in the outdoor environment is a central or substantial element of the intervention.*

Disagreements between reviewers were resolved through discussion and, where necessary, searches for additional information.

3.3.4 Recording interventions in the database

We entered details of all relevant interventions in a database. This summarised the following information about each initiative, where available:

- intervention category
- intervention type
- example intervention
- location
- target
- methods/elements
- implemented by
- targeted/untargeted
- dates
- evaluation
- web link.

The Database of Current Activity is not included as it is a snapshot carried out during the writing of this report and it is unlikely that it will be regularly updated. If however you would like a copy of the database please email Graeme Scobie (graeme.scobie@nhs.net) at NHS Health Scotland for a copy.

4. Overview of the evidence

4.1 Studies retrieved

4.1.1 Reviews

Thirty-six reviews were retrieved in the searches, of which 21 were relevant to and included in this Evidence Review. Eleven of these reviews were systematic reviews, including two published by the Cochrane Collaboration, two by the EPPI-Centre and one published by the National Institute for Health and Clinical Excellence (NICE). The rest of the systematic reviews were published in peer-reviewed journals. The other ten we included were non-systematic reviews; seven published by NICE and three from peer-reviewed journals.

Amongst these were reviews that covered active travel interventions in all three settings: communities, schools and workplaces. Some of the reviews evaluated walking groups and programmes in the community and workplace settings, and two reviews covered cycling promotion in the community and school settings. Modification to the physical environment and campaigns and events were only examined in the community setting within the included reviews. No review specifically evaluated organisational change interventions but several included it as part of a wider set of interventions in both school and workplace settings. No reviews were retrieved that examined the outdoor experience. Six of the reviews were also relevant for views of intervention participants and implementers.

Even where not all the interventions included in a review met the criteria (i.e. where some were concerned with physical activity in indoor settings, or where there was insufficient information to gauge where the physical activity took place), the review was included providing at least some of the interventions reported on met the criteria above. The included reviews are listed in Appendix 2, as are the references for any studies cited from these reviews.

4.1.2 Primary studies

Forty-six primary studies met the relevance and quality criteria. Around a third of the primary studies (*n*=16) were conducted in the USA, 12 were from the UK, 8 from Australia, 2 each from Belgium and Norway, and one each from Denmark, Ireland, the Netherlands, New Zealand, Portugal and Taiwan. Twenty-two studies were quasi-experimental studies (non-RCTs or before-and-after studies), 10 studies were RCTs and 6 were observational studies. A further 5 studies used qualitative research methods, 2 papers were discursive pieces and one was a cost-effectiveness paper. Fifteen of the primary studies (encompassing 8 of the 10 included RCTs) examined walking groups and programmes. Nine studies were relevant to campaigns and events to increase physical activity outdoors and another 8 primary studies were relevant to outdoor experience. Six of the included primary studies examined modifications to the physical environment. Four primary studies looked at active travel, and another 4 looked at organisational changes – all within the school setting. Only one primary study was identified for cycling promotion.

The included primary studies are listed in Appendix 3.

The studies used a heterogeneous range of measures of physical activity, including:

- duration of activity (e.g. minutes per day or week)
- level of activity (light, moderate, vigorous intensity)
- frequency of engagement (e.g. number of times per week engaged in 30 minutes of activity sufficient to increase breathing rate)
- step counts as measured by pedometers
- energy expenditure.

Some studies also reported attitudinal measures such as:
- intentions regarding physical activity
- stages of change in relation to physical activity (e.g. movement from precontemplation to contemplation)
- perceptions of the ease or difficulty of becoming physically active
- confidence in one's ability to engage in or increase physical activity.

Studies of the effectiveness of physical activity interventions have used a number of methods to assess changes in physical activity behaviour. Many studies have used subjective methods (e.g. self-report questionnaires), whereas fewer studies have used objective methods (e.g. accelerometers, heart rate monitors and pedometers). Subjective methods tend to produce less valid and reliable estimates of physical activity compared to objective measures because the estimates of physical activity are influenced by the individual's perceptions and emotions, individuals may not recall their activities accurately, and social desirability bias can lead to over-estimation of the duration and/or intensity of activities (Reilly, Penpraze, Hislop *et al.*, 2008). In addition, physical activity results may also be influenced by 'intervention bias' whereby individuals receiving an intervention may be more likely to over estimate their physical activity levels compared to controls (Harnack, Himes, Anliker *et al.*, 2004). Objective methods produce more accurate and reliable estimates of physical activity because they are not prone to the same biases as subjective methods, however they too have limitations (Reilly, Penpraze, Hislop *et al.*, 2008).

Pedometers were primarily designed to measure walking behaviour, thus they are a good outcome measure in walking interventions; however, since they are less able to detect other types of physical activity, they may not be an adequate outcome measure in other types of interventions (e.g. Naylor, Macdonald, Warburton *et al.*, 2008 used pedometers to assess the impact of an active school intervention on physical activity levels in children). Accelerometers and heart rate monitors provide better estimates of physical activity behaviour, but are not able to detect some modes of physical activity accurately and heart rates are affected by factors other than physical activity (Reilly, Penpraze, Hislop *et al.*, 2008). It should also be noted that season and weather are likely to influence physical activity results regardless of the method used to measure physical activity, thus studies that have measured physical activity before and after an intervention should either measure baseline and post intervention physical activity levels in the same season or include a control group to address seasonal/weather effects.

Process evaluations and basic evaluations tended to focus primarily on usage measures such as awareness of the intervention/initiative/service, uptake (e.g. visitor numbers) and types of activity or facility used. Such measures do not provide robust evidence of impact on physical activity but are useful indicators of progress (for

example, are interventions appealing to particular target groups or attract first time participants?).

4.1.3 Grey literature evaluations

Forty-four grey literature evaluations were found to be relevant and were included in this Evidence Review. Thirty of the publications evaluated a local or national intervention in Scotland, seven evaluated a UK-wide programme and six evaluated a national programme in England. Thirty-six of the publications were evaluation reports for a programme or scheme. Three of the publications were organisations' strategy or guidance documents. Two publications were the data tables of survey results. A further two documents were literature reviews and one document was an economic impact study. Nineteen of the grey literature evaluations provided views of intervention participants and implementers. Grey literature publications were identified for all the relevant community and school settings interventions; however, none were identified in workplace settings for either active travel interventions or outdoor experience interventions.

The included grey literature evaluations are listed in Appendix 4.

4.2 Types of interventions included in the evidence review

We developed a typology of intervention categories, reflecting the different focus and approach adopted. The typology is presented in Table 4.1.

Table 4.1 Intervention categories examined in the review

Intervention category	Examples in different settings		
	Community	**School**	**Workplace**
1. Active travel interventions	Whole population interventions Targeted behaviour change programmes	Walking buses School travel initiatives (e.g. school travel plans/coordinators, multi-faceted initiatives including diaries, materials, events/information for parents)	Workplace campaigns Rewards and disincentives
2. Modifications to the physical environment	Paths and trails Cycle infrastructure Restrictions on car use Other modifications to urban infrastructure Park improvements	N\A	N\A

Intervention category	Examples in different settings		
	Community	**School**	**Workplace**
3. Organisational change interventions	N/A	Improving playgrounds and playground equipment Introducing play facilitators Increasing opportunities for physical activity in the school day Opening playgrounds out of hours	Improvements to workplace facilities
4. Walking groups and programmes	Walking groups/programmes with a health focus or for specific target groups: - inactive populations - primary care populations - older people - new mothers Walking groups/programmes for a general population	N/A	Workplace walking programmes
5. Cycling promotion	Community cycling initiatives (may include publicity, events, education, training, bicycle loan/subsidised purchase schemes)	Cycling promotion campaigns (e.g. cycling groups, training, events, bike maintenance, new facilities and infrastructure)	Workplace cycling initiatives
6. Campaigns and events	Community-wide physical activity campaigns (e.g. multi-component interventions, social marketing) Themed 'Days'/'Weeks' 'Challenge' events Mass participation events	Mass participation events	'Challenge' events
7. Outdoor experience	Conservation and 'Green Gym' Therapeutic experience of nature (e.g. for mental health service users) Other woodland activities Gardening and allotments Adventure/achievement schemes (e.g. John Muir) Unstructured play/wild places	Conservation and 'Green Gym' Forest School/outdoor school Unstructured play/wild places	N/A

Although we have differentiated the three settings – community, school and workplace – in the table above, in reality some interventions concern two or more settings. This is particularly the case with engineering/physical interventions involving measures such as cycle route creation or traffic calming, where the intended beneficiaries include children travelling to school, adults travelling to work and residents travelling around local communities. Similarly, a project could involve school-age children but be implemented in a community setting, or could involve a partnership between education and voluntary/community providers. The distinction between different settings is therefore sometimes artificial.

There is no ideal way of categorising interventions in this area – the existing reviews all use different categorisation schemes - and some degree of overlap is inevitable. For example, active travel interventions (which we have treated as a distinct category) may include some element of physical modification to the environment (category 2 in Table 4.1), some element of cycling promotion (category 5), and/or a campaign or event (category 6). We have tried to reflect in our categorisation scheme what we perceive as the key focus of interest or distinguishing characteristic of a particular group of interventions. Where there is overlap with another category, we flag this up when reporting findings.

It is also worth noting that the interventions are very heterogeneous; their only shared feature is the dual focus on physical activity and the outdoors. Further, the distinction between what is a relevant intervention and what is not, for the purpose of this review, can sometimes be somewhat slight and arbitrary. For example, a school or workplace intervention which used broadly similar methods to one included in this review but in which the resulting physical activity took place in a gym, rather than outside on a playing field or path, would be excluded because the physical activity is not outdoors.

4.3 Reporting the findings

The findings from the review of evidence are reported for each intervention category in the following Sections 5 to 11. We follow the same structure in each section, first of all outlining the types of interventions included, then the types of evidence found, and then the findings for each setting in turn. We then discuss any studies of the views of participants and practitioners on the feasibility and acceptability of the intervention approach.

For each type of intervention, we have attempted to summarise the strength of the evidence using the following definitions:

Strength of evidence definitions used in the review:

Support: The best available evidence of effectiveness comes from studies which take before and after measures and which use a control/comparison group (e.g. RCTs, controlled before and after studies), of which the majority report positive effects.

Moderate support: The best available evidence of effectiveness comes from studies which take before and after measures but do not involve a control/comparison group (e.g. uncontrolled before and after studies), of which the majority report positive effects.

? Insufficient evidence: The best available evidence of effectiveness comes from studies which take 'after-only' measures (e.g. post-intervention surveys) OR there is too little evidence to make an assessment.

✗ No support: The majority of the best available evidence suggests the intervention is ineffective.

Where there is no majority trend in the best available evidence (for example, where there are two RCTs, one positive and one negative), we assess the rating on the basis of the next level of evidence down, adding the higher quality evidence to it.

It is important to emphasise that 'insufficient evidence' does not necessarily mean that an intervention is ineffective; rather, that our review has not found evidence to suggest that the intervention has been evaluated to a sufficient extent using methods capable of demonstrating an impact on physical activity.

We have adopted this relatively simple approach to developing evidence statements rather than, for example, the approach used in NICE reviews, as we believe this is more accessible and useful for intervention planners interested in promoting physical activity in the outdoor environment.

5. Active travel interventions

5.1 Types of interventions

Interventions in this category seek to discourage car use and encourage more active modes of travel such as walking, cycling and mixed methods (e.g. public transport plus walking). Active travel interventions are often multi-faceted, involving a mixture of 'upstream' methods (e.g. creation and signage of routes, traffic restriction measures) and downstream methods (e.g. information and education directed at individuals). They tend to be implemented by partnerships rather than single institutions; school-based active travel interventions, for example, may involve partnerships between schools, the community, local authorities and voluntary or campaigning groups such as Sustrans. Some active travel interventions adopt a whole population approach (i.e. aimed at everyone in a particular community, school or workplace), while others are more targeted (for example, focusing on those individuals who are already interested in and motivated to consider alternative modes of travel). In this section we look at the evidence for:

- active travel interventions aimed at whole populations and designed to be implemented community wide, within schools or within workplaces
- targeted behaviour change programmes aimed at particular subgroups and individuals
- school walking buses
- school active travel initiatives
- workplace active travel campaigns
- policies and schemes to reward or disincentivise particular kinds of travel.

Interventions which are solely or primarily concerned with changes to physical infrastructure, such as the creation of a new cycle path, are examined in Section 7.

5.2 Evidence of effectiveness

Systematic reviews in this area include a NICE review of Active Travel interventions (NICE Public Health Collaborating Centre for Physical Activity, 2008a), and two reviews by Ogilvie and colleagues (2004, 2007) which examine interventions to promote walking and cycling, and walking only. Systematic reviews of workplace interventions also include some active travel interventions (Dugdill, Brettle, Hulme *et al*., 2007). We also looked for and included relevant primary studies conducted since the systematic reviews. A small number of the studies use RCT or controlled before and after designs, but the majority of studies use weaker designs (e.g. uncontrolled before and after panel studies).

5.3 Interventions in the community setting

Two systematic reviews (Ogilvie, Egan, Hamilton *et al*., 2004; Ogilvie, Foster, Rothnie *et al*., 2007) of interventions to promote walking and cycling include active travel programmes. The 2004 review examines walking and cycling interventions, whereas the 2007 review is restricted to walking interventions. As there is some overlap between the studies included in the reviews, we report the findings from the two reviews together. A distinction is made in the 2004 review between 'targeted behaviour change programmes', which involve measures aimed at motivated

subgroups and individuals, and 'whole population interventions' which are aimed at all individuals in a particular community "undifferentiated by motivation or personal travel circumstances" (Ogilvie, Egan, Hamilton *et al.*, 2004: 764). We adopt the same distinction below.

<u>Whole population interventions</u>
The Ogilvie, Egan, Hamilton *et al.* (2004) review includes two publicity-based interventions delivered to all residents in a particular community or region (Hodgson, May, Tight *et al.*, 1998; Alcott and DeCindis, 1991). In Maidstone, England, a controlled repeated cross sectional study of households on trunk route corridors showed that two years after a publicity campaign on sustainable transport, the only significant change was a decrease in cycling trips in the intervention area ($p < 0.05$) (Hodgson, May, Tight *et al.*, 1998). Drivers responding to an uncontrolled repeated cross sectional telephone survey in Phoenix (Arizona, USA) reported a positive shift of 1% of commuting journeys seven months after a mass media campaign promoting not driving to work one day a week (Alcott and DeCindis, 1991).

An evaluation of Local Exercise Action Pilots (LEAP), a national two-year initiative in England involving multi-faceted interventions at ten sites, reported that participants who were sedentary and 'lightly active' at baseline increased their overall level of activity (Pringle, Gilson, McKenna *et al.*, 2009; Carnegie Research Institute, 2007). Some of the LEAP project interventions included active travel; however, the design of the evaluation does not allow impacts to be linked to particular intervention approaches.

The current Scottish Government and COSLA initiative 'Smarter Choices, Smarter Places' is funding local projects in seven areas of Scotland to encourage locals and visitors to the area to reduce their car use in favour of active travel and more sustainable alternatives. Projects are being monitored and evaluated over 3 years, with self-reported levels of physical activity and health of the populations included in the monitoring programme's specific objectives. At the time of writing, only the results of the baseline monitoring have been taken and published in a grey literature report (Halden, Anable, Parker *et al.*, 2010). Follow-up measures will be taken annually until 2012.

> Strength of evidence: Insufficient evidence **?**

<u>Targeted behaviour change programmes</u>
The two reviews by Ogilvie and colleagues (2004, 2007) between them include 16 studies of community-based active travel interventions which are targeted at motivated subgroups or which provide information and advice customised to people's particular requirements. The interventions included in the reviews which are directed at school and workplace populations are discussed in Sections 5.4 and 5.5 below.

The majority of the studies included in the two reviews (13) are pilots or full studies in different communities of the Travel Smart/Individualised Marketing (IndiMark) programme (see Ogilvie, Foster, Rothnie *et al.*, 2007 for full details). This is an intervention which segments households in a community in terms of level of interest in active travel, and then provides appropriately tailored support such as home visits,

timetables, personal journey planners and so on. Seven of the Travel Smart studies were in England, with the remainder in Australia and Europe. The Travel Smart/Individualised Marketing studies used either non-randomised panel study designs, or controlled repeated cross-sectional designs, or a mixture of the two. They consistently reported a net increase in the proportion of household trips per year for which walking was the main mode of travel. However, the authors note that it was not possible to judge the statistical precision of the results, and only one of the studies (Perth, Australia) reported the statistical significance of the increase (49 trips per year ($p < 0.01$), and a decline in walking in the control group).

Of the other three studies, an uncontrolled panel study evaluation of the BikeBuster campaign in Aarhus, in which "inveterate motorists" were offered a free bike, free bus pass and other accessories and information for one year, reported a positive shift towards active travel (see Ogilvie, Egan, Hamilton *et al.*, 2004 for full details). An uncontrolled panel study evaluation of the TravelBlending campaign in Adelaide, Australia, reported decreases in car driving and increases in walking, while a panel study evaluation of an individualised travel planning campaign in York reported an increase in the proportion of household trips involved walking (see Ogilvie, Egan, Hamilton *et al.*, 2004 for full details). In all three studies, however, the reviewers note that there was insufficient data to judge the statistical precision of the results.

Strength of evidence: Moderate support 🌳

5.4 Interventions in the school setting

We have grouped school active travel interventions into two categories:
- 'Walking Buses', in which parents and carers arrange for their children to walk to school as part of a pre-arranged group along a set route, usually with a 'timetable' for what time pupils will be collected or dropped off from the Walking Bus to and from school
- School travel initiatives. These are more multi-faceted initiatives involving education, information and other measures. School travel plans may act as a mechanism for delivering a range of associated school travel initiatives, including walking buses, cycling promotion, safe routes to school and so on. Children may be encouraged to keep travel diaries, and materials and other activities may be developed for parents.

Walking Buses

A systematic review undertaken for NICE (NICE Public Health Collaborating Centre for Physical Activity, 2008a) which evaluated physical activity interventions for children included 4 UK studies, all using uncontrolled before and after designs. Evidence from three of the studies (DETR, 1999d; Mackett, Lucas, Paskins *et al.*, 2005; Cairns, 2006c) suggested that Walking Buses (volunteer-led walking groups supported by parents and teachers plus the involvement of the local highways or transport authority), led to increases in self reported walking among 5 to 11 year olds, and reduced car use for children's' journeys to and from school at 10 weeks and 14 to 30 months. The fourth UK study (Bickerstaff and Shaw, 2000) found no effect. Retaining volunteers to act as coordinators for these schemes appears to be

a key factor in the sustainability of walking buses. Currently walking buses are found to be commonly delivered in the UK; however, evidence for their generalisability remains uncertain (as they may be applicable only to the specific populations or settings included in the studies).

We also found two primary studies conducted since the NICE review. A controlled study (Heelan, Abbey, Donnelly *et al.*, 2009) of a 2-year walking school bus intervention which evaluated prevalence of walking to school by self-report and daily physical activity by accelerometer, reported 27% more walking to school in the intervention schools than in the control school, plus significantly more daily physical activity ($p < 0.05$). The authors conclude that a walking school bus intervention may increase frequency of walking to school and establish a link with increased daily physical activity.

Another study, using a controlled quasi-experimental design, evaluated a walking primary school bus programme in a low income community (Mendoza, Levinger and Johnston, 2009). Comparing baseline to 12-month follow up, the numbers of students who walked to the intervention school increased, compared with the control school, while the numbers of students who used the other forms of transport did not change ($p < 0.0001$).

> Strength of evidence: Moderate support

School travel initiatives

A systematic review undertaken for NICE (NICE Public Health Collaborating Centre for Physical Activity, 2008a) which evaluated physical activity interventions for children, included several interventions promoting active travel to school. School active travel programmes are also included in reviews by Ogilvie and colleagues (2004, 2007). As there is some overlap between the reviews, we combine the studies and discuss them below.

Together the reviews include eight studies in this category: a good quality UK RCT (Rowland, DiGuiseppi, Gross *et al.*, 2003), two UK controlled before and after studies (McKee, Mutrie, Crawford *et al.*, 2007; Tapestry, 2003), three UK uncontrolled before and after studies (DETR, 1999c; Cairns, 2006a,b), and two other uncontrolled before and after studies, in the US (Staunton, Hubsmith and Kallins, 2003; Zaccari and Dirkis, 2003). The studies report mixed results:

The methodologically strong UK RCT study (Rowland, DiGuiseppi, Gross *et al.*, 2003) suggested that introduction of school travel plans and direct support from a primary school travel plan advisor for a year, did *not* lead to increases in self reported levels of walking and cycling. This was a cluster RCT involving ten intervention primary schools in Camden and Islington (London). After a year's input from a school travel coordinator, children were no less likely to travel to school by car than those in control schools (odds ratio 0.98, 95% confidence interval 0.61 to 1.59) (Rowland, DiGuiseppi, Gross *et al.*, 2003). A UK controlled before and after study (Tapestry, 2003), suggested that walking campaign packs alone, including promotion materials for children and parents, did *not* lead to increases in walking among 4 to 11

year olds at 4 weeks. In three of the studies there was evidence that targeting on the basis of proximity to the school may increase effectiveness.

Six studies of schemes involving a mix of intervention elements designed to encourage and support walking to school report positive effects. Four studies - a UK controlled before and after study (McKee, Mutrie, Crawford *et al.*, 2007), two UK uncontrolled before and after studies (Cairns, 2006a,b) and an Australian uncontrolled before and after study (Zaccari and Dirkis, 2003) – provide evidence to suggest that walking promotion schemes, involving promotional materials, incentives and rewards, travel diaries for children and parents and provision of "park and walk" parking areas close to school and restriction of parking outside of schools, can lead to increases in self reported walking to school among 4 to 11 year olds, and reduced car use for children's' journeys to and from school at 4 to 10 weeks and 41 to 48 months. A further two uncontrolled before and after studies, one in the US (Staunton, Hubsmith and Kallins, 2003) and one in the UK (DETR, 1999c), suggested that a mix of promotional measures including curriculum, parental and community promotions (e.g. mapping safe routes to school, walk and bike to school days) could increase self reported walking and cycling at 24 months. In the UK study this activity was in support of a travel plan.

A grey literature evaluation of three active travel pilot projects in Scotland focusing on the transition from primary to secondary school, reported that active travel behaviour remained fairly stable across the period (Inchley and Cuthbert, 2007). In the absence of a comparison group, it is unclear whether this reflects a positive impact of the projects (i.e. whether active travel might have been expected to decline otherwise over the transition period).

Strength of evidence: Moderate support

5.5 Interventions in the workplace setting

We have grouped workplace active travel interventions into two categories: campaigns (which may involve multiple elements such as information, materials, and improvements to facilities), and rewards and disincentives to influence employees' travel behaviour.

Workplace campaigns
A NICE review (Dugdill, Brettle, Hulme *et al.*, 2007) of workplace health promotion interventions for physical activity included two intervention studies in this area, a UK RCT of 'Walk in to Work Out' in Glasgow (Mutrie, Carney, Blamey *et al.*, 2002), a theory-based campaign targeted at motivated subgroups (public sector employees contemplating or actively preparing to change their travel behaviour), and an Australian before and after study of a social marketing campaign promoting walking and cycling to work (Wen, Orr, Bindon *et al.*, 2005).

The strongest study (Mutrie, Carney, Blamey *et al.*, 2002) (which is also included in the Ogilvie, Egan, Hamilton *et al.*, 2004 and Ogilvie, Foster, Rothnie *et al.*, 2007 reviews) reported an increase in time spent walking to work (but not cycling to work) among both those who already walked to work and those who did not at the start of

the study. The assessment of the impact of a social marketing campaign on active travel (walking and cycling) to work found no significant increase in reported active travel to work at 12 weeks, but there was a significant reduction in the proportion of staff who reported driving to work 5 days/week (p = 0.012) (Wen, Orr, Bindon *et al.*, 2005).

Strength of evidence: Moderate support

Workplace schemes to reward or disincentivise particular kinds of travel
A systematic review of interventions promoting walking and cycling as an alternative to using cars included two studies involving subsidies or disincentives to encourage employees to alter their mode of travel (Ogilvie, Egan, Hamilton *et al.*, 2004). One controlled repeated cross-sectional study found that providing subsidies equivalent to the subsidy for workplace parking for employees who did not drive to work resulted in a positive shift in 1% of commuting journeys after one to three years (Shoup, 1997).

An uncontrolled repeat cross-sectional study in Oregon, USA (Zvonkovic, 2001) which involved promotional events organised by workplace transport coordinators and the distribution of free bus passes for state employees found no evidence of a shift in employees' usual mode of travel to work after nine months.

Strength of evidence: Insufficient evidence **?**

5.6 Views of participants and implementers

We summarise here findings from studies which have examined the views of participants and intervention implementers concerning the barriers and facilitators to active travel and the feasibility and acceptability of active travel interventions. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

Views of children and adults
A review (Brunton, Oliver, Oliver *et al.*, 2006; Lorenc, Brunton, Oliver *et al.*, 2008) synthesised 97 studies of people's views on walking and cycling to identify the barriers and facilitators of active travel. The key barriers were dangerous traffic, weather, concern about safety/accidents, convenience and personal preferences, while the key facilitators were the opportunity for sociability, environmental aspects, convenience, preferences and health benefits. From a thematic analysis across the studies, the authors identified four overarching explanations of transport choices: a culture of car use; fear and dislike of local environments; children as responsible transport users; and parental responsibility and behaviour. Views reflected a culture of car use which reinforced perceptions of the benefits of travel by car and discouraged the use of alternative modes. In addition, both children and parents expressed fear and dislike of local environments, including concerns about safety, traffic, and inadequate facilities for cyclists and pedestrians. However, children had

their own views about transport and perceived themselves to be responsible transport users in their own right. Finally, parents' perceptions of their own roles and responsibilities, and children's views of these, influenced transport choice at the level of the family. All these themes differed in importance and content according to factors such as children's age, sex, and location.

A literature review (Carver, Timperio and Crawford, 2008) identified some similar barriers to children's active travel and outdoor play, such as the perceived risk of traffic and the unattractiveness for walking and play of streets with a lot of traffic and parked cars. The review states that children may be less concerned about road safety than parents, but parents exert a strong influence on their actual behaviour; parental concerns about 'stranger danger' are also a deterrent. Carver, Timperio and Crawford (2008) discuss the 'social trap' or paradox of parents contributing to the very dangers from which they are protecting their children by driving them to school or by fostering anxiety about outdoor play and active play, thereby contributing to fewer people being out and about in the neighbourhood.

Living too far away and a perceived lack of time are given by pupils as the main reasons for not walking to school in a survey of pupils' views of active travel in three areas of Scotland (Inchley and Cuthbert, 2007). Having too much to carry is the next most popular reason given in the survey, suggesting that increasing the locker provision at schools might help encourage more walking to school.

A qualitative study explored the views of 10 to 13 year old Scottish schoolchildren on active travel to school and their ideas about promotion strategies for school-based interventions (Kirby and Inchley, 2009). The most common perceived barriers to active school travel were personal safety, weather conditions and time/distance. To a lesser extent, image, physical discomfort and aspects of the physical environment also prevented children from walking or cycling to school. Perceived benefits centred on health and fitness, environmental and social factors. Students suggested a number of potential promotion strategies, including incentives and reward schemes to enhance motivation. Practical exercises such as a group walk or cycle were more popular than classroom-based activities.

In the RCT of 'Walk in to Work Out' in Glasgow (Mutrie, Carney, Blamey *et al.*, 2002), focus groups were conducted with participants to explore barriers to active commuting. The main barriers reported by the walkers were time constraints and the expense of buying more equipment to walk in all weathers and carry work documents, while the barriers cited by cyclists included pollution, other road users, lack of covered cycle locking facilities, state of repair of cycle paths and safety. A qualitative study included in the NICE review of workplace health promotion interventions for physical activity (Dugdill, Brettle, Hulme *et al.*, 2007), which explored the views and experiences of adults who were new to cycling to work, identified several factors which might encourage or impede continued cycling (Gatersleben and Appleton, 2007). Barriers included "bad weather, darkness, feeling tired, having to expend too much effort cycling up hills, and saddle soreness"; "other traffic, unsafe roads, and traffic fumes"; and "flat tyres, lack of cycle lanes makes cycling unsafe, and work and family commitments" (Dugdill, Brettle, Hulme *et al.*, 2007: 126). Facilitating factors included positive experiences of cycling, such as enjoyment, a sense of achievement and being outdoors.

<u>Views of implementers</u>

A grey literature report (Cleary and Stevens, 2008) which reviewed and commented on Sustrans' School Travel programme in Scotland included an exploration of the views of key stakeholders and implementers. This raised several issues about the limits and challenges of school active travel interventions as perceived by those involved in their planning and delivery:

- there was a general consensus that expecting *all* schools to reduce their car use by a third was unrealistic, particularly for remoter rural schools
- a one-size-fits-all approach is unlikely to be successful
- schools with the highest levels of walking and cycling are often influenced by factors unconnected with school travel planning
- there was a general feeling that infrastructure provision implemented in support of school travel planning has only scratched the surface of what is required. Many considered that the highway network, in both urban and rural areas, was still heavily geared to the needs of motor vehicles
- the importance of ongoing maintenance and improvements to infrastructure
- conversely, some stakeholders felt that too much emphasis was placed on the provision of new facilities, particularly traffic-free routes, to encourage walking and cycling, and not enough on making better use of what exists, perhaps with some modest improvements. There was a view that equating 'safe routes to schools' with new paths reinforced the idea that travel behavioural change relies on new infrastructure, and perhaps discouraged the pursuit of alternative and cheaper approaches
- School Travel Coordinators concurred that it is important to involve pupils on the travel planning process. They also felt that there are numerous external influences that constrain this, such as the attitude of the school and parental choices
- access to young people in relation to school travel planning is still largely controlled by parents and schools. In particular, if the school management is disinterested in getting involved, it is unlikely that either parents or pupils could act very effectively independently
- schools are most likely to respond positively to initiatives like school travel planning, and thus allow/encourage their pupils to engage with it, if they can see some tangible benefit for the school community, e.g. tackling a school gate congestion problem, encouraging healthy lifestyles, improving road safety
- a culture of "unfettered car use" persists and will continue to undermine active travel efforts.

A grey literature evaluation of three active travel pilot projects in Scotland included stakeholder interviews to explore the factors influencing delivery of the projects (Inchley and Cuthbert, 2007). From the interviews, having an active and influential 'school champion' was identified as an important factor in successful implementation. Active travel programmes risked being perceived as 'yet another initiative' unless they were linked in with other ongoing work which school staff regard as beneficial (for example, existing programmes concerned with the transition to secondary school)

The evaluation states that promoting active travel requires sustained long-term action over several years to bring about the required "culture shift" in pupils' and parents' attitudes.

5.7 Summary of active travel interventions

The review has found moderate support for active travel interventions in the community which involve targeted approaches (for example, which target those who are already motivated to or preparing to adopt more active travel, or which provide information and support tailored to individuals or households). Interventions involving targeting (for example, for those already interested in changing their modes of travel) appear to be more effective than those which are aimed at a whole population.

In the school setting, the review finds moderate support for walking buses, an approach which has been reasonably well tested in the UK, although the evidence suggests that effectiveness may be dependent on specific aspects of the setting (i.e. the neighbourhood and how the walking bus is organised). There is also moderate support for multi-faceted school travel initiatives involving elements such as education, information, safe routes to school, cycle promotion, travel diaries, activities for parents and so on; however, it is not possible from the evidence to identify which elements contribute to effectiveness or the best mix of different intervention elements.

In the workplace setting, we found moderate support for workplace travel campaigns, which tend to be similarly multi-faceted, involving for example information, materials and improvements to facilities. We found insufficient evidence to support the use of employee rewards or disincentives to encourage more active modes of commuting.

Studies of participants' and practitioners' views identify a wide range of barriers to active travel including concerns about safety, inconvenience, time and location, and a culture of car use.

6. Modifications to the physical environment

6.1 Types of interventions

Interventions in this category involve making modifications and improvements to the physical outdoor environment, both built and natural, to support and encourage physical activity. They include:
- creation/improvement of paths and trails
- creation/improvement of cycle infrastructure
- restrictions on car use
- other modifications to urban infrastructure
- park improvements.

They are usually untargeted 'general population' interventions in that they potentially benefit all members of a geographical community. However, through their design or location they may be intended particularly to benefit certain subgroups in a community, such as children travelling to school, people in low income neighbourhoods, and so on.

Physical modification interventions whose primary purpose is to increase road safety or influence driving behaviour (rather than, say, to increase walking, cycling or play) are included in this section if there is evidence of their impact on physical activity.

Note that interventions to improve school playgrounds are examined in Section 7, as these interventions often involve organisational or policy changes (for example, introducing new equipment or play coordinators into the playground). Some of the active travel interventions examined in the previous section also involve some element of physical modification, such as signage or improvements to paths and routes to school.

We have defined all the interventions in this section as being implemented in the community setting, even though the beneficiaries/users of interventions will in some cases include children travelling to school and commuters.

6.2 Evidence of effectiveness

We found several systematic reviews of the effect of modifying the physical environment on physical activity. In addition, systematic reviews which examine active travel interventions and interventions to promote walking or cycling include interventions which involve modifying the environment by, for example, creating or signposting routes.

There is more evidence for paths and trails and for modifications to the urban environment than for modifications to the natural environment and for parks.

Because of the difficulty of identifying an appropriate comparison community, only a handful of the studies use controlled before and after designs, with many simply taking before and after, or after-only, measures, such as self-report surveys of

visitors/users. Studies of this sort of intervention need to measure activity in a whole population over a potentially wide area. Automatic counters offer a means of measuring usage levels over a specified time, but do not necessarily indicate the level or type of activity (walking or cycling), only someone's presence on the route being monitored. Observation can provide a more detailed picture of the types of activity being engaged in, but is a resource-intensive method.

Much of the evidence in this section is from the UK, and therefore the findings are generally applicable to the UK context.

Given the number of systematic reviews of this category of interventions, we have concentrated on systematic review findings in assessing the evidence, but include some more recent studies and also studies of people's views where these help shed light on the outcomes found in studies or illustrate important factors in the design and implementation of these interventions.

6.3 Interventions in the community setting

<u>Paths and trails</u>
Multi-use trails
A NICE review of transport-based interventions to promote physical activity in the outdoor environment (NICE Public Health Collaborating Centre for Physical Activity, 2006a) included four studies examining the impact of multi-use trails on walking and cycling (Evenson, Herring and Huston, 2005; Merom, Bauman, Vita et al., 2003; Sustrans, 2006a; Sustrans, 2005). Multi-use trails were defined in the review as routes open to cyclists and pedestrians, but closed to motor traffic, which may be developed for recreational purposes and/or utility trips such as travel to work, school or shops. Two of the studies, using uncontrolled before and after designs, were in the UK, one examining the impact on cycling and walking of on-going route improvements in Stoke (Sustrans, 2005), and one assessing the impact of signing and a leaflet concerning a section of the National Cycle Network in Edinburgh, Scotland (Sustrans, 2006a). Both the UK studies, plus an uncontrolled before and after study in Sydney of a 'rail trail' on disused railway tracks, showed increases in self-reported and observed walking and cycling. A controlled before and after study in the USA, showed no positive effects (Evenson, Herring and Huston, 2005). The two UK studies both reported increases in activity among women.

From these four studies, the review concludes that there is evidence to suggest that introduction of multi-use trails can lead to increases in levels of walking and cycling in both the short and long term. The review also suggests that the setting of the delivery of the intervention may influence its effectiveness, with trails located closer to population centres being likely to be better used. The review also suggests that trails may need to form part of a wider network of paths and routes which provide pedestrians and cyclists with sufficient facilities in order to overcome barriers to the use of these modes of transport.

A NICE review of the effects of urban planning and design interventions on physical activity (NICE Public Health Collaborating Centre for Physical Activity, 2006b) found two studies, both in the USA, which examined the impact of creating multi-use trails, one using disused railway tracks and one involving community coalitions in its

creation. Both studies used weaker designs (after-only surveys of trail usage and self-reported physical activity levels). The studies suggested that trails can lead to self-reported increases in physical activity in the short term (Gordon, Zizzi and Pauline, 2004) and long term (Brownson, Housemann, Brown *et al.*, 2000), and that factors such as trail surface, length and maintenance can influence trail use and attitudes towards trails. There was insufficient evidence from the studies to assess any differential effect of the trails by socio-demographic or cultural factors.

The review states that both of these studies would be feasible to implement in the UK with appropriate financial and political support. Some adaptations may be necessary to reflect local preferences and concerns - for example, in relation to the design or type of trail surface. Consideration may be needed to the levels of political and public support.

A cost-effectiveness study of four multi-use (cycle and walking) trails in the USA (Wang, Macera, Scudder-Soucie et al., 2004) reported that, taking into account the cost of constructing the trails and data on the physical activity levels of subsequent trail users, the average annual cost for persons becoming more physically active was US$98 (range US$65-253); US$142 (range US$95-366) for persons who are active for general health, and US$884 (range US$590-2,287) for persons who are active for weight loss.

Paths and trails by the seaside and in woodlands
Another study in the NICE urban planning review (NICE Public Health Collaborating Centre for Physical Activity, 2006b) examined the impact of building a boardwalk path along a seashore and harbour in Nova Scotia, Canada. Over three quarters of users reported using the new boardwalk more than once weekly, and a large majority of persons among both previously active (71%) and less active groups (29%) reported that they exercised more than before the boardwalk was constructed. The NICE review states there is insufficient evidence from this one study to draw any conclusions on the effect of interventions involving modification to foreshores.

A NICE review examined the effectiveness of interventions which involve some modification to the natural environment (NICE Public Health Collaborating Centre for Physical Activity, 2006c). Only two studies were found, both involving paths in the UK:
- in one study (Cannock Chase Council, Forestry Commission and Cannock Chase Primary Care Trust, 2005), a one-mile woodland trail in the West Midlands was modified to include a range of sculptures and statues, including creative rest stops and benches, designed to encourage people to use the trail. Infrared counters were used to monitor visitor numbers on a monthly basis over a one year period. Although it could be assumed that visitors were physically active along the trail, this study did not provide any information about mode of activity during the visit. In addition, a cross-sectional survey was undertaken at the launch of the trail. The study reported that the number of visitors using the route-to-health trail increased ten-fold to 50,000 visitors over the year, compared to the number of visitors using the same trail before the project started
- the second study examined the impact of a new circular coastal path which linked a village and an existing linear coastal path (Peacock, Hine and Pretty,

2006). Park benches and locally designed artwork were sited along the route. A post-only survey of visitors reported an increase in the number of visits per person per month and in the average duration of visits per person. The timing of the study was not reported; therefore any seasonal effects cannot be taken into consideration when examining the results.

From these two studies, the NICE review concludes that there is some evidence that improvements to paths may increase visitor numbers, but cautions that the evidence for impacts on physical activity is insufficient.

Strength of evidence: Moderate support 🌳 for multi-use trials

Insufficient evidence **?** for coastal and woodland paths

Cycle infrastructure
A NICE review of transport-based interventions to promote physical activity in the outdoor environment (NICE Public Health Collaborating Centre for Physical Activity, 2006a) included cycle infrastructure interventions. These were defined as physical measures to support cycling, such as cycle lanes, paths, advanced stop lines at traffic signals and signage, either forming part of a town or city network of routes or comprising a single section of infrastructure. Seven studies were included in the review, one from the UK, two from The Netherlands, one from Australia, one from Austria, one from Italy, and one from Denmark. Two of the studies used controlled before and after designs, two used uncontrolled before and after designs, and the remainder were weaker quality.

All seven studies reported an increase in cycling as measured through cycle counts on the routes. Five of these studies reported significant increases only in cycling (Ashton-Graham, 2003; Troelsen, 2004; Cope, Cairns, Fox *et al.*, 2003; CTC, 1995a,b). One study reported significant increases in cycling and a significant decline in walking (Mamoli, 2003) and one study reported a small increase in cycling, albeit from a very high baseline figure and a 'likely' decline in walking (Hartman, 1990). All seven studies measured outcomes in the long term, up to three years in one case. The review states that there is evidence that the introduction of cycle infrastructure can lead to long term increases in levels of cycling within the area of the scheme.

A systematic review of interventions to promote walking and cycling (Ogilvie, Egan, Hamilton et al., 2004) included three studies of cycling infrastructure, in Delft in the Netherlands, Detmold and Rosenheim in Germany, and Stockton in England. Using repeated cross-sectional household studies in the intervention area and a control area, the Delft study reported a 3% increase after three years in the share of all trips made by bike, with no change in the shares for walking or car use; in the control area, the frequency of car trips increased and the frequency of bike trips did not change. A nested panel study found a positive shift of 0.6% of all trips. However, the other two studies, which were uncontrolled before and after studies, found a negative effect on cycling after the routes were opened. The review concludes that the best available evidence indicates that cycle infrastructure measures are not effective.

A grey literature report by Sustrans Scotland (Sustrans Research & Monitoring Unit, 2009) drew on a variety of data sources (automatic cycle counters, route user surveys, hands-up surveys in schools, and manual counts) to assess usage of the National Cycle Network in Scotland. Key findings from the report include:

- the aggregate usage estimate for the National Cycle Network in Scotland was over 28.3 million trips in 2007, and increased by +10.6% to over 31.3 million in 2008
- Sustrans Route User Surveys conducted at five National Cycle Network sites in 2008 indicated that 14% of users were first time users of the route. Of the cyclists interviewed, 8% stated that they are novice cyclists (new to cycling, starting to cycle again or occasional cyclists)
- Route User Survey data collected before and after the delivery of infrastructure projects which link to the National Cycle Network show marked increases in commuting. At Guildiehaugh, Bathgate, the construction of a traffic-free path, linking to the National Cycle Network, is reported by Sustrans to have increased commuting from 11% of route users (3,000 users annually) to 41% (14,000 users annually), following the delivery of the intervention
- a Route User Survey in Inverkeithing in Fife, before and after the delivery of a scheme linking a new traffic-free path to the National Cycle Network, increased commuting from 17% (6,000 users annually) to 21% (7,000 users annually)
- analysis of data from automatic cycle counters also shows considerable increases in levels of cycling at the times of day associated with commuting trips
- before and after monitoring for the 'Get Active Getting There!' intervention in Perth suggested that there had been an overall increase in usage from 433,000 users annually to 509,000 users annually, a +18% change. At one of the sites, usage increased from an estimated 286,000 annually before the intervention to 361,000 after the intervention, a +26% change
- of those intercepted through the Route User Survey programme in 2008, 80% stated that the presence of the routes has helped them to increase their levels of physical activity (Sustrans Research & Monitoring Unit, 2009).

A brief grey literature report by Sustrans Scotland (2009) examined the impact of building or upgrading new routes to school at various locations across Scotland, using data from before- and after- route user surveys and 'cordon counts'. The report also stated that the aggregate usage data represents a 60.6% increase in usage, accounting for 135,690 more trips by non-motorised modes (both cycling and walking).

Strength of evidence: Support

Restrictions on car use
A NICE review of transport-based interventions to promote physical activity in the outdoor environment (NICE Public Health Collaborating Centre for Physical Activity, 2006a) examined the effect of traffic calming and of closing/restricting roads to cars on levels of walking and cycling. The review found eight traffic calming studies, all in the UK, of which six were uncontrolled before and after studies, one was a case study, and one was an after-only study. Evidence from five of the studies suggested

that traffic calming can lead to small self-reported and observed increases in walking and cycling (including children's play) both in the short and in the long term. However, three studies reported either no significant change in self reported and observed levels of walking or cycling, or slight declines in walking and cycling in the short and long term. The review comments that children may be an age group which benefits particularly as a result of traffic calming, not least through parents' greater willingness to let them play out.

The same review (NICE Public Health Collaborating Centre for Physical Activity, 2006a) examined three studies involving closure of roads or restrictions on car use. One study was in the UK, one in Germany and one in Denmark, and all were uncontrolled before and after studies. All three studies provided evidence to suggest that closing or reducing the capacity of roads can lead to long term increases in levels of walking within the area of the scheme, and one of the studies also suggested that closing or reducing the capacity of roads can lead to increases in cycling.

Strength of evidence: Moderate support

Other modifications to urban infrastructure

A NICE review of the effects of urban planning and design interventions on physical activity (NICE Public Health Collaborating Centre for Physical Activity, 2006b) included interventions which involved modifications to the urban infrastructure, such as pedestrianisation, conversion of residential roads to street parks, urban park improvement and aesthetic changes such as regular cleaning and maintenance. Seven studies were found, all weak in design (low quality before and after studies or after-only studies). Six were conducted in the UK and one was conducted in Norway. Because the majority were in the UK, we summarise the individual studies and findings below:

- improved street lighting for three urban streets and a footpath led to increased pedestrian use of between 34% and 101% from baseline in both men and women (Painter, 1996)
- pedestrian flows after the construction and opening of the pedestrian Millennium Bridge in London increased by 43% throughout the day and by 60% during lunchtime (Space Syntax Ltd, 2002)
- space-use patterns in Trafalgar Square, London, following the re-design of the public space in and around the square, increased around threefold (Space Syntax Ltd, 2004a)
- Feet First, a UK local authority initiative to improve the pedestrian environment and promote walking and cycling in 12 city centres, was associated with self-reported increases in children allowed to play out in the street and people walking in improved areas (Newby and Sloman, 1996)
- creating 3 'street parks' in a city in Norway was associated with a significant increase in the number of children observed compared with the numbers in three control parks (Skjoeveland, 2001)
- a Home Zone scheme in Leeds was associated with no change in levels of walking or cycling (Layfield, Chinn and Nicholls, 2003)

- the re-design of Paternoster Square in London was associated with pedestrian flow decreases of 7% mid-morning and 60% at lunchtime (Space Syntax Ltd, 2004b).

Where studies examined other outcomes as well as physical activity, the review found some evidence to suggest that fear of crime and perceptions of safety, attractiveness, and pollution (air and noise) can be favourably changed as a result of street-level urban change interventions.

Strength of evidence: Moderate

Park improvements

One primary study (New South Wales Health Department, 2002) included in the NICE review of the effects of urban planning and design interventions on physical activity (NICE Public Health Collaborating Centre for Physical Activity, 2006b) examined the effectiveness of improving an urban park in Sydney, Australia in increasing physical activity. A controlled before and after study, which assessed outcomes by observation, a survey and infrared counters, found mixed results. Respondents in the intervention ward were more likely to have 'walked for reasons other than exercise or recreation' in the two weeks prior to follow-up compared to no change in the control parks ($p < 0.0001$). However, there was no change between baseline and follow up in the number of respondents identified as being 'adequately active' and no change in self reported park use in either ward. Observational data revealed no difference in park use between intervention and control wards and infra-red counts showed some increases in all study parks including the control wards. The NICE review concludes that from this one study, there is insufficient evidence to draw any conclusions on the effect of interventions within urban parks on physical activity.

A primary study, published since the NICE review, examined the impact of renovations to two San Francisco parks on visitor levels and physical activity (Tester and Baker, 2009). Structured observations were conducted in the two intervention parks and a control park before and after the renovations, over a week long period. The authors report that both intervention park playfields saw significant increases in male and female visitors, with over a fourfold increase in the average number of visitors per observation among most age groups. For both genders, the study reports that there was a significant increase in sedentary, moderately active, and vigorously active visitors to the intervention park play fields.

Strength of evidence: Insufficient evidence **?**

6.4 Views of participants and implementers

We summarise here findings from studies which have examined people's views of facilitators and barriers to activity in the local physical environment and the views of those involved in designing and implementing physical environment interventions. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included relevant studies of views

which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

<u>Views of path and infrastructure users</u>
Several studies have examined public views on aspects of the physical environment which encourage and discourage walking and cycling.

A public opinion survey of walking and public space in Scotland conducted for Paths For All (Paths For All and Living Streets Scotland, 2009a) asked respondents to identify features which would encourage them to walk more. Features most commonly mentioned were: seating and public toilets, better maintenance of paths and spaces, information on places to walk, safe places to cross roads, vehicle speeds limited to 20mph, better lighting, and more paths with signs.

A review of studies of children's views of physical activity outside of PE classes (Brunton, Harden, Rees et al., 2003; Brunton, Thomas, Harden et al., 2005) found that children would welcome more access to or more attractive outdoor space such as gardens, parks and cycle paths. Barriers to activity in the local environment included fear of assault, bicycle theft, and neglected play areas.

A review of studies of children's views on the barriers to outdoor play (NICE Public Health Collaborating Centre for Physical Activity, 2008b) identified several aspects of the local physical environment, including fears for safety, in particular being bullied by older children, mugging and 'stranger danger'; dirty, unkempt play areas and parks; and traffic.

A literature review of the benefits and barriers to walking in Scotland (Paths For All and Living Streets Scotland, 2009b) cites data from the Living Streets' Scottish Community Street Audits on the aspects of the local walking environment which impact on people's feelings about walking in their local area. These include: poorly maintained footways, poorly designed street furniture, obstructions, lack of seating and toilets, inadequate crossings, and too much priority given to vehicles over pedestrians.

Although the increased usage reported in many of the studies discussed above suggests that residents felt positively about improvements to their local environment, a few studies were associated with no change in use or decreases in use. This suggests that residents do not always welcome new infrastructure. A focus group study in a low income neighbourhood to explore attitudes towards a proposed home zone development and extension of the National Cycle Network found that the residents were concerned that the new cycle/walk way would reduce their safety, while planners believed the developments would make the environment safer and healthier (Trayers, Deem, Fox et al., 2006). Similarly, focus groups conducted in two low-income city neighbourhoods in Ireland revealed that a new walking initiatve and path were not particularly well-received (Burgoyne, Coleman and Perry, 2007). Concerns about anti-social behaviour and safety, combined with an unattractive and decaying physical infrastructure, made residents disinclined to walk in particular areas, including the area covered by the intervention path. On top of this, residents expressed more general feelings of pessimism, disillusionment and apathy regarding the perceived neglect of the area by the authorities; in this context, the path initiative

appeared to be perceived as inappropriate and disappointing. The study highlights the need for full community engagement and multi-faceted action, particularly when introducing initiatives into disadvantaged communities.

Views of implementers
A review (Brennan Ramirez, Hoehner, Brownson *et al.*, 2006) of 'indicators of activity-friendly communities' generated through consultation with agencies involved in public health, transportation, urban planning, parks and recreation, reports that the top ten indicators as judged by those involved in the consultation are: integration of residential and non-residential land use in dense population areas, facilities or natural features which support activity, attractiveness of the area (e.g. features, public art, absence of litter), frequency of non-motorised travel, protective social factors and absence of social disorder, funds for parks and recreation facilities, funds for pavements and cycle lanes, policies which support active travel, and the presence of community-wide campaigns to support active living.

6.5 Summary of physical modification interventions

The evidence above provides moderate support for the idea that improving or creating trails and paths can increase their usage and impact on levels of walking and cycling. In some of the studies, the modifications took place alongside promotional activities or activities to enhance its appeal for users, such as the creation of sculptures and features. The review also finds evidence to support the creation of cycling infrastructure.

There is moderate support for restricting car use through physical measures (e.g. speed bumps, road closing) as a means of encouraging greater cycling and walking, and also for modifications to urban infrastructure which make public spaces more attractive for pedestrians.

The review found insufficient evidence of effectiveness for renovations to public parks (only two studies, reporting inconsistent results).

Studies of the views of community residents yield considerable information on the features of the local physical environment which might deter or encourage greater physical activity. These differ to some extent between children and adults, but common themes include safety, both in terms of cars and the danger from other people, attractiveness, and the importance of maintenance.

7. Organisational change interventions

7.1 Types of interventions

Interventions in this category involve making modifications and improvements to organisational structures and facilities to support and encourage physical activity outdoors. They include the following types of school and workplace interventions:

- improving playgrounds and playground equipment
- introducing play facilitators
- increasing opportunities for physical activity in the school day
- making school playgrounds available out of hours
- improvements to workplace facilities.

They are usually untargeted 'general population' interventions in the sense that they target and benefit the whole population in a school or workplace. They are sometimes implemented as part of wider, multi-faceted interventions concerned with promoting physical activity or general health across the whole school or a workplace active travel initiative.

7.2 Evidence of effectiveness

There are no systematic reviews specifically examining this type of intervention, but several systematic reviews include this type of intervention as part of a wider set of interventions (for example, concerned with workplace physical activity in general, or approaches for promoting activity by children). We also found a small number of primary studies and grey literature reports which were too recent to be included in the systematic reviews and/or which contained useful insights for the UK context. Because some of the interventions are relatively simple, experimental designs involving control groups and before- and after- measures are possible and have been used in some studies.

7.3 Interventions in the school setting

Improving playgrounds and playground equipment

A systematic review of non-curricular approaches for increasing physical activity in youth (Jago and Baranowski, 2004) included two studies involving improvements to playground provision – a controlled before and after study of painting lines on the playground surface (Stratton, 2000), and an uncontrolled before and after study of providing equipment for outdoor games (Jago, Bailey and Baranowski, 2003). In both, the interventions were associated with an increase in minutes spent in moderate to vigorous physical activity (MVPA) as assessed by heart rate monitoring.

A systematic review (Dobbins, DeCorby, Robeson *et al.*, 2009) of school-based interventions to increase children's physical activity included a randomised controlled study (Verstraete, Cardon, De Clercq *et al.*, 2006) which reported that providing additional game equipment during breaks was effective in increasing physical activity levels among 10 to 11 year olds. The authors comment that the increase was greater at lunchtime than during the morning break, perhaps because the longer break period allowed children to organise competitive games.

We found three studies conducted since the most recent systematic review. A non-randomised controlled study examined the effect of playground redesign in 15 schools in low income areas in England, with eleven matched schools acting as a control group (Ridgers, Stratton, Fairclough *et al.*, 2007). The study reported statistically significant effects at 6 week and 6 month follow-up for moderate-to-vigorous and vigorous activity assessed using both heart rate and accelerometers. The authors state that "a playground redesign, which utilizes multicolor playground markings and physical structures, is a suitable stimulus for increasing children's school recess physical activity levels" (Ridgers, Stratton, Fairclough *et al.*, 2007: 393).

Another non-randomised controlled study in England examined the effect of painting playgrounds in four schools with multi-coloured markings (Stratton and Mullan, 2005). Compared with children in four matched schools, children in the intervention schools spent more time in moderate and vigorous physical activity as measured by heart rate monitors over a four week period after the markings had been introduced.

An uncontrolled before and after study examined the effect of introducing extra relatively inexpensive outdoor play equipment during primary school (aged 6 to 12 years) breaks as a strategy for increasing physical activity levels (Lopes, Lopes and Pereira, 2009). Physical activity during school breaks was objectively measured by accelerometry over two consecutive weeks (baseline information in the first week and post intervention in the second week). The study reported a significant increase in the percentage of time spent in total physical activity (i.e. moderate to very vigorous intensity) among both girls and boys, all age groups and weight categories (i.e. lean and overweight/obese). Although younger boys and girls benefited significantly more from the intervention, the play equipment used may have been more appropriate for this age group. Limitations of this study include the lack of a control group and failure to measure the longer-term effect of the intervention (thus the increase in physical activity could be due to the novelty effect of the intervention).

A grey literature evaluation reports on the New Opportunities for PE and Sport (NOPES) initiative (2003-2009), which provided capital investment in sports and PE facilities across the UK (Nevill, Mason, Jeanes *et al.*, 2009). Some of the projects involved upgrading of playground facilities, although most of the funded activity was for larger infrastructure projects, such as new gyms. The evaluation states that there was a significant increase in the proportion of pupils receiving two hours of PE/school sport/extra-curricular activities after the opening of the NOPES facilities. However, it is not possible to separate out any benefits associated with outdoor activity elements in the projects as opposed to benefits associated with indoor facilities.

Strength of evidence: Support

Introducing play facilitators
A systematic review of non-curricular approaches for increasing physical activity in youth (Jago and Baranowski, 2004) included three studies which sought to increase physical activity in school by introducing facilitated play, led by teachers, supervisors or volunteers. An RCT (Sallis, McKenzie, Conway *et al.*, 2003) of multi-faceted

school policy interventions which included introducing volunteer physical activity providers and the purchase of new physical activity equipment reported a significant increase in boys' physical activity at 2 year follow-up, but no change for girls. An uncontrolled before and after study of introducing a games curriculum led by playground supervisors (Connolly and McKenzie, 1995) led to an increase in self-reported sweating by children.

The third study in the review was an RCT (Ernst and Pangrazi, 1999) examining the effect of introducing a 15-minute break into intervention schools for a four week period, during which classroom teachers encouraged students to participate in games and activities. The control group also received the extra 15 minutes, but teachers did not facilitate or encourage activity during the break. The study reports that intervention children engaged in significantly more physical activity during the intervention and at 12 week follow-up, while control group children did not increase their activity levels. This suggests that simply providing an extra break may not be enough unless children are encouraged to engage in active play.

A NICE review of 'family and community' interventions (NICE Public Health Collaborating Centre for Physical Activity, 2008c) for promoting physical activity in children included a controlled before and after study (Taylor, McAuley, Williams *et al.*, 2006; Taylor, McAuley, Barbezat *et al.*, 2007) which examined the effect of recruiting Community Activity Co-ordinators to set out play equipment and initiate games. One year follow-up showed an increase in children's physical activity both during school hours and at home (i.e. outwith the intervention), after adjusting for baseline physical activity and measured by accelerometers. By Year 2, no differences were found.

A grey literature report examined the delivery of the Active Primary School Pilot Programme (APSPP) in Scotland, initiated in 2000, which provided coordinators to work with primary schools to introduce the range and quality of opportunities for physical activity (Lowden, Quinn and Kirk, 2004). The evaluation covered 2001-2003, at which time the programme involved 21 local authorities; eleven pilot schools were examined in detail. Findings from pupil self-report surveys suggested that the time pupils spent being physically active in a typical week increased over the three years, with boys reporting more time than girls; however, in the absence of a comparison group, findings should be treated with caution. The increases in more disadvantaged schools (as measured by free school meal entitlement) were comparable to those in more affluent schools.

Strength of evidence: Support (for boys; possibly less effective for girls)

<u>Increasing opportunities for physical activity in the school day</u>
A small scale primary study using a randomised controlled design tested the effect on low income pre-school children's daily physical activity levels of increasing outdoor free play time by two additional 30 minute periods per day for two days (Alhassan, Sirard and Robinson, 2007). No statistically significant differences were found in physical activity levels as assessed by accelerometers after two days.

A cluster RCT study by Naylor, Macdonald, Warburton *et al.* (2008) assessed the impact of an active school model on physical activity levels in children aged 9 to 11 years. Three control schools received usual practice and seven intervention schools received the active school model (which used a whole school approach to provide children with more opportunities to be active throughout the school day) and was supported either by an external facilitator or an internal 'champion'. Physical activity was measured using pedometers (total steps/day) at baseline and throughout the intervention. Among boys, total steps/day were significantly higher in the external facilitator group, and higher (but not significantly) in the internal champion group (though not significantly), compared with the control schools. The intervention had no effect on girls' physical activity.

The study by Ernst and Pangrazi (1999) discussed above suggests that simply providing an extra break may not be enough unless children are also encouraged to engage in active play.

Strength of evidence: No support ✘

Opening school playgrounds out of hours
A two-year primary study using observational methods (Farley, Meriwether, Baker *et al.*, 2007) examined the effect of opening a schoolyard out of hours and providing attendants to ensure children's safety, by observing the number of children and their activity levels in the intervention yard and in a comparison schoolyard in a matched neighbourhood; children were also observed in the neighbourhoods surrounding the yards. The study states that the number of children observed who were outdoors and physically active was 84% higher in the intervention neighbourhood than the comparison neighbourhood. A survey of the children suggested that those in the intervention area reported a decline in time spent watching television and playing video games.

Strength of evidence: Insufficient evidence ?

7.4 Interventions in the workplace setting
Improvements to workplace facilities
A systematic review of interventions involving changes to the workplace environment to promote health-enhancing physical activity included two studies which fell into this category (the remainder concerned internal changes such as staircase modifications and signage) (Foster and Hillsdon, 2004). In one, a controlled before and after study (Linenger, Chesson and Nice, 1991) providing new cycle paths and a cycling club, plus changes to facilities to make physical activity more convenient (e.g. women-only facilities and extended hours), was associated with a small increase in fitness levels 12 months after baseline. In the other, an uncontrolled before and after study (Vuori, Oja and Paronen, 1994), improving facilities for walking and cycling to work (e.g. showers and changing rooms) alongside promotional events, education and incentives was associated with a 7% increase in active commuting six months after baseline.

A systematic review of worksite health promotion programmes involving 'environmental changes' included two studies in this category (the remainder were largely concerned with changes to food provision) (Engbers, van Poppel, Chin *et al.*, 2005). In one, a non-randomised controlled study, creating a walking track on company grounds had no effect on employees' perceived ability to exercise or exercise behaviour (Pegus, Bazzarre, Brown *et al.*, 2002). In the other study, which was an RCT, the creation of a walking route at lunchtime alongside provision of new or improved internal exercise facilities (part of the Working-Well Trial) was associated with a significant increase in self-reported time spent in exercise as well as positive attitudinal change towards exercise (Emmons, Linnan, Shadel *et al.*, 1999).

Improvements to workplace facilities are among the strategies used by projects in the Well@Work scheme, a national health promotion initiative in England comprising nine regional projects across 32 workplaces and evaluated in a grey literature report (Bull, Adams and Hooper, 2008). Intervention activities included provision of bicycle storage and changing facilities, bicycle purchase and loan schemes, and signposting of distances and steps walked around the workplace, alongside a wide range of other activities and themes. Although the report states that increases in active travel were observed in three projects and in sports and recreation participation in nine projects, the evaluation design did not allow outcomes to be linked to specific intervention activities (most projects were multi-faceted and involved other elements not concerned with outdoor activity). The authors also note that the observed increases could have been associated with seasonality.

Strength of evidence: Support 🌳🌳

7.5 Views of participants and implementers

We summarise here findings from studies which have examined participants' and implementers' views of the facilitators and barriers in relation to organisational and policy interventions to promote physical activity. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

Children's views of active play
A review of studies of children's views of physical activity outside of PE classes (Brunton, Harden, Rees *et al.*, 2003; Brunton, Thomas, Harden *et al.*, 2005) found that children would welcome, among other things, more extra-curricular activities organised by schools and access to school facilities out of hours. The review also suggests that many children dislike, are bored by or feel embarrassed about sport, suggesting that less structured and less competitive play might be a more appropriate approach to encouraging physical activity for some children.

Children's views on the benefits and barriers to active outdoor play are discussed in a NICE review synthesising studies of children's and practitioners' views and case studies (NICE Public Health Collaborating Centre for Physical Activity, 2008b). The review finds that although children say they appreciate the opportunities afforded by

being outdoors for socialising, quiet activity and sport, the local neighbourhood is often not conducive to play because of neglected play parks, 'grumpy neighbours' and fears about bullying by older teenagers. These factors support the strategy of making greater use of school playgrounds.

Views of implementers
Practitioners' views on the benefits, risks and barriers involved in promoting active play are discussed in a NICE review synthesising studies of children's and practitioners' views and case studies (NICE Public Health Collaborating Centre for Physical Activity, 2008b). The review identifies the following themes from the studies of practitioners' views:

- strong support for the principle of ensuring that children in the foundation stage are given the opportunity for regular outdoor play as part of the school day
- outdoor play should provide opportunities for movement and challenge, and opportunities to play safely with natural elements
- children's play in outdoor space can be optimised through a number of practical measures such as: seeing the indoor and outdoor spaces as one environment; providing materials specifically for physically active play; making links to the curriculum; provide for diverse active activities; planning to take account of issues such as weather, light, wind direction
- adults can help to facilitate active play through: creating the right context for play in which children feel secure and still have the necessary freedom and autonomy to explore through free play; observing play and understanding children's interests, in order to guide the provision of resources and environments for play; interacting appropriately and intervening only when necessary; creating the right environment for play including materials and resources for play, as well as the actual place to play
- practitioners may limit the amount of outdoor play offered to children due to a number of assumptions: that the outside is dangerous; that higher adult:child ratios are needed outside; that educators are merely supervisors outdoors, and that no learning happens outside; that the weather is a barrier; and that being outside is somehow less healthy. All of these assumptions can be tackled to increase active play outdoors
- there appears to be a strong consensus among practitioners that there should be much more out of hours use of school grounds
- for older children, play facilities are most valued when they are close at hand. If a facility is more than a few hundred metres away, regular use declines dramatically.

A grey literature evaluation of a training package which involved interviews with active school coordinators, play workers and playground supervisors suggests a number of issues and challenges in making playgrounds more supportive of active play (Casey, 2005). These include: existing attachment among professionals to a more controlling and structured approach to sport and play; the need to allow children to take more risks; the influence of the 'blame culture' and health and safety legislation; the low status of playground supervisors in relation to other staff and their limited ability to introduce change in school; and the need for inclusion when designing playgrounds and encouraging active play.

Interviews with project staff involved in the NOPES initiative described above (Nevill, Mason, Jeanes *et al*., 2009) identified various factors thought to be important to the successful delivery of projects. These included: good quality inspirational leadership, effective partnership, and clear ownership. Interviewees felt that the improved facilities and infrastructure enhanced the provision of school support, increased the opportunities for teaching and learning, and helped to involve less active and less motivated pupils in physical activity.

The grey literature evaluation of the Active Primary School Pilot Programme in Scotland (Lowden, Quinn and Kirk, 2004), discussed above, included interviews with coordinators on the facilitators and barriers to encouraging more active play. The issues identified included the need to reduce 'boys' monopoly on playground space' and to encourage girls to engage in more playground games and sports; the potential to train classroom assistants in playground games; and the value of improving playground markings and providing equipment to facilitate activity.

The evaluation of the Well@Work programme discussed above (Bull, Adams and Hooper, 2008) included interviews with project coordinators to explore the facilitators and barriers to healthy and active workplace initiatives. The report identifies several barriers, including workplace locations and characteristics which are not supportive of or attractive for walking and cycling, and workplace cultures which discourage lunchtime activity. Facilitating factors identified in the report include supportive management, having a 'champion' for workplace physical activity initiatives, and the engagement of employees themselves in planning and delivery of programmes.

7.6 Summary of policy and organisational change interventions

The evidence provides support for modest playground improvements (for example, coloured paint markings) and for providing additional playground equipment as strategies for encouraging active play. These are relatively simple and low cost replicable interventions. However, effectiveness has not been measured over the longer-term, and it is possible that such interventions may have a novelty effect which wears off over time.

The review also finds support for introducing play facilitators to encourage children to engage in active play and games, although this strategy may be less effective with girls than with boys.

We found no support for increasing the number of outdoor activity breaks in the school day. Taken together, the evidence suggests that simply increasing the amount of time children spend in the school playground is not effective unless the playground experience is enhanced either with improved markings and better equipment or with facilitators to encourage active play.

We found insufficient evidence for making school playgrounds available out of hours.

Finally, the review finds support for improvements to workplace facilities such as changing facilities and bicycle storage. However, interventions tend to be multi-faceted, involving several different elements, and it is not possible to identify the contribution of specific elements.

Studies of the views of participants and implementers suggest that both children and school professionals see potential to make greater use of school playgrounds for less structured and more informal activity. However, a number of organisational and attitudinal barriers are identified, particularly concerns about danger and risk and an attachment to more structured and safer approaches to promoting physical activity. In workplaces, management support and employee involvement are important factors.

8. Walking groups and programmes

8.1 Types of interventions

Types of interventions included in this category include:
- walking groups/programmes with a health focus or for specific target groups
- walking groups/programmes for a general population
- workplace walking programmes (excluding active travel).

Interventions to promoting walking to school by children and parents are examined in Section 5, Active Travel.

8.2 Evidence of effectiveness

Walking as an intervention has been evaluated more frequently, and is of higher quality than other outdoor interventions. The reasons for the higher quantity and quality of evidence is that it is relatively easy and feasible (compared to some of the other outdoor interventions) to undertake studies comparing walking intervention with either no intervention or another intervention. Therefore, a higher percentage of studies can use experimental designs such as the randomised controlled trial (RCT). We identified five high quality reviews (Foster, Hillsdon and Thorogood, 2005; Ogilvie, Foster, Rothnie *et al.,* 2007; NICE Public Health Collaborating Centre for Physical Activity, 2008a; NICE Public Health Collaborating Centre for Physical Activity, 2006d; Kahn, Ramsey, Brownson *et al.,* 2002) which either focussed on walking interventions, or included some studies of walking interventions. Due to the number of high quality reviews, this section mainly focuses on their findings, supplemented with primary studies published subsequently.

8.3 Interventions in the community setting

Interventions included in this category involve encouragement to people to walk more around their neighbourhood, and include (in some cases such as health walks) the use of volunteer 'walking group leaders'. Walking maps and suggested routes may be included.

Walking groups/programmes with a health focus or for specific target groups
One Cochrane review (Foster, Hillsdon and Thorogood, 2005) evaluated a range of interventions to increase physical activity in the general population such as counselling/advice/support/education; self-directed or prescribed physical activity; supervised or unsupervised physical activity; home-based or group based physical activity. Twenty-nine RCTs were included in the review, of which four RCTs involved referral to, or promotion of, outdoor walking groups/health walks in the community setting with or without other elements (e.g. motivational interviewing, counselling, telephone advice). One RCT included in the review evaluated a workplace intervention (Lombard, Lombard and Winett, 1995) which is described in more detail in Section 8.4. The results from the four RCTs (Lamb, Bartlett, Ashley *et al.*, 2002; Elley, Kerse, Arroll *et al.*, 2002; Kriska, Bayles, Cauley *et al.*, 1986; Resnick, 2002) are described in more detail below under the relevant headings (grouped by target population group). Results were mixed (two positive, two no effect).

Inactive populations

Three high quality RCTs were identified that targeted inactive populations. An ongoing RCT in Scotland (Walking for Well-being in the West) is assessing the effectiveness of a 12-week pedometer-based walking programme in combination with physical activity consultation in increasing and maintaining physical activity and walking behaviour over a 12 month period (Baker, 2008; Fitzsimons, Baker, Wright *et al.*, 2008). The intervention is targeted at adults not meeting current physical activity recommendations. Physical activity measured by pedometers (steps/day) and by self-report as well as other health outcomes (e.g. quality of life, body mass index, cardiovascular risk factors) were recorded at baseline and week 12. There were significant increases in steps/day, self-report leisure time walking and time spent sitting in the intervention group compared to the control group. No significant changes in most health outcomes were found in either group. Data analysis on the longer-term effect of the intervention is ongoing.

A 6-month randomised trial targeting middle aged inactive adults compared the impact of two different websites on self-reported walking, neighbourhood walking and total physical activity in Brisbane (Ferney, Marshall, Eakin *et al.*, 2009). The authors note that the internet offers a method of delivering mass-reach interventions and that while previous studies have shown some modest effects, usage of such interventions is low and declines over time, suggesting a need for interventions which can sustain participant engagement. The intervention website was developed specifically for residents of a local neighbourhood community, following a user-centred design approach and focusing on promoting local opportunities for walking and other activities. The comparison website was a motivational information website. Participants were sent regular emails inviting them to access 'their' website. Statistically significant self-reported increases in walking and total physical activity were observed in both groups; however, intervention group participants maintained more of their initial increase in physical activity at 6 months, and more frequent use of the website was associated with more frequent walking on the community trail.

An RCT comparing two interventions – a self-help walking programme plus weekly diaries, and the same walking programme plus a pedometer, both targeted at inactive adults aged 30 to 65 years – with no intervention, reported that the walking programme plus pedometer was associated with significant increases at three month follow-up in sport/recreation participation and the proportions meeting physical activity recommendations (Merom, Rissel, Phongsavan *et al.*, 2007).

A Scottish based evaluation of Paths to Health Pedometer Pack (McKay, Awty, Lowry *et al.*, 2007) found that over 70% of patients met or exceeded their target number of steps and significantly increased their step counts between start and finish of the structured walking programme. In addition, at three month follow-up, 57% had maintained their reported level of activity on at least 5 days a week.

Strength of evidence: Support
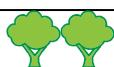
Primary care populations

Four high quality RCTs evaluated primary care based interventions with mixed results. An RCT of green prescriptions for primary care patients found positive effect on self-reported physical activity (Elley, Kerse, Arroll *et al.*, 2002) as did an RCT of a walking programme (offering choice of group or independent walking) targeted at older women (Kriska, Bayles, Cauley *et al.*, 1986). However, an RCT of a walking programme for primary care patients (group sessions, advice, offer of health walks programme) found no effect on achieving a target amount of self-reported physical activity (Lamb, Bartlett, Ashley *et al.*, 2002). A large UK based RCT evaluated the effectiveness of a leisure centre-based exercise programme, an instructor-led walking programme and advice-only in patients who were not physically active (referred for exercise by their GPs) (Isaacs, Critchley, Tai *et al.*, 2007). There was an increase in the proportion of participants achieving at least 150 minutes per week of at least moderate activity measured by self-report in all three study groups: at 6 months, the net increases were 13.8% in the leisure centre group, 11.1% in the walking group and 7.5% in the advice-only group. The authors concluded that: "The inclusion of supervised exercise classes or walks as a formal component of the scheme may not be more effective than the provision of information about their availability" (Isaacs, Critchley, Tai *et al.*, 2007: iv).

Strength of evidence: Support

Older people

Four studies evaluated walking interventions for older people. An RCT of a walking programme (choice of group or individual walking) targeted at adults in a retirement community found no effect on self-reported physical activity (Resnick, 2002). Another RCT of a progressive walking programme for women aged 79 to 91 years including outdoor walking, reported a positive effect as measured by heart rate at six months (Hamdorf and Penhall, 1999). More recently, a before and after pilot study (Rosenberg, Kerr, Sallis *et al.*, 2009) evaluated the feasibility and acceptability of a walking intervention for older adults in a continuing care retirement community (CCRC). The intervention included site-specific walking route maps, pedometers, and individualised goal setting. Steps per day (measured by a pedometer) were very low at baseline and increased significantly at post-test. Another before and after study randomly selected older (65 to 74 years) inactive adults to participate in a neighbourhood-based walking programme (Jancey, Clarke, Howat *et al.*, 2008). A total of 65% of participants completed the programme and the mean weekly walking time for recreation, measured by self-report, increased by about 100 minutes, and 80% of participants reported that they would continue to walk twice per week upon program completion (no data was provided on whether they did carry out their intention).

An RCT of a six-month walking intervention targeting older people with mild to moderate hypertension in a rural area of Taiwan found that face to face and telephone support from a public health nurse was associated with an increase in self-reported walking and exercise self-efficacy scores (Lee, Arthur and Avis, 2007).

We also identified a non-peer reviewed Scottish evaluation of a volunteer health walk programme which included older people, sedentary, people with ongoing health

conditions, people with Alzheimer's and carers (Melrose, 2008). Although this was primarily a process and qualitative evaluation, walk participants believed that the walks improved their health, experienced increased confidence and self-esteem, and appreciated the social contact (especially those who had been recently bereaved). Volunteer leaders described increased confidence to engage in other community activities.

Strength of evidence: Support

New mothers
A controlled before and after study in Australia (Watson, Milat, Thomas *et al*., 2005) evaluated the effect of a pram-walking intervention on self-reported physical activity, mental health and social indicators but found no significant differences for any of the outcomes at follow up. Members of the study team also surveyed the women halfway through the programme (Currie, Boxer and Devlin, 2001) and concluded that pram walking is an activity that can overcome some barriers identified by this group as it is free, requires no child care, and can easily fit between competing obligations.

A 12-week randomized controlled trial examined the effect a pram-walking programme compared to a social support group (non-structured sessions, similar to a playgroup) on physical fitness and depression (Armstrong and Edwards, 2004). The results showed that mothers in the pram-walking intervention group improved their fitness levels (as well as reducing their level of depressive symptoms) significantly more than the social support group. However, impact on general physical activity levels was not measured.

Strength of evidence: Insufficient evidence ?

Walking groups/programmes for a general population
In this section we discuss walking programmes aimed at general populations, i.e. those which are not targeted at specific sub-groups. The interventions discussed in this category share some similarities in methods with the interventions discussed in Section 10.3, which examines community-wide campaigns promoting physical activity in general.

A rapid review undertaken for NICE (NICE Public Health Collaborating Centre for Physical Activity, 2006d) evaluated the effectiveness of community-based walking (and cycling programmes) to promote physical activity in adults. Three relevant RCTs were identified, two of which (Lamb, Bartlett, Ashley *et al*., 2002; Hamdorf and Penhall, 1999) are described above. The other community based RCT found an increase in self-reported walking or physical activity levels at 6 months (Fisher and Li, 2004). This was a cluster RCT evaluating a 6-month neighbourhood walking programme involving trained volunteer community walk leaders leading three walks per week.

Since that review was published several other studies have been undertaken. A community-based study using a before and after design evaluated multiple interventions (included sponsoring walking groups, improving walking routes, providing information about walking options, and advocating for pedestrian safety) to

increase walking activity at a multicultural public housing site (Krieger, Rabkin, Sharify *et al.*, 2009). The authors reported that at follow-up (period not stated), self-reported walking activity increased among walking group participants (p = 0.001). The proportion that reported being at least moderately active for at least 150 minutes per week (i.e. achieving the current recommendations) increased from 62% to 81% (p = 0.018).

A theory-based mass media campaign promoting walking and local community-sponsored wellness initiatives through four types of media (billboard, newspaper, radio, and poster advertisements) was evaluated using a post-campaign-only, cross-sectional telephone survey (*n*=297) (Wray, Jupka and Ludwig-Bell, 2005). Reported exposure to the campaign was significantly associated with positive changes in attitudes to walking and with participation in a community-sponsored walk, controlling for demographic, health status, and environmental factors.

We identified one non-peer reviewed Scottish evaluation which included some outcome data. The report evaluated a 12 month Walk Forward project, a partnership between Ramblers Scotland and Paths to Health which had the aim of encouraging fitter participants in Paths to Health schemes to move beyond very easy walks (Ramblers Scotland and Paths to Health, 2009). Although participants were overwhelmingly positive about the new groups, no notable changes were found in self-reported levels of walking achieved or levels of health.

A Scottish process evaluation of walking groups (the Ramblers Scotland 'Promoting Walking' project) (Ramblers Scotland, 2007) explored whether the project succeeded in forming new groups focused on short walks and in encouraging existing groups to diversify to meet the needs of less active walkers. The evaluation did not examine impact on levels of walking, but reports that the project was associated with a substantial increase in the number of short walks (less than 5 miles) provided within the overall Scottish programme, and with attracting between 500 and 600 new participants. Characteristics of new walkers included: those new to walking, returning to walking after health/mobility problems, 'graduates' of health walks programmes, and those previously more active.

Strength of evidence: Support 🌳🌳

8.4 Interventions in the workplace setting

This section examines workplace interventions to promote walking, excluding active travel interventions which are examined in Section 5. We have grouped all the relevant workplace interventions under the heading 'workplace walking programmes'.

Workplace walking programmes
The Cochrane review by Foster, Hillsdon and Thorogood (2005) identified one workplace study. This was an RCT of a walking programme at a university, comprising information materials, group walks and telephone calls. The study reported that participants who received a high frequency of follow up telephone calls (10 calls over 12 weeks) were more successful at increasing their self-reported

walking behaviour than participants who did not receive telephone calls (Lombard, Lombard and Winett, 1995).

A NICE review (Dugdill, Brettle, Hulme *et al.*, 2007) evaluated workplace health promotion interventions on physical activity. Four studies were identified which aimed to increase walking (step counts) in employees – two studies (UK based) used an RCT (individual) design (Murphy, Murtagh, Boreham *et al.,* 2006; Gilson, McKenna, Cooke *et al.,* 2007) and the other two were before and after studies (Chan, Ryan and Tudor-Locke, 2004; Thomas and Williams*,* 2006), in Canada and Australia respectively. Three of the studies (Chan, Ryan and Tudor-Locke, 2004; Murphy, Murtagh, Boreham *et al.,* 2006; Gilson, McKenna, Cooke *et al.,* 2007) measured physical activity objectively with pedometers, but all the studies relied on the participants to self-report their step counts. There is evidence from all four studies in public sector worksites that workplace walking interventions using pedometers that focus on: facilitated goal setting, diaries and self monitoring and walking routes can produce positive results by increasing step count. Another study in the same review, a controlled before and after study, reported that an employee-designed multi-component intervention involving information, action days to encourage commuting or stair climbing, led walks, fitness tests and counselling, resulted in a significantly higher level of energy expenditure (Titze, Martin, Seiler *et al.*, 2001).

Primary studies published more recently include an RCT of a face-to-face versus telephone support intervention which aimed to increase physical activity and mental health among university employees (Opdenacker and Boen, 2008). Both groups increased leisure-time physical activity and the only difference between the groups was for active transportation (the face-to-face support group increased their active travel). The authors concluded that both interventions increased self-reported physical activity.

A primary study using an uncontrolled before and after design evaluated a communications-based worksite campaign which sought to promote awareness of an existing local walking path through emails, flyers and other information at the workplace (Napolitano, Lerch, Papandonatos *et al.*, 2006). Borderline statistically significant increases in walking activity from baseline were observed during and following the campaign (p = 0.075).

Strength of evidence: Support
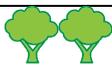
8.5 Views of participants and implementers

We summarise here findings from studies which have examined participants' and implementers' views and experiences of walking groups and programmes, focusing particularly on facilitators and barriers to successful implementation. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

Because most of the literature in this area examines the views of both participants and implementers and identifies linked issues, we report studies of the views of participants and implementers together in this section.

A Scottish process evaluation of walking groups (Ramblers Scotland, 2007), reported above, identified a number of facilitators and challenges experienced by the walking groups. Facilitating factors included the existing volunteer structure, which meant that groups were able to sustain themselves once up and running, and the potential of the programme to deliver other benefits, such as social contact. The challenges included difficulty attracting volunteer walk leaders, reluctance among some existing groups to provide shorter walks, and resistance among some existing groups to the formation of new groups perceived as competitors or threats.

A Scottish feasibility study and process evaluation explored the potential to use national nature reserves (NNRs) as a setting for health walks (MNT Associates, 2007). Interviews with participants in the feasibility study suggested that walking in NNRs could be a positive and enjoyable experience for walking groups, but that careful attention needed to be paid to matching the group to the right NNR, and the group's needs in terms of access, ability, information about terrain, and physical infrastructure. Walking in NNRs was perceived by participants to be more complicated than walking in more accessible settings, requiring bespoke travel and more time.

A grey literature evaluation of a Ramblers Family Walking Programme – Furness Families Walk4Life (Milton, Kelly and Foster, 2009) – included interviews with participants, project workers and other stakeholders to identify barriers and facilitators to the successful implementation to the project. Facilitating factors included the partnership between the Ramblers and Action for Children, which was perceived as critical to the success of the pilot, and the involvement of Children's Centres, which was perceived to have helped encourage families to take part. Those who attended the programmes reported several benefits including social interaction, weight loss and increased confidence. The biggest challenge in implementing the programmes identified was the short lead-in time, the lack of a systematic marketing strategy and utilising newly established Children's Centres to recruiting participants.

Focus groups with participants and co-ordinators in the Ramblers Scotland Walk Forward project (Ramblers Scotland and Paths to Health, 2009), reported above, suggested that walkers were reluctant to move away from the group walking structure, or to progress from their healthy walking scheme groups once they had attained a certain level of walking ability. This constrained the ability of healthy walking schemes to cater successfully for new, formerly inactive participants, but the strategy of imposing a limit on the amount of time fitter walkers could remain with a healthy walking group was felt to be inappropriate. The report suggested that, if walkers were to be able to continue indefinitely with a healthy walking scheme, staff should be more involved in encouraging their transition to longer walks and Ramblers groups should be supported to develop short walks programmes.

An evaluation of the Paths to Health programme focusing specifically on the potential links between projects and employability included interviews with coordinators, managers and stakeholders exploring the project delivery process (Linked Work &

Training Trust, 2009). Factors identified by interviewees as important in the delivery of the projects included:

- volunteer walk leaders who were local to the community were felt to be critical to the success of groups
- social interaction and a feeling of belonging were perceived to be important motivating factors for participants, with physical fitness being secondary
- links between projects and GPs were felt to be limited.

Although interviewees recognised that the walks programmes appeared to build people's confidence, some felt more could be done within the projects to encourage progression (Linked Work & Training Trust, 2009).

8.6 Summary of walking groups and programmes

The review finds support for walking groups and programmes which are aimed at general populations within a community and for ones which are targeted specifically at inactive populations, primary care populations and older populations.

The review also finds support for walking groups and programmes implemented in workplaces.

There is insufficient evidence of walking programmes targeted specifically at recent mothers.

Studies of the views of participants and implementers suggest that a major challenge for people involved in the delivery of walking for health programmes is how to encourage progression in walking once participants have increased their levels of physical activity beyond that provided by led health walks.

9. Cycling promotion

9.1 Types of interventions

Interventions in this category are concerned with promoting cycling, either in the context of active travel or in general, and include:
- community cycling initiatives
- school-based cycling promotion campaigns
- workplace cycling initiatives.

Note that interventions which seek to encourage and support cycling in the context of active travel are examined in Section 5, while cycling infrastructure is examined in Section 6.

9.2 Evidence of effectiveness

There is less evidence for cycling promotion interventions than for interventions promoting walking. A NICE review of community-based walking and cycling programmes (NICE Public Health Collaborating Centre for Physical Activity, 2006d) suggests that this is likely to be due to a combination of two main factors: cycling programmes are relatively new interventions compared to community-based walking and exercise referral, and the transport literature tends to use different research methods, with fewer controlled trials and more use of case studies. We found few primary studies in the academic literature, with the majority of the evidence being grey literature evaluation reports, several of which rely on self-reported and retrospective assessments of cycling frequency by respondents.

9.3 Interventions in the community setting

Apart from studies of active travel, which are examined in Section 5.3, and studies of cycling infrastructure, which are examined in Section 6.3, we found no studies in the academic literature of community-based cycling promotion initiatives. The grey literature evaluations are summarised below.

Community cycling initiatives
A NICE rapid review (NICE Public Health Collaborating Centre for Physical Activity, 2006d) of community-based walking and cycling programmes to promote adult physical activity found no studies of cycling programmes which were methodologically strong enough to meet the review's criteria. It did however find and summarise the findings from five grey literature evaluations. These were described as mainly project evaluation reports which did not incorporate a control group in their study design, did not take measures before the intervention, and relied on self-reported, retrospective assessments of cycling frequency.

The results are briefly summarised below:
- an evaluation of Pedal Back the Year led bike rides did not examine the impact on physical activity or cycling outcomes, but reported that 470 rides had taken place

- a survey of cycle training participants reported that 81% claimed to cycle more or more confidently since they had completed the training
- an evaluation of a scheme in which a GP surgery bought bikes for patients' use and offered led rides reported that there was no uptake by patients
- an evaluation of cardiac rehabilitation using organised bike rides reported that 50% of participants continued to cycle on a regular basis
- another evaluation of cardiac rehabilitation using led bike rides reported that patients had positive experiences of the scheme and that 60% (of nine participants) cycled regularly after six months (NICE Public Health Collaborating Centre for Physical Activity, 2006d).

A grey literature report evaluates the delivery of the national Scottish Cycle Challenge Initiative, a 1997 funding scheme set up to meet the Scottish Government target of doubling the amount of cycling between 1996 and 2002 and again by 2012 (Halden, McGuigan and Troy, 2001). A total of 37 projects were funded and 35 completed, comprising a total investment of nearly £2 million supported by £0.58 million from the Cycle Challenge Initiative. The 37 projects comprised:
- cycle route construction (addressed in 7 projects)
- secure cycle parking, facilities and other support for cycling to work (8 projects)
- Safer Routes to School schemes (4 projects)
- publicity and cycle promotion (8 projects)
- cycle purchase and cycle hire schemes (4 projects)
- integration of cycling with public transport (2 projects)
- support for cycle training, information, and cycle clubs (4 projects).

Robust data on cycling levels were generally not available for projects, and project managers were therefore asked for their views on what impact had been made on cycling levels by their project. These findings, which should be treated with caution, suggested that managers of projects involving engineering measures (construction of routes and paths) and parking/workplace facilities tended to perceive their projects to have been successful at increasing cycling levels, while managers of cycle purchase schemes, publicity campaigns and schemes integrating cycling with public transport, were less likely to perceive their projects to have been successful. In 14 projects, managers felt there had been no impact on the target group, and in 24 projects no impact on overall cycling levels.

Strength of evidence: Insufficient evidence **?**

9.4 Interventions in the school setting

We found a small number of studies of cycling promotion interventions in the school setting (apart from active travel interventions, which are examined in Section 5.4). As there were too few to group into distinct categories, we discuss them all below under the heading 'cycling promotion campaigns'.

Cycling promotion campaigns
A NICE systematic review of active travel interventions for children (NICE Public Health Collaborating Centre for Physical Activity, 2008a) examined several different

types of intervention: cycling promotion, safe routes to school, walking buses and walking promotion. The five cycling promotion studies were all conducted in the UK using uncontrolled before and after designs (DETR, 1999a,b,e; Osborne, 2006; Sustrans, 2007). The review states that cycling promotion projects, targeting primary and secondary school children, can lead to large self-reported increases in cycling both at 9-11 months and over 20-23 months. (However, in two of the studies, where cycling infrastructure was commonly part of the local transport infrastructure or children were encouraged to cycle to curriculum related events or sports fixtures, self-reported levels of walking *declined*, implying that some of the increase in cycling may have been offset by a decrease in walking). The projects included bicycle maintenance classes, cycling groups, events, modifications to the physical environment and new facilities (routes, cycle sheds). Although the study designs do not enable the impact of different intervention elements to be identified, the review states that characteristics of successful interventions included the involvement of external agencies to facilitate schools to promote and maintain cycling, with the support of parents and the local community.

A grey literature evaluation examines the impact of Bike It, Sustrans' cycling promotion programme for primary and secondary schools (Sustrans Scotland, 2009a,b). The programme involves Bike It officers working with schools to develop strategies to promote and support cycling, and was in its fifth year in 2009. Data collection methods comprised 'hands-up surveys' conducted pre- and post- the involvement of a Bike It Officer in the school, and counts of bicycles in school shelters and storage facilities, conducted by the Bike It Officer at the same time points. Aggregate data from the hands-up surveys suggested that the percentage of children reporting cycling to school had doubled from 4% to 8% over the year, and the number reporting never cycling dropped from 75% to 55%. Activities claimed to be associated with success included new/improved cycle storage, rewards for children who took up cycling, regular Bike to School days, promotion of cycle training, bicycle fancy dress events, teachers cycling, work with feeder primary schools to map cycle routes. The evaluation methods had a number of limitations: changes in cycling measured by self-report may not be accurate, the hands-up survey method may encourage socially desirable responses, and the results may have been affected by seasonality (baseline measures tended to be taken in Autumn term, follow-up measures in Summer term). In addition, it was not possible to tell how reported changes in cycling are brought about (e.g. at expense of which other mode of travel).

Strength of evidence: Moderate support

9.5 Interventions in the workplace setting

We found only a handful of studies of workplace cycling promotion interventions other than in the context of active travel (which is examined in Section 5.5).

Workplace cycling initiatives
An uncontrolled before and after evaluation of the Cycling 100 Project to promote cycling among commuters in Western Australia reported that participants 'replaced' 121,000 kilometres of car commuting with cycling and had statistically significant

improvement in measures of physical walk capacity (Marshall, 2001). The intervention sought to identify a group of 100 car drivers who would be sponsored by organisations to replace four car work trips each week with bicycle travel, using the motivational incentive of a loan bicycle. Impacts on cycling beyond the intervention period were not examined.

A grey literature evaluation summarises activities run in 2008 by Bike Station Edinburgh, a project which recycles donated bicycles, runs 'fix your own bike' and 'build your own bike' sessions, and provides bicycle repair services and cycle training at workplaces (The Bike Station, 2009). The report does not examine levels of cycling, but notes that the scheme provided 80 low-cost bikes to clients of various health and homeless agencies, provided cycle training to over 800 individuals, and repaired over 1,000 bikes at various workplace sites; over 1,300 people also made use of 'fix your own bike' sessions.

9.6 Views of participants and implementers

We summarise here findings from studies which have examined implementers' views of the facilitators and barriers in cycling promotion interventions (we found no relevant studies of participants' views). Note that studies of views of cycling in the context of active travel are discussed in Section 5.6, and studies of views of cycling infrastructure are discussed in Section 6.4. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

Views of implementers
The evaluation of the Cycle Challenge Initiative in Scotland, reported above (Halden, McGuigan and Troy, 2001) included interviews with project managers to explore issues such as funding, integration and sustainability of the projects. Key issues included:
- cycling promotion initiatives need to be developed with the support of the local community, recognising specific culture and attitudes. Project activities which were perceived as inconsistent with accepted community norms were less successful (for example, there was no uptake by patients of a bicycle loan scheme implemented at a GP surgery in Dundee). Cycling need not be a minority activity and can benefit all groups in society
- a comprehensive approach is needed to tackle obstacles to cycling. Piecemeal schemes are less likely to be effective. Publicising success is one of the most effective ways of motivating wider change
- construction of more cycle routes could significantly increase the attractiveness of cycling
- partnership projects will often be the best way forward, but this requires flexible and committed management
- input by volunteers can considerably add to the value of projects, but initiatives can be vulnerable if they are dependent solely upon voluntary resourcing

- cycle security is important and there are several approaches to deliver acceptable security tailored to local circumstances. Cycle parking which offers both convenience and security is likely to be successful
- the links between cycling and public transport are important but satisfactory solutions must be tailored to the needs of potential users
- cycle training can be one of the best value approaches to encouraging cycling and improving safety. Projects with a strong community focus encourage participation
- leisure cycling currently appeals to a wider population than cycling for transport
- school and workplace schemes need a champion who is prepared to overcome obstacles and work with relevant communities to achieve change.

9.7 Summary

The review finds insufficient evidence for cycling promotion campaigns (excluding active travel and infrastructure interventions, which are examined in Sections 5 and 6) in the community and in workplaces, but moderate support for cycling promotion campaigns in schools. More research is needed in this area.

One study of implementers' views suggests that comprehensive approaches are needed to overcome cultural and other barriers to promote more widespread cycling.

10. Campaigns and events

10.1 Types of interventions

We have defined interventions in this category as including the following:
- community-wide physical activity campaigns
- themed 'Days' and 'Weeks'
- 'challenge' events
- mass participation events.

A key feature of many interventions in this category is that they seek to influence attitudes and behaviours by fostering shared norms and experiences across a whole community, school or workplace population.

By 'community-wide physical activity campaigns', we mean community campaigns which typically involve multiple activities including awareness-raising, mass media events and sometimes environmental changes. We are not including here community-wide campaigns specifically focussing on active travel, as these are examined in Section 5, nor community programmes specifically focussing on walking, which are examined in Section 8; however, their methods and approach may be similar. Themed awareness-raising events are one-off or annual 'days' and 'weeks' which seek to raise awareness and involve large numbers of people in trying an activity (e.g. 'Walk to Work Day'), while 'challenge' events involve challenging people as individuals or in teams to meet an agreed target for physical activity and usually involve competitiveness. Finally, we have defined mass participation events as including both large sporting events (such as the Olympics), which might be assumed to have a trickle-down effect on participation in outdoor activity, and large participatory events such as fun runs and marathons.

10.2 Evidence of effectiveness

There is a reasonable amount of published evidence concerning community-wide and media-based initiatives, as these represent traditional and established health promotion strategies. There is less evidence on the effectiveness of themed 'days' and 'weeks', and very little evidence on the impact of mass participation events, and studies in these two areas tend to be short term and weaker in quality. Two systematic reviews, one of physical activity interventions (Kahn, Ramsey, Brownson *et al.*, 2002) and one of interventions to promote walking (Ogilvie, Foster, Rothnie *et al.*, 2007), include community-wide campaigns and media based initiatives among the set of interventions reviewed. We also found a number of primary studies and grey literature published since the systematic reviews, and these are reported here.

Experimental studies are challenging in this area because of the difficulty of establishing a control group for a whole community and because community interventions are often complex in design and evolve over time. The stronger studies in this area are those evaluating large community-wide campaigns using comparison communities matched on socio-demographic characteristics and taking pre- and post-intervention measures. Events and mass participation events tend to be evaluated using weaker designs such as after-only surveys with no comparison group.

10.3 Interventions in the community setting

<u>Community-wide physical activity campaigns</u>

Community-wide physical activity campaigns have been reasonably well evaluated, so we concentrate in this section on systematic review findings and findings from good quality primary studies conducted too recently to be included in reviews. A difficulty with interventions in this category is that the focus is not always outdoor activity specifically but rather physical activity in general, and the extent to which activity took place outdoors as opposed to indoors is not always apparent from evaluation results.

Systematic review findings

A systematic review (Kahn, Ramsey, Brownson *et al.*, 2002) of interventions to increase physical activity in different settings, groups interventions into different categories, one being community-wide campaigns. These are defined in the review as multi-component programmes involving many community sectors in highly visible, broad-based, multiple intervention approaches to increasing physical activity, with a mix of elements such as communications, some element of social support, screening, counselling and education, and environmental changes such as the creation of walking trails. The reviewers identified ten studies, of which two were high quality and eight were of lesser quality. The review reports that there is strong evidence that community-wide campaigns are effective in increasing physical activity as measured by increase in the percentage of people engaging in activity, energy expenditure or other measures. Note, however, that it is not clear what proportion of the reported increase in physical activity in the studies took place out of doors, and nor is it clear how large a role promotion of physical activity in the outdoor environment (as opposed to promotion of physical activity in general) played in the interventions. The reviewers concluded that there was strong support for community multi-faceted approaches involving both upstream measures and downstream approaches, particularly group and individual support.

A systematic review (Ogilvie, Foster, Rothnie *et al.*, 2007) of interventions to promote walking included five interventions described as using community-wide approaches, four in the USA and one in Australia. All were multi-faceted interventions including elements such as newsletters, brief advice to individuals, formation of walking groups, promotion of local walking trails, mass media, community events and other elements. Of the five, one, a non-randomised panel study (Reger-Nash, Bauman, Booth-Butterfield *et al.*, 2005) reported a significant (p < 0.01) increase in minutes walked per week at 12 month follow-up, while a controlled repeated cross-sectional study (New South Wales Health Department, 2002) reported a significant increase in certain types of walking in the previous fortnight. Two non-randomised panel studies reported increases in walking which were not significant (Brownson, Hagood, Lovegreen *et al.*, 2005; Reger-Nash, Cooper, Orren *et al.*, 2005). The fifth study, a controlled repeated cross-sectional study (Brownson, Baker, Boyd *et al.,* 2004) reported no impact on walking per week.

Primary studies

We found several primary studies conducted since the two systematic reviews reported above, and these are examined below.

A large community cardiovascular disease prevention campaign in Maastricht region sought to reduce fat intake and encourage physical activity and smoking cessation (Wendel-Vos, Dutman, Verschuren *et al.*, 2009). The intervention was a large umbrella project from 1999 until 2003 comprising 590 'major interventions' including printed guides showing walking and cycling routes, daily TV aerobics, nutrition parties, debt assistance, and antismoking media campaigns, with around half taking place in deprived areas. A 5-year cohort study showed that in general, lifestyle factors changed unfavourably in the control group, whereas changes were less pronounced or absent in the intervention group, and were significantly improved for walking and cycling, particularly among women and those with low SES.

Two studies by Reger-Nash and colleagues (Reger-Nash, Fell, Spicer *et al.*, 2006; Reger-Nash, Bauman, Cooper *et al.*, 2008) examined whether the 'community wide physical activity social marketing campaign' Wheeling Walks, in Wheeling, West Virginia, could be replicated in larger communities (included in the Ogilvie, Foster, Rothnie *et al.,* 2007 review, and discussed above). The first, in Broome County New York (Reger-Nash, Fell, Spicer *et al.*, 2006) comprised an 8-week paid advertising and media relations campaign complemented by community health activities such as worksite and school health programmes and exercise prescription. Before and after random cohort telephone surveys in the intervention county and a comparison county over 200 miles away with similar demographic profile and distinct media market found increases in the proportion progressing from non-active to active walkers and an increase in total weekly walking time, compared to the comparison county, although no increase was found for progression from moderate to vigorous physical activity. The increase in walking was smaller than in the original study, which the authors suggest may be explained by less media activity and lower community involvement in planning and organization in the replication community.

The second study replicated the original intervention in a large area of West Virginia (Reger-Nash, Bauman, Cooper *et al.*, 2008) and comprised a high intensity mass media campaign, policy and environmental changes, a community advisory board and participatory planning. Controlled before and after telephone surveys found a significant increase in walking behaviour represented by an increase in insufficiently active adults becoming active, versus the comparison community. The authors comment that the study suggests that the original smaller intervention is replicable in other similar rural communities.

The Norwegian community campaign 'Romsas in Motion' (Jenum, Lorentzen and Ommundsen, 2009) involved a range of strategies targeting individuals, groups and the environment and tailored to different stages of change. The evaluation, a quasi-experimental 3-year cohort study, found a significant increase in self-reported physical activity and a lower rate of increase in body mass compared with the control district. Among the effective intervention components were participation in walking and aerobic exercise groups, a "Walk the stairs" poster and a walk path. The authors conclude that a theoretically informed, low-cost, population-based intervention programme can increase physical activity levels and lead to reduced weight gain.

A community campaign '10,000 Steps Ghent', comprising a local media campaign, website, sale and loan of pedometers, workplace projects, projects for older people, information through health professionals and schools and 'environmental

approaches', was evaluated using before and after telephone surveys and pedometer counts with random samples of intervention and comparison community adults aged 25 to 75 years (De Cocker, Cardon and De Bourdeaudhuij, 2007). After one year there were increases in the number of people reaching the '10,000 steps' standard and in average daily steps in Ghent compared with no increase in the comparison community.

An evaluation of a national media campaign, 'Push Play', in New Zealand, conducted through three annual cross-sectional surveys, reported a significant increase in reported intentions to be physically active, but did not detect any impact on self-reported physical activity levels (Bauman, McLean, Hurdle *et al.*, 2003).

An evaluation of Local Exercise Action Pilots (LEAP), a national two-year initiative in England involving multi-faceted interventions at ten sites, reported that participants who were sedentary and 'lightly active' at baseline increased their overall level of activity (Pringle, Gilson, McKenna *et al.*, 2009; Carnegie Research Institute, 2007). Some of the LEAP project interventions involved multi-component community approaches; however, the design of the evaluation does not allow impacts to be linked to particular intervention approaches.

Strength of evidence: Insufficient evidence ?

Themed 'Days' and 'Weeks'
One non-systematic literature review examines the impact of one-off themed mass events to promote physical activity (Murphy and Bauman, 2007). The review notes that, despite their popularity, there are few good quality evaluations of mass physical activity health promotion events, with many being assessed primarily in process terms (e.g. number of participating schools or communities). Findings reported in the review from studies of mass events designed to promote active travel include:

- Australia's Walk to Work Day event was associated with an increase in minutes spent walking per week but there was no significant change in vigorous physical activity
- the New South Wales Walk Safely to School Day in 2002 increased the prevalence of walking to school by 6.8%, as measured two weeks after the event
- car-free human powered mobility (HPM) events have taken place in Switzerland since 2000. A 2004 evaluation showed that between 37% and 82% participated for the first time, and that 30.1% of people who were insufficiently active indicated a likelihood of walking or cycling more in daily life
- a survey five months after the 2004 Ride to Work Day in Victoria, Australia, suggested that 23% first-time participants in the event were still riding to work.

The review suggests that the more successful events may have been those embedded in a broader, strategic developmental approach, such as with Bike to Work or Walk to Work or School days, involving coherent policies, inter-agency action and public health input.

A more recent evaluation, published in the academic literature, of the 2003 Australian Walk to Work Day reports a significant population-level increase of 3.9% in 'health-enhancing active commuting' (30 minutes or more a day in a usual week) shortly after the campaign (Merom, Miller and van der Ploeg, 2008). Breakdown of the results suggested that those with high confidence in their ability to incorporate walking into their commute and who were already active before the campaign were more likely to report more active commuting following the campaign.

Two grey literature evaluation reports examine European Mobility Week (European Mobility Week, 2007, 2008), which involves a wide range of activities across Europe (including in some communities in Scotland) to raise awareness of the impact of mobility choices, to test and promote infrastructure and services promoting more sustainable mobility, and to motivate citizens to be more involved in transport policy issues. The evaluation focuses on process measures (what actions and policies are implemented in the participating communities and how the event is used to focus and mobilize action on sustainable travel), and does not attempt to measure impact on physical activity levels.

> Strength of evidence: Insufficient evidence **?** (but some positive short-term effects)

'Challenge' events
A before and after study examined the 'Walk Kansas' programme, in which residents were encouraged to form teams of six individuals who would collectively 'walk' the 423-mile distance across Kansas over an 8-week period through participation in any moderate intensity physical activity (Estabrooks, Bradshaw, Dzewaltowski, *et al.*, 2008). The study found that the programme attracted a large number of participants, but they were more likely to be female, more active, and older. Those who were inactive or insufficiently active at baseline experienced significant increases in both moderate ($p < 0.001$) and vigorous ($p < 0.001$) self-reported physical activity at 6 months.

> Strength of evidence: Insufficient evidence **?**

Mass participation events
One non-systematic review examined the impact of elite sporting events such as the Olympic Games or World Cup and non-elite sporting participation events such as mass road races on physical activity participation (Murphy and Bauman, 2007). The review notes that few quality evaluations have been conducted in any of the three areas, with most studies being after-only surveys or concerned with other outcomes, such as economic impact, image or tourism. Evaluations of the impact of major sporting events (such as the Olympics) on physical activity behaviour are scarce, and suggest either a modest or no effect on physical activity behaviour. The review cites a 2002-3 survey of 3600 adults in Manchester which showed that the Manchester Commonwealth Games had no impact on participation in sports activities (although walking was excluded). The review also notes that some data suggest that sporting club membership increases following a major tournament, but methodologies have generally been poor. The authors cite evidence that curling club membership increased by 3% and visits to curling rinks increased by 6% following

Scotland's gold medal win in the 2002 Winter Olympics, but note that curling is a minority sport unlikely to impact on population physical activity levels.

Associated events that take place around major events may also impact on physical activity. The review (Murphy and Bauman, 2007) comments on a programme linked to the Manchester Commonwealth Games which offered 11 to 15 year olds from disadvantaged communities activities during the summer holiday period. By 2003, programmes were operating in 16 areas involving 5,390 young people, and some young people were signposted from the summer activities onto permanent programmes in their local community. However, no data are reported on the impact on physical activity levels.

In terms of non-elite mass events, the review (Murphy and Bauman, 2007) notes there is a paucity of research on whether events such as the London Marathon impact on subsequent sport and physical activity involvement. However, the authors comment that marathons are attracting an increasing number of walkers, suggesting that such events are not just attracting the fittest segment of the population and have mass reach potential.

A grey literature evaluation of a mass participation cycling event in Scotland, the 2009 Original Bicycle Festival in Dumfries and Galloway, examined the age profile of participants and spectators and examined the economic impact of the event, but did not assess any impact on physical activity after the event (Cogent Strategies International, 2009).

Strength of evidence: Insufficient evidence **?**

10.4 Interventions in the school setting

Mass participation events

We only found one evaluation of an intervention in the school setting, a grey literature report on the Primary and Special Games in Renfrewshire, a one-day annual event offering primary school age pupils the opportunity to participate in competitive sports including badminton, street basketball and tennis (Stewart, 2009). A separate annual special games event was introduced in 2007 for pupils with physical, sensory and learning disabilities. The report does not evaluate the impact on physical activity levels, but describes an increase from the first to the second year in the number of schools and pupils participating, together with an increase in the number of sports development centres to help interested pupils progress to more regular sporting activity.

Strength of evidence: Insufficient ?

10.5 Interventions in the workplace setting

One-off events including challenges are among the strategies used by projects in the Well@Work scheme, a national health promotion initiative in England comprising nine regional projects across 32 workplaces and evaluated in a grey literature report (also discussed in Section 7.4) (Bull, Adams and Hooper, 2008). Intervention

activities included pedometer, cycle and weight loss challenges and 'come and try' events. Although the report states that increases in active travel were observed in three projects and in sports and recreation participation in nine projects, the evaluation design did not allow outcomes to be linked to specific intervention activities (most projects were multi-faceted and involved other elements not concerned with outdoor activity). The authors also note that the observed increases could have been associated with seasonality.

'Challenge' events
A grey literature evaluation of a workplace walking campaign, which challenged employees to walk 1222 miles, the equivalent of a route around all the Diageo sites in Scotland, noted that over one million steps were walked by 91 participants, and the participating employees lost a combined total of 185kg and 330cm from around their collective waist, but did not measure any impact on physical activity levels following the campaign (Diageo Occupational Health Team, 2010).

10.6 Views of participants and implementers

We summarise here findings from studies which have examined implementers' views of the factors which facilitate and impede community-wide campaigns and other types of campaigns and events (we found no studies of participants' views). As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

The systematic review (Kahn, Ramsey, Brownson *et al.,* 2002) of interventions to increase physical activity in different settings, identifies a number of facilitators and barriers to successful implementation of community-wide campaigns; however, it is not clear whether the facilitators and barriers were identified from interviews with implementers or by some other method. The review states that community-wide campaigns "require careful planning and coordination, well-trained staff, and sufficient resources to carry out the campaign as planned. Success is greatly enhanced by community buy-in, which can take a great deal of time and effort to achieve. Insufficient resources may result in exposure to messages and other planned campaign interventions that is inadequate to achieve the 'doses' necessary to change knowledge, attitudes, or behavior over time, especially among high-risk populations. Inadequate resources and lack of professionally trained staff may affect how completely and appropriately interventions are implemented and evaluated" (Kahn, Ramsey, Brownson *et al.,* 2002: 78-79).

The evaluation of the Well@Work programme discussed above (Bull, Adams and Hooper, 2008) included interviews with project coordinators to explore the facilitators and barriers to workplace campaigns and events. The report states that one-off events are popular with employees and have the benefit of being cheap and easy to implement and requiring little time commitment. However, it also notes that more comprehensive and sustained efforts are needed to bring about more lasting change.

10.7 Summary

The review finds support for multi-faceted community-wide campaigns, with some studies measuring impact over several years. The interventions examined above are complex multi-faceted interventions, and this poses challenges for both sustainability and replicability. While the elements in an intervention can in theory be specified and replicated elsewhere, it may be the process by which they are implemented which is key to success.

The review finds insufficient evidence that themed 'days' and 'weeks' can have an impact on routine physical activity levels, although such events can be effective in stimulating participation and short-term increases in physical activity. The review finds insufficient evidence to support challenge events in either community or workplace settings, and insufficient evidence to support mass participation events.

11. Outdoor experience

11.1 Types of interventions

Interventions in this category include:
- conservation and 'Green Gym'
- therapeutic experience of nature
- other woodland activities
- gardening and allotments
- adventure/achievement schemes
- unstructured play/wild places
- Forest School/outdoor school.

A shared feature of interventions in this category is that their primary goal is not necessarily to increase physical activity but to bring about other benefits such as mental wellbeing, personal development, skills, improved behaviour or learning, or benefits to the natural environment. Our approach was to include an intervention study if, regardless of the intervention's core aim, it had evaluated whether the intervention had an impact on physical activity. Some of the interventions included in this section offer highly structured and organised outdoor experiences, such as the John Muir award scheme and Forest Schools, while others are less structured, and involve participants determining their own engagement with the outdoor environment (for example, gardening, or unstructured play in wild places).

Because our focus was on evidence of physical activity effects, we did not include studies which only examined, for example, mental wellbeing, learning or personal development outcomes. However, where a study measured physical activity *and* other types of outcomes, these are briefly mentioned in the findings section below.

Interventions in this category may be targeted at specific groups – for example, mental health service users, children with behavioural difficulties – or available to general populations. Most of the interventions in this area are implemented in community settings, with some being implemented in school settings and some involving both settings. We found no interventions in this category implemented in workplace settings.

11.2 Evidence of effectiveness

We found no systematic reviews examining the impact of outdoor experience on physical activity. Only a small number of primary studies in the academic literature and a small number of grey literature evaluations were found, none employing designs more rigorous than uncontrolled before and after studies. Many of the studies in this area focus on process issues – how feasible projects are to deliver and whether they are acceptable and appealing to participants – using qualitative techniques and simple questionnaires. Where health impact or effects on physical activity are examined, this tends to be immediately after the intervention, often using limited methods such as untested questionnaires; few of the studies in this area use objective methods such as accelerometers, which produce more accurate and reliable estimates of physical activity than self-report questionnaires. Few studies

examine whether outdoor experience projects lead to longer term behaviour change in relation to physical activity after the immediate lifespan of the project.

11.3 Interventions in the community setting

<u>Conservation and 'Green Gym'</u>
The concept of Green Gym, a national initiative of BTCV, is that physical and mental health can be promoted through active supervised participation in conservation work. Conservation projects may include creating gardens, managing woodlands, and maintaining footpaths. Participants can self-refer or be referred by a GP, and meet at least weekly.

A grey literature report on the national evaluation of 52 BTCV Green Gym projects (Yerrell, 2008) examined participants' characteristics, physical and mental health status (using the Short Form 12 v 2 (SF-12), a widely used measure of health status) and self-reported physical activity levels before and at least 3 months after starting volunteering (67% were completed between three to eight months, for the remaining third a longer gap was recorded). Seven-hundred and three participants completed the baseline questionnaires and 194 the follow-up. Around a third had been referred to projects by health and social care professionals, while others self-referred. The projects attracted a relatively diverse range of participants in terms of age, gender (60% were male), employment/education (46% were unemployed, 28% had no formal qualification, 31% had degrees). Over 60% were new to volunteering, and only 32% had been involved in conservation, suggesting that the project succeeded in widening the base of people involved in conservation. Self-reported physical activity levels improved (though not significantly) from baseline to follow-up and further analysis showed that participants who were the least active at baseline were more likely to increase their level of physical activity at follow-up. Results from the SF-12 suggest that physical health status increased significantly (indicating an improvement) and mental health status decreased significantly. Further analysis showed that participants with lower scores (than mean values) for physical or mental health status at baseline were more likely to get an equal or higher score on the follow-up questionnaire, suggesting that the 'worst off' were more likely to improve the most.

A study (Pretty, Peacock, Hine *et al.*, 2007) and a grey literature report (Pretty, Griffin, Peacock *et al.*, 2005) report on ten 'green exercise' case study projects. The projects included conservation, mountain biking and walking in a forest area, community canal boat trips, walking, horse riding, fishing and other outdoor activities, and took place in Scotland (2), Wales (2), Northern Ireland (2) and England (4). A standard questionnaire was designed to be completed by participants before and after project activities. Combined data from the 263 participants who filled in the questionnaire showed that the group were physically healthy and generally quite active compared with the general population; the evaluation was not able to demonstrate whether participation in the projects further increased their physical activity levels, but did suggest that participants' mental health improved.

Strength of evidence: Insufficient evidence **?**

Therapeutic experience of nature

The Forestry Commission 'Branching Out' project, a partnership with NHS Greater Glasgow and Clyde, Glasgow Centre for Population Health, Glasgow and Clyde Valley Green Network Partnership and Glasgow City Council, involves what is described as 'ecotherapy' for users of mental health services in the Greater Glasgow and Clyde area (Wilson, 2009). Clients participate in small groups in approximately three hours of activities per week in an outdoor woodland setting for a 12-week period. The course includes elements of bushcraft, nature conservation, environmental art, woodwork, green exercise and relaxation. Walking was an integral part of the project as clients had to reach the sites on foot. A before and after survey was conducted with 77 participants who completed the programme (out of 110 who were referred), plus qualitative interviews. The researchers suggest that the fairly constant attendance and "low attrition rate is uncommon in secondary and tertiary care mental health services as the population is typically hard to engage" (Wilson, 2009: 45). The Scottish Physical Activity Questionnaire: 7-Day Recall was used to measure overall self-reported physical activity in minutes per week. A significant increase was found between baseline and post-intervention scores for physical activity (t (69) = -3.14; p = 0.003). Breakdown of this increased activity showed that amounts of all types of activity apart from cycling increased after the programme, with the biggest increase being found for 'walking outdoors' but not within the context of the Branching Out programme.

Strength of evidence: Insufficient evidence **?**

Other woodland activities

A grey literature report describes the delivery and impacts of a range of community woodland projects in England including mountain bike trails, the creation of woodland artworks along a 'health route', tai chi, conservation, group walks and den-building (O'Brien, 2005). Evaluation methods (where evaluation was conducted) are only briefly described and appear mostly to focus on process issues, such as visitor numbers, benefits as perceived by participants and stated intentions to visit the woodland sites in the future.

Strength of evidence: Insufficient evidence **?**

Gardening and allotments

We found only three studies relating to gardening and allotments.

A small scale north American study (Austin, Johnston and Morgan, 2006) examined the effect of access to community gardening for elderly people (*n*=6) on various health and fitness measures. Measures of functional health and walking ability improved from pre-intervention levels.

A small scale study (Kien and Chiodo, 2003) examined the impact of leisure activities in the summer holidays, including gardening and adventure education, on children's physical activity. Two small experiments suggested that energy expenditure and physical activity increased significantly when children took part in the activities compared with when they watched a videotape.

A grey literature report (Wood-Gee, 2008) describing several 'health and natural heritage' projects in Scotland included a brief case study of a community organic gardening project in Edinburgh. Although the case study notes that there have been both physical and mental health benefits from the physical activity inherent in gardening, the project has not attempted to evaluate any impact on levels of physical activity.

Strength of evidence: Insufficient evidence **?**

Adventure/achievement schemes
The potential impact of the John Muir Award on physical activity and other health outcomes is examined in a grey literature report by Mitchell and Shaw (2008). The Award, the main educational initiative of the John Muir Trust, is delivered through partnerships with youth organisations, schools, clubs, Councils, outdoor centres and so on. To gain a John Muir Award, participants must tackle four challenges - Discover, Explore, Conserve and Share 'wild' places, with a loose and accommodating definition of wild which includes everything from park land to remote wilderness. Some degree of physical activity is inherent in the Award. This small longitudinal study attempted to measure whether the Award makes a contribution to participants' health or increases people's desire to be 'outdoors' in the longer term. The study used an uncontrolled before and after design: a small cohort of 8 to 18 year olds completed questionnaires at baseline (n=316), immediately after the Award (n=205) and then again around 18 months later (n=69). Although changes in actual physical activity were not the main focus of the study, the researchers did measure self-reported physical activity at each wave, as well as aspirations regarding and actual visits to wild places.

Nearly one in ten participants had not previously visited a 'wild place' before the Award, with those from the poorest backgrounds being nearly six times more likely to have no previous wild place experience. Participants' self-reported amount of physical activity actually fell at the final survey wave, a result which could have been explained by the participants simply getting older. Self-reported perceived fitness did not change across waves. Attitudes to sport, which tended to be more negative among older respondents and girls, did improve slightly immediately after the Award, but not by wave 3. Aspirations for future wild experience were measured by asking respondents how likely they thought it that they would be walking in the countryside or mountains when they were 21. Higher aspirations were associated with greater previous experience of wild places at baseline, suggesting that experience of wild places can stimulate interest in future contact. Among the respondents as a whole, there was no change in aspirations for future outdoor experience, but among those resident in areas comprising the 15% most deprived population in Scotland, there was a significant rise in aspirations for future contact with nature between waves 1 and 2 which was sustained at wave 3. The authors conclude that participation in the Award seems to have increased aspiration for future contact with nature among those living in some of Scotland's most deprived environments. Despite these aspirations, the survey found no increase in the number of reported visits to wild places after the Award. Overall, the study suggests that such Award schemes can increase young people's contact with wild places (particularly young people from disadvantaged backgrounds) and positively influence aspirations for future contact,

but the potential for such schemes to have sustained effects on physical activity, fitness or actual wild experience is unclear.

Strength of evidence: Insufficient evidence ?

Unstructured play/wild places
A grey literature report by OPENspace for Natural England (Ward Thompson, Travlou and Roe, 2006) explored the role and benefits of "wild adventure space" for young people. Combining a literature review, focus groups with young people, workshops and mapping of projects, the report discusses a wide range of projects in England including forest adventure, water sports, angling, cycling, conservation, Forest School, orienteering, camps and expeditions. Project evaluation methods (if any) are unclear in many cases. Increased physical activity is described as a benefit, alongside mental and emotional well-being, skills, self-esteem, environmental awareness and other benefits, but no evidence is cited.

Strength of evidence: Insufficient evidence ?

11.4 Interventions in the school setting

Conservation and 'Green Gym'
A grey literature report examines the effects of BTCV Green Gym projects in primary schools (BTCV, 2009). A BTCV Officer ran a 10-week Green Gym programme in nine primary schools between January 2007 and March 2009. Weekly sessions ran for 60-90 minutes and involved children in environmental activities in the school grounds or nearby open spaces. The study used an uncontrolled before and after design, in which 122 children aged 7 to 11 years completed questionnaires at baseline and at the end of the programme. Children's self-reported physical activity at the weekends (i.e. not during the Green Gym sessions) significantly improved from 142 to 189 minutes. Results from the Paediatric Quality of Life Inventory showed significant improvements over the 10 weeks in psychosocial health and total health (i.e. a combined measure of physical health and psychosocial health); physical health also improved, although not significantly. The authors suggest that Green Gym may be an appropriate strategy for children who do not engage in traditional forms of physical activity.

Strength of evidence: Insufficient evidence ?

Forest School/outdoor school
'Forest Schools' derive from a Scandinavian approach to teaching children about the natural world, and are designed to provide hands-on learning in a woodland environment. The approach is assumed to improve children's confidence, well-being, motivation to learn and feelings of interest and pride in their local environment (Pretty, Griffin, Peacock *et al*., 2005).

We found no primary studies in the academic literature which measured the impact of outdoor school/forest school on physical activity. A discussion paper on the Danish concept of 'udeskole', regular compulsory outdoor education for Danish

children aged 7 to 16 years, reports findings from Danish evaluations suggesting that children displayed a significantly higher level of physical activity during teaching days in a natural environment than on normal school days (Bentsen, Mygind and Randrup, 2009). However, the study notes that research and evidence in this area are limited.

A grey literature report for the Countryside Recreation Network (Lovell and Roe, 2009) summarised results from a Forest School evaluation in a school in Scotland, conducted by the University of Edinburgh. A multi-phased mixed method design assessed the quantity, frequency and duration of the participants' (*n*=26 aged 9 to 10 years) physical activity during Forest School and two control day types (typical school days with and without timetabled physical activity: 'active' and 'inactive' days). The quantity and intensity of physical activity during Forest School was shown to be significantly greater ($p < 0.001$) than during the typical school days; levels of activity during Forest School were 2.2 times greater than those on active school days and 2.7 times greater than on inactive school days. The children, on average, exceeded the daily recommended one hour of moderate and vigorous physical activity (MVPA) on the Forest School days (89.4 minutes); however on the typical school days the children, on average, did not meet the recommendation (active school days 29.1 minutes, inactive school days 20.5 minutes). The children consistently engaged in a higher number of bouts of continuous MVPA on the Forest School days in comparison to the typical school days. Two thirds of the children achieved at least one bout of 20 or more minutes of continuous MVPA at Forest School. There was no significant difference ($p = 0.112$) in the amount of activity during Forest School between the boys and the girls – an encouraging finding, as boys tend to display higher levels of activity than girls. Significant differences were found on the typical school days (active school days $p = 0.042$; inactive school days $p < 0.001$). Citing data from the same study, a literature review by Muñoz (2009) suggests that children are more active on Forest School days, and that girls' level of physical activity increases in the outdoor setting to be more comparable with that of boys.

A grey literature report on Forest School Scotland (Borradaile, 2006) examined case study projects in two primary schools, one in Fauldhouse, a disadvantaged community in West Lothian, and one in Clunes near Fort William, in which the children participating in Forest School were particularly vulnerable and/or demonstrated unsociable behaviour, learning or socialising difficulties. The two case study Forest Schools were supported by Forestry Commission Scotland employed Rangers, training as Forest School leaders. Impact on physical activity was not examined, but anecdotal evidence suggested that children's play became more adventurous and their physical development improved, alongside educational and social benefits. A Forestry Commission Scotland (2009) report on the Woods for Health strategy states that children in Forest School projects are significantly more active on project days than on typical school days, but the data source is not given.

Swarbrick, Eastwood and Tutton (2004), discussing the development of a Forest School project in Oxfordshire, note that Forest School activities involve physical challenges for children, such as walking to and in the forest, but their main focus is on potential educational benefits.

Two grey literature process evaluations using participatory methods examined the wider benefits of Forest School (Murray and O'Brien, 2005; O'Brien and Murray, 2006). The report noted 'ripple effects' beyond Forest School, such as children 'bringing their experience home' and asking their parents to take them outdoors at the weekend or in the school holidays; this in turn may help parents develop a different view of the outdoors in terms of its perceived risks. Other changes observed in children include increased self-confidence and self-belief; an increased awareness of the consequences of actions on other people and a better ability to work cooperatively; increased physical stamina and motor skills through free and easy movement round the Forest School site and by making objects and structures; and an increased interest in nature. They suggest that regular access to woodland settings is particularly important in areas of the country where there is little opportunity for contact with the natural environment.

Strength of evidence: Insufficient evidence **?**

Unstructured play/wild places

An experimental study (Fjortoft, 2001) explored whether play in a natural environment (a forest) might stimulate a greater degree of motor fitness among 5 to 7 year olds (pre-primary school) in Norway, compared with play in a traditional playground. An experimental group of 46 children was offered the opportunity for "versatile play" in a forest next to the kindergarten over a year. A reference group of 29 children in two other kindergartens used their traditional playground over the same period. Various tests of motor fitness, including balance, flexibility and strength, were performed. The results suggested that the experimental group improved more on most measures than the reference group over the study period, and the authors suggest that these differences were unlikely to be affected by confounding factors (such as socio-demographic status), although the study was not capable of controlling for these. The authors suggest that the results can be attributed to the forest being a more varied and stimulating "enriched" environment for play.

Strength of evidence: Insufficient evidence **?**

11.5 Views of participants and implementers

We summarise here findings from studies which have examined participants' and implementers' views of the facilitators and barriers in relation to outdoor experience interventions. As the focus of the review was on reviewing evidence of effectiveness, we did not search systematically for studies of views, but included studies of views which were uncovered in the search. The findings below should therefore be treated with caution as they are not fully representative of the literature on this topic.

Views of participants

Several studies identify factors which facilitate people's engagement with outdoor experience interventions. A major facilitating factor is that outdoor experience interventions are perceived by participants to deliver a wide range of benefits, not necessarily linked to physical activity. For example, a qualitative study of Green

Gym participants noted that they experienced feelings of improved fitness, enhanced mental wellbeing and enjoyable social contact, and felt that they had performed a valued productive role by participating in the project (Birch, 2005). Similarly, a survey of allotment holders in 2007 found that fresh fruit and vegetables, mental wellbeing, physical fitness and physical health were identified as key benefits of having an allotment (City of Edinburgh Council, 2009). The potential to learn new crafts and skills is a motivating factor in some interventions (e.g. BTCV, 2009 – school Green Gym). Being out in the natural environment in general is perceived to have several benefits, including enjoyment of nature and getting away from others (Ward Thompson, Aspinall, Bell et al., 2002). A focus group study of young people's feelings about wild spaces found that a particular benefit they identified was the opportunity to relax with friends or by themselves, without feeling they would get into trouble (Ward Thompson, Travlou and Roe, 2006).

Interviews with participants in the Branching Out project reported above (Wilson, 2009) identified a number of facilitating factors in terms of participants' engagement with the project. The programme's delivery in an outdoor non-institutional setting was appealing to mental health service users, and the more equal relationship they experienced with the project providers helped to contribute to self-esteem. Several reported a sense of achievement and increased feelings of confidence and interest in life. Barriers to engagement in the project included dislike of some of the activities, weather, inadequate equipment and clothing for some of the activities, and the logistics of travelling to the project.

Barriers to accessing the natural environment in general are identified in several reports. Focus groups and surveys conducted with users of woodlands in central Scotland (Ward Thompson, Aspinall, Bell *et al.*, 2002) suggested that littering of woodlands, vandalism and anti-social behaviour could deter people from visiting woodlands, as could concerns about safety, particularly for elderly users and women. Another focus group study (OpenSpace, 2006) found the following barriers to use of woodlands among BME groups, people with disabilities, and young people from a low income area:
- lack of reliable public transport
- lack of signs, information and well-maintained paths
- fear of getting lost and lack of rangers to help
- fear of other people
- cultural barriers that make it harder for certain groups to see the benefit of using woodlands.

A focus group study for the Black Environment Network (Wong and Auckland, 2005) explored issues and barriers relating to use of outdoor places by BME groups in Britain. These included limited awareness by BME groups of their local green spaces, feeling unwelcome in particular outdoor spaces, perceptions that local green spaces do not meet their social and cultural needs, 'territorial disputes' and anti-social behaviour. The report contains several examples of good practice designed to make green spaces more inclusive for and attractive to BME groups.

A survey for Natural England comparing children's and older adults' views of outdoor play (England Marketing, 2009) found that although a majority of the children said they would like more freedom to play outside, their opportunities to do so were

constrained compared with previous generations. Parental fears and unwillingness to let children play unsupervised were reported as barriers to children playing in outdoor natural places. A literature review (Muñoz, 2009) suggests that parental concerns about safety, injury and 'dirt' play a major role in determining children's ability to play in outdoor spaces. The review notes also a gender dimension, with boys being permitted a greater range from the home than girls.

The evaluation of the John Muir Award Scheme, reported above (Mitchell and Shaw, 2008), highlights some barriers to continued engagement in outdoor experience following participation in the scheme. Some participants expressed a concern that it would be difficult for them individually to match the same high quality outdoor experiences that they had had as part of the scheme without, for example, travel, expert guidance, or a high level of self-motivation. This raises questions about the extent to which more intensive and structured interventions can produce sustained effects.

<u>Views of implementers</u>
Studies of implementers' views suggest that outdoor experience interventions are perceived to deliver wide-ranging benefits. For example, Forest Schools are perceived by those involved in their delivery to have the potential to meet national curriculum and wider learning objectives, as well as to enhance children's development and skills (Murray and O'Brien, 2005; O'Brien and Murray, 2006; Borradaile, 2006). A study of teachers' views of a scheme to develop their skills in out-of-classroom learning found that teachers felt it improved their own confidence as well as the confidence of children (Nundy, Dillon and Dowd, 2009).

An evaluation of Forest Schools in England and Wales (O'Brien and Murray, 2006) also identified barriers to delivery of Forest Schools as perceived by stakeholders. These included nervousness about the outdoor environment (among both teachers and children), poor weather, and initial resistance among the local community to the idea of teaching in local woodland.

11.6 Summary

The review found insufficient evidence to support any of the interventions examined in this section. This reflects the fact that outdoor experience interventions have been less well evaluated in terms of impact on physical activity than other types of intervention examined in this review. The bulk of the studies in this area are process evaluations and/or are focused on other benefits, such as wellbeing, learning and mental health. More research is needed to establish how effective these sorts of interventions might be in terms of increasing physical activity.

Beyond this, there is evidence to suggest that such interventions are appreciated by and acceptable to participants, and are perceived by implementers and others as having the potential to deliver a wide range of benefits, not restricted to physical activity. Some of the interventions examined in the review seem to have the potential to engage vulnerable and marginalised groups who might otherwise have little contact with the natural environment. Facilitators and barriers to outdoor experience include safety, relaxation, enjoyment of nature, littering and antisocial behaviour, and cultural perceptions.

12. Key messages from the review

In this final section we identify key messages for promoting physical activity in the outdoor environment in each of the three settings examined, community, school and workplace. We also identify key messages for research commissioners.

Our approach to appraising the evidence has been described in Sections 3 and 4 above. To help in interpreting the tables below, we repeat here how we have developed and applied the evidence statements:

Strength of evidence definitions used in the review:

Support: The best available evidence of effectiveness comes from studies which take before and after measures and which use a control/comparison group (e.g. RCTs, controlled before and after studies), of which the majority report positive effects.

Moderate support: The best available evidence of effectiveness comes from studies which take before and after measures but do not involve a control/comparison group (e.g. uncontrolled before and after studies), of which the majority report positive effects.

? Insufficient evidence: The best available evidence of effectiveness comes from studies which take 'after-only' measures (e.g. post-intervention surveys) OR there is too little evidence to make an assessment.

✘ No support: The majority of the best available evidence suggests the intervention is ineffective.

Where there is no majority trend in the best available evidence (for example, where there are two RCTs, one positive and one negative), we assess the rating on the basis of the next level of evidence down, adding the higher quality evidence to it.

It is important to emphasise that 'insufficient evidence' does not necessarily mean that an intervention is ineffective; rather, that our review has not found evidence to suggest that the intervention has been evaluated to a sufficient extent using methods capable of demonstrating an impact on physical activity.

12.1 Key messages for the community setting

The table below (Table 12.1) summarises the types of community-setting interventions examined in the review and the strength of evidence found in the review for each. Where our search for current activity in Scotland has found an example of this particular type of intervention in Scotland, this is listed in the final column of the table.

Table 12.1 Community interventions: summary of evidence

Types of intervention examined in the review	Strength of evidence	Example in Scotland
Active travel interventions *(see Section 5.3)*		
Whole population interventions	Insufficient evidence	-
Targeted behaviour change programmes	Moderate support	Dundee Active Travel: includes personalised travel planning; improved information on routes; support for active prescriptions and targeted travel advice; and public transport incentives. (In addition to other, whole population interventions).
Modification to the physical environment *(see Section 6.3)*		
Creation/improvement of paths and trails	Moderate support (for multi-use trails; insufficient evidence for coastal/woodland paths)	Glentress Forest Park trail marking for walking and mountain biking. Trails owned and maintained by Forestry Commission Scotland. On-site café
Creation/improvement of cycle infrastructure	Support	National Cycle Network: construction of high quality on- and off-road cycling (and walking) trails
Restrictions on car use	Moderate support	Go Barrhead! A range of initiatives to improve active and healthy travel options around the town includes a speed reduction pilot project
Other modifications to urban infrastructure	Moderate support	Kick Start Kirkwall, a programme encouraging more people to use public transport and to walk and cycle around town, includes infrastructure improvements; active travel planning inbuilt to planning for new houses/schools; buses equipped with cycle-racks; a mapping & signage network strategy; and access policies.
Park improvements	Insufficient evidence	-

Types of intervention examined in the review	Strength of evidence	Example in Scotland
Walking groups and programmes *(see Section 8.3)*		
Walking groups/ programmes with a health focus or for specific target groups :		
- Inactive adults	Support	Paths for All's Paths to Health walking groups throughout Scotland run weekly Health Walks
- Primary care populations	Support	Upper Deeside Walking to Health project in Cairngorms National Park. Additional promotion by local health practitioners
- Older people	Support	Ageing Well in Edinburgh: encourages a more active and healthy lifestyle through participating within various activities including walking, cycling and gardening
- New mothers	Insufficient evidence	-
Walking groups/programmes for a general population	Support	Culture & Sport Glasgow and Glasgow City Council's walking programme. Printed brochure of organised walks from health walks to mountain walks
Cycling promotion *(see Section 9.3)*		
Community cycling initiatives	Insufficient evidence	-
Campaigns and events *(see Section 10.3)*		
Communitywide physical activity campaigns	Support	European Mobility Week 2006 – the Commuter Challenge in Glasgow to find out which mode of transport produced the least CO2 emissions to win the 'climate change challenge'
Themed 'Days'/'Weeks'	Insufficient evidence	-
'Challenge' events	Insufficient evidence	-
Mass participation events	Insufficient evidence	-

Types of intervention examined in the review	Strength of evidence	Example in Scotland
Outdoor experience *(see Section 11.3)*		
Conservation and 'Green Gym'	Insufficient evidence	-
Therapeutic experience of nature	Insufficient evidence	-
Other woodland activities	Insufficient evidence	-
Gardening and allotments	Insufficient evidence	-
Adventure/achievement schemes	Insufficient evidence	-
Unstructured play/wild places	Insufficient evidence	-

The table shows that, for interventions in the community setting, the best available evidence in the review supports the **creation/improvement of infrastructure for cycling**, **targeted walking groups and programmes for specific groups** (inactive populations, primary care populations and older people), **walking groups and programmes for general populations**, and **community-wide physical activity campaigns**.

The review provides moderate support also for active travel targeted behaviour change programmes, the creation/improvement of paths and trails, measures to restrict car use, and modifications to urban infrastructure to encourage more walking, cycling and recreation.

We found insufficient evidence to date for active travel interventions targeted at whole populations, park improvements, walking groups and programmes targeted at new mothers, community cycling initiatives, various types of events (themed 'days'/'weeks', 'challenge' events and mass participation), conservation and 'Green Gym', and for interventions involving therapeutic experience of nature, other woodland activities, gardening and allotments, adventure/achievement schemes, and unstructured play/wild places.

12.2 Key messages for the school setting

The table below (Table 12.2) summarises the types of school-setting interventions examined in the review, and the strength of evidence found in the review for each. Where our search for current activity in Scotland has found an example of this particular type of intervention in Scotland, this is listed in the final column of the table.

Table 12.2 School interventions: summary of evidence

Types of intervention examined in the review	Strength of evidence	Example in Scotland
Active travel interventions *(see Section 5.4)*		
Walking buses	Moderate support	Hopeman Primary School, Moray
School travel initiatives	Moderate support	School Travel Co-ordinators in most local authorities in Scotland – remit to increase active travel to primary and secondary schools
Organisational change interventions *(see Section 7.3)*		
Improving playgrounds and playground equipment	Support	Supergrounds programme, 6 year, RBS-funded programme to improve school grounds in 140 primary schools across Scotland
Introducing play facilitators	Support (for boys; less effective for girls)	Broxburn Family Centre, West Lothian, a community development involving local schools
Increasing opportunities for physical activity in the school day	No support	-
Opening school playgrounds out of school hours	Insufficient evidence	-
Cycling promotion *(see Section 9.4)*		
Cycling promotion campaigns	Moderate support	Build your own bike at the Bike Station bicycle-recycling social enterprise in Edinburgh
Campaigns and events *(see Section 10.4)*		
Mass participation events	Insufficient evidence	-
Outdoor experience *(see Section 11.4)*		
Conservation and 'Green Gym'	Insufficient evidence	-
Forest School/outdoor school	Insufficient evidence	-
Unstructured play/wild places	Insufficient evidence	-

The table shows that, for school-based interventions, the best available evidence in the review supports **improving playgrounds and playground equipment** and **introducing play facilitators** into school playgrounds.

The review also provides moderate support for walking buses, school travel initiatives, and cycling promotion campaigns in schools.

We found insufficient evidence to date to support increasing the opportunities for physical activity in the school day and for opening school playgrounds out of hours. The evidence suggests that simply giving children more opportunities to play outdoors is ineffective unless active play is encouraged and supported, either through how the playground is laid out and equipped or through the presence of play facilitators. The review also found insufficient evidence to support one-off mass participation events in schools, conservation and 'Green Gym' for schools, Forest School/outdoor school, and unstructured play/wild places.

12.3 Key messages for the workplace setting

The table below (Table 12.3) summarises the types of workplace-setting interventions examined in the review, and the strength of evidence found in the review for each. Where our search for current activity in Scotland has found an example of this particular type of intervention in Scotland, this is listed in the final column of the table.

The table shows that the best available evidence in the review supports two types of workplace interventions: **improvements to workplace facilities** to support physical activity (for example, cycle lockers, showers), and **workplace walking programmes**. Workplace walking programmes are typically multi-faceted, involving elements such as information, led walks, facilitated goal-setting, diaries, pedometers and support.

The review also finds moderate support for **workplace active travel campaigns**.

We found insufficient evidence to date to support the use of rewards and disincentives for particular types of travel to work, for workplace cycling initiatives (other than in the context of active travel), and for 'challenge' events in workplace settings.

Table 12.3 Workplace interventions: summary of evidence

Types of intervention examined in the review	Strength of evidence	Example in Scotland
Active travel interventions *(see Section 3.5)*		
Workplace campaigns	Moderate support	Personal travel planning, Stirling Council
Rewards and disincentives	Insufficient evidence	-
Types of intervention examined in the review	**Strength of evidence**	**Example in Scotland**
Organisational change interventions *(see Section 7.4)*		
Improvements to workplace facilities	Support	Cycle Friendly Employer award scheme run by Cycling Scotland - currently approximately 20 workplaces have received the award
Walking groups and programmes *(see Section 8.4)*		
Workplace walking programmes	Support	Workplace Walks Train – led lunchtime walks for NHS Greater Glasgow and Clyde and Glasgow City Council employees
Cycling promotion *(see Section 9.5)*		
Workplace cycling initiatives	Insufficient evidence	-
Campaigns and events *(see Section 10.5)*		
'Challenge' events	Insufficient evidence	-

12.4 Key messages for research commissioners

This review has examined the evidence for a wide-ranging set of interventions to promote physical activity. As we discuss in Section 4, the interventions are very heterogeneous; their only shared feature is the concern with physical activity and the outdoors. In some, increasing physical activity is the sole or a central objective,

while in others it is one of many desired outcomes. Similarly, the prominence of the outdoor environment in an intervention may vary widely.

This heterogeneity in intervention approaches is reflected in the evidence base, which is similarly varied in both coverage and quality. Not surprisingly, this tends to mean that there are more and generally better studies of interventions which more easily lend themselves to evaluation by experimental methods because they are relatively simple (such as playground improvements, walking buses and walking groups) and of interventions which adopt widely used and tested public health methods, such as multi-component community campaigns. Physical environment interventions have also been evaluated to a reasonable extent.

However, in the category we have called 'outdoor experience', there are fewer studies generally and no studies using strong experimental designs capable of detecting impact on physical activity. This may partly reflect the focus of interest to date with these interventions, which tends to have been on their psycho-social benefits as much as or more than on their potential physical activity benefits. These interventions merit further exploration because their potential to deliver benefits on several levels – educational, psychological, behavioural, social – makes them of interest to a wide range of policymakers, organisations and funders.

> ► **More robust evaluation is needed to assess the potential impact on physical activity of 'outdoor experience' interventions such as conservation, therapeutic experience of nature and Forest Schools.**

A limitation with nearly all of the studies is that impacts are only measured in the short or medium term. Many studies show that it is possible to increase physical activity during the period of an intervention or immediately afterwards; in order to ensure more people meet the physical activity requirements and to bring about lasting public health benefits, however, effects need to be sustained. The most promising interventions are likely to be those which 'continue working' after people have engaged with them (for example, a walking programme which helps someone to progress to independent walking), or those which need only minimal resources in order to carry on producing effects (for example, introducing play equipment into a playground, where the main resource needed to sustain the intervention will be ongoing maintenance and occasional replacement). However, measuring long term impact is challenging and requires more resources than are often available for programme evaluation.

> ► **Studies should consider the long-term impact of their interventions by measuring physical activity at follow-up to determine whether initial increases in physical activity as a result of the intervention are maintained.**

> ► **Evaluation commissioning should recognise the importance of measuring long term effects on routine physical activity.**

Some interventions are designed specifically for target groups considered to be in particular need of support and encouragement, such as the inactive, older people, primary care patients, low income communities and so on. Others are aimed at general populations. With all interventions and with the latter type in particular, it is important to measure whether the intervention is actually being utilized by the people

who could benefit from it most, or whether it is being utilized by people who are already active and/or at low risk.

► **Evaluations should measure reach and uptake among groups most in need of support and encouragement to become physically active, and should analyse whether interventions produce differential effects among key subgroups.**

► **This includes girls (because the evidence shows that boys tend to be more active already and to respond better to certain interventions), and BME groups who do not currently access the outdoor environment.**

The review has shown that a large number of studies rely on self-report as their key measure of impact on physical activity. As we outline in Section 4.1.2 above, self-report is less reliable than objective methods such as pedometers and accelerometers, although all methods have some limitations.

► **Where possible, studies should incorporate an objective method to measure physical activity (even in a sub sample to confirm the results from self-report methods).**

Appendices

Appendix 1. Sample search strategy for primary studies

OVID MEDLINE

78   remove duplicates from 77
77   limit 76 to yr="2000 -Current"
76   limit 75 to human
75   limit 74 to english language
74   73 and 64
73   71 or 72
72   14 and 57
71   14 and 37 and 70
70   or/65-69
69   pedometer$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
68   leisure activities/ or leisure activities.kw.
67   physical fitness/ or physical fitness.kw.
66   (physical$ adj3 (activ$ or exercise$)).ti,ab.
65   Exercise/
64   or/58-63
63   Evaluation Studies as Topic/
62   trial$.ot,ab,ti,hw,kw,sh.
61   pilot$.ot,ab,ti,hw,kw,sh.
60   intervention$.ot,ab,ti,hw,kw,sh.
59   evaluat$.ot,ab,ti,hw,kw,sh.
58   effective$.ab,ti. or effects.ti,ab. or effects.ti,ab. or impact.ti,ab.
57   38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51
      or 52 or 53 or 54 or 55 or 56
56   green prescription.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
55   (green adj gym$).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
54   (water adj sport$).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
53   biking.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
52   rambling.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
51   (mode adj2 (transport or travel)).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id,
      tc]
50   (travel adj plan).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
49   (green adj travel).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
48   (modal adj shift).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
47   (alternative adj (travel or transport)).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct,
      id, tc]
46   (Bike adj3 work).mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
45   bike$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
44   (active adj (travel$ or transport$ or commute$)).mp. [mp=ti, ot, ab, nm, hw, ui,
      sh, kw, tx, ct, id, tc]
43   walk$.mp.
42   Walking/ or walking.mp.
41   (outdoor and (education or activit$ or exercise$)).mp. [mp=ti, ot, ab, nm, hw, ui,
      sh, kw, tx, ct, id, tc]
40   jog$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
39   bicycl$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]

38   cycling.ot,ab,ti,hw,kw,sh. or cycle.ti.
37   or/15-36
36   allotment$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
35   gardening.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
34   mountain$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
33   footpath$.tw.
32   recreation$.tw.
31   (pavement$ or sidewalk$).tw.
30   (pedestrianis$ or pedestrianiz$).tw.
29   outside.tw.
28   conservation$.tw.
27   open space$.tw.
26   playing field$.tw.
25   waterway$.tw.
24   canal$.tw.
23   lake$.tw.
22   beach$.tw.
21   river$.tw.
20   tree$.tw.
19   forest$.tw.
18   (wood or wood$1 or woodland$).tw.
17   (park or parks or parkland or parklands).tw.
16   outdoor$.mp. [mp=ti, ot, ab, nm, hw, ui, sh, kw, tx, ct, id, tc]
15   (in adj2 nature).ot,ab,ti,hw,kw,sh.
14   or/1-13
13   neighbo*rhood$.ti,ab.
12   communit$.ti,ab.
11   community.ti,ab.
10   school.mp. or Schools/
9   business.ti,ab.
8   worker$.ti,ab.
7   factory.ti,ab.
6   (company or companies).ti,ab.
5   (employee$ or employer$).ti,ab.
4   worksite$.mp.
3   workplace$.mp.
2   occupational health/
1   workplace/ or workplace.kw.

Appendix 2. Reviews bibliography

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