



*National Institute for
Health and Clinical Excellence*

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**Promoting and creating
built or natural
environments that
encourage and support
physical activity**

**NICE public health guidance 8
Promoting and creating built or natural environments that encourage
and support physical activity**

Ordering information

You can download the following documents from www.nice.org.uk/PH008

- The NICE guidance (this document) which includes all the recommendations, details of how they were developed and evidence statements.
- A quick reference guide for professionals and the public.
- Supporting documents, including an evidence review and an economic analysis.

For printed copies of the quick reference guide, phone the NHS Response Line on 0870 1555 455 and quote N1444.

This guidance represents the views of the Institute and was arrived at after careful consideration of the evidence available. Those working in the NHS, local authorities, the wider public, voluntary and community sectors and the private sector should take it into account when carrying out their professional, managerial or voluntary duties.

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Introduction

The Department of Health (DH) asked the National Institute for Health and Clinical Excellence (NICE or the Institute) to produce public health guidance on the promotion and creation of physical environments that support increased levels of physical activity.

The guidance is for NHS and other professionals who have a direct or indirect role in – and responsibility for – the built or natural environment. This includes those working in local authorities and the education, community, voluntary and private sectors. It may also be of interest to members of the public.

The guidance complements and supports, but does not replace, NICE clinical guidelines on obesity (for further details, see section 7).

The Programme Development Group (PDG) has considered reviews of the evidence, an economic appraisal, stakeholder comments and the results of fieldwork in developing these recommendations.

Details of membership of the PDG are given in appendix A. The methods used to develop the guidance are summarised in appendix B. Supporting documents used in the preparation of this document are listed in appendix E. Full details of the evidence collated, including fieldwork data and activities and stakeholder comments, are available on the NICE website, along with a list of the stakeholders involved and the Institute's supporting process and methods manuals. The website address is: www.nice.org.uk

This guidance was developed using the NICE public health programme process.

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1 Recommendations

This document is the Institute's formal guidance on promoting and creating built or natural environments that encourage and support physical activity. When writing the recommendations, the PDG (see appendix A) considered the evidence of effectiveness (including cost effectiveness), fieldwork data and comments from stakeholders. Full details are available on the Institute's website at: www.nice.org.uk/PH008

The evidence statements that underpin the recommendations are listed in appendix C.

The evidence reviews, supporting evidence statements and economic appraisal are available on the Institute's website at www.nice.org.uk/PH008

The PDG considers all the recommended interventions are likely to be cost effective.

The PDG also considered whether a recommendation should only be implemented as part of a research programme, where evidence was lacking. For the research recommendations and other gaps in the research, see section 5 and appendix D respectively.

The guidance offers the first national, evidence-based recommendations on how to improve the physical environment to encourage physical activity. It demonstrates the importance of such improvements and the need to evaluate how they impact on the public's health.

The recommendations are aimed at many settings and sectors:

- Recommendations 1, 4, 5 (on land use planning) are relevant when developing regional spatial strategies, local development frameworks and other local plans using, for example 'Policy planning guidance 17' (Office of the Deputy Prime Minister undated).

- Recommendations 1, 2, 3, 4, 5 are relevant when developing local transport plans and guidance using, for example 'Policy planning guidance 13' (Office of the Deputy Prime Minister 2001).

All the recommendations are relevant when developing joint NHS and local authority strategies (for example, joint community strategies, access plans and local area agreements). They are also relevant when planning and managing the NHS (including its premises).

Strategies, policies and plans

Recommendation 1

Who should take action?

Those responsible for all strategies, policies and plans involving changes to the physical environment. This includes the development, modification and maintenance of towns, urban extensions, major regeneration projects and the transport infrastructure. It also includes the siting or closure of local services in both urban and rural areas.

What action should they take?

- Involve all local communities and experts at all stages of the development to ensure the potential for physical activity is maximised.
- Ensure planning applications for new developments always prioritise the need for people (including those whose mobility is impaired) to be physically active as a routine part of their daily life. Ensure local facilities and services are easily accessible on foot, by bicycle and by other modes of transport involving physical activity. Ensure children can participate in physically active play.
- Assess in advance what impact (both intended and unintended) the proposals are likely to have on physical activity levels. (For example, will local services be accessible on foot, by bicycle or by people whose mobility

Transport

Recommendation 2

Who should take action?

Those responsible for all strategies, policies and plans involving changes to the physical environment, including local transport authorities, transport planners and local authorities.

What action should they take?

Ensure pedestrians, cyclists and users of other modes of transport that involve physical activity are given the highest priority when developing or maintaining streets and roads. (This includes people whose mobility is impaired.) Use one or more of the following methods:

- re-allocate road space to support physically active modes of transport (as an example, this could be achieved by widening pavements and introducing cycle lanes)
- restrict motor vehicle access (for example, by closing or narrowing roads to reduce capacity)
- introduce road-user charging schemes
- introduce traffic-calming schemes to restrict vehicle speeds (using signage and changes to highway design)
- create safe routes to schools (for example, by using traffic-calming measures near schools and by creating or improving walking and cycle routes to schools).

Recommendation 3

Who should take action?

Planning and transport agencies, including regional and local authorities.

What action should they take?

Plan and provide a comprehensive network of routes for walking, cycling and using other modes of transport involving physical activity. These routes should offer everyone (including people whose mobility is impaired) convenient, safe and attractive access to workplaces, homes, schools and other public facilities. (The latter includes shops, play and green areas and social destinations.) They should be built and maintained to a high standard.

Public open spaces

Recommendation 4

Who should take action?

- Designers and managers of public open spaces, paths and rights of way (including coastal, forest and riverside paths and canal towpaths).
- Planning and transport agencies including regional and local authorities.

What action should they take?

- Ensure public open spaces and public paths can be reached on foot, by bicycle and using other modes of transport involving physical activity. They should also be accessible by public transport.
- Ensure public open spaces and public paths are maintained to a high standard. They should be safe, attractive and welcoming to everyone.

Buildings

Recommendation 5

Who should take action?

Architects, designers, developers, employers and planners.

What action should they take?

- Those involved with campus sites, including hospitals and universities, should ensure different parts of the site are linked by appropriate walking and cycling routes. (Campuses comprise two or more related buildings set together in the grounds of a defined site.)
- Ensure new workplaces are linked to walking and cycling networks. Where possible, these links should improve the existing walking and cycling infrastructure by creating new, through routes (and not just links to the new facility).

Recommendation 6

Who should take action?

Architects, designers and facility managers who are responsible for public buildings (including workplaces and schools).

What action should they take?

- During building design or refurbishment, ensure staircases are designed and positioned to encourage people to use them.
- Ensure staircases are clearly signposted and are attractive to use. For example, they should be well-lit and well-decorated.

Schools

Recommendation 7

Who should take action?

Children's services, School Sport Partnerships, school governing bodies and head teachers.

What action should they take?

- Ensure school playgrounds are designed to encourage varied, physically active play.
- Primary schools should create areas (for instance, by using different colours) to promote individual and group physical activities such as hopscotch and other games.

2 Public health need and practice

Physical activity not only contributes to wellbeing, it is essential for good health (DH 2004). Increasing physical activity levels in the population will help prevent or manage over 20 conditions and diseases. This includes coronary heart disease, diabetes, some cancers and obesity. It can help to improve mental health. It can also help older people to maintain independent lives.

In 2004, the DH estimated that physical inactivity in England cost £8.2 billion annually (this included the rising cost of treating chronic diseases such as coronary heart disease and diabetes). It is estimated that a further £2.5 billion each year is spent on dealing with the consequences of obesity. Again, this can be caused, in part, by a lack of physical activity (DH 2004).

Physical activity levels vary according to age, gender, disability, ethnicity and socioeconomic status. (National data on physical activity are not broken down by faith, religious belief or sexual orientation.)

Facts and figures

Adults are recommended to undertake a minimum of 30 minutes of at least moderate-intensity activity on most days of the week (DH 2004). Around 65% of men and 76% of women in England do not achieve this (Joint Health Surveys Unit 2004). Seventy per cent of boys and 61% of girls aged 2–15 years are sufficiently active to meet the recommendations for their age (at least 60 minutes of at least moderate-intensity activity each day). Trends between health surveys for England in 1997, 1998, 2003 and 2004 found small increases in physical activity levels between 1997 and 2004. Between 1999 and 2004 (when the same physical activity questions were included for each survey) there were significant increases in the percentage of adults meeting the national recommendations. However, changes in the way physical activity is measured over time mean that no clear trends can be determined (Stamatakis et al. 2007).

Data from the 'National travel survey' show that the distance people walk and cycle has declined significantly in the last 3 decades (Department for Transport 2007a). The average distance walked, per person per year, has fallen from 255 miles in 1975/76 to 201 miles in 2006. Bicycle mileage for the same years fell from 51 to 39 miles per person per year. However, some of the surveys may not have captured all walking and cycling trips.

Environmental issues

Increasing levels of physical activity is a challenge, not just for those directly involved in public health but for professionals, groups and individuals in many sectors of society. Adults, young people and children can achieve the national recommended levels by including activities such as walking, cycling or climbing stairs as part of their everyday life. However, while individual interventions to promote such activity may be important, they are not the only (nor possibly the main) solution. Other issues, including environmental factors, need to be tackled. As Schmid and colleagues say (1995), 'It is unreasonable to expect people to change their behaviours when the environment discourages such changes'.

For the purposes of this guidance, the environment is defined as: ‘any aspect of the physical (natural) environment or the urban or constructed (built) environment that subconsciously or consciously relates to an individual and their physical activity behaviour’ (Foster and Hillsdon 2004).

Government targets

A more physically active population will help the government to achieve the aims and targets it has set out in the following:

- national service frameworks (NSFs) on coronary heart disease, diabetes, mental health, older people and children
- DH policy documents on physical activity including ‘Choosing activity’ (DH 2005) and ‘At least five a week’ (DH 2004)
- other policies including:
 - the cross-cutting sustainable development strategy ‘Securing the future’ (Department for Environment, Food and Rural Affairs 2005)
 - ‘Walking and cycling: an action plan’ (Department for Transport 2004)
 - ‘Sustainable communities: building for the future’ (Office of the Deputy Prime Minister 2003)
 - public service agreement (PSA) 12 (improve the health and wellbeing of children and young people). This includes reducing the proportion of overweight and obese children under 11 by 2020. It includes a target for all those aged 5–16 to spend 2 hours a week doing PE and school sport as part of (and outside) the curriculum. That means increasing the numbers taking part from 25% (2002) to 85% by 2008. The Department for Children, Schools and Families (DCSF) leads on this (HM Government 2007a)
 - PSA 18 (promote better health and wellbeing for all). This includes reducing the: rate of all causes of mortality among all age groups; mortality rate for cancer among people under 75

(by 20% by 2010); mortality rate for heart disease, stroke and related diseases among people under 75 (by 40% by 2010). The number of people from poorer backgrounds dying from these diseases (compared to those from better off backgrounds) also has to be reduced. The aim is to reduce this 'health inequalities gap' by at least 6% for cancer and 40% for heart disease, stroke and related diseases, by 2010 (HM Government 2007b)

- PSA 21 (increase the uptake of cultural and sporting opportunities by adults and young people aged 16 and above). One target is to increase adult participation in at least nine sporting or cultural events by 2008. The Department for Communities and Local Government (DCLG) leads on this (HM Government 2007c)
- PSA 22 (deliver a successful Olympic Games in 2012 and a sustainable legacy). One indicator is that, in addition to providing all those aged 5–16 with 2 hours a week of PE and sport, there is an increase in the percentage of those aged 5–19 participating in a further 3 hours a week. The Department for Culture, Media and Sport (DCMS) leads on this (HM Government 2007d)
- PSA 27 (lead the global effort to avoid dangerous climate change). This includes a target to reduce UK net CO₂ emissions by 26–32% by 2020. Measures to achieve this include encouraging more people to cycle and walk. The Department for Environment, Foods and Rural Affairs (DEFRA) leads on this (HM Government 2007e)
- agreements between local authorities, primary care trusts (PCTs) and other partners to increase local physical activity levels.

Physical activity framework

Figure 1 (below) shows the links between national policy, local plans and the types of intervention that can increase levels of physical activity. This comprehensive framework was used to develop the recommendations.

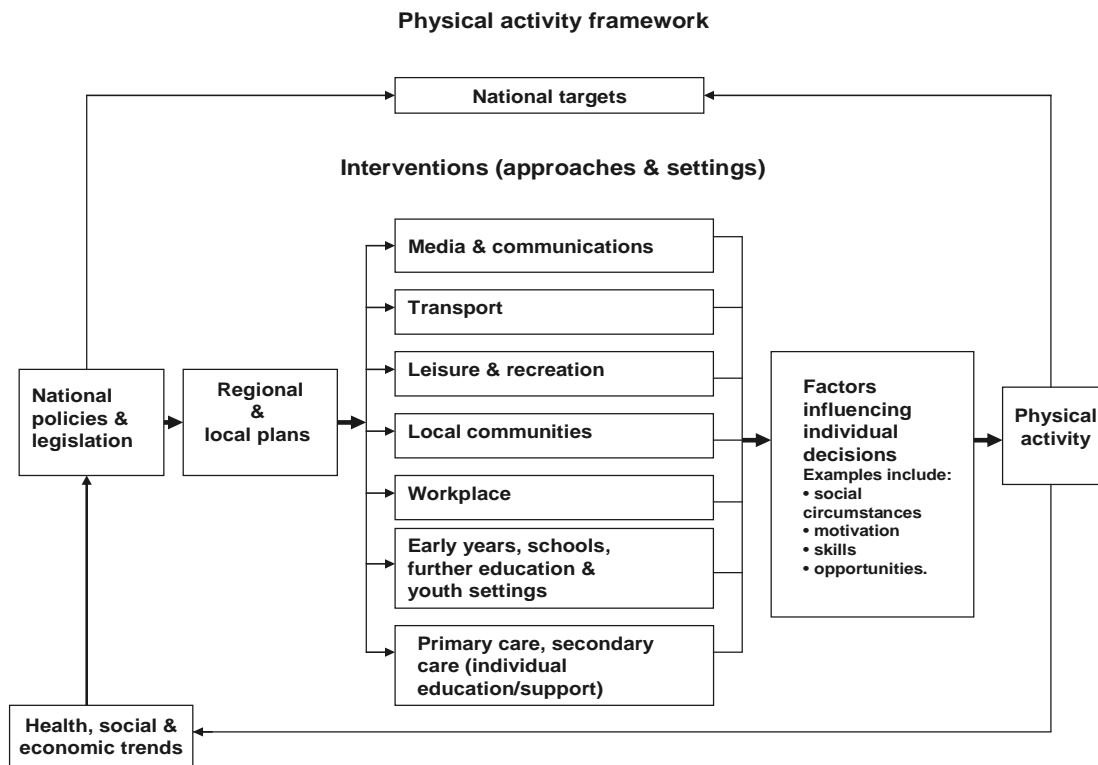


Figure 1

National policies, including ‘Choosing activity: a physical activity action plan’ (DH 2005), are designed (either implicitly or explicitly) to impact on physical activity levels. ‘Choosing activity’ asserts that a ‘culture shift’ is needed if physical activity levels in England are to increase. It commits the government to ‘changing the physical and cultural landscape – and building an environment that supports people in more active lifestyles’.

These policies (including cross-government initiatives) are translated into regional and local plans that cover a range of issues including: health, community safety, sustainable development and communities, neighbourhood renewal, social inclusion and transport.

The types of intervention used to support these plans may range from media campaigns (promoting ways of being more physically active) to changes to the physical environment (such as traffic-calming measures or improvements to public open spaces, workplaces and schools).

3 Considerations

The PDG took account of a number of factors and issues in making the recommendations.

- 3.1 Moderate-intensity activity will usually lead to an increase in breathing and heart rates (to the level where the pulse can be felt) and a feeling of increased warmth. It may also cause the person to sweat on hot or humid days. This level of activity can be achieved during daily life, for example, by walking at a brisk pace (at least 3 miles per hour or 5 kilometres an hour) and cycling. Stair climbing is more likely to be a vigorous-intensity exercise and so may lead to a larger physiological response (a bigger increase in heart and breathing rates). However, it is likely to take place for a shorter length of time.
- 3.2 Past policy and practice has often – perhaps not intentionally – given priority to sedentary modes of transport and ways of using buildings. Over recent decades, environmental changes in England have made habitual activity less common. Many components of the environment can be modified to make it easier for more people to be physically active. The design and layout of towns and cities can encourage or discourage travel and access on foot or by bicycle. Similarly, building location and design can encourage (or discourage) the use of stairs and other physical activities. These modifications can be achieved by public sector agencies working in partnership with other organisations, including those in the voluntary and community sectors.
- 3.3 Many organisations own, manage or otherwise influence the space

used routinely by the public and so can influence people's ability to be physically active. (For instance, the location and accessibility of a building can affect whether or not people choose to walk or cycle there). These organisations include public sector landowners and managers (such as local authorities, the education sector and the NHS) as well as private organisations (including businesses) and voluntary sector or non-governmental organisations (NGOs).

- 3.4 A range of economic, social, cultural and environmental factors influence physical activity levels and the overall impact may be synergistic rather than simply cumulative. While all these factors are important, this guidance focused on changes to the physical environment.
- 3.5 The PDG noted that a number of interventions use the natural environment to encourage physical activity. Green gyms, where groups are organised to maintain and improve a green space, are one example. This type of project was outside the scope of the guidance because it focused mainly on increasing the physical activity levels of individuals, rather than changing the environment.
- 3.6 The guidance aims to increase the routine level of physical activity achieved by the population. Individuals need to be capable of activities such as walking or cycling, or have the ability to use a manual wheelchair, to benefit. The PDG recognised that there will always be individuals who cannot, for a variety of reasons, participate. These people require individual support to maintain their mobility and to be as active as possible. Such support was outside the scope of this guidance.
- 3.7 The recommendations note the importance of getting the community involved to increase physical activity levels (and the need to empower communities to do this). However, it was not part of the PDG's remit to examine how this would be best achieved. Advice will be provided in NICE public health guidance on community

engagement, to be published in February 2008 ('Community engagement to improve health').

3.8 Safety is an important consideration. At the same time, environments that encourage physical activity need to be welcoming, attractive, interesting and even inspirational. It was not within the PDG's remit to consider what might constitute an acceptable level of risk when undertaking physical activity in different settings.

3.9 The five effectiveness reviews carried out for this guidance searched extensively for studies which looked at whether environmental change had altered people's physical activity levels. Out of 94,172 possible papers, 54 studies were finally included in the reviews. However, it was difficult to ascertain to what extent the interventions under examination were responsible for the changes seen because:

- less than 20% used a comparison group
- a substantial number (35) only measured physical activity levels after an intervention
- only a minority used an appropriate, overall measure of physical activity
- follow-up was often short (at around 8 weeks)
- few studies took into account any other factors that might have led to the results
- most studies did not account for the fact that the intervention may have only had an impact on groups that were already active – and may not have affected the population as a whole.

3.10 It is often difficult to interpret physical activity outcomes and to ascribe causality. A change in physical activity levels (an increase or decrease) was often an unintended outcome of the interventions studied and was not usually the main focus of evaluation. In addition, the evaluation process was frequently designed by non-health professionals who may take a different approach to examining the

effects of projects. Specifically, the following evaluation issues were considered by the PDG.

- Physical activity was frequently measured in terms of 'numbers of users' or 'trips'. These were difficult to translate into physical activity levels.
- Much of the evidence considered only one type of physical activity (such as walking or cycling as a mode of transport) making it difficult to determine if there was any overall change in physical activity levels. (For example, someone might be walking more but doing less sport, resulting in no increase – or even an overall decrease – in their level of physical activity.)
- Environmental interventions in one geographical area may have had an unidentified (and potentially negative), knock-on effect in other areas. For instance, reducing traffic speed in some streets may have increased traffic in others, leading to a reduction in the number of people who, for example, walked or cycled in those areas.

3.11 There is a dearth of evidence on how environmental interventions affect the physical activity levels of different groups, so it is not clear what impact the recommendations will have on health inequalities. For example, little is known about how the effects vary in relation to gender, age, ethnicity, culture and religion. In addition, there is little evidence in relation to people with disabilities or according to people's sexual orientation. The PDG stressed that the impact on local health inequalities must be taken into account when implementing the recommendations.

3.12 Much of the evidence came from non-UK studies undertaken in a limited range of settings and its applicability to the UK needs to be taken into account. In addition, the evidence primarily relates to urban

areas: it is important that planners and delivery agencies also consider and address the needs of people living in rural areas.

3.13 The PDG noted that most of the recommendations reflect current best practice.

3.14 The PDG considered a number of health economics issues.

- Both cost–benefit and cost–utility analyses were carried out. As many interventions were not NHS-based, a cost–benefit analysis (as favoured in transport economics) might be considered more appropriate than the cost–utility analysis generally used in health economics. On the other hand, using the latter meant that these interventions could be compared with health interventions that had been assessed using NICE cost-effectiveness methods.
- As increased physical activity was not the main aim of many interventions studied, it was not clear what proportion of the cost might be attributed to the health benefits arising from a subsequent increase in physical activity levels.
- Many of the recommended changes would probably be carried out anyway (for other purposes). For example, little extra cost is likely to be incurred in designing stairs to encourage people to use them. However, such changes would still incur a small opportunity cost.

3.15 The literature reviews focused on finding links between an intervention and a change in physical activity patterns. Details of how to implement an intervention (for instance, how best to design traffic-calming schemes) were outside the scope of the guidance. Links to examples of best practice such as ‘Manual for streets’ (Department for Transport 2007b) and ‘Active by design’ (Sport England 2007) will be provided in the implementation materials.

3.16 When implementing the recommendations, it is important to pay

particular attention to the needs of people whose mobility is impaired. This includes the needs of people with physical disabilities (including wheelchair users), frail older people and parents or carers with small children. This is important, not only to ensure these groups benefit directly, but to get the largest possible increase in physical activity levels across the population as a whole.

3.17 Only interventions that change the physical environment were included within the scope of the guidance. Nevertheless, the PDG stressed the importance of providing information on the benefits of physical activity – and publicising how people can be more physically active. (The latter could be achieved by using posters or stair-riser banners to encourage people to use stairs, and by using posters and leaflets to encourage them to use cycle routes and other physical activity facilities.)

3.18 It is likely that facilities such as secure cycle parking and showers at work could play an important role in helping to encourage people to be active at work. However, the relevance of such facilities was not reported in the literature considered by the PDG.

3.19 Implementation of many of the recommendations (for example, on the siting and design of stairs and in relation to walking and cycling routes) will be subject to existing legislation. The ‘Equality act’, ‘Disability discrimination act’ and all other relevant legislation, including that covering fire safety and building design, needs to be taken into account.

3.20 An equality impact assessment (EQIA) of the draft guidance resulted in a number of changes to the final document. For details see appendix E.

3.21 The PDG is aware of the relationship between the lack of physical activity and obesity (see section 2). It is also aware of the government’s Foresight programme on obesity (Government Office

4 Implementation

NICE guidance can help:

- Local authorities fulfil their remit to promote the economic, social and environmental wellbeing of communities.
- National and local organisations within the public sector meet government indicators and targets to improve health and reduce health inequalities.
- Provide a focus for health and wellbeing partnerships, children's trusts and other multi-sector partnerships working on health within a local strategic partnership.
- NHS organisations meet DH standards for public health as set out in the seventh domain of 'Standards for better health' (updated in 2006). Performance against these standards is assessed by the Healthcare Commission, and forms part of the annual health check score awarded to local healthcare organisations.
- NHS organisations and local authorities (including social care and children's services) meet the requirements of the government's 'National standards, local action, health and social care standards and planning framework 2005–2008'.
- Local NHS organisations, local authorities and other local public sector partners benefit from any identified cost savings, disinvestment opportunities or opportunities for re-directing resources.

NICE has developed tools to help organisations implement this guidance. For details, see our website at www.nice.org.uk/PH008

5 Recommendations for research

The PDG has made the following recommendations to plug the most important gaps in the evidence.

Recommendation 1

Who should take action?

Research councils, research commissioners and funders.

What action should they take?

- Fund studies, based on the most rigorous designs possible, to examine the impact that changes to the physical environment have on physical activity levels. The studies should:
 - include initiatives related to urban planning, transport, the natural environment and building design
 - take account of the needs of rural as well as urban populations
 - examine the cost effectiveness of environmental changes that improve physical activity levels.

- Develop theoretical frameworks and methodologies for evaluating the economic benefits of environmental change to encourage physical activity. These should use methods familiar to those outside the health sector (such as cost-benefit analysis) to allow comparison with other environmental interventions. They should also use methods that allow comparison with other health interventions.

- Develop reliable and valid impact assessment methods that can identify changes in physical activity levels resulting from changes to the physical environment.

Recommendation 2

Who should take action?

Research councils, research commissioners, funders and researchers.

What action should they take?

- Ensure public health outcomes can be identified and attributed as a standard part of research into the links between changes to the physical environment and physical activity levels. Include:
 - control groups or areas
 - appropriate and valid measures, including measures of overall physical activity levels before and after an intervention
 - follow-up periods (ideally, for at least a year)
 - the impact that environmental changes may have outside the target area (such as neighbouring areas)
 - consideration of how interventions can have a different impact on people according to how physically active they were at the outset
 - other factors that may have led to the results.
- Consider the impact of environmental change on health inequalities: how it affects people's physical activity levels according to, for instance, their socioeconomic status, age, gender, disability, ethnicity, religion and sexual orientation.
- Examine the relative contribution of environmental factors and personal characteristics to variations in physical activity levels.

More detail on all the evidence gaps identified during the development of this guidance is provided in appendix D.

6 Updating the recommendations

NICE public health guidance is updated as needed so that recommendations take into account important new information. We check for new evidence 2

and 4 years after publication to decide whether all or part of the guidance should be updated. If important new evidence is published at other times, we may decide to update some recommendations at that time.

7 Related NICE guidance

Published

Four commonly used methods to increase physical activity: brief interventions in primary care, exercise referral schemes, pedometers and community-based exercise programmes for walking and cycling. NICE public health intervention guidance 2 (2006). Available from: www.nice.org.uk/PHI002

Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43 (2006). Available from: www.nice.org.uk/CG043

Under development

Community engagement to improve health. NICE public health guidance (due February 2008)

Workplace health promotion: how to encourage employees to be physically active. NICE public health guidance (due May 2008).

Promoting physical activity, play and sport for pre-school and school-age children in family, pre-school, school and community settings. NICE public health guidance (due January 2009).

8 Glossary

Access/accessibility

‘Access’ is used to mean that a particular place or destination is accessible to local residents using a mode of transport that involves physical activity.

Destinations may include work, healthcare and education facilities and shops.

Active play

The Children's Play Council defines play as: '...freely chosen, personally directed, intrinsically motivated behaviour that actively engages the child...' (National Playing Fields Association 2000). Active play involves physical activity. (For a definition of physical activity see below.)

Mobility impairment

Mobility impairment means that an individual has difficulty getting about. This includes disabilities such as visual impairment as well as impairment due to old age and frailty. It also includes temporary problems due to, for instance, transporting young children in buggies or prams.

Opportunity cost

Opportunity cost is a term used in economics to express the notion that money, time or resources spent in one area cannot be spent on something else. The value of an opportunity cost is the value of the next best alternative way of using that time, money or resource.

Physical activity

Physical activity is: 'Any force exerted by skeletal muscle that results in energy expenditure above resting level' (Caspersen et al. 1985). It includes the full range of human movement and can encompass everything from competitive sport and active hobbies to walking, cycling and the general activities involved in daily living (such as housework).

Physical activity measurements

Physical activity is measured in terms of:

- the time it takes (duration)
- how often it occurs (frequency)
- its intensity (the rate of energy expenditure – or rate at which calories are burnt).

The intensity of an activity is usually measured either in kcals per kg per minute or in METs (metabolic equivalents – multiples of resting metabolic rate). Depending on the intensity, the activity will be described as: moderate-

intensity or vigorous-intensity. Moderate-intensity activities increase the heart and breathing rates but, at the same time, allow someone to have a normal conversation. An example is brisk walking.

Traffic calming

Traffic calming is a means of restricting vehicle speeds, primarily using traffic engineering measures such as speed bumps.

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Appendix A: membership of the Programme Development Group, the NICE Project Team and external contractors

The Programme Development Group

PDG membership is multidisciplinary. It comprises researchers, practitioners, stakeholder representatives and members of the public as follows:

Deirdra Armsby Group Leader, Forward Planning and Transportation, London Borough of Newham

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External reviewers: effectiveness reviews

‘Physical activity and the environment review one: transport review’ was carried out by the Public Health Collaborating Centre for Physical Activity. (The 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].) The principal authors were: Fiona Bull, Nick Cavill, Adrian Davis and Charlie Foster.

‘Physical activity and the environment review two: urban planning and design review’ was carried out by the Public Health Collaborating Centre for Physical Activity. The principal authors were: Fiona Bull, Nick Cavill, Charlie Foster and Catherine Hutton.

‘Physical activity and the environment review three: natural environment review’ was carried out by the Public Health Collaborating Centre for Physical Activity. The principal authors were: Fiona Bull, Kim Buxton, Ruth Carr, Nick Cavill and Charlie Foster.

‘Physical activity and the environment review four: policy review’ was carried out by the Public Health Collaborating Centre for Physical Activity. The principal authors were: Fiona Bull, Nick Cavill and Charlie Foster.

‘Physical activity and the environment review five: building design review’ was carried out by the Public Health Collaborating Centre for Physical Activity. The principal authors were: Fiona Bull, Nick Cavill, Charlie Foster and Catherine Hutton.

External reviewers: expert report

Expert report on ‘Environmental correlates of physical activity and walking in adults and children: a review of reviews’. This was carried out by Adrian Bauman and Fiona Bull working as freelance consultants.

External reviewers: economic appraisal

'A Rapid review of economic literature related to environmental interventions that increase physical activity levels in the general population' was carried out by the York Health Economics Consortium. The principal authors were: Sophie Beale, Matthew Bending, Paul Trueman and Yunni Yi.

'An economic analysis of environmental interventions that promote physical activity' was carried out by the York Health Economics Consortium. The principal authors were: Sophie Beale, Matthew Bending and Paul Trueman.

Fieldwork

The fieldwork was carried out by the Public Health Collaborating Centre for Physical Activity.

Appendix B: summary of the methods used to develop this guidance

The reports of the reviews, expert report and economic appraisal include full details of the methods used to select the evidence (including search strategies), assess its quality and summarise it.

The minutes of the PDG meetings provide further detail about the Group's interpretation of the evidence and development of the recommendations.

All supporting documents are listed in appendix E and are available from the NICE website at: www.nice.org.uk/PH008

The guidance development process

The stages of the guidance development process are outlined in the box below:

1. Draft scope
2. Stakeholder meeting
3. Stakeholder comments
4. Final scope and responses published on website
5. Reviews and cost-effectiveness modelling
6. Synopsis report of the evidence (executive summaries and evidence tables) circulated to stakeholders for comment
7. Comments and additional material submitted by stakeholders
8. Review of additional material submitted by stakeholders (screened against inclusion criteria used in reviews)
9. Synopsis, full reviews, supplementary reviews and economic modelling submitted to the PDG
10. The PDG produces draft recommendations
11. Draft recommendations published on website for comment by stakeholders and for field testing
12. The PDG amends recommendations
13. Responses to comments published on website
14. Final guidance published on website

Key questions

The key questions were established as part of the scope. They formed the starting point for the reviews of evidence and facilitated the development of recommendations by the PDG. The overarching question was:

What environmental interventions 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?

The subsidiary questions were:

1. What is the aim/objective of the intervention?
2. How does the content influence effectiveness?
3. How does delivery influence effectiveness?
4. Does the site/setting influence effectiveness?
5. Does the intensity (or length) of the intervention influence effectiveness/duration of effect?
6. Does impact vary according to the age, sex, socio-economic position and ethnicity of the target population?
7. How much does it cost (in terms of money, people and time)?
8. What evidence is there on cost effectiveness?
9. What are the barriers to implementation?
10. What is the differential impact on inequalities in health?
11. What are the adverse or unintended consequences?

These questions were refined further in relation to the topic of each review (see reviews for further details).

Reviewing the evidence of effectiveness

Five reviews of effectiveness were conducted. A review of review-level correlate studies was also carried out.

Identifying the evidence

The following databases were searched for all five effectiveness reviews, for interventions involving a change to the environment and which reported physical activity outcomes (from January 1990–July 2006):

- Cambridge Scientific Abstracts (CSA)
- Cambridge Scientific Abstracts Education Resources Information Centre (CSA ERIC)
- CINAHL
- Cochrane Library
- EMBASE
- Global Health
- ISI Science Citation Index and Social Science Citation Index
- MEDLINE
- Public Affairs Information Services (PAIS)
- Psychlit
- PsycINFO
- SIGLE
- SportDISCUS.

Other relevant databases were also searched for each review and references from included studies were searched. In addition, a number of websites were searched and information was sought from experts.

Expert report

The review of correlates identified reviews published between 2002–2007 that reported on factors in the built or natural environment that were linked to physical activity or walking.

Further details of the databases, websites, search terms and strategies are included in the full reports.

Selection criteria

Studies were included in the effectiveness reviews if:

- an intervention altered the physical environment
- physical activity levels were measured at least after the intervention had taken place
- (for the policy review) environmental change was linked to a policy initiative.

Studies were excluded if they:

- did not report on an environmental intervention
- did not include physical activity as an outcome
- were purely descriptive or an opinion piece
- were not published in English
- were published before 1990.

Papers were included in the expert report (correlates review) if they:

- were reviews
- used a clear measure of physical activity or walking
- provided evidence of a review or summary process
- were published in English
- were published between 2002–2007.

Papers were excluded if they:

- focused on strength training or clinical exercise programmes (such as exercise for rehabilitation)
- only reported the results from one study
- focused on one disease or a specific clinical condition.

Quality appraisal

Included papers were assessed for methodological rigour and quality using the NICE methodology checklist, as set out in the NICE technical manual 'Methods for development of NICE public health guidance' (see appendix E). Each study was described by study type and graded (++, +, -) to reflect the risk of potential bias arising from its design and execution.

Study type

- Meta-analyses, systematic reviews of randomised controlled trials (RCTs) or RCTs (including cluster RCTs).
- 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.
- Non-analytical studies (for example, case reports, case series).
- Expert opinion, formal consensus.

Study quality

- ++ All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions are thought very unlikely to alter.
- + Some criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought unlikely to alter the conclusions.
- Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter.

The studies were also assessed for their applicability to the UK.

Summarising the evidence and making evidence statements

The review data was summarised in evidence tables (see full reviews and the synopsis).

The findings from the studies were synthesised and used as the basis for a number of evidence statements relating to each key question. The evidence statements reflect the strength (quantity, type and quality) of evidence and its applicability to the populations and settings in the scope.

Economic appraisal

The economic appraisal consisted of a review of economic evaluations and a cost-effectiveness analysis.

Review of economic evaluations

In addition to scanning the effectiveness evidence for economic data, the following databases were searched:

- EconLIT
- Health Economic Evaluation Database (HEED)
- Health Management Information Consortium (HMIC)
- NHS Economic Evaluation Database (NHS EED).

Searches were also undertaken of PDG members' personal libraries and the Internet. Details can be found in the full review (www.nice.org.uk/PH008).

Studies were reviewed if they provided economic evidence directly linked to any of the environmental interventions considered in the effectiveness reviews. Published studies that met the inclusion criteria were rated to determine the strength of the evidence, using the NICE algorithm and the Drummond checklist (Drummond MF, Jefferson TO [1996] 'Guidelines for authors and peer reviewers of economic submissions to the BMJ'. British Medical Journal 313: 2075–283).

Cost-effectiveness analysis

Three economic models were constructed to incorporate data from the effectiveness and cost-effectiveness reviews. The results are reported in: 'An economic analysis of environmental interventions that promote physical activity'. It is available on the NICE website at: www.nice.org.uk/PH008

Fieldwork

Fieldwork was carried out to evaluate the relevance and usefulness of NICE guidance for practitioners and the feasibility of implementation. It was conducted with professionals who are involved in architecture, transport, environment, planning and public health.

The fieldwork comprised:

- eight focus groups conducted in London, Manchester, Bristol and York by the Public Health Collaborating Centre for Physical Activity with members of the groups listed above
- three one-to-one interviews: with a senior Highways Agency official and two architects.

The studies were commissioned to ensure there was ample geographical coverage. The main issues arising from these studies are set out in appendix C under 'Fieldwork findings'. The full fieldwork report is available on the NICE website: www.nice.org.uk/PH008

How the PDG formulated the recommendations

At its meeting in May 2007, the PDG considered the evidence of effectiveness and cost effectiveness and the expert report to determine:

- whether there was sufficient evidence (in terms of quantity, quality and applicability) to form a judgement
- whether, on balance, the evidence demonstrates that the intervention is effective or ineffective, or whether it is equivocal
- where there is an effect, the typical size of effect.

The PDG developed draft recommendations through informal consensus, based on the following criteria:

- Strength (quality and quantity) of evidence of effectiveness and its applicability to the populations/settings referred to in the scope.
- Effect size and potential impact on population health and/or reducing inequalities in health.
- Cost effectiveness (for the NHS and other public sector organisations).
- Balance of risks and benefits.
- Ease of implementation and the anticipated extent of change in practice that would be required.

The PDG also considered whether a recommendation should only be implemented as part of a research programme where evidence was lacking.

Where possible, recommendations were linked to an evidence statement(s) (see appendix C for details). Where a recommendation was inferred from the evidence, this was indicated by the reference 'IDE' (inference derived from the evidence).

The draft guidance, including the recommendations, was released for consultation in June 2007. At its meeting in September 2007, the PDG considered comments from stakeholders and the results from fieldwork. The guidance was signed off by the NICE Guidance Executive in November 2007.

Appendix C: the evidence

This appendix sets out the evidence statements taken from five reviews (see appendix B for the key to study types and quality assessments) and links to the relevant recommendations. The evidence statements are presented here without references – these can be found in the full review (see appendix E for details). It also sets out a brief summary of findings from the expert report and the economic appraisal.

The five reviews of effectiveness are:

- ‘Physical activity and the environment review one: transport review’
- ‘Physical activity and the environment review two: urban planning and design review’
- ‘Physical activity and the environment review three: natural environment review’
- ‘Physical activity and the environment review four: policy review’
- ‘Physical activity and the environment review five: building design review’.

Evidence statement **T1** indicates that the linked statement is numbered **1** in ‘Physical activity and the environment review one: transport’. Evidence statement **UP1** indicates that the linked statement is numbered **1** in ‘Physical activity and the environment review two: urban planning and design’.

Evidence statement **NE2** indicates that the linked statement is numbered **2** in ‘Physical activity and the environment review three: natural environment review’. Evidence statement **P1** indicates that the linked statement is numbered **1** in ‘Physical activity and the environment review four: policy review’. Evidence statement **BD3** indicates that the linked statement is numbered **3** in ‘Physical activity and the environment review five: building design review’.

The reviews and economic appraisal are available on the NICE website (www.nice.org.uk/PH008). Where a recommendation is not directly taken from

the evidence statements, but is inferred from the evidence, this is indicated by IDE (inference derived from the evidence) below.

Recommendation 1: evidence statements UP2, UP5, P1, P2, P3; expert report; IDE

Recommendation 2: evidence statements T1, T2, T3, T4, T5, T6, UP3, P2; expert report; IDE

Recommendation 3: evidence statements T5, UP1, P3; expert report; IDE

Recommendation 4: evidence statements UP4, UP5, UP6, NE1, NE2; expert report; IDE

Recommendation 5: evidence statements T5, UP5, BD1; IDE

Recommendation 6: evidence statement BD2

Recommendation 7: evidence statement BD3

Evidence statements

Evidence statement T1

The evidence from five studies: one 2 (++), two 2 (-) , one 3 (+) and one 3 (-) quality, tends to suggest that traffic calming can lead to small self-reported and observed increases in walking and cycling (including children's play) both in the short and in the long term. However, three studies: one 2 (+), two 2 (-) reported either no significant change in self-reported and observed levels of walking or cycling, or slight declines in walking and cycling in the short and long term. The evidence is applicable to the UK.

The evidence from one 2 (++), two 2 (-) and one 3 (+) quality studies suggests that traffic-calming interventions may be useful in enabling children specifically to benefit from physical activity through play outdoors in the short and long term.

Evidence statement T2

Evidence from three studies one 2 (++) and two 2 (+) quality, suggests that introduction of multi-use trails can lead to increases in levels of walking and cycling in both the short and long term. However, one US 2 (++) quality study found decreases in walking and cycling following the introduction of a multi-use trail.

The evidence from the UK studies is applicable to the UK while the evidence from the US and [other] Australian studies may not be directly applicable.

There is some evidence to suggest that the setting of the delivery of the intervention may influence its effectiveness in the short term and long term. Specifically, trails located closer to population centres may be better used.

Evidence statement T3

There is evidence from three 2 (-) quality studies to suggest that closing or reducing the capacity of roads can lead to long-term increases in levels of walking within the area of the scheme. One 2 (-) quality study suggests that closing or reducing the capacity of roads can lead to increases in cycling.

Evidence from three 2 (-) quality studies would suggest that it is important that a wider range of measures is introduced to support road closures.

There is some evidence to suggest that the setting of the delivery of the intervention through location in city or town centres can lead to short-term increases in cycling and long-term increases in walking.

There is evidence from two 2 (-) quality studies that closing or restricting use of roads can result in a decrease in road traffic casualties.

There is some evidence to suggest that more intense interventions can lead to long-term increases in walking and cycling. This evidence is likely to be applicable in the UK, with appropriate adaptations.

Evidence statement T4

There is evidence from one 2 (++) and one 2 (-) quality study to suggest that introduction of road user charging schemes and changes to the road system can lead to short-term increases in levels of walking and long-term increases in cycling within the area of the scheme.

There was evidence of either no change or a decrease in road traffic casualties as a result of the road user charging interventions. The evidence comes from UK studies and so is directly applicable.

Evidence statement T5

Evidence from one 2 (+), three 2 (-), one 3 (++), and two 3 (-) quality studies suggests that the introduction of cycle infrastructure can lead to long-term increases in levels of cycling within the area of the scheme.

Cycle infrastructure interventions may result in important positive public health outcomes alongside increasing cycling, notably a reduction in cycle casualties.

It appears that cycle infrastructure in both urban and rural areas can be effective in increasing cycling. It is likely that this evidence is applicable to the UK, with appropriate modification for existing infrastructure and cultural issues.

Evidence statement T6

There is evidence from one 2 (+) and one 3 (+) quality study to suggest that introduction of safe routes to schools schemes can lead to short-term increases in levels of walking and cycling within the area of the scheme. This evidence may be applicable to the UK with some caution.

Evidence statement UP1

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.

Evidence statement UP2

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.

Evidence statement UP3

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 and long term. Overall, based on two 3 (+) studies, the evidence tends to suggest that trail surface, length and maintenance influence trail use and attitudes towards trails.

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.

Evidence statement UP4

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.

Evidence statement UP5

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.

Evidence statement UP6

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 [who were] previously active.

Evidence statement NE 1

There is insufficient evidence to draw any conclusions on the effect of interventions involving changes to the physical environment and design features of woodland areas on physical activity outcomes. There is, however, evidence from one 3 (-) quality, post-only study to suggest that building creative features along a woodland trail may increase visitor numbers.

Evidence Statement NE2

There is insufficient evidence to draw any conclusions on the effect of interventions involving changes to the physical environment and design features of coastal areas on physical activity outcomes. There is, however, evidence from one 3 (-) quality, post-only study to suggest that improving a coastal path may increase frequency and duration of visits.

Evidence statement P1

The evidence from one 3 (-) study suggests there may be an association between national policies on physical activity which include a focus on improving the environment, and increased recreational physical activity and sport.

Evidence statement P2

The evidence from one 3 (-) study suggests there may be an association between national transport-related policies that include an environmental modification component and improved levels of walking and cycling compared to countries without such policies.

Evidence statement P3

The evidence from one 3 (-) study suggests there may be an association between national spatial planning policies and levels of walking and cycling, particularly in more urbanised areas.

Evidence statement BD1

The evidence from three studies: one 1 (+), one 2 (+) quality, and one 2 (-) quality, suggests that interventions that include changes to the built environment of a worksite may lead to both short and long-term changes in levels of physical activity

From this set of studies, conducted in diverse settings and involving different worksites and different interventions, it is difficult to interpret any clear trends on how the content of the intervention may have influenced effectiveness. It does appear, however, that the provision of facilities or trails for walking, jogging or cycling, and improvements to existing or provision of new facilities (such as new space, improved equipment, or improved aesthetics [painting, carpet]) may lead to increases in use and/or levels of physical activity.

Evidence statement BD2

The evidence from two 2 (+) quality studies aimed at improving the physical environment of a stairwell by physical improvements such as carpets, painting

and addition of art work may lead to increases in stairwell usage in the short term.

Evidence statement BD3

The evidence from three studies: one 1 (++) RCT and two 2 (++) controlled before and after studies suggests that colourful/fluorescent markings painted on a school playground can lead to objectively assessed increases in variables related to physical activity during playtime, such as time spent in moderate/vigorous physical activity, time spent in vigorous activity and total energy expenditure during play, in the short term. However, there is no evidence available to assess the effect of school playground markings on physical activity beyond 4 weeks post implementation.

Expert report: 'Environmental correlates of physical activity and walking in adults and children: a review of reviews' (Bauman and Bull 2007)

- Environments and physical activity
There are reasonably consistent associations between physical activity levels and the accessibility of physical activity and other facilities, the density of residential areas, land use mix and urban 'walkability' scores. There are also reasonably consistent links between physical activity levels and the perceived safety of an area and the availability of footpaths or equipment for exercising. There were less clear links between physical activity levels and the aesthetic features of the environment, topographic factors and perceived levels of crime.
- Environments and walking
The correlates for walking are more similar than different to those found for general physical activity, although there are some differences between walking for exercise and walking to reach a destination.

Cost-effectiveness evidence

Overall, the walking and cycling infrastructure, stair signage and painted school playgrounds were all considered cost effective (although this was based on the limited effectiveness evidence available).

Interventions involving the walking and cycling infrastructure could help people to avoid long-term chronic diseases, leading to incremental cost-effectiveness ratios (ICERs) of approximately £130– £25,000 per quality of life year (QALY). When additional, short-term improvements in wellbeing are taken into account, ICER estimates range from £90– £9400.

A cost–benefit analysis (CBA) of the cycling infrastructure generated a standardised cost–benefit ratio of 1:11 which, from a transport perspective, is very cost effective.

Lack of data meant that a number of assumptions had to be made, particularly when translating proxy measures for physical activity (for example, the number of cyclists or walkers) into the physical activity intensity levels required to benefit health over the short and longer term. However, sensitivity analyses demonstrated that the assumptions and estimates would not markedly affect the ICER per QALY estimates generated in the main report.

Where physical activity was not the main aim (for example, where an intervention aimed to reduce traffic accidents or congestion) the physical activity benefits could be considered to be free. However, it may be argued that once these benefits are identified and included in a cost–benefit analysis, their contributing costs need to be taken into account. Promoting physical activity through these types of intervention is likely to incur only a small, additional cost.

Fieldwork findings

Fieldwork aimed to test the relevance, usefulness and the feasibility of implementing the recommendations and the findings were considered by the PDG in developing the final recommendations. For details, go to the fieldwork section in appendix B and visit the NICE website at: www.nice.org.uk/PH008

Fieldwork participants were very positive about the recommendations and their potential to help promote physical activity. Although many said they were overwhelmed with guidance on how to do their jobs, they welcomed this endorsement and recognition from the health sector of the links between

physical activity and the environment They thought it was highly appropriate that NICE should issue such guidance and believed that the Institute's reputation and authority would maximise the impact of the recommendations.

There was a very strong feeling among participants that many of the recommendations appeared to re-state existing policy or legislation, but were not explicitly linked to existing policy documents. They suggested that NICE would have a greater impact if it worked to influence policy and connected its work to existing and new policy and legislation.

Appendix D: gaps in the evidence

The PDG identified a number of gaps in the evidence related to the programme under examination, based on an assessment of the evidence. These gaps are set out below.

1. There is a lack of good quality studies which identify changes in an individual's overall physical activity levels (taking all their activities into account) using valid pre and post-intervention measures.
2. There is a lack of evidence on the broader geographical impact of interventions (including unintended impacts, either positive or negative). This is particularly important for transport interventions.
3. There is a lack of evidence on how environmental interventions affect physical activity levels in rural settings. There is also a lack of evidence on the effect of environmental interventions specific to rural areas.
4. There is little evidence on the differential impact that interventions can have on different social groups. This includes people of different ages, sex, ethnicity, religion, disability and sexual orientation.
5. There is a lack of evidence on how environmental interventions can impact on physical activity levels in the UK.
6. There is a lack of evidence on the long-term effect of interventions to change behaviour.
7. Appropriate methodologies and assessment tools are needed to measure how environmental policies and projects can help increase people's physical activity levels, thereby improving their health.
8. There is a lack of good quality evidence on the impact of changes made to the natural environment.
9. There is a lack of good quality evidence on how environmental changes within schools (such as the introduction of bike sheds) can

affect pupils' physical activity levels. The only good quality evidence relates to changes made to primary school playgrounds.

10. There is a lack of evidence on how environmental changes in the workplace (other than modifications to stairwells) can affect employees' physical activity levels. Other changes that could be evaluated include the introduction of travel-related facilities, such as secure bicycle parking and showers, or modifications to the layout of the workplace to encourage more physical activity during the day.
11. There is a lack of evidence on the cost-effectiveness of interventions involving environmental change. In addition, the economic studies that are available use different methods, making comparisons difficult.

The Group made two recommendations for research. These are listed in section 5.

Appendix E: supporting documents

Supporting documents are available from the NICE website (www.nice.org.uk/PH008). These include the following.

- Reviews of effectiveness:
 - ‘Physical activity and the environment review one: transport review’
 - ‘Physical activity and the environment review two: urban planning and design review’
 - ‘Physical activity and the environment review three: natural environment review’
 - ‘Physical activity and the environment review four: policy review’
 - ‘Physical activity and the environment review five: building design review’.
- Expert report:
 - ‘Environmental correlates of physical activity and walking in adults and children: a review of reviews’.
- Economic analysis:
 - ‘A Rapid review of economic literature related to environmental interventions that increase physical activity levels in the general population’
 - ‘An economic analysis of environmental interventions that promote physical activity’.
- Equality impact assessment:
 - ‘Physical activity and environment guidance – equality impact’.
- A quick reference guide (QRG) for professionals whose remit includes public health and for interested members of the public. This is also

available from the NHS Response Line (0870 1555 455 – quote reference number N1444).

For information on how NICE public health guidance is developed, see:

- ‘Methods for development of NICE public health guidance’ available from: www.nice.org.uk/phmethods
- ‘The public health guidance development process: an overview for stakeholders including public health practitioners, policy makers and the public’ available from: www.nice.org.uk/phprocess