

# Physical activity and the environment

## Review Two:

### URBAN PLANNING AND DESIGN

NICE guideline PH8 (published January 2008) has been updated and replaced by NG90.

New recommendations have been added on strategies, policies and plans to increase physical activity in the local environment (1.1.1 to 1.1.3); active travel (1.2.1 to 1.2.4 and 1.2.6 to 1.2.9); public open spaces (1.3.1 to 1.3.3). NICE has deleted some recommendations from the 2008 guideline because the evidence has been reviewed and the recommendations have been updated.

This evidence review is relevant to the updated guideline.

See the [guideline](#) for more details.

## CONTENTS

1.	Introduction .....	8
1.1.	<i>Background to this review</i> .....	8
1.2.	<i>The need for guidance</i> .....	8
1.3.	<i>The nature of evidence on the environment</i> .....	10
1.4.	<i>Scope of the reviews</i> .....	11
2.	Methodology .....	14
2.1.	<i>Literature Search</i> .....	14
2.2.	<i>Study Type and Quality Appraisal</i> .....	17
2.3.	<i>Study categorisation</i> .....	20
2.4.	<i>Assessing applicability</i> .....	22
2.5.	<i>Synthesis</i> .....	22
3.	Urban Infrastructure – Street Level: Summary of Findings .....	23
4.	Urban Infrastructure – Community Level: Summary of Findings .....	33
5.	Trails: Summary of Findings .....	35
6.	Urban Parks: Summary of Findings .....	42
7.	Building Placement: Summary of Findings .....	43
8.	Foreshore: Summary of Findings .....	44
	Evidence Tables .....	46
	Appendix A – Example search strategy .....	52
	Appendix B – Included studies .....	55
	Appendix C – Excluded Studies .....	57
	Appendix D - Glossary .....	69

## ***Executive Summary***

This report examines the evidence for the effectiveness of urban planning and design interventions in increasing physical activity.

Studies were included in the review if they assessed the effect of an intervention involving a modification to the physical urban environment. This included studies that aimed to change, for example, the spatial-physical configuration, aesthetic qualities, land use, amenities, and/or provision of specific facilities for physical activity (e.g. trails, street parks, green space) within an urban area. Studies varied in scale from street level changes, a few city parks to a comparison on the scale of whole suburbs. The outcome of the intervention had to include a measure of physical activity behaviour or use (including walking/ cycling/ pedestrian counts).

Only intervention study designs were included, studies that examined the association (correlations) between physical activity and urban design and planning were excluded.

Thirteen studies were included, comprising 1 quasi-experimental study, 7 before and after studies (2 of which used a control area), and 5 studies presenting after intervention measures only.

The studies covered six main areas:

### **1. Urban Infrastructure – Street Level**

**The evidence from four studies (three (2-) quality and one (3-) quality), tends to suggest that interventions to change the urban structure at the street level can lead to increased levels of pedestrian activity in the short-term. The evidence from two studies (one (3-) quality and one (2-) quality) tends to suggest that interventions changing the urban structure at the street level can lead to increased levels of children out in the areas in the long-term.**

Urban planning and design evidence review.

However, the evidence from two (2-) quality studies reported no changes in various measures of activity in the short-term in either children or adults, and one (2-) quality study reported decreased pedestrian flow in the short-term.

From this diverse body of evidence it is difficult to interpret any clear trends in how the content of the intervention may have influenced effectiveness. It does appear however that in most cases, a multi-faceted approach was taken to re-designing the urban environment giving priority to the needs of pedestrians.

There is some indication that urban change interventions may have a differential affect on different sub population groups, however there is insufficient evidence to assess this issue in any detail.

Overall the evidence 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.

## **2. Urban Infrastructure – Community Level**

The evidence from one (2+) quality quasi-experimental study suggests that the composition of the built environment at the community level may have a positive impact upon levels of walking and cycling.

## **3. Trails**

The evidence from two (3+) quality studies tends to suggest that trails can lead to self-reported increases in physical activity in the short term (Gordon et al., 2004) and long term (Brownson et al., 2000).

Overall, based on two (3+) studies, the evidence tends to suggest that trail surface, length and maintenance influence trail use (Brownson et al., 2000) and attitudes towards trails (Gordon et al, 2004).

Urban planning and design evidence review.

**On the basis of two (3+) quality post only studies there is insufficient evidence to assess any differential effect of the interventions by socio-demographic or cultural factors.**

**Overall, there is some evidence from two (3+) studies that trails can be perceived as safe places to use for physical activity, specifically walking.**

#### **4. Urban Parks**

**Overall, based on one (2+) quality controlled before and after study the evidence suggests that modification and promotion of parks may increase walking and can raise the awareness of parks.**

#### **5. Building Placement**

**The evidence from one (3-) quality post only study suggests that building shopping malls at the fringes of cities may lead to a reduction in the number of shopping trips made per month and a tendency for increased use of motorised vehicles and decreased pedestrian travel as the mode to access the shopping mall.**

#### **6. Foreshore**

**Overall, the evidence from one (3-) quality post only study suggests that building a boardwalk along a foreshore may increase levels of self-reported physical activity, particularly in people previously active.**

## Included studies

Brownson RC, Housemann RA, Brown DR, Jackson-Thompson J, King AC, Malone BR, Sallis JF. (2000) Promoting physical activity in rural communities: Walking trail access, use, and effects. *Am J Prev Med* 18(3):235-241.

Gordon PM, Zizzi SJ, Pauline J. (2004) Use of a community trail among new and habitual exercisers: a preliminary assessment. *Preventing Chronic Disease* 1(4):A11.

Handy S, Cao XY, Mokhtarian PL. (2006) Self-selection in the relationship between the built environment and walking - Empirical evidence from northern California. *J Am Planning Ass.* 72(1):55-74.

Layfield R, Chinn L, Nicholls D. (2003) Pilot home zone schemes: evaluation of The Methleys, Leeds. Transport Research Laboratory, UK.

Mangham C, Viscount PW. (1997) Along the boardwalk: effects of a boardwalk on walking behaviour within a Nova Scotia community. *Can J Pub Health*, 88(5): 325-326.

New South Wales (NSW) Health Department. (2002) Walk it: active local parks: the effect of park modifications and promotion on physical activity participation: summary report. North Sydney; Australia: NSW Health Department.

Newby L, Sloman L. (1996) Small steps, giant leaps. A review of the Feet First project and the practice and potential of promoting walking. Environ, Leicester (GB); Transport 2000 Trust, London (GB).

Newmark GL, Plaut PO, Garb Y. (2004) Shopping travel behaviors in an era of rapid economic transition - Evidence from newly built malls in Prague, Czech Republic. *Transportation Research Record: Journal of the Transportation Research Board*, (1898):165-174.

Painter K. (1996) The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape and Urban Planning*, 35: 193-201.

Skjoeveland O. (2001) Effects of street parks on social interactions among neighbors: a place perspective. *Journal of Architectural and Planning Research*, 8(2):131-47.

Space Syntax Ltd. (2002) Millennium Bridge and Environs: Pedestrian impact assessment study. Space Syntax Ltd, London: UK.

Space Syntax Ltd. (2004a) Trafalgar Square: Comparative study of space use patterns following the re-design of the public space. Space Syntax Ltd, London: UK.

Space Syntax Ltd. (2004b) Paternoster Square: Comparative study of pedestrian flows following the re-design of the public space. Space Syntax Ltd, London: UK.

## **1. Introduction**

### ***1.1. Background to this review***

The National Institute for Health and Clinical Excellence ('NICE' or 'the Institute') has been asked by the Department of Health (DH) to develop guidance on a public health programme aimed at improving the environmental factors that promote physical activity.

This guidance is in response to a number of developments in the fields of physical activity and public health in recent years, including:

- A growing recognition of the influence of the environment as a determinant of the behaviour of individuals and communities;
- A corresponding increase in published research on the environment and physical activity;
- A desire by public health professionals to work in partnership with local authorities and other key agencies on public health programmes;
- A need to complement interventions targeted at individuals with programmes that have the potential to have a larger population impact.

### ***1.2. The need for guidance***

#### **1.2.1. Physical activity and ill health**

Increasing activity levels will contribute to the prevention and management of over 20 conditions and diseases including coronary heart disease, diabetes, cancer, and weight management; and can help to improve mental health.

In 2004 the DH estimated the cost of inactivity in England to be £8.2 billion annually – including the rising costs of treating chronic diseases such as

coronary heart disease and diabetes. The contribution of inactivity to obesity is estimated to cost a further £2.5 billion each year.

Around 35% of men and 24% of women (aged 16 plus) are physically active enough to meet the current national recommendations (achieving at least 30 minutes of at least moderate activity on 5 or more days a week). Seventy per cent of boys and sixty-one percent of girls aged 2-15 years achieve the recommended physical activity levels (at least 60 minutes of at least moderate intensity physical activity each day). Physical activity varies according to age, gender, class and ethnicity (Department of Health, 2006).

### **1.2.2. Trends in physical activity**

Trends between Health Surveys for England in 1997, 1998, 2003 and 2004 found small increases in physical activity levels between 1997 and 2004 (Department of Health 2006). Other data from national travel surveys show that the distance people walk and cycle has declined significantly in the last three decades while travel by car has increased (Department for Transport, 1995; Department for Transport., 2005). Although there are limitations with these estimates, including the absence of published confidence intervals, the use of different questionnaire items and potential misclassification, there is concern about the generally low levels of physical activity undertaken by the population as a whole, and particular concern regarding the prevalence of participation amongst specific sub population groups (women, older adults, lower socio-economic class, minority ethnic groups).

### **1.2.3. Physical activity and the environment**

The environment can influence people's ability to be active (Department of Health., 2004). For example, the design and layout of neighbourhoods, towns and cities can encourage or discourage access on foot or by bike, while building design can encourage (or discourage) the use of stairs. Access to parks, the countryside and other green space, as well as specific features of green space, can help people to be more active.

Many components of the environment can be modified by public sector agencies through changes to policy and practice. Action can be taken in partnership with workplaces or other key organisations.

### **1.3. *The nature of evidence on the environment***

Over the past 5 or so years, and in response to the shifting focus within the field of public health and physical activity, a large body of evidence has accumulated exploring which features of the environment are associated with different types of physical activity. Typically these studies use a cross sectional design, are undertaken in defined urban areas, may use existing behavioural data on physical activity and collect new environmental data, or may have existing direct or proxy measures of the environment and collect measures of physical activity. Some studies collect environmental data within a specific area defined as a distance around the responders residential home. Much of the published work has been undertaken in developed countries, specifically in North America and Australia, and has mostly focussed on adult populations. Objective measures of the environment (e.g. traffic speed or volume) as well as subjective measures (e.g., perceived attractiveness or distance) can be used separately and in combination.

A recent review (Bauman and Bull, In press) indicates that to date approximately 100 published papers reporting primary studies and 9 reviews of the physical activity and environment field have been conducted along with one recent descriptive review of reviews (Gebel et al., 2005). Across these reviews, the emerging findings suggest that a set of characteristics or features of urban planning and design are consistently found to be associated with levels of physical activity, these include: mixed land use, high level of connectivity, good provision of walking and cycling facilities, perceived and objective measures of safety, aesthetic features, accessible destinations, density of shop facilities, convenience and satisfaction with facilities, street lighting and higher population density. Although there are many methodological differences within this literature, notably the lack of consistency between the measurement methods, definitions

used and population studied, overall these results provide a basis from which intervention research and potentially programme planning can be developed.

It is worth noting a number of significant challenges associated with undertaking a review of the evidence on environmental interventions. Firstly, the search strategy needs to be broad enough to capture studies from non-traditional sources including sources and journals not indexed in public health databases. Much of the work may be in the 'grey' literature (such as government reports or case studies). Furthermore, few studies report levels of physical activity, walking or cycling as a study outcomes, or present unvalidated measures that are difficult to equate to established measures of physical activity. Finally, a wider range of study types tends to be used with more of a focus on case studies, post only measures or uncontrolled pre and post studies, increasing the risk of bias.

## **1.4. Scope of the reviews**

### **1.4.1. Aspects of the environment that will be covered**

NICE guidance will be based on the findings from five reviews on specific aspects of the environment:

- Transport
- Urban planning and design
- The natural environment (urban and rural)
- Building design
- National, regional or local policy influencing physical activity through the environment.

This report presents the findings from the urban planning and design review. The scope includes interventions that involved a modification to the physical urban environment such as changes to the spatial-physical configuration, aesthetic qualities, land use, and provision or improvement to urban amenities. Studies which aimed to modify the physical urban environment for the primary

purpose of changing the transportation system (for example, in terms of traffic flow, volume, speed, mode) were excluded as these interventions were the focus of the transport review undertaken as part of this set of reviews for NICE (NICE, 2006a). Although there is some conceptual overlap, because all transport-related interventions may also be considered to involve a change to the urban environment, interventions aimed at traffic calming / bike networks / safe routes to school were excluded. Readers interested in the evidence on these approaches are referred to the transport review (NICE, 2006a). It is also noted that the inclusion of interventions undertaken in urban parks also presents an overlap with the scope of the forthcoming review on the Natural environment.

#### **1.4.2. Population groups that will be covered**

The general population, including both children and adults. The guidance will investigate the effectiveness of interventions across the broad social gradient, including those in the poorest circumstances and those in the poorest health.

#### **1.4.3. Areas that will not be covered**

The influence of national fiscal policy on physical activity levels is not addressed. As noted above interventions aimed primarily at transportation system and infrastructure are excluded.

#### **1.4.4. Outcomes**

The primary aim is to recommend environmental interventions that are likely to increase physical activity levels in the general population by: incorporating physical activity into every day life; increasing formal or informal recreational activity (including active play); increasing active travel (cycling and walking). In addition, secondary outcomes were reviewed and those relevant or potentially related to physical activity were summarized in both the evidence tables and in summary text.

#### **1.4.5. Review team**

This review has been carried out by a team from the Public Health Collaborating Centre (CC) for Physical Activity. The Collaborating Centre is an alliance

between the British Heart Foundation Health Promotion Research Group (University of Oxford) and the British Heart Foundation National Centre for Physical Activity and Health (Loughborough University).

## **2. Methodology**

### **2.1. Literature Search**

Literature searches were conducted using the terms and databases listed below. References were downloaded into a Reference Manager database and de-duplicated resulting in 23,714 references. Online contents pages for the Journal of Physical Activity and Health (JPAH) were browsed for relevant articles (this journal is not yet indexed in any electronic database), from first publication (Jan 2004) until latest available (May 2006), and 13 additional citations were retrieved. References that were identified by other search strategies were also followed up; 1 from the Transport and 7 from the Natural environment NICE search strategies. Contact was made via e-mail with a number of people including authors of included papers, key international and national experts, lead organisations and members of the Programme Development Group (PDG), this identified a further 12 possible references. References of included studies and key review papers were also checked which resulted in 4 additional references.

#### **2.1.1. Search terms**

All search strategies were designed by the CC and NICE. Tailored search terms were used appropriate to a particular database. Search terms followed the same order (1) urban design and planning terms and (2) physical activity terms. Typical search terms included:

Town, urban, built, city or cities, regional, community, neighbourhood or neighborhood, urban health, residence characteristics, AND landscape, pedestrianise or pedestrianize, structure, layout, facility, surrounding, amenity, location, planning, space, environment, development, design, sprawl, land use, aesthetic or esthetic, pavement or sidewalk, sign, path, trail, AND physical activity, exercise, sport, walk, running, jogging, bike or biking, rollerblading, rollerskating, skating, recreation, play.

A full search for MEDLINE is presented in Appendix A

All searches were performed from January 1990 to the most recently published version of the database (July 2006).

### **2.1.2. Databases searched**

Medline; Embase; Cinahl; PsycInfo; SportDISCUS; Global Health; Geobase; SIGLE; Cochrane Library; PAIS; ISI Science Citation Index and Social Science Citation Index; Cambridge Scientific Abstracts (CSA) Physical Education Index; CSA ERIC; CSA DAAI (Design and Applied Arts Index), Urbadoc, British Architectural Library online

### **2.1.3. Selection of studies for inclusion**

The agreed search strategy resulted in 23,714 titles, which were initially screened for potential relevance by one person. A pilot screening was performed on 15% of the total hits downloaded into the Reference Manager database in order to assess sensitivity of screening. This pilot assessed titles and abstracts against relevance of a possible study relating to both urban planning and design intervention and assessing physical activity outcomes.

After the initial screening 1,013 titles and abstracts were assessed for relevance by one person and consistency was assessed by 2 researchers checking relevance on a 10% sample. In total 143 titles were assessed to be relevant and the full papers were retrieved, and were checked against in-out criteria by one person. Where any uncertainty existed, the full paper was assessed independently by a second reviewer. Thirteen studies were accepted for full data extraction (see Appendix B) and 130 were rejected (see Appendix C). Any discrepancies were resolved by a third reviewer.

Studies were included if they assessed the effect of an intervention related to modifying the physical urban environment. Studies varied in scale from a street block, a few city parks to a comparison on the scale of whole city suburbs. The outcome of the intervention had to include a measure of physical activity behaviour (including total physical activity/ walking / cycling/ pedestrian counts) although other 'proxy' measures such as usage were accepted. Measures of

pedestrian traffic or 'footfall' is often used as an outcome measure in the urban and landscape planning literature and this was accepted. Such measures represent a proxy measure of walking but do not provide a summary measure of physical activity behaviour.

Only intervention (experimental or quasi-experimental) study designs were included. Studies that examined the association (or correlation) between physical activity and characteristics of the built urban environment were excluded. Furthermore, studies that only described patterns of usage of existing facilities (e.g. trails, greenways, sports facilities) and studies where no intent to modify or improve a physical feature of the urban environment was evident were excluded as these do not provide evidence on the effectiveness of changes to the environment on physical activity.

The main reason for exclusion of studies was that they did not involve a change to the urban environment, they did not include a measure physical activity as an outcome, the focus was on correlations or the paper was purely a description of the area or an opinion piece (Appendix C).

Effectiveness was examined over the following timescales:

- in the short term (up to and including one year)
- in the longer term (over one year)

**Table 1 Search strategy results by source**

<b>Searching</b>						
	Data sources					Total
	Electronic databases	JPAH	Expert & lead organisations	Hand searching	Other review searches	
Number of hits	23714	13	10	4	8	23749
<b>Assessing relevance for review</b>						
Number of studies assessed	974	13	10	4	8	1009
<b>Assessed against in/ out criteria</b>						
Number of studies assessed	121	0	10	4	8	143
<b>Data extraction and quality appraisal</b>						
Number of included review studies	8	0	4	1	0	13

## **2.2. Study Type and Quality Appraisal**

Each study was categorised by study type (categorised as type 1-4) and graded for quality using a code '++', '+' or '-', based on the extent to which the potential sources of bias had been minimised (NICE, 2006b, p27.). The studies were categorised into the following study types:

- Type 1      Systematic reviews, meta-analyses of RCTs (randomised controlled trials), or RCTs
- Type 2      Systematic reviews of, or individual, non-randomised controlled trials, case-control studies, cohort studies, controlled before-and-after (CBA) studies, interrupted time series (ITS) studies, correlation studies.
- Type 3      Non-analytic studies (for example, case reports, case series studies, after only studies)

Studies were quality appraised against NICE quality criteria (NICE, 2006b) appropriate for study types, and subsequently classified into one of three categories (++, + or -). The included studies were quality assessed independently by 2 reviewers and any discrepancies were resolved through discussion.

#### **NICE Quality Criteria**

Does the study describes its methods and results  
Where was the study published?  
Who published the study?  
Was the study peer reviewed?  
Who funded the study?  
Were the study samples shown to be representative of the study population in baseline and follow-up (where applicable)?  
Was the method/instrument used to assess physical activity or travel mode appropriate to the research question(s) of the study? (i.e. capable of measuring the outcome under consideration)  
Did the study provide details of the measures used?  
Did the study take into account any potential confounders?

- ++**      **All or most** of the data are adequately described and the conclusions of the study are thought very unlikely to alter (low risk of bias).
- +**        **Some** of the data are adequately described and the conclusions of the study are thought unlikely to alter (risk of bias)

- **Few or no** data are adequately described and the conclusions of the study are thought likely to alter (high risk of bias)

No type 1 studies were found. Eight studies were categorised as type 2 with the remaining five as type 3. Table 2 shows the majority of studies were categorised as (-) quality with 4 studies categorised as (+) and none as (++). The main reasons for studies being assessed as (-) quality were failure to describe methods adequately, a low quality measure of physical activity (for example, reporting the observed presence of people) and failure to take potential confounders into account.

**Table 2. Study type and quality**

<b>Study type and quality</b>	<b>Authors</b>
2++	
2+	NSW Health Department, 2002; Handy et al., 2006.
2-	Space Syntax, 2002; Space Syntax, 2004a; Space Syntax, 2004b; Skjovoeland, 2001; Layfield et al., 2003; Painter, 1996.
3++	
3+	Brownson et al., 2000; Gordon et al., 2004.
3-	Newby and Sloman, 1996; Newmark, 2004; Mangham and Weld Viscount, 1997.

## **2.3. Study categorisation**

### **2.3.1. Description of studies**

The 13 studies are described in Section 4 and presented in the Evidence Table.

They included:

- 2 controlled before and after studies (NSW Health Department, 2002; Skjovoeland, 2003).
- 1 quasi-experimental study (Handy et al., 2006)
- 5 before and after studies (Layfield et al., 2003; Painter, 1996; Space Syntax, 2002; Space Syntax, 2004a; Space Syntax, 2004b).
- 5 after measures only studies (Newmark, 2004; Mangham and Weld Viscount, 1997; Newby and Sloman, 1996; Brownson et al., 2000; Gordon et al., 2004)

These studies tested a range of different environmental interventions related to urban environment and fell into six different categories (see section 3-8 for full definitions):

- Urban Infrastructure – Street Level
- Urban Infrastructure – Community Level
- Trails
- Urban Parks
- Building Placement
- Foreshore

All interventions included some form of change or modification to the physical urban environment either by adding or improving the amenities, changing the

function (for example, pedestrianisation) or the placement of a facility (for example, shopping mall, bridge). In addition, some interventions included other elements such as promotional activities (for example, mass media, posters) or group activity programmes (for example, walking groups in parks). All interventions were conducted wholly or partially in areas of established urban/suburban development, this included large cities, regional towns and small towns in rural communities.

### 2.3.2 Country of studies

Six of the studies were conducted in the UK. Table 3 presents the studies by country and lead author.

**Table 3 Summary of studies by country of origin**

<b>Country of origin</b>	<b>Authors</b>
UK	Newby and Sloman, 1996; Layfield et al., 2003; Painter, 1996; Space Syntax, 2002; Space Syntax, 2004a; Space Syntax, 2004b.
USA	Brownson et al., 2000; Gordon et al., 2004, Handy et al., 2006;
Canada	Mangham and Weld Viscount, 1997.
Australia	NSW Health Department, 2002.
Czech Republic	Newmark, 2004.
Norway	Skjovoeland, 2003.

### 2.3.3 Length of outcome measures

Eight studies measured short-term outcomes (up to 12 months follow up) only (NSW Health Department, 2002; Layfield et al., 2003; Painter, 1996; Space Syntax, 2002, 2004a, 2004b; Gordon et al., 2004; Handy et al., 2006). Five studies measured long-term outcomes (over 12 months follow up) only

(Newmark, 2004; Mangham and Weld Viscount, 1997; Skjovoeland, 2001; Newby and Sloman, 1996; Brownson et al., 2000).

The focus of this review meant that several of the included studies came from urban design and landscape planning disciplines and the reporting of physical activity as a study outcome is a rare occurrence compared with those studies conducted within a public health paradigm. In general, the best available outcome data on physical activity were 'usage' or pedestrian counts and in some cases cycling counts were reported. Other non physical activity outcomes were often included and examples of these are resident or user perceptions of perceived safety or fear of crime, attitudes and objective measures air quality or noise.

In addition, the evidence hierarchy practised within public health is not reflected within urban design and planning research. For example, use of controlled research designs is rare, and issues such as data capture, contamination and bias make some public health study designs inappropriate, with causality being very difficult to demonstrate. Consequently, research is often conducted using 'natural experiments' applying poorer quality study designs, in a small number of studies a quasi-experimental design has been incorporated.

## ***2.4. Assessing applicability***

Each study was assessed on its external validity: that is, whether or not it was directly applicable to the target population(s) and setting(s) in the scope. This assessment took into account whether the study was conducted in the UK, any barriers identified by studies or the review team, with references as appropriate, to implementing each intervention in the UK, (NICE, 2006b).

## ***2.5. Synthesis***

It was not appropriate to use meta-analysis to synthesise the outcome data as interventions, methods and outcomes were heterogeneous. This review is restricted to a narrative overview of all studies that met the inclusion criteria and

contained sufficient data for data extraction and quality assessment. The effects of studies were examined within the categories of the type of urban planning intervention, stratified by study quality. The evidence statements were developed using NICE criteria (NICE, 2006b, p37), outlined below.

- The best available evidence of the effect of an intervention
- The strength (quality and quantity) of supporting evidence and its applicability to the populations and settings in question
- The consistency and direction of the evidence base

It is noted that for several categories of interventions contained within this review, only one study met the inclusion criteria. Evidence statements were drafted for these sections but due caution should be taken in generalizing due to this limitation. This review did not produce any evidence statements based upon any cost-effectiveness data, where relevant studies with economic data were found these were highlighted for consideration in the economic review.

### **3. Urban Infrastructure – Street Level: Summary of Findings**

#### **3.1. *The studies***

This category termed ‘urban structure-street level’ groups a broad set of interventions involving a change to either an individual or a set of characteristics, features or design elements of the built urban environment at the scale of a small section of a street, a town square or a few blocks. Intervention examples include pedestrianisation of an area, conversion of residential roads to street parks, modifications to built urban features (urban park improvement) and aesthetic changes such as regular cleaning and maintenance.

Seven studies, six (2-) quality studies and one (3-) quality study, reported evidence on the effectiveness of street level urban structure on physical activity outcomes. Six were conducted in the UK and one was conducted in Norway.

Painter K. (1996) assessed the influence of street lighting improvements on crime, fear and pedestrian street use, after dark in three urban streets and a pedestrian footpath considered to be crime and fear prone in the UK.

Skjoveoland (2001) assessed whether the development of 3 'street parks' in a city in Norway would lead to an increase in residents outdoor usage which was measured by observation and compared with 5 control street areas.

Layfield et al., (2003) conducted a before and after survey to evaluate the impact of a Home Zone scheme in Leeds, UK, on levels of cycling, walking and activities people engaged in whilst in the street.

Space Syntax (2002) observed pedestrian flows across 2 bridges and the surrounding local area in Central London after construction and opening of the Millennium Bridge, London, UK.

Space Syntax (2004a) examined space-use patterns and reported pedestrian counts in Trafalgar Square, London, UK following the re-design of the public space in and around the square.

Space Syntax (2004b) assessed whether the re-design of Paternoster Square in London, UK affected movement flows across the public space. Pedestrian counts were measured by observation.

Newby and Sloman (1996) provided a report of *Feet First* projects, a set of 12 initiatives involving local authorities developing and implementing practical schemes to improve the pedestrian environment and promote walking and cycling in 12 city centres across the UK. Two of the twelve projects report survey data on various outcomes, including pedestrian use and children's play.

### **3.2. Evidence of efficacy**

Five (2-) quality studies, all based in the UK, reported short-term physical activity related outcomes following street level changes to urban structure; four reported pedestrian counts (Painter, 1996; BA 2-; Space Syntax, 2002; BA 2-, 2004a; BA 2-, 2004b; BA2-) and one reported levels of cycling, walking and activities in the street (Layfield et al., 2003; BA 2-). Three of these five studies reported increased pedestrian counts (Painter, 1996; BA 2-; Space Syntax, 2002; BA2-, 2004a; BA 2-); one study reported increased pedestrian street use following improved street lighting by between 34% and 101% from baseline in both men and women (Painter, 1996; BA 2-). One study reported a 3.5 and 3-fold increase in movement levels in 2003 and 2004, respectively, following baseline assessment in 2001 (Space Syntax, 2004a; BA 2-). One other study observed a 43% increase in pedestrian counts throughout the day and a 60% increase in use during lunch-time amongst all people using a newly constructed bridge and surrounding areas (Space Syntax, 2002; BA 2-). One of the five studies reported no change in the number of self-reported walking or cycling trips taken in the short-term in either children or adults (Layfield et al, 2003; BA 2-) and one study reported a decrease in pedestrian flow by 7% during the mid-morning period and 60% during the lunch-time period after the re-design of an open public space (Space Syntax et al., 2004b; BA 2-).

Two studies, one (2-) quality study based in Norway (Skjovoeland, 2001; CBA) and one (3-) quality study based in the UK (Newby and Sloman, 1996; PI) reported results in the long-term. Newby and Sloman, (1996; PI 3-) reported self-reported increases in both the number of children allowed to play out in the street and numbers of people walking where improvements have been made to the pedestrian environment in residential areas. Skjovoeland, (2001; CBA 2-) reported a significant increase in the presence of children observed in one of two newly created street parks compared with no observed change in any of the three control parks; however, the observed presence of adults in the street parks significantly decreased in one of the two intervention parks and two of the three control streets.

These results are summarised in Table 1.

**Table 1. Summary of studies by quality and outcome**

Quality		++	+	-
Outcome	+ve			Painter (1996) (2-) Space Syntax (2002) (2-) Space Syntax (2004a) (2-) Newby and Sloman (1996) (3-)
	0			Layfield et al., (2003) (2-) Skjoveoland (2001) (2-)
	-ve			Space Syntax (2004b) (2-)

The evidence from four studies (three (2-) quality and one (3-) quality), tends to suggest that interventions to change the urban structure at the street level can lead to increased levels of pedestrian activity in the short-term. The evidence from two studies (one (3-) quality and one (2-) quality) tends to suggest that interventions changing the urban structure at the street level can lead to increased levels of children out in the areas in the long-term.

However, the evidence from two (2-) quality studies reported no changes in various measures of activity in the short-term in either children or adults, and one (2-) quality study reported decreased pedestrian flow in the short-term.

## ***Key questions***

### ***3.2.1. What is the aim/objective of the intervention?***

All studies assessed the impact of a change to the physical urban structure. Five interventions aimed to change the urban structure to provide increased opportunity for pedestrian activity (Newby and Sloman, 1996; Layfield et al., 2003; Space Syntax, 2002, 2004a, 2004b) which involved changes to the aesthetic environment and the introduction of traffic calming measures. One study primarily aimed to investigate the effects of creating street parks through changes to the residential street layout including pedestrianisation, landscaping and the provision of amenities on 'neighbouring' (Skjovoeland, 2001). One study assessed the impact of improving street lighting by upgrading the standard orange lamps with white light sources (Painter, 1996).

### ***3.2.2. How does the content of the intervention influence effectiveness?***

Two (2-) quality studies reported on interventions involving pedestrianisation (Skjovoeland, 2001; Space Syntax 2004a). Skjovoeland (2001) studied the conversion of several streets into street parks where motor vehicles and parking were prohibited, buildings were demolished or improved to increased openness, improved naturalness and aesthetics, and street furniture was introduced. The study by Space Syntax reported on an intervention where Trafalgar Square was redesigned, by pedestrianisation of one street, building of a staircase and the introduction of pedestrian islands (Space Syntax, 2004a). Both studies reported positive outcomes, a significant increase in the presence of children in the street parks and increased pedestrian flow, respectively.

Two studies, one (2-) quality (Layfield et al., 2003) and one (3-) quality (Newby and Sloman, 1996), reported on interventions that developed practical schemes to improved the pedestrian environment and promote walking and cycling, for example, imposing 20 mph limits, introducing chicanes and speed humps, and typically included improvements to the aesthetic environment, for example,

including coloured block work, planting trees and plant beds and improving general upkeep. Layfield et al., (2003) reported on changes within a home zone and found no change in levels of walking, cycling or activities in the street, whilst Newby and Sloman (1996) reported on effects of feet first projects and found a 20% increase and a 55% increase in children playing in the street in 2 different projects, and an increased perception by residents that more people walked in the street since the intervention.

One (2-) quality study reported on the effect of improved street lighting in three urban streets and a pedestrian footpath which were considered to be crime and fear prone (Painter, 1996). An increased pedestrian street use after dark was observed.

One (2-) quality study reported on the effect that the opening of the Millennium bridge and building of a new footbridge had on pedestrian flow over three bridges and the surrounding area (Space Syntax, 2002). A significant increase was found in the percentage of both local residents and tourists walking in the area throughout the day and during lunch time.

One(2-) quality study reported on an intervention within a London square involving space re-design, buildings were demolished and rebuilt with changes to the layout and connectivity (Space Syntax, 2004b). This study reported a decrease in pedestrian flow.

**From this diverse body of evidence it is difficult to interpret any clear trends in how the content of the intervention may have influenced effectiveness. It does appear however that in most cases, a multi-faceted approach was taken to re-designing the urban environment giving priority to the needs of pedestrians.**

### **3.2.3. *How does the way that the intervention is carried out influence effectiveness?***

There is insufficient evidence available to make any conclusions about the way in which the intervention is carried out and effectiveness.

**3.2.4. Does the effectiveness depend on the job title/position of the deliverer?**

None of the papers provided data addressing this question. Therefore, there is insufficient evidence to make clear inferences about the impact of the job title/position of the deliverer of the intervention.

**3.2.5. Does the site/setting of delivery of the intervention influence effectiveness?**

The setting varied between studies. Two studies were conducted in defined residential areas where specific projects were taking place (Newby and Sloman, 1996; Layfield et al., 2003), one was conducted in a street park (Skjovoeland, 2001), two were conducted in open public spaces (Space Syntax, 2004a; Space Syntax, 2004b), one was conducted in conjunction with the building of a pedestrian bridge over the River Thames (Space Syntax, 2002), it was noted however that the opening of this bridge coincided with the opening of the Tate Modern gallery which is a major tourist attraction. One study was conducted in streets considered by a multi-agency team to be crime and fear prone (Painter, 1996).

Positive increases in pedestrian counts were seen across a number of the studies which suggests there is potential for increasing walking through a variety of approaches informed by urban design and pedestrian traffic movement principles. Overall there is insufficient evidence to make clear inferences about the impact of the setting on the intervention.

Six of the seven studies were conducted in the UK and are therefore potentially applicable to other areas within the UK. One study was conducted in Bergen, Norway, however with adaptation this intervention is likely to be applicable to the UK.

**3.2.6. *Does the intensity (or length) of the intervention influence effectiveness/duration of effect?***

This set of studies included interventions that had taken between several months to several years to implement and also the follow-up measures varied in nature and timing from a few months to several years. However due to the heterogeneity among the studies, there is insufficient evidence to make any conclusions about the intensity (or length) of the intervention and corresponding impact.

**3.2.7. *How does the effectiveness vary with age, gender, class, ethnicity etc?***

Three studies reported outcomes relating to children (Newby and Sloman, 1996; Skjovoeland, 2001; Layfield et al., 2003). Newby and Sloman, (1996) reported increases in the number of children allowed to play out in the street in 2 projects where improvements had been made to the pedestrian environment in residential areas. Skjovoeland, (2001) reported an increase in the presence of children observed in newly created street parks, whilst there was no observed change in control parks. However the presence of adults, a proxy indicator of impact on adult behaviour, decreased suggesting adults used the urban area less after the intervention. A third study (Layfield et al., 2003) with a very small sample of child respondents (baseline n=8; follow up n=17) reported that at follow up 27% of children thought they rode their bicycle more often, and that the use of roller skates and skateboards had increased, however the prevalence of other outdoor activities appeared unchanged.

**There is some indication that urban change interventions may have a differential affect on different sub population groups, however there is insufficient evidence to assess this issue in any detail.**

**3.2.8. *What are the barriers to implementation?***

There was insufficient evidence from the studies to make clear inferences about barriers to implementation.

### **3.2.9. *What are the non-physical activity outcomes of the intervention?***

Five studies presented data on non-physical activity outcomes, in particular perceptions of safety. Newby and Sloman (1996) reported some data suggesting an increased perceived level of safety and reduced traffic accidents. Space Syntax (2004a) reported that following the modifications in Trafalgar square, the area has become 'much safer' in that observations of the area indicated people now used the pedestrian crossings provided compared with crossing the roads in unsafe locations.

Layfield et al., (2003) found children reported being able to spend time outdoors more safely since the home zone was created. Furthermore, traffic levels, driver behaviour and safety, and environmental factors (such as 'friendliness of the street', appearance of the street, noise and air quality) were also reported as outcomes. Almost all respondents interviewed thought the home zone had made the appearance of the streets 'more attractive' and the results indicate that noise levels had reduced, although about two thirds of the people surveyed thought that traffic noise and traffic pollution in the street hadn't changed, and most people thought the 'friendliness of the street' had not changed since the home zone was introduced.

Painter (1996) reported that improved street lighting was effective in reducing crime and fear at night. After 12 months, fears elderly residents (n=10) held about crime had dropped from 6 out of 10 residents reporting they worried 'a lot', to 2 out of 10. Skjovoeland (2003) presented data on outcomes relating to 'neighbouring' showing that supportive acts of 'neighbouring' and 'neighbour annoyance' both increased in the intervention streets, these results were interpreted by the authors as a sign of increased involvement in the neighbourhood.

**Overall the evidence 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.**

### ***3.3. Implementability of intervention.***

All of the studies would be highly feasible to implement in UK residential and city centre settings with appropriate political and public support and resources for the necessary capital investment. Some adaptation of interventions may be necessary to reflect any local concerns about street design and types of intervention implemented. Promotion of increased opportunities for children to play outdoors safely and improved amenities for walking and cycling because of a modification to the built environment may also be important in the promotion of future changes to the urban structure.

#### **Urban infrastructure – street level summary evidence statement:**

**The evidence from four studies (three (2-) quality and one (3-) quality), tends to suggest that interventions to change the urban structure at the street level can lead to increased levels of pedestrian activity in the short-term. The evidence from two studies (one (3-) quality and one (2-) quality) tends to suggest that interventions changing the urban structure at the street level can lead to increased levels of children out in the areas in the long-term.**

**However, the evidence from two (2-) quality studies reported no changes in various measures of activity in the short-term in either children or adults, and one (2-) quality study reported decreased pedestrian flow in the short-term.**

**From this diverse body of evidence it is difficult to interpret any clear trends in how the content of the intervention may have influenced effectiveness. It does appear however that in most cases, a multi-faceted approach was taken to re-designing the urban environment giving priority to the needs of pedestrians.**

**There is some indication that urban change interventions may have a differential affect on different sub population groups, however there is insufficient evidence to assess this issue in any detail.**

**Overall the evidence 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.**

#### **4. Urban Infrastructure – Community Level: Summary of Findings**

This category termed 'urban structure-community level' groups interventions involving change to the physical environment and urban design features at the broader (larger) community level, for example, a whole neighbourhood or community, a town or city. A large scale or a set of characteristics, features or design elements might be modified, built or demolished, upgraded or redesigned. Few intervention studies have been undertaken at this scale, and no published studies using a true experimental design (i.e., involving a physical change to the built environment) were identified. Quasi-experimental studies, in which a change in the environmental structure and composite features is simulated by assessing the impact of a change in residential location (i.e., participants in the study have moved house from one neighbourhood design to another) are more feasible to conduct. This type of study provides a stronger measure of association and potential causality than cross sectional study designs. One published study was identified.

One (2+) quality study based in the USA used a quasi-experimental design to provide evidence for the effect of changes in the community level urban infrastructure on changes in walking and cycling behaviour.

Handy et al., (2006) examined the association between changes in the built environment and changes in walking and cycling amongst residents across 8

neighbourhoods (4= 'traditional' design and 4 = 'suburban' design) in Northern California, USA. A community-based, random telephone survey was conducted in each neighbourhood to collect data from residents who had either recently moved (n=500 in each neighbourhood) or who had not (n=500 in each neighbourhood). Change in behaviour was assessed using a 5-point scale ranging from 'a lot less' to 'a lot more'. Change in the built environment was computed as the difference between perceived characteristics of the current and previous neighbourhood.

### ***Evidence of efficacy***

One (2+) quality study met the inclusion criteria for an intervention aimed at the community level. Handy et al., (2006) estimated the relationship between changes in built environment and changes in walking using an ordered probit model controlling for attitudes, age, income, children aged under 5 years and physical limitations. Positive relationships ( $p < 0.05$ ) were reported for change in walking and attractiveness, the number of banks within 800m and the number and type of business within 1600m, however a negative relationship ( $p < 0.05$ ) was found for change in walking and spaciousness (namely, a higher score for 'spaciousness' was associated with smaller increases in walking and with larger decreases in walking). The model assessing change in cycling indicated a 'positive attitude towards biking and walking' was an important attitudinal variable in explaining changes in cycling. Controlling for attitudes and preferences two environmental characteristics were significant in influencing cycling: number of local businesses within 1600m and proximity to a health club.

Based on one (2+) quality quasi-experimental study there is insufficient evidence to draw any conclusions on the effect of changes to the composition of the urban structure at the larger, community scale on physical activity. It is therefore not possible to identify any features potentially related to effectiveness in terms of the intervention content, delivery, setting or intensity, nor can any statements be made about any potential differential impact for specific socio-demographic

groups or cultural factors. No conclusions can be made regarding the applicability or implementability of this type of intervention.

**Urban infrastructure – community level summary evidence statement:**

**The evidence from one (2+) quality quasi-experimental study suggests that the composition of the built environment at the community level may have a positive impact upon levels of walking and cycling.**

## **5. Trails: Summary of Findings**

### **5.1. *The studies***

Trails are routes and pathways that are open to the public and are used for walking, cycling, picnicking and other recreational activities. The intervention studies included involved trails built primarily for recreational not transportation purposes and present data relating to total activity and/or recreational physical activity. The studies include interventions where railway lines have been converted to trails, known as rail-trails, or where trails have been built or enhanced, for example a pathway around a wooded or natural area. Rail-trails are multi use pathways constructed on abandoned railway beds and can be used for both recreational and transportation-related physical activity. Studies were included if they were located within an urban area or within close proximity to urban areas.

Two, (3+) quality studies, both based in the USA reporting post-intervention data only, provide evidence for the effectiveness of trails in increasing physical activity.

Gordon et al (2004) evaluated physical activity patterns and trail use of 2 newly constructed rail-trails in a rural community in the USA. On-site intercept surveys were used to collect data on activity patterns from new and habitually-active exercisers using the trail.

Brownson et al (2000) assessed walking trail use and levels of physical activity amongst community residents in 12 rural counties in Southern Missouri, USA where walking trails were built in partnership with community coalitions.

Telephone interviews were conducted with a random sample of households within the local area surrounding the trail to evaluate physical activity over the past week, month and since using the trail.

## **5.2. Evidence of efficacy**

One (3+) study measured short-term outcomes by conducting an intercept survey of users approximately 6 months post completion of 2 new trails (Gordon et al., 2004). This US study reported that 22.5% (n=93) of trail users were classified as new exercisers, the other 77.5% (n=321) were classified as habitually active.

When asked 'since using the trail, has the amount of exercise that you do: increased; decreased; stayed the same or don't know, 98% reported that their level of exercise had increased. Furthermore, when asked the same question 52% of habitually active exercisers reported that their exercise amounts had increased since using the trail. Of new exercisers 31% reported that their use of the trail was their only form of physical activity

One (3+) study measured long term outcomes (Brownson et al., 2000). Trails were in place for between 6 months and 5 years and were assessed after an average 1.53 years using a telephone survey of local residents. This study was based in the US and found that 52% of trail users reported that they had increased their amount of walking since they started using the trail.

**The evidence from two (3+) quality studies tends to suggest that trails can lead to self-reported increases in physical activity in the short term (Gordon et al., 2004) and long term (Brownson et al., 2000).**

### **5.3. Key questions**

#### **5.3.1. What is the aim/objective of the intervention?**

Both interventions aimed to increase levels of physical activity through the provision of trails. In one study this was through the construction of new trails and the enhancement of existing trails, as part of a community-based project targeting change in behavioural risk factors for heart disease, physical inactivity, cigarette smoking and poor diet (Brownson et al., 2000). In the second study two new trails were constructed from disused rail beds (Gordon et al., 2004).

#### **5.3.2. How does the content of the intervention influence effectiveness?**

Both studies were conducted within the city limits of rural communities.

One intervention focussed on the construction of new walking trails and the enhancement of existing trails resulting in a total of 21 trails across 12 rural south-eastern Missouri counties comprising a total population of approximately 280 000. The majority of the trails were located in residential park areas within city limits and were generally asphalt, gravel or wood chip covered. Trails varied in length from 0.13 miles to 2.38 miles with some being a simple loop around ball playing fields or playgrounds (Brownson et al., 2000). Results from the sub analysis indicate that use of trails and increases in physical activity was more likely where trails were longer (>0.25 miles) and made of asphalt (compared with wood chips or gravel). Although promotional activities to raise awareness of trails were mentioned in this study, no details were provided on what this may have involved.

The second study involved the conversion of 2 old rail beds into 2 new trails which comprised 12 miles of level, paved trails that bisect a rural community within Morgantown, USA comprising of 26 809 residents. The trails ran adjacent to either a river or a creek within the city limits, and in addition to stretching along waterways, the trails intersected neighbourhoods and business establishments within the city limits. In addition a further 14 miles of unpaved trails existed outside the city limits (Gordon et al., 2004). Terrain (path surface) was ranked

high as an enabling factor by all trail users (both 'new exercisers' and 'habitually active exercisers') and trail maintenance also was ranked high as a 'concern about the trail' (ranked 2 and 3 by 'habitually active exercisers' and 'new exercisers', respectively). Gordon et al. provide no details on whether any promotional activities were undertaken within their intervention.

These two interventions differ in terms of the number of trails, location and length; one study included multiple trails which were relatively short in distance and located in parks or woodlands areas in or close by to residential areas (Brownson et al., 2000). In contrast, the second study included 2 longer trails intersecting neighbourhoods and business establishments (Gordon et al., 2004). Neither study reported information on any promotional activities that may have taken place.

Based on these two intervention studies there is insufficient evidence to indicate whether use of signage and/or promotional interventions provides additional benefits leading to increased trail use. However drawing on evidence from other reviews (including the NICE Transport review) it is the opinion of the reviewers that additional promotional activities supporting the trail infrastructure would increase the likelihood of increased trail use.

**Overall, based on two (3+) studies, the evidence tends to suggest that trail surface, length and maintenance influence trail use (Brownson et al., 2000) and attitudes towards trails (Gordon et al, 2004).**

### ***5.3.3. How does the way that the intervention is carried out influence effectiveness?***

In one study the interventions (new trails) were delivered largely by community volunteers via organised coalitions as part of a larger community-based intervention project (Brownson et al., 2000). The other study does not report information on the way in which the intervention was carried out (Gordon et al., 2004).

There is insufficient evidence available to make any conclusions about the way in which the intervention is carried out and effectiveness.

**5.3.4. Does the effectiveness depend on the job title/position of the deliverer?**

Neither of the two studies provided data addressing this question. Therefore, there is insufficient evidence to make clear inferences about the impact of the job title/ position of the deliverer on the intervention.

**5.3.5. Does the site/setting of delivery of the intervention influence effectiveness?**

Both studies were located in urban areas within rural communities in the USA. One study was conducted in South-eastern Missouri counties comprising a population of approximately 280,000 residents (Brownson et al., 2000). The second was conducted within the city of Morgantown, West Virginia with a population of 26,809 residents (Gordon et al., 2004).

Both studies were conducted in the USA, however the interventions described are potentially applicable to the UK. There is insufficient evidence to make clear inferences about the impact of the specific setting on the intervention.

**5.3.6. Does the intensity (or length) of the intervention influence effectiveness/duration of effect?**

One study included trails that had been either built or enhanced within the last 6 months to 5 years, with the average duration of existence being 1.53 years (Brownson et al., 2000). The second study collected data 6 months post completion of the trails (Gordon et al., 2004).

There is insufficient evidence available to make clear inferences about the length of time that the intervention had been in place.

**5.3.7. *How does the effectiveness vary with age, gender, class, ethnicity etc?***

Both studies reported data relating to socio-demographic characteristics. In Brownson et al., the sub analysis of persons reporting using the trail indicated the following significant differences: women were more likely than men to report that they had increased their amount of walking since they began using the trail (60% versus 41% respectively); nearly 62% of persons with a high school education or less reported increasing walking compared with 46% of those with a college education; and lower-income groups were more likely to have increased walking due to trail use compared with the highest income group.

In Gordon et al., no data were presented on differences in trail use by socio-demographic or cultural factors but the authors did report that there were no significant differences on sex, age and employment status between those identified during the intercept survey as 'new exercisers' compared with 'habitually active exercisers.'

**On the basis of two (3+) quality post only studies there is insufficient evidence to assess any differential effect of the interventions by socio-demographic or cultural factors.**

**5.3.8. *What are the barriers to implementation?***

There was insufficient evidence from the studies to make any inferences about barriers to implementation.

**5.3.9. *What are the non-physical activity outcomes of the intervention?***

One study reported data on perceived levels of safety (Brownson et al., 2000), and the results suggest that safety was not a barrier to trail use, 87% of trail users felt 'very safe' when using the trails. The other study reported data on enablers and barriers to trail use ranked or rated in order of importance (Gordon et al., 2004). The results showed that safety (defined as free from personal injury) was ranked third (after convenience and terrain [trail surface]) amongst

'new exercisers' as an enabling factor for using the trail. However, mean scores on concerns about the trail showed that 'new exercisers' identified 'unsafe conditions' as a higher concern compared with 'habitually active exercisers.'

Perceptions of safety can present both a potential barrier to use of trails as well as a potential enabler if the trail is perceived as offering a safe environment. Gordon et al., (2004) and Brownson et al., (2000) both provide favourable results on perception of safety of trails among trail users and provide some evidence that trails can be built addressing the issue of perceived safety.

**Overall, there is some evidence from two (3+) studies that trails can be perceived as safe places to use for physical activity, specifically walking.**

#### ***5.4. Implementability of Intervention***

Both of these studies would be feasible to implement in UK with appropriate financial and political support. Some adaptations may be necessary to reflect local preferences and concerns, for examples about the design or type of trail surface. Consideration may be needed to levels of political and public support.

#### **Trails summary evidence statement:**

**The evidence from two (3+) quality studies tends to suggest that trails can lead to self-reported increases in physical activity in the short term (Gordon et al., 2004) and long term (Brownson et al., 2000).**

**Overall, based on two (3+) studies, the evidence tends to suggest that trail surface, length and maintenance influence trail use (Brownson et al., 2000) and attitudes towards trails (Gordon et al, 2004).**

**On the basis of two (3+) quality post only studies there is insufficient evidence to assess any differential effect of the interventions by socio-demographic or cultural factors.**

**Overall, there is some evidence from two (3+) studies that trails can be perceived as safe places to use for physical activity, specifically walking.**

## **6. Urban Parks: Summary of Findings**

Parks are considered an element of the urban environment when they are located within an urban area and when they have been in some way man-made. Urban parks are typically found in or near residential areas and are used for leisure activities and recreational play, including walking, cycling, playing and picnicking.

One (2+) quality study based in Australia, provides evidence for the effectiveness of an urban park in increasing physical activity. This was a controlled before and after study. The NSW Health Department (2002) assessed the impact of park modifications including erecting project signs, repairs, a new playground, pruning, new bins and some painting to three urban parks in Sydney, Australia, on physical activity levels, and park use. Outcomes were assessed by observation, a survey and infrared counters.

### ***Evidence of efficacy***

One (2+) study met the inclusion criteria that detailed an intervention to improve parks. This study (NSW Health Department, 2002) found that in the short-term 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. The awareness of information about walking and cued recall of the project slogan increased significantly at follow-up in both intervention and control ward respondents. However, at follow-up the intervention ward respondents were more aware of all project activities than the control wards ( $p = 0.003$ ). Additional data were reported from observational measures of park use and from an objective (infra-red) measure of park use. 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 direction of these results was probably a consequence of intervention contamination (that is changes were undertaken in control parks within the study period).

Based on one (2+) quality controlled before and after study there is insufficient evidence to draw any conclusions on the effect of interventions within urban parks on physical activity. It is therefore not possible to identify any features potentially related to effectiveness in terms of the intervention content, delivery, setting or intensity, nor can any statements be made about any potential differential impact for specific socio-demographic groups or cultural factors. No conclusions can be made regarding the applicability or implementability of this type of intervention.

**Urban parks – community level summary evidence statement:**

**Overall, based on one (2+) quality controlled before and after study the evidence suggests that modification and promotion of parks may increase walking and can raise the awareness of parks.**

## **7. Building Placement: Summary of Findings**

This section concerns intervention studies examining the specific location of building placement including the spatial placement of specific public use buildings or business, retail and residential areas. It may include studies looking at the impact of different land use patterns. These studies are often undertaken with no measures of physical activity outcomes or with measures of associated travel behaviours, for example trip frequency, activity duration and modal choice.

One (3-) quality study based in the Czech Republic reported post-intervention data only, and provides evidence for the effect of building placement on physical activity. Newmark (2004) used a survey to assess the effect of 4 new fringe

shopping malls in Prague, Czech Republic, and reported outcomes as measures of shopping related travel behaviour.

### ***Evidence of efficacy***

Newmark, (2004) reported that over the long term an increase in the number of fringe shopping malls led to fewer shopping trips being made; a drop from 47% to 20% who make more than 4 trips per month, and there was a tendency to shift travel mode from pedestrian to vehicle; pedestrian mode split declined from 33% to 4%.

Based on one (3-) quality post only study there is insufficient evidence to draw any conclusions on the effect of interventions aimed at assessing building placement. It is therefore not possible to identify any features potentially related to effectiveness in terms of the intervention content, delivery, setting or intensity, nor can any statements be made about any potential differential impact for specific socio-demographic groups or cultural factors. No conclusions can be made regarding the applicability or implementability of this type of intervention.

### **Building placement – community level summary evidence statement:**

**The evidence from one (3-) quality post only study suggests that building shopping malls at the fringes of cities may lead to a reduction in the number of shopping trips made per month and a tendency for increased use of motorised vehicles and decreased pedestrian travel as the mode to access the shopping mall.**

## **8. Foreshore: Summary of Findings**

### ***The studies***

Foreshore interventions would include any intervention taking place on or near to the shoreline. This includes improvements to harbours, building or improvements to a promenade, constructing a boardwalk or improving a fishing wharf.

On (3-) quality study based in Canada reported post-intervention data only, and provides evidence for the effectiveness of building a boardwalk along a seashore and harbour in increasing physical activity.

Mangham and Weld Viscount (1997) evaluated physical activity patterns and use of a new board walk in Nova Scotia, Canada. On-site surveys were used to collect data on use and activity patterns from people who were previously active and people who were less active users.

### ***Evidence of efficacy***

Only one study met the inclusion criteria that detailed an intervention within a foreshore area. Mangham and Weld Viscount (1997) reported that over three quarters of users reported using a 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 starting to use the boardwalk. There is insufficient evidence available to draw any conclusions on the content of the intervention, its delivery, the setting, intensity or any socio-demographic or cultural factors.

Based on one (3-) quality post-intervention study there is insufficient evidence to draw any conclusions on the effect of interventions involving modification to foreshores. It is therefore not possible to identify any features potentially related to effectiveness in terms of the intervention content, delivery, setting or intensity, nor can any statements be made about any potential differential impact for specific socio-demographic groups or cultural factors. No conclusions can be made regarding the applicability or implementability of this type of intervention.

### **Foreshore summary evidence statement:**

**Overall, the evidence from one (3-) quality post only study suggests that building a boardwalk along a foreshore may increase levels of self-reported physical activity, particularly in people previously active.**

## Evidence Tables

Category	Author and Date	Study design and research type/ quality	Research question	Study population, setting, country, sample size	Description of intervention	Length of follow-up	Physical activity outcome variables (inc measures)	Short term findings (<1 year)	Long term findings (>1 year)	Non-physical activity outcomes	Confounders/ potential sources of bias	Applicability to the UK
Urban Structure - Street Level	Painter (1996)	Before and after study (2-)	Research was designed to evaluate the impact of street lighting improvements on crime and fear of crime.	Community members using the streets, London, UK. n= not appropriate.	The street lighting was upgraded in three urban streets and a pedestrian footpath considered by a multi-agency team to be crime and fear prone.	6 weeks	Pedestrian street use after dark.  Observation.	In all areas observed the number of men and women pedestrians increased after lighting improvements. <i>Edmonton</i> Pedestrian footpath; <ul style="list-style-type: none"> <li>• Male +50%</li> <li>• Female +64%</li> </ul> Road; <ul style="list-style-type: none"> <li>• Male +44%</li> <li>• Female +45%</li> </ul> <i>Town hamlets</i> <ul style="list-style-type: none"> <li>• Male +34%</li> <li>• Female +48%</li> </ul> <i>Hammersmith and Fulham</i> <ul style="list-style-type: none"> <li>• Male +101%</li> <li>• Female +71%</li> </ul>	None reported	Reduced fear of crime at night; 90% of pedestrians interviewed in all locations thought fear of crime in the surrounding area had decreased. In one street 62% felt safer using the street and in the other 69% felt safer. Elderly peoples concerns and fears about crime were greatly reduced; after 12 months fears about crime had dropped from 6 out of 10 reporting that they worried a lot, to 2 out of 10.	Possible measurement bias.	Yes
	Skjovoeland (2001)	Controlled before and after (2-)	Investigated the influences of residential street layout on presence in parks and measures relating to 'neighbouring'	Community members using street parks, Bergen, Norway. pretest n=23 post test n=33	The intervention samples each ranged from 50-80m and involved the conversion of several streets into street parks where driving and parking were prohibited and buildings were demolished or improved to increased openness, improved naturalness and aesthetics, trees were planted upkeep was raised, and street furniture was introduced.	3 years	Presence of people in the street parks.  Observation.	None reported	Increase in the presence of children in one of the intervention streets and decrease or no change in control street parks (p<0.05). Presence of adults showed decrease in both intervention and control streets (p<0.01).	'Supportive acts of 'neighbouring' and 'neighbour annoyance' both increased in the intervention streets.	Possible selection bias. Poorly reported methods.	Yes

Physical Activity Collaborating Centre. Urban review.

Layfield et al., (2003)	Before and after study (2-)	To assess the effectiveness of pilot home zone schemes.	Community members, Methleys, Leeds, UK. Adults; Before n=97 After n=99 Children; Before n=8 After n=17 (+4 adults who had previously been interviewed as children)	The aim of home zones is to change the way that streets are used in order to improve the quality of life in residential streets. This included a shared surface made up of 4 main elements; buff paved areas, plant beds, coloured concrete block work and sections of tarmacadam, and traffic calming measures, such as road narrowing, chicanes and 20 mph zones.	2 months	Cycling and walking levels, activities in the street.  Survey.	Walking; 94% of adults felt there had been no change in number of walking trips. 73% felt walking was more pleasant. Most of the children felt the school journey was neither better nor worse. Cycling; In adults cycle use was very low in both the before and after surveys. Of the eleven children who owned bicycles, three (27%) said they rode them more often than they did before the home zone was implemented. Activities in the street; Fewer adults reported undertaking activities such as gardening or chatting with neighbours. Use of roller skates and skateboards increased from 11% to 19%. The prevalence of other outdoor activities was unchanged.	None reported	Children reported being able to spend time outdoors more safely.  Almost all respondents interviewed thought the home zone had made the appearance of the streets 'more attractive'  Objective measures suggested that the noise levels had reduced, although about two thirds of the people surveyed thought that traffic noise and traffic pollution in the street hadn't changed.  Most people thought the 'friendliness of the street' had not changed since the home zone was introduced.	Possible selection bias. Possible recall bias. Possible measurement bias. Confounders not reported.	Yes
Space Syntax (2002)	Before and after study (2-)	To analyse the impact of the Millennium Bridge on pedestrian flows levels on two adjacent bridges and surrounding areas.	Community members using 3 bridges before and after the opening of the Millennium Bridge, London, UK. n=not stated	The opening of the Millennium Bridge and building of another new pedestrian bridge, one further pedestrian bridge already existed.	2 months	Levels of pedestrian flows.  Observation.	The Millennium Bridge generated increased pedestrian movement in the area: Local residents; <ul style="list-style-type: none"> <li>• 30% increase in movement flows was observed throughout the day</li> <li>• 32% increase at lunchtime</li> </ul> All people (residents and tourists); <ul style="list-style-type: none"> <li>• 43% increase in movement flows was observed throughout the day</li> <li>• 60% increase at lunchtime for all people</li> </ul>	None reported	None reported	Possible measurement bias. Confounders not reported.	Yes

Physical Activity Collaborating Centre. Urban review.

Space Syntax (2004a)	Before and after study (2-)	To examine space use patterns in Trafalgar Square following the re-design of the public space.	Community members and tourists using Trafalgar Square, London, UK. n=not stated	The public space within Trafalgar Square was redesigned, this included pedestrianisation, building a staircase and the introduction of pedestrian islands.	8 months	Levels of pedestrian flows. Observation.	Compared to 2001 a 3.5 and 3-fold increase in movement levels was observed in 2003 and 2004 respectively. An amalgamation of the 2003 and 2004 data shows that there was a 5-fold increase in the numbers of non-tourists crossing Trafalgar Square over and above 2001 levels. The number of local users spending time in the Square was 9 times higher in 2003 (summer tourists peak season) and 5 times higher in 2004 when compared to 2001 levels.	None reported	The square was a safer place defined as; Higher levels of 'pedestrian green-phase crossing' and lower levels of crossing away from designated areas	Possible measurement bias. Confounders not reported.	Yes
Space Syntax (2004b)	Before and after study (2-)	To investigate whether the re-design of Paternoster Square has increased movement flows across the public space.	Community members using Paternoster Square before and after the its re-development, London, UK. n=not stated	Since the early 1990's work has taken place within Paternoster Square to re-design the building layout and connectivity.	6 months	Levels of pedestrian flows. Observation.	<ul style="list-style-type: none"> <li>A decrease of 7% in movement flows was observed during the mid morning period (10 to 12 pm).</li> <li>A decrease of 60% in movement flows was observed during the lunch time period (12 to 2 pm).</li> </ul>	None reported	None reported	Possible measurement bias. Confounders not reported.	Yes
Newby and Sloman (1996)	Intervention with post data only (3-)	To provide a review of the <i>Feet First</i> project	Community members, various project locations in cities across the UK. n=not stated.	<i>Feet First</i> authorities have developed practical schemes to improve the pedestrian environment and promote walking and cycling. This included traffic calming measures, and changes to the aesthetic environment. Leicester - around 10km of roads in the area were traffic calmed and environmental improvements. Children were involved in redesigning the streets to be 'safer and more fun to	Various. Projects began early 1990's.	Number of children playing in the street, number of children walking to school, People walking in the area, trips made by car.  Survey.	None reported	Various; Leicester; the numbers of children allowed to play in the street and to walk to school have both increased by about 20% 59% said there were more people walking in the area and 36% of drivers said they made fewer car trips. Sheffield; 55% of people thought there were more children playing in the street and around 1/3 <sup>rd</sup> thought there were more people walking.	Increased perceived level of safety and reduced traffic accidents	Methods not reported. Possible selection bias. Possible recall bias. Possible measurement bias. Confounders not reported.	Yes

Physical Activity Collaborating Centre. Urban review.

					play in'. Sheffield – included pedestrian crossings, road narrowing, paved gateways and 20mph zones.							
<b>Urban Structure – Community Level</b>	Handy et al., (2006)	Quasi-experimental (2+)	To examine the association between changes in the built environment and changes in walking and cycling.	Neighbourhood community members, Northern California, USA. n=1672 across 8 neighbourhoods	In eight neighbourhoods 1000 residents were targeted; 500 who had recently moved and 500 who had not. Intervention was defined as residents who move from one neighbourhood to another.	Within 1 year	Change in walking and change in biking.  Telephone survey.	Estimated relationship between change in built environment and change in walking using ordered probit model. Significant variables (p<0.05) were; Change in walking; <ul style="list-style-type: none"> <li>• Attractiveness (+ve)</li> <li>• Number of banks within 800m (+ve)</li> <li>• Number of types of businesses within 1600m (+ve)</li> <li>• Spaciousness (-ve)</li> </ul> Change in biking; <ul style="list-style-type: none"> <li>• +ve attitude towards biking and walking is most important in explaining changes in biking, but that changes in the built environment also contribute</li> </ul>	None reported	None reported	Possible selection bias. Possible recall bias.	Yes
<b>Multi-use trails</b>	Gordon (2004)	Intervention with post data only (3+)	To evaluate physical activity patterns and trail use among new and habitually active exercisers who accessed two new rail-trails.	Adult users of trails, Monongalia County, West Virginia, USA. n=414	The Caperton and Decker's Creek trails comprise 12 miles of paved trails that bisect the town and run adjacent to the Monongahela River and Decker's Creek. The trails intersect neighbourhoods and business establishments within city limits, and also extend outside the city limits with 14 miles of unpaved trails.	6 months	Whether the addition of the trail to the community caused any trail users to adopt new physical activity programmes.  Onsite interview.	22.5% of trail users were classified as new exercisers, the other 77.5% were classified as habitually active. 31% of new exercisers reported that the use of the trail was their only form of physical activity. 98% of the new exercisers reported that their exercise amounts had increased. 52% of the habitually active exercisers reported that their exercise amounts had increased.	None reported	Safety was ranked third as an enabling factor for using the trail. New exercisers identified unsafe conditions as a higher concern about using the trail when compared to habitually active exercisers.	Possible selection bias. Possible recall bias. Possible measurement bias.	Yes

Physical Activity Collaborating Centre. Urban review.

	Brownson (2000)	Intervention with post data only (3+)	To determine the extent of walking trail use and possible effects on rates of physical activity.	Community members of 12 rural counties in Missouri, USA. n=1269.	Construction of new walking trails and enhancement of existing trails.	Trail existence varied from 6 months to 5 years.	Whether exercise behaviour had changed due to walking trail use.  Telephone interview.	None reported	Among persons who used the trails 55.2% reported that they had increased their amount of walking since they began using the trail.	87% of trail users felt 'very safe' when using the trail	Possible selection bias. Possible recall bias. Possible measurement bias.	Yes
<b>Urban Parks</b>	NSW Health Department (2002)	Controlled before and after (2+)	To assess the impact of park modifications	Community members in an urban city, Australia. Telephone survey; intervention ward n= 420, control ward n= 420.	Environmental modifications to three parks which included erecting project signs, repairs a new playground, pruning, new bins and some painting.	≤10 months	Participation in PA, change in PA, use of park and walking behaviours.  Survey. Infrared counters, observation.	Inadequately active respondents in the intervention ward were more likely to have walked for reasons other than exercise or recreation in the previous 2 weeks. No change in adequately active respondents. No change in self reported park use. No change in observed number of park users or mean number of walkers in any of the parks. Infra red counters indicated that in all study parks park use increased between baseline and follow-up.	None reported	Survey respondents from the intervention ward were significantly more likely to report awareness of the project slogan, the walking promotion, the promotion of walking groups and to have seen or heard information about local parks than the control ward.	Possible selection bias. Respondents to the telephone survey were not representative of residents in their ward.	Yes
<b>Building Placement</b>	Newmark (2004)	Intervention with post data only (3-)	To examine shopping travel behaviour following the building of fringe shopping malls	Community members using shopping malls, across a city, Prague, Czech Republic. n=1649.	Building of 4 new fringe shopping malls all locate near or at the intersection of a radial highway around the city.	4 years	Shopping trip frequency. Survey.  Travel mode. Survey.	None reported	Fewer shopping trips made; a drop from 47% to 20% who make >4 trips per month. A tendency to shift travel mode from pedestrian to vehicle; pedestrian mode split declined from 33% to 4%.	None reported	Possible selection bias. Confounders not reported.	Yes
<b>Foreshore</b>	Mangham and Weld Viscount (1997)	Intervention with post data only (3-)	To determine whether a new boardwalk i) provided an alternate setting for people already walking, ii) lead to increases in walking, iii) stimulated less active people to take up walking.	Community members, Nova Scotia, Canada. n=151.	A raised wooden boardwalk, slightly over 1 km in length was erected along the seashore and harbour approaches to the local beach and fishing wharf.	2 years	Self report use of boardwalk and walking patterns.  Intercept survey and observation.	None reported	Over three quarters reported using the board walk more than once weekly. A large majority of persons among both previously active (71%) and less active groups (29%) reported that they now exercised more than before starting to use the boardwalk.	None reported	Possible selection bias. Poorly reported methods.	Yes, with adaption



## **Appendix A – Example search strategy**

### **OVID Medline**

#### **Urban planning terms**

1. town\$.tw.
2. urban.tw.
3. built.tw.
4. (city or cities).tw.
5. regional.tw.
6. communit\$.tw.
7. (neighbourhood\$ or neighborhood\$).tw.
8. Cities/
9. Urban Health/
10. Residence Characteristics/
11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. landscap\$.tw.
13. renewal.tw.
14. regeneration.tw.
15. (pedestrianis\$ or pedestrianiz\$).tw.
16. structur\$.tw.
17. layout\$.tw.
18. facilit\$.tw.
19. feature\$.tw.
20. surrounding\$.tw.
21. amenit\$.tw.
22. location\$.tw.
23. planning.tw.
24. space\$1.tw.
25. environment\$.tw.
26. development\$.tw.
27. design\$.tw.

28. sprawl.tw.
29. land us\$.tw.
30. (aesthetic\$ or esthetic\$).tw.
31. (pavement\$ or sidewalk\$).tw.
32. sign\$.tw.
33. path\$.tw.
34. trail\$.tw.
35. 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
36. 11 and 35
37. exp Social Planning/
38. 36 or 37

### **Physical activity terms**

1. (physical adj5 (fit\$4 or train\$3 or activ\$3 or endur\$4)).tw.
2. (exercis\$3 adj5 (fit\$4 or train\$3 or activ\$3 or endur\$4)).tw.
3. (leisure adj5 (centre\$1 or center\$1 or facilit\$)).tw.
4. (fitness adj5 (centre\$1 or center\$1 or facilit\$)).tw.
5. ((promot\$ or uptak\$ or encourag\$ or increas\$ or start\$ or adher\$) adj5 gym\$).tw.
6. ((promot\$ or uptak\$ or encourag\$ or increas\$ or start\$ or adher\$) adj5 physical activit\$).tw.
7. ((promot\$ or uptak\$ or encourag\$ or increas\$ or start\$ or adher\$) adj5 (circuits or aqua\$)).tw.
8. ((promot\$ or uptak\$ or encourag\$ or increas\$ or start\$ or adher\$) adj5 exercis\$).tw.
9. ((promot\$ or uptak\$ or encourag\$ or increas\$ or start\$ or adher\$) adj5 (keep fit or fitness class\$ or yoga)).tw.
10. ((decreas\$ or reduc\$ or discourag\$) adj5 (sedentary or deskbound)).tw.
11. sport\$3.tw.
12. walk\$3.tw.
13. running.tw.

14. jogging.tw.
15. bicycl\$3.tw.
16. (bike\$1 or biking).tw.
17. (exercis\$3 adj5 aerobic\$1).tw.
18. rollerblading.tw.
19. rollerskating.tw.
20. skating.tw.
21. exertion\$1.tw.
22. recreation\$1.tw.
23. stair\$.tw.
24. exp Exertion/
25. Physical Fitness/
26. exp "Physical Education and Training"/
27. exp Dancing/
28. exp Sports/
29. exp Yoga/
30. pilates.tw.
31. Exercise Therapy/
32. exp Fitness Centers/
33. Recreation/
34. "Play and Playthings"/
35. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34

Combine 38 (urban) AND 35 (physical activity)

## **Appendix B – Included studies**

Brownson RC, Housemann RA, Brown DR, Jackson-Thompson J, King AC, Malone BR, Sallis JF. (2000) Promoting physical activity in rural communities: Walking trail access, use, and effects. *Am J Prev Med* 18(3):235-241.

Gordon PM, Zizzi SJ, Pauline J. (2004) Use of a community trail among new and habitual exercisers: a preliminary assessment. *Preventing Chronic Disease* 1(4):A11.

Handy S, Cao XY, Mokhtarian PL. (2006) Self-selection in the relationship between the built environment and walking - Empirical evidence from northern California. *J Am Planning Ass.* 72(1):55-74.

Layfield R, Chinn L, Nicholls D. (2003) Pilot home zone schemes: evaluation of The Methleys, Leeds. Transport Research Laboratory, UK.

Mangham C, Viscount PW. (1997) Along the boardwalk: effects of a boardwalk on walking behaviour within a Nova Scotia community. *Can J Pub Health*, 88(5): 325-326.

New South Wales (NSW) Health Department. (2002) Walk it: active local parks: the effect of park modifications and promotion on physical activity participation: summary report. North Sydney; Australia: NSW Health Department.

Newby L, Sloman L. (1996) Small steps, giant leaps. A review of the Feet First project and the practice and potential of promoting walking. *Environ*, Leicester (GB); Transport 2000 Trust, London (GB).

Newmark GL, Plaut PO, Garb Y. (2004) Shopping travel behaviors in an era of rapid economic transition - Evidence from newly built malls in Prague, Czech Republic. *Transportation Research Record: Journal of the Transportation Research Board*, (1898):165-174.

Painter K. (1996) The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape and Urban Planning*, 35: 193-201.

Skjoeveland O. (2001) Effects of street parks on social interactions among neighbors: a place perspective. *Journal of Architectural and Planning Research*, 8(2):131-47.

Space Syntax Ltd. (2002) Millennium Bridge and Environs: Pedestrian impact assessment study. Space Syntax Ltd, London: UK.

Space Syntax Ltd. (2004a) Trafalgar Square: Comparative study of space use patterns following the re-design of the public space. Space Syntax Ltd, London: UK.

Space Syntax Ltd. (2004b) Paternoster Square: Comparative study of pedestrian flows following the re-design of the public space. Space Syntax Ltd, London: UK.

## Appendix C – Excluded Studies

Study reference	Reason for exclusion
Am. J. Public Health. (2003) Built environment and health. Am. J. Public Health, 83:1369-1608.	No intervention studies
Dooley EE. (2005) More muscle needed for built environment research. Environmental Health Perspectives. 113(8): A517.	Not an intervention study
National Recreation and Parks Association (NRPA). (2002) Celebrating recreation and parks month: highlighting just a few ways that NRPA members leave it better than they found it. Parks & Recreation, 37(7):38-42.	Not an intervention study
Aitchison J, Lloyd Jones P. (1994) A sporting chance for the countryside. Sport and recreation in the Welsh countryside; case studies of good practice. Sports Council for Wales, Cardiff: GB; Countryside Council for Wales, Bangor: GB.	Not an intervention study
Andrade LO, Baretta IC, Gomes CF, Canuto OM. 2005 Public health policies as guides for local public policies: the experience of Sobral-Ceara, Brazil. Promotion et Education S3:28-31.	Not an intervention study
Andrulis DP. (2000) Community, service, and policy strategies to improve health care access in the changing urban environment. Am. J. Pub. Health, 90(6): 858-862.	Not an intervention study - commentary
Atash F. (1994) Redesigning suburbia for walking and transit - emerging concepts. Journal of Urban Planning and Development, 120(1):48-57.	Not an intervention study - descriptive commentary and overview
Babey SH, Brown ER, Hastert TA. (2005) Access to safe parks helps increase physical activity among teenagers. UCLA Center for Health Policy Research.	Policy brief

Badland H, Schofield G. (2005) Transport, urban design, and physical activity: an evidence-based update. <i>Transportation Research Part D-Transport and Environment</i> , 10(3):177-196.	Review - included no urban environmental change/ intervention
Baggot I, Spray A. (1999) Park of the family. The value of parks to the local community goes far wider than the mere provision of space. <i>Leisure manager</i> , 17(3):20-21.	Not an intervention study - Opinion
Baker EA, Brennan LK, Brownson R, Houseman RA. (2000) Measuring the determinants of physical activity in the community: current and future directions. <i>Research Quarterly for Exercise and Sport</i> , 71(2S):146-158.	Not an intervention study - descriptive
Baker S. (2001) Best value review. Parks and open spaces and foreshore: part 1; overview. North Norfolk District Council, Cromer: GB. Parks, Open Space and Foreshore Service.	Not an intervention study - report on improving public services
Banister C. (1993) The greening of urban transport - planning for walking and cycling in western cities. <i>Transport Reviews</i> , 13(4): 375-376.	Not an intervention study - book review
Banister D. (1999) Some thoughts on a walk in the woods. <i>Built Environment</i> , 25(2):162-167.	Not an intervention
Bauman A. (2005) The physical environment and physical activity: moving from ecological associations to intervention evidence. <i>Journal of Epidemiology &amp; Community Health</i> , 59(7):535-536.	Not an intervention study - Editorial
Benson E. (2002) Rivers as urban landscapes: renaissance of the waterfront. <i>Water Science &amp; Technology</i> , 45(11):65-70.	Case study
Alexi Marmot Associates. (2003) Better places for sport. A client guide to achieving design quality. Sport England, GB; Great Britain. Commission for Architecture and The Built Environment, GB; Alexi Marmot Associates, GB.	Not an intervention study - practical guidance document
Boarnet MG, Anderson CL, Day K, McMillan T, Alfonzo M. (2005) Evaluation of the California Safe Routes to School legislation: urban form changes and children's active transportation to school. <i>Am. J. Prev. Med.</i> , 28(2S2):134-140.	Transport focussed intervention

Boarnet MG, Day K, Anderson C, McMillan T, Alfonzo M. (2005) California's safe routes to school program: impacts on walking, bicycling, and pedestrian safety. <i>Journal of the American Planning Association</i> , 71(3):301-317.	Transport focussed
Breslow L, Tai Seale T. (1996) An experience with health promotion in the inner city. <i>Am J Health Promotion</i> , 5(10): 185-188.	Not an urban intervention
Briggs-Marsh J, Warren J. (2000) A park for all the people. <i>Public Health Reports</i> , 115(2-3):253-256.	Not an intervention study
Brown C, Grant M. (2005) Biodiversity and human health: what role for nature in healthy urban planning? <i>Built Environment</i> , 31(4):326-38.	Not an intervention study - commentary, description, reviews literature
Brown WJ, Eakin E, Mummery K, Trost SG. (2003) 10,000 steps Rockhampton: establishing a multi-strategy physical activity promotion project in a community. <i>Health Prom. J. of Australia</i> , 14(2):95-100.	Not an intervention study
Buchner D, Miles R. (2002) Seeking a contemporary understanding of factors that influence physical activity. <i>Am. J. Prev. Med.</i> , 23(2S1): 3-4.	Not an intervention study - commentary
Carnall D. (2000) Cycling and health promotion. A safer, slower urban road environment is the key. <i>Brit. Med. J.</i> , 320(7239):888.	Not an intervention study - Editorial
Central Research Unit. (1999) Research on walking. Scottish Office, Edinburgh: GB.	Not an intervention study - survey and monitoring
Clancy T. (1993) Rethinking our park spaces. <i>Recreation Canada</i> , 51(5):18-19.	Not an intervention study
Coday M, Klesges LM, Garrison RJ, Johnson KC, O'Toole M, Morris GS. (2002) Health Opportunities with Physical Exercise (HOPE): social contextual interventions to reduce sedentary behavior in urban settings. <i>Health Ed. Res.</i> , 17(5):637-647.	No urban environmental change/intervention
Coe B. (2003) A successful city is a walkable city. <i>Planning in London</i> , (44):47-49.	Not an intervention study
Cohen CA. (1996) Building a model park. <i>Parks &amp; Recreation</i> , 31(7):62-66.	Not an intervention study
Committee on Physical Activity, Health Transportation, and Land Use. (2005) Does the built environment influence physical activity? Examining the evidence.	Not an intervention study - Descriptive review and recommendations

Connolly P. (2002) Liveable London: the need for a walkable neighbourhood. Living streets: UK.	Not an intervention study
Cooper JM. (1993) A small price to pay for parks. An assessment district was formed and the monies generated were used to maintain the district. Parks & Recreation, 28(12):30-32.	Not an intervention study
Cooper JM. (2006) Accreditation excellence: Gainesville parks and recreation. Parks & Recreation, 41(2):72.	Included no urban environmental change/intervention
Cote A, Coffey S. (2001) The best cycling cities: meet 10 urban places that do cycling right - population, sprawl and congestion be damned! Bicycling. Emmaus, Pa, 42(11):32-39.	Not an intervention study – magazine article
Cycling and health. (2003) National Cycling Strategy Board, England: GB.	Not an intervention study - leaflet
Deary A. (2004) Impacts of our built environment on public health. Environmental Health Perspectives, 112(11): A600-A601.	Not an intervention study - Editorial
Department for Transport, Local Government and the Regions (DTLR). (2002) Improving urban parks, play areas and open spaces. Urban research summary. DTLR, London: GB.	Not an intervention study - report on research with design recommendation
Department of the Environment, Transport and the Regions (DETR). (1998) The Town and Country Planning (Playing Fields), DETR, London: GB.	Not an intervention study
Designing Communities for Active Living. (2004) The Journal of Physical Education, Recreation & Dance, 75(2):8.	Not an intervention study
Dunn AL. (1996) Getting started - a review of physical activity adoption studies. British Journal of Sports Medicine, 30(3):193-199.	Not an intervention study
Egan M, Petticrew M, Ogilvie D, Hamilton V. (2003) New roads and human health: a systematic review. American Journal of Public Health American Public Health Association, Washington, (9): 1471.	Review (non specific)
Evenson KR, Herring AH, Huston SL. (2005) Evaluating change in physical activity with the building of a multi-use trail. Am. J. Prev. Med., 28(2S2):177-185.	Transport focussed intervention

Ewing-Garber C, Lazar IG, Lapane KL, Hall JP, Rose S, Greene KM, Marcus B, Carleton RA. (2001) Slit Path to Health Walking Routes in Rhode Island: Evaluation of a Community-Based Physical Activity. Environmental Change Program: Preliminary Work. Australia: walking the 21 <sup>st</sup> Century, Perth: Australia.	No outcome data reported
Falt E. (2006) Sport and the environment. Environmental Health Perspectives, 114(5): A268-A269.	Not an intervention study - Editorial
Felton G, Saunders RP, Ward DS, Dishman RK, Dowda M, Pate RR. (2005). Promoting physical activity in girls: a case study of one school's success. J. of School Health, 75(2):57-62.	No urban environmental change/ intervention
Foley J, Pirk H. (1991) Taking back the parks. Part 2. Parks & Recreation, 26(4):22.	Not an intervention study
Foster C, Hillsdon M. (2004) Changing the environment to promote health-enhancing physical activity. J. of Sports Sci., 22(8):755-769.	Review (non specific) - 3/17 studies may be relevant
Frank LD, Engelke PO. (2001) How land use and transportation systems impact public health: A literature review of the relationship between physical activity and built form. Atlanta, GA: Centres for Disease Control and Prevention.	Not an intervention study
Frank LD. (2004) Public health and the built environment: emerging evidence and complexity. Canadian Journal of Dietetic Practice & Research, 65(2): 4.	Not an intervention study
Freudenberg N. (1998) Urban health promotion: Current practices and new directions. Health Ed & Behaviour, 25(2):138-145.	Not an intervention study
Frumkin H. (2002) Urban sprawl and public health. Public Health Reports, 117(3): 201-217.	Not an intervention study - commentary
Garcia-Ramon MD. (2004) Urban planning, gender and the use of urban space in a peripheral neighbourhood of Barcelona. Cities, 21(3): 215-223.	Not an intervention study
Givoni B. (1991) Impact of planted areas on urban environmental quality: A review. Atmospheric Environment Part B-Urban Atmosphere, 25(3): 289-299.	No PA related outcome data reported
Gobster PH, Westphal LM. (2004) The human dimensions of urban greenways: planning for recreation and related experiences. Landscape & Urban Planning, 68(2-3):147-165.	Not an intervention study

Gobster PH. (1995) Perception and use of A Metropolitan greenway system for recreation. <i>Landscape &amp; Urban Planning</i> , 33(1-3):401-413.	Not an intervention study - intercept study on use data
Peel GR, Booth M. (2001) Impact evaluation of the Royal Australian Air Force Health Promotion Program. <i>Aviation Space &amp; Env. Med.</i> , 72:44-51.	Included no urban environmental change/intervention
Gratton C. (2005) Sport and economic regeneration in cities. <i>Urban Studies</i> , 985-999.	Not an urban intervention - assessing the evidence of the success of using sport for economic regeneration
Gray S, Pedler A, Gardner G. (1998) Assessment of cycle challenge initiatives - cycling to school. Research Report. Transport Research Laboratory, Crowthorne: GB.	Not an urban environment intervention
Low N, Gleeson B, Green R, Radovic D. (2005) <i>The green city: sustainable home, sustainable suburbs</i> . University Press Books, Berkeley: US.	Not an intervention study - book
Greenhalgh L, Worpole K, Grove White R. (1996) <i>People, parks and cities. A guide to current good practice in urban parks</i> . Department of the Environment, London: GB.	Not an intervention study
Hahn A, Craythorn E. (1994) Inactivity and the physical environment in two regional centres. <i>Health Prom. J. Australia</i> , 4(2):43-45.	Not an intervention study
Handy S. (1998) <i>The greening of urban transport: Planning for walking and cycling in western cities</i> , 2nd edition. Transportation Research Part A-Policy and Practice, 32(8):638-640.	Not an intervention study - book review
Handy S.(2004) Health and community design: The impact of the built environment on physical activity. <i>J. Am. Planning Association</i> , 70(3): 375-376.	Not an intervention study - book review
Haney DC. (2003) Lessons learned in a rails-to-trails conversion. <i>Planning-Advisory-Service-Memo (JAN)</i> :1-6.	Not an intervention study - memorandum
Harnik P, Simms J. (2004) Parks: how far is too far? <i>Planning</i> , 70(12):8-11.	Not an intervention study
Harnik P. (2003) The excellent city park system: what makes it great and how to get there. <i>Parks &amp; Recreation</i> , 38(4):64-66.	Not an intervention study
Healy M. (2005) Places to park and stride: neighborhoods are being designed to get people out of their cars and on their feet. <i>Los Angeles Times</i> . Mar 14; Health:F1.	Not an intervention study - Newspaper article

Heath GW, Brownson RC, Kruger J, Miles K, Powell KE, Ramsey LT, and the Task Force on Community Preventive Services. (2006) The effectiveness of urban design and land use and transport policies and practices to increase physical activity: A systematic review. <i>Journal of Physical Activity &amp; Health</i> , 3:S55-S76.	Review (non specific) – 2 additional references identified and followed up
Hebbert M. (1993) The City of London walkway experiment. <i>J. Am. Planning Association</i> , 59(4):433-450.	Not an intervention study - retrospective description
Hesseln H, Loomis JB, Gonzalez-Caban A, Alexander S. (2003) Wildfire effects on hiking and biking demand in New Mexico: A travel cost study. <i>J. Env. Management</i> , 69(4):359-368.	No urban environmental change/ intervention
Hillsdon M, Thorogood M, Anstiss T, Morris J. (1995) Randomised controlled trials of physical activity promotion in free living populations: a review. <i>J Epidemiology &amp; Community Health</i> , 49:448-453.	Included no urban environmental change/ intervention
Hodgkinson M, Whitehouse J, Grubb E. (2002) Urban street activity in 20mph zones. <i>Traffic Engineering &amp; Control</i> , 43(1):12-15.	Not an urban intervention
Jackson RJ. (2003) The impact of the built environment on health: an emerging field. <i>Am. J. Public Health</i> , 93(9):1382-1384.	Not an intervention study - opinion/ descriptive overview
Keenan TA. (2004) Physical activity and constraints in the built environment. <i>Journal of Aging &amp; Physical Activity</i> . 12(3):305.	Not an intervention study
Killingsworth RE, Schmid TL. (2001) Community design and transportation policies: New ways to promote physical activity. <i>Physician &amp; Sportsmedicine</i> , 29(2):31-34.	Not an intervention study - description/ opinion piece
Korfhage J. (2003) Creating community through people, parks and programs. <i>Parks &amp; Recreation</i> , 38(7):2.	Not an intervention study
Larkin M. (2003) Can cities be designed to fight obesity? Urban planners and health experts work to get people up and about. <i>Lancet</i> , 362(9389):1046-1047.	Not an intervention study - feature piece/commentary
Leslie E, Fotheringham M, Veitch J, Owen N. (2000) A university campus physical activity promotion program. <i>Health Prom. J. Australia</i> , 10(1):51-54.	No urban environmental change/ intervention
Linenger JM, Chesson CV, Nice DS. (1991) Physical fitness gains following simple environmental change. <i>Am. J. Prev. Med.</i> , 7(5):298-310.	No urban environmental change/ intervention – building design

Llewelyn-Davies CLP. (2003) Quality streets:why good walking environments matter for London's economy. Transport for London, London: UK.	Not an intervention study
Macbeth AG, (1999) Bicycle Lanes in Toronto. ITE Journal, April:38-46,	Transport focussed
Malkusak T, Schappet J, Bruya L. (2002) Turning accessible playgrounds into fully integrated playgrounds...just add a little essence. Parks & Recreation, 37(4):66.	Not an intervention study
Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. (2005) A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? Am. J. Health Prom., 1919;(3):167-93.	Review - included no urban environmental change/intervention
McMillan TE. (2005) Health and community design: The impact of the built environment on physical activity. J. Architectural & Planning Res., 22(1):88-90.	Not an intervention study - book review
Merom D, Bauman A, Vita P, Close G. (2003) An environmental intervention to promote walking and cycling-the impact of a newly constructed Rail Trail in Western Sydney. Prev. Med., 36:235-242.	Transport focussed
Milano C. (2005) Outward bound: using design and environment to spur outdoor activity. Long-Term Care Interface, 6(10):30-35.	Not an intervention study
Central Research Unit. (2002) Monitoring the National Cycling Strategy in Scotland: A report by the Scottish Cycling Development Project. Scottish Executive, Edinburgh: GB.	Not an intervention study - survey and monitoring
National Cycling Strategy Board. (2002) More cycling solutions. A further guide to innovative cycling solutions. National Cycling Strategy Board: GB.	Not an intervention study - leaflet
Neiman AB, Jacoby ER. (2003) The first 'Award to Active Cities Contest' for the Region of the Americas. Revista Panamericana de Salud Publica/Pan. Am. J. Public Health, 14(4):277-280.	Not an intervention study
Owen N, Humpel N, Leslie E, Bauman A, Sallis JF. (2004) Understanding environmental influences on walking; Review and research agenda. Am. J. Prev. Med. 27(1):67-76.	Not a review of intervention studies - commentary and overview of topic -
Patz A. (2001) "Walkable city" - experience from a town planning project in Tubingen. Petermanns-Geographische-Mitteilungen, 145(5):28-35.	In German

Powell KE, Martin LM, Chowdhury PP. (2003) Places to walk: convenience and regular physical activity. <i>Am. J. Public Health</i> , 93(9):1519-1521.	Not an intervention study - commentary,
Powell KE. (2005) Land use, the built environment, and physical activity: a public health mixture; a public health solution. <i>Am. J. Prev. Med.</i> 28(2S2):216-217.	Not an intervention study - commentary
Pucher J, Dijkstra L. (2000) Making walking and cycling safer: Lessons from Europe. <i>Transportation Quarterly</i> , 54(3):25-50.	Not an intervention study - descriptive data on use
Reed JA, Wilson DK, (2006) Awareness and use of a university recreational trail, <i>J. Am. College Health</i> , 54(4):227-230	Included no urban environmental change/intervention - building design
Rodriguez DA, Khattak AJ, Evenson KR. (2006) Can new urbanism encourage physical activity? Comparing a new urbanist neighborhood with conventional suburbs. <i>J. Am. Planning Association</i> , 72(1):43-54.	Not an intervention study - cross sectional design
Sallis JF, Bauman A, Pratt M. (1998) Environmental and policy interventions to promote physical activity. <i>Am. J. Prev. Med.</i> , 15(4):379-397.	Review
Sallis JF, Kraft K, Linton LS. (2002) How the environment shapes physical activity. A transdisciplinary research agenda. <i>Am. J. Prev. Med.</i> , 22(3):208.	Not an intervention study - editorial
Salwen P. (2000) Urban recreation: New York City's parks are revamped and rehabilitated. What some have called a "filthy, noisy" city is home to creatively designed, functional parks for adults and children. <i>Parks &amp; Recreation</i> , 35(4):68-77.	Not an intervention study - case study
Sisson SB. (2005) Taking it to the streets: Increasing physical activity through community improvement: Part one. <i>ACSMs Health &amp; Fitness Journal</i> . (6):8-11.	Not an intervention study
Srinivasan S, O'Fallon LR, Deary A. (2003) Creating healthy communities, healthy homes, healthy people: Initiating a research agenda on the built environment and public health. <i>Am. J. Public Health</i> , 93(9):1446-1450.	Not an intervention study - descriptive commentary and overview
Stainer N. (1990) Folk sports. The provision of outdoor activities among city dwellers can encourage people of a wide variety of age groups and backgrounds to participate and result in more caring attitudes about local areas and urban regeneration. <i>Sport &amp; Leisure</i> , 31(4): 28-19.	Not an urban intervention

Stanilov K. (2004) Health and community design: The impact of the built environment on physical activity. <i>J. Planning Ed. &amp; Res.</i> , 24(1):107-108.	Not an intervention study – review
Stubbs J, Giles-Corti B, Engelhard S, Milat AJ. (2002) Promoting participation in physical activity in a community intervention study. <i>Health Prom. J. Australia.</i> , 13(3):205-210.	Reported on promotional aspect of NSW study ID17149
Sustrans. (2005). Route User Monitoring Report, Sustrans: UK.	Transport focussed
Sustrans. (2006). Economic Appraisal of Links to Schools, Sustrans: UK	Transport focussed
Sustrans. (2006) Survey of cycling and walking activity at Stedfastgate, Edinburgh. Sustrans: UK.	Transport focussed
Sustrans. (2004) Travel Behaviour Research Baseline Survey 2004. Sustrans: UK.	Transport focussed
Taylor KS. (1994) Healthier communities by design. <i>Hospitals &amp; Health Networks.</i> 68(16).	No outcome data
Land Management Research Unit. (1996) The New Forest Sport and Recreation Study. Land Management Research Unit, Portsmouth University: GB.	Could not locate
Twiss J, Dickinson J, Duma S, Kleinman T, Paulsen H, Rilveria L. (2003) Community gardens: lessons learned from California Healthy Cities and Communities. <i>Am. J. Public Health</i> , 93(9):1435-1438.	Not an intervention study - discussion of a funds programme
DTZ Debenham Thorpe. (1997) UK leisure parks report. <i>Estates Gazette</i> , London: GB.	Not an intervention study
Vernez MA. (2005) Active living research and the urban design, planning, and transportation disciplines. <i>Am. J. Prev. Med.</i> , 28(2S2):214-215.	Not an intervention study - commentary
Vojnovic I. (2006) Building communities to promote physical activity: A multi-scale geographical analysis. <i>Geografiska Annaler Series B-Human Geography</i> , 88B(1):67-90.	Not an intervention study
Vuori IM, Oja P, Paronen O. (1994) Physically active commuting to work - testing its potential for exercise promotion. <i>Med. Sci. Sports &amp; Ex.</i> , 26(7):844-850.	No urban environmental change/ intervention
Wakefield J. (2004) Fighting obesity through the built environment. <i>Env. Health Perspectives</i> , 112(11):A616-618.	Not an intervention

Walker I. (2005) The Oxford and Cambridge Cycling survey: a large scale study of bicycle users in two major UK cycling cities, Oxfordshire County Council: UK.	Not an intervention study - survey
Walmsley A. (1995) Greenways and the making of urban form. <i>Landscape &amp; Urban Planning</i> , 33(1-3):81-127.	Not an intervention study
Wang G, Macera CA, Scudder-Soucie B, Schmid T, Pratt M, Buchner D. (2005) A cost-benefit analysis of physical activity using bike/pedestrian trails. <i>Health Promotion Practice</i> , 6(2):174-9,	Not an intervention study - economic focussed
Wang G, Macera CA, Scudder-Soucie B, Schmid T, Pratt M, Buchner D, et al. (2004) Cost analysis of the built environment: the case of bike and pedestrian trails in Lincoln, Neb. <i>Am. J. Public Health</i> , 94(4):549-553.	Not an intervention study – economic focussed
Wang G, Macera CA, Scudder-Soucie B, Schmid T, Pratt M, Buchner D, et al. (2004) Reconnecting urban planning and public health. Cost analysis of the built environment: the case of bike and pedestrian trails in Lincoln, Neb. <i>Am. J. Public Health</i> , 94(4):549-553.	Not an intervention study
Webb M. (1997) Building for bikes. <i>Metropolis</i> , 17(1):42.	Not an intervention study
White RR. (2005) Health and community design: The impact of the built environment on physical activity. <i>Ecological Economics</i> , 52(2):258-259.	Not an intervention study - Book review
Williams JE, Evans M, Kirtland KA, Cavnar MM, Sharpe PA, Neet MJ, et al. (2005) Development and use of a tool for assessing sidewalk maintenance as an environmental support of physical activity. <i>Health Promotion Practice</i> , 6(1):81-88.	Not an intervention study - measurement focus
Winter M. (2005) The built environment can encourage or obstruct healthful behavior. <i>Human Ecology Ithaca</i> , 33(3):4-5.	Not an intervention study
Yanagawa T. (2004) We are where we live: creating environments that improve our health. 'Smart Growth' challenges us to build 'livable, walkable communities'. <i>Active living</i> , 13(5):22-24.	Not an intervention study
Zavestoski S. (2006) The new urban park: Golden gate national recreation area and civic environmentalism. <i>Society &amp; Natural Resources</i> , 9(1):87-89.	Book review
Zimring (2005). Increasing physical activity through innovative stair design: Evaluating skip-stop elevators combined with spacious stairs. <i>Active Living Research</i> .	No outcome data reported

Zimring C, Joseph A, Nicoll GL, Tsepas S. (2005) Influences of building design and site design on physical activity: Research and intervention opportunities. Am. J. Prev. Med., 28(2S2):186-193.	Not an intervention study - discussion of research and intervention opportunities
---	---

## Appendix D - Glossary

CBA	Controlled before and after
CPHE	Centre for Public Health Excellence
DfT	Department for Transport
DH	Department of Health
CC	Collaborating Centre
NHS	National Health Service
NICE	The National Institute for Health and Clinical Excellence
NSF	National service frameworks
PDF	Portable document format
PHCC	Public Health Collaborating Centre
PDG	Programme Development Group
QALY	Quality-adjusted life year
RCT	randomised controlled trial
Home zones	Residential areas in which road space is shared between drivers of motor vehicles and other road users, with the wider needs of residents (including people who walk and cycle, and children) in mind.
Ordered probit model	A probit model is a popular specification of a generalized linear model, using the probit link function
Traffic calming	An approach to constraining vehicle speeds, notably by self-enforcing traffic engineering measures, such as speed bumps
Multi-use trails	Routes open to cyclists and pedestrians, but closed to motor traffic.

## References

Bauman A, Bull FC. Physical Activity: Correlates and interventions. In: Prevention of Cancer; a global perspective. World Cancer Research fund, London: UK. (In press)

Department of Health., (2004) At least five a week. Evidence on the impact of physical activity and its relationship to health. A report from the Chief Medical Officer. London: Department of Health.

Department of Transport., (1995) Transport Statistics Report. National Travel Survey; 1992/94. London: HMSO.

Department of Transport., (2005) Transport Statistics Report. National Travel Survey; 2004. London: TSO.

Department of Health. (2006) Health Survey for England.

<http://www.dh.gov.uk/PublicationsAndStatistics/PublishedSurvey/HealthSurveyForEngland/fs/en>

Gebel K, King L, Bauman A, Vita P, Gill T, Rigby A, Capon A. (2005) Creating healthy environments – a review of links between the physical environment, physical activity and obesity. Sydney. NSW Health Department and NSW Centre for Overweight and Obesity.

National Institute for Health and Clinical Excellence. (2006a) Physical Activity and the Environment: Review One - Draft Transport Review. NICE, London: UK.

National Institute for Health and Clinical Excellence. (2006b) Public health guidance: development process and methods. London: NICE.

© NICE 2018. All rights reserved. Subject to [Notice of rights](#).

ISBN 978-1-4731-2913-9