

Health, place and nature

**How outdoor environments influence health and well-being:
a knowledge base**



Contents

1. Executive Summary	3
2. Introduction	3
2.1 Rationale	3
2.1.1 Challenges to health	4
2.2 Sustainable development.....	5
2.3 Scope	6
2.4 Approach	7
2.5 How to use this document	7
3. Knowledge base – how outdoor environments influence health and well-being	8
3.1 Aspects of the outdoor environment that influence health (direct)	8
3.1.1 Natural spaces.....	8
3.1.2 Air pollution.....	10
3.1.3 Road traffic.....	10
3.1.4 Noise.....	11
3.1.5 Floods	11
3.1.6 Climate	11
3.2 Aspects of the outdoor environment that influence health (indirect)	12
3.2.1 Accessibility.....	13
3.2.2 Safety and incivilities.....	14
3.2.3 Mixed land-use	15
3.2.4 Street design	16
3.2.5 Natural spaces.....	16
4. Conclusion	19
Glossary	20
References.....	22

1. Executive Summary

The health of the UK population continues to improve, measured in terms of increasing life expectancy and decreasing infant mortality. However, significant problems remain. Health inequalities persist and obesity-related diseases are increasing. Poor health is expensive to the economy. For example, mental illness costs the UK an estimated £76 billion each year, obesity up to £3.7 billion per year.

Sustainable development aims to ensure a strong, healthy and just society while living within environmental limits. It also takes into account a sustainable economy, good governance and sound science. Within the context of sustainable development, this document examines the contribution of aspects of the outdoor environment (both natural and built) to health. It draws together evidence to provide a comprehensive knowledge base to be used by those promoting a more sustainable approach to the natural and built environment and health.

This knowledge base shows that exposure to natural spaces – everything from parks and open countryside to gardens and other greenspace – is good for health. Contact with natural spaces can improve health directly and indirectly (by, for example, encouraging physical activity and social contact). It has been suggested that the percentage of greenspace in a person's residential area is positively associated with their perceived general health.

Direct effects of the environment around us – such as noise, air quality and floods – can influence health. Road traffic remains a particular problem, affecting air quality and road casualties. Air pollution in the UK, mainly from traffic emissions, is estimated to reduce life expectancy by about seven to eight months and to cost up to £20.2 billion per annum. Road traffic is responsible for more than 250,000 road casualties a year, of which more than 3,000 incidents result in death.

The outdoor environment can also indirectly influence health by determining our behaviour and opportunities. The natural environment may have a role to play in tackling obesity. Research from across Europe found people living in areas with high levels of greenery to be three times more likely to be physically active and 40 per cent less likely to be overweight or obese than those living in areas with low levels of greenery. The location of shops and services, and the travel connections to them, can determine whether people attend healthcare appointments and influence levels of physical activity and social contact. The environmental quality and perceived safety of an area has been shown to influence levels of activity in the local population – the higher the perceived level of crime and the more litter and graffiti an area has, the lower the level of physical activity.

This document demonstrates that, for people to be healthy, the environment around us must be health enhancing and provide opportunities to live a healthy life. It is acknowledged that the evidence base is incomplete, but conclude that research findings to date about the health impacts of the outdoor environment are sufficient to warrant action. To improve health and reduce health inequalities it is vital to ensure that the natural environment is protected and enhanced and that communities are built and maintained to be truly sustainable.

2. Introduction

2.1 Rationale

The aim of sustainable development is to ensure a strong, healthy and just society while living within environmental limits. Although population health is, in general, improving, significant health problems, with associated costs to the public purse, remain. Many of these health problems are influenced, directly or indirectly, by the environment around us. In turn, our behaviour can affect the environment upon which our health depends. It is therefore in our own interest to

create and maintain environments that can support and promote human health.

By first identifying the health problems affecting the UK population, this document then examines how they are influenced by the outdoor environment around us.

2.1.1 Challenges to health

Health and well-being have contested definitions. Here we use the World Health Organisation's definition of health, which states that 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.¹ Well-being is recognised as a broader concept, being commonly understood by government as 'a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity. It requires that basic needs are met, that individuals have a sense of purpose, that they feel able to achieve important personal goals and participate in society. It is enhanced by conditions that include supportive personal relationships, strong and inclusive communities, good health, financial and personal security, rewarding employment, and a healthy and attractive environment'.²

As Social Trends 2007 shows, health in the UK is generally improving with infant mortality levels at their lowest ever and life expectancy at its highest.³ However, particular challenges remain:

➤ **Healthy life expectancy**

Although life expectancy in the UK is increasing, healthy life expectancy is increasing at a slower rate. Between 1981 and 2002, life expectancy at birth rose for both males (by 5.1 years to 76.0) and females (by 3.7 years to 80.5). However, during this period healthy life expectancy rose by only 2.8 and 3.2 years for males and females respectively. So while people are living for longer, they are also suffering poor health for longer – and this is particularly apparent in males.⁴ The proportion of people in England who consider themselves to be in poor health is slightly higher than it was in the mid-1990s.⁵

➤ **Health inequalities are increasing**

The Government's most recent figures on health inequalities (data from 2004-06) show that, although life expectancy has increased in all areas for both men and women, it has increased more slowly in more deprived areas. Since the 1995-97 baseline, the relative gap in life expectancy between England and the fifth of areas with the worst health and deprivation indicators has increased by two per cent for males and by eleven per cent for females.⁶

For infant mortality, the figures show the infant mortality rate among the routine and manual group was 17 per cent higher than in the total population in 2004-06. This compares with 13 per cent higher in the baseline period of 1997-99.⁷

These figures indicate that a significant challenge remains in order to meet the Government's public service agreement (PSA) target to reduce health inequalities, as measured by infant mortality and life expectancy at birth, by ten per cent by 2010.

➤ **Incidence of certain diseases is increasing**

- *Mental illness*

In Great Britain, mental health disorders affect about one in six of the adult population. Anxiety with depression is the most common disorder.⁸ For children, about one in ten 5-16 year olds are diagnosed with a mental disorder.⁹ The World Health Organisation predicts that depression will become the second most prevalent cause of ill health worldwide by 2020.¹⁰ Mental ill health can also negatively affect physical health and is associated with health damaging behaviors such as smoking and alcohol consumption.^{11 12 13}

- *Obesity related illnesses*

Obesity is associated with cardiovascular disease, diabetes, osteoporosis, certain cancers and premature death. The prevalence of obesity has trebled over the last two decades,¹⁴ so that the UK now has the highest obesity levels in the European Union.¹⁵ Levels of obesity in the UK vary from 27 per cent of women being obese in Scotland¹⁶ to 17 per cent of males being obese in Northern Ireland.¹⁷ In England in 2005 nearly a quarter of

men and women were obese.¹⁸ The UK Government's Foresight programme has predicted that by 2050, 60 per cent of men, 50 per cent of women and 25 per cent of children under 16 in Britain could be obese.¹⁹ The burden of disease associated with Foresight's predicted rise in obesity could increase levels of diabetes by more than 70 per cent, stroke by 30 per cent and coronary heart disease by 20 per cent.

- *Diabetes*

Between 1994-2003 in England, the prevalence of diabetes has increased by nearly two-thirds among men and has almost doubled among women.²⁰ It is forecast that one in twenty of the English population will have diabetes by 2010²¹ and one in ten of the Scottish population within 25 years.²²

2.1.2 The cost of ill health

The cost of some of these health problems has been calculated (Figure 1).

The cost of ill health is expected to rise. In 2002, Derek Wanless estimated that failure to realise what he called a 'fully engaged scenario', including a stronger emphasis on preventing ill health, would cost the NHS an extra £30 billion a year by 2022-23.²³

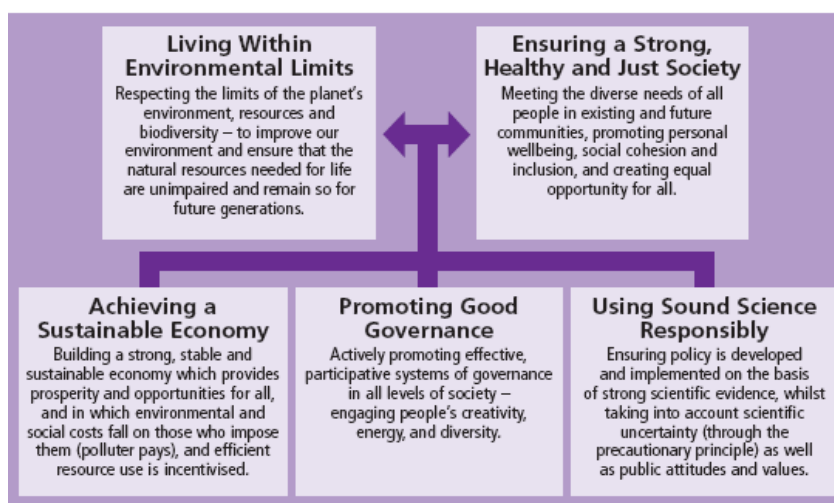
2.2 Sustainable development

Sustainable development provides a framework to achieve and maintain a strong, healthy and just society, whilst respecting environmental limits, through using sound science responsibly, promoting good governance and achieving a sustainable economy (Figure 2).

Figure 1: Table to show costs of some health problems in England

	Health and social care	Wider economy	Total
Mental ill health	£12 billion/annum ²⁴	£64 billion/annum ²⁵	£76 billion/annum
Obesity	>£1 billion/annum ²⁶	> £2.3 billion/annum ²⁷	>£3.7 billion/annum
Diabetes	£1.3 billion/annum ²⁸	Unknown	> £1.3 billion/annum

Figure 2: Guiding principles of sustainable development



The current health scenario in the UK is not in line with the desired outcomes of sustainable development. This knowledge base therefore aims to look at some of the environmental determinants that could influence, and improve, population health.

The UK Sustainable Development Strategy²⁹ sets out the following priority areas for immediate action:

- Sustainable consumption and production
- Climate change and energy
- Natural resource protection and environmental enhancement
- Sustainable communities.

This document focuses on the health aspects of two of these priorities - sustainable communities and natural resource protection and environmental enhancement.

2.3 Scope

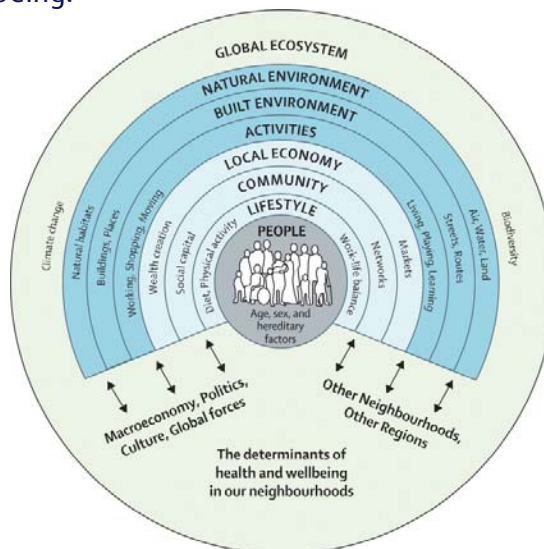
It is recognised that human health is affected by the world around us. The 2004 *Choosing Health* white paper states, 'The environment we live in, our social networks, our sense of security, socio-economic circumstances, facilities and resources in our local neighbourhood can affect individual health'.³⁰ This is illustrated in the Health Map (Figure 3) below, which highlights the natural and built environment as part of the wider determinants of health and well-being.

This knowledge base explores the relationship between the outdoor environment and health. The 'outdoor environment' is defined in terms of the physical aspects of the built and natural environment, excluding the buildings themselves and the indoor environment. This includes air quality, natural spaces, urban design, transportation systems and land-use.

We look at aspects of the outdoor environment that directly and indirectly influence health. Direct health impacts are understood here to mean features of the environment that affect a person's health regardless of their behaviour; indirect impacts are understood to be intermediate factors that affect a person's choices and behaviours that then influence their health. However, it is recognised that the two are inter-related.

We focus on a selection of features of the outdoor environment that influence health, which have been chosen due to their prevalence in the literature and to build on previous evidence bases by, for example, the Royal Society for the Protection of Birds (2004, 2007),³¹ Royal Commission on Environmental Pollution (2007),³² Newton (2007)³³ and Rao (2007).³⁴ These features are natural spaces, air pollution, road traffic, noise, floods, climate, accessibility, safety and incivilities, mixed land-use and street design.

Figure 3: Health Map (Barton and Grant, 2006)³⁵



2.4 Approach

This project involved a comprehensive review of the literature investigating the links between the outdoor environment and health. A 'snowball method' of literature review was conducted, looking at the reference lists of key articles and documents. Where key documents cited other literature, the original source of information was acquired, where possible. As part of information gathering, policy staff met with key stakeholders to share information, gain support and guide the project.

In deciding which studies to use, peer-reviewed, published literature was given preference, alongside evidence from reputable sources such as the World Health Organisation and the Office of National Statistics. The most recent evidence was preferred (post-2000), although on occasion older studies were included in areas where subsequent research has been limited. Studies from across the world have been used, and their country of origin referenced in the text. UK literature has been sought in all cases, and where it is not available this has been noted.

Due to limits on time and resources, a systematic review of the literature has not been conducted, and individual studies have not been assessed on methodology or sample size, although where other research has done this, this has been reflected in the text. Areas where the evidence is considered weak or in need of further exploration have been identified. In illustrating the relationship between the outdoor environment and health, we acknowledge that there will be confounding factors that make it difficult or impossible to trace causality. However, we believe that the evidence, taken together, demonstrates how human health can be affected by the outdoor environment.

This knowledge base has been peer-reviewed by key stakeholders, both individuals and organisations.

2.5 How to use this document

This knowledge base and the accompanying slide-set are intended to bring together information on health and the outdoor environment to be used as tools by policy makers, practitioners and others who are interested in helping to make the case for sustainable development.

3. Knowledge base – how outdoor environments influence health and well-being

As approximately 80 per cent of the UK population live in urban areas (defined as an area with a population over 10,000 people),³⁶ the growing evidence of the relationship between the built environment and health gains particular significance.³⁷ The World Health Organisation (WHO) believes that urban planning is a significant determinant of health and recognises that attempts to change behaviour without changing social, economic and environmental conditions are likely to have little success.³⁸ According to the WHO, the characteristics of a healthy urban area include:

- A clean, safe physical environment of high quality
- Stable and sustainable ecosystems
- A strong, mutually supportive, integrated and non-exploitative community
- A high degree of participation and control by inhabitants over decisions affecting their lives, health and well-being
- Basic needs of all inhabitants met (in terms of food, water, shelter, income, safety and employment)
- Access to a wide variety of experiences and social and cultural resources
- A diverse, vital and innovative urban economy
- Enabling connections with the cultural and biological heritage of the various urban inhabitants
- An urban form that is compatible with enhancement of all the other specified characteristics
- An optimum level of appropriate public health and care services accessible to all
- High levels of positive health outcomes and low levels of morbidity.³⁹

Conditions of the local neighbourhood in which people live can influence well-being as well as health. In 2004/05, the aspects of the neighbourhood that householders in England were least satisfied with were: opportunities and

facilities for children and young people, local amenities, parks and leisure facilities, public transport services and levels of crime and vandalism.⁴⁰ It is often the poorest people who experience the poorest quality environments. In 2004, 20 per cent of the lowest income group lived in poor quality environments compared to 11 per cent of those in the highest income distribution group.⁴¹

From 2008, the majority of the world's population will live in urban areas,⁴² those which by definition have less nature than rural ones. It has been suggested that, by reducing contact with natural spaces, this trend towards urbanization may reduce levels of well-being.⁴³

This document explores how the outdoor environment influences physical and mental health. Section 3.1 looks at some of the direct health impacts of natural and built environment factors such as air pollution, road traffic and natural spaces, and section 3.2 explores the indirect health impacts of factors such as safety, accessibility and street design.

3.1 Aspects of the outdoor environment that influence health (direct)

Various dimensions of the outdoor environment – such as the air we breathe and the scenery around us – can directly influence our health and well-being. Here we explore the direct health impacts of natural spaces, road traffic, air pollution, noise, floods and climate.

3.1.1 Natural spaces

Exposure to natural spaces (everything from parks and open countryside to gardens and other greenspaces) has generally been found to have positive benefits for mental and physical health.⁴⁴

Studies have found that people with access to nearby nature are generally healthier than those without.^{45 46} It has been suggested that mental health is generally better in rural rather than urban areas, and that populations in urban areas with gardens and greenspace have fewer mental health problems.⁴⁷ A Dutch study of 10,000 people

suggested that, when assuming a causal relationship between greenspace and health, a ten per cent increase in greenspace in the living environment can lead to a decrease in health complaints equivalent to a reduction in age of five years.⁴⁸ This study found that it is the total amount of greenspace (rather than the type of greenspace) that is important for health.⁴⁹ More recent Dutch research has corroborated this finding, similarly concluding that the percentage of greenspace in a person's residential area is positively associated with their perceived general health, a relationship that is strongest for lower socioeconomic groups.⁵⁰

An Australian review of the empirical, theoretical and anecdotal evidence concluded that contact with nature specifically impacts positively on blood pressure, cholesterol, outlook on life and stress reduction.⁵¹ Natural spaces have also been found to benefit well-being; a literature review concluded that the human response to nature includes feelings of pleasure and interest and a reduction in anger and anxiety.⁵² Natural spaces have also been shown to have a restorative effect, helping people recover more quickly from attention-demanding tasks.^{53 54}

A report in 2004 from the Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment, that controlled for confounding factors such as age, sex and socio-economic differences, concluded that natural spaces play a role in recovery from stress and can benefit concentration and mood. They also agree that contact with nature can enhance child development, by encouraging recovery from stressful experiences and providing opportunities for exploration. In adults too it is suggested that contact with nature provides opportunities for personal development and well-being, stimulating feelings of relaxation, autonomy and competence.⁵⁵ This conclusion is supported by a study of urban public housing residents in Chicago who were randomly assigned to buildings with and without natural spaces (trees and grass) nearby. Residents living in the building without nearby trees and grass reported more procrastination in

facing their problems and assessed their issues as more severe, less soluble and more long standing than the residents living in greener surroundings.⁵⁶

So it would appear that there is a broad body of evidence to support the statement that natural spaces directly benefit health. This is a view shared by Natural England, who are working to promote the health benefits of the natural environment to primary care practitioners, and the Royal Commission on Environmental Pollution who state,

'From our evaluation of the evidence, we are strongly persuaded that access to good quality greenspace provides an effective, population-wide strategy for the promotion of good health, wellbeing and quality of life....We are convinced that the evidence is sufficiently strong to warrant amending planning guidance to recognise the health benefits of greenspace and to build greenspace into new and existing developments'.⁵⁷

A number of studies have tested the hypothesis that exposure to nature is beneficial in a variety of organisational settings. In the most famous study Ulrich compared the recovery time for patients following gallbladder surgery. Patients with a view of trees stayed in hospital for approximately one day less than patients with a view of a wall. They also required fewer and weaker painkillers.⁵⁸ In another study the wall of a clinic waiting room was either decorated with a large mural depicting a view of distant mountains and trees or left blank on alternate days. Patients felt calmer or less stressed on the mural days.⁵⁹ A study with prison inmates concluded that prisoners who have a view of nature from their cells use healthcare facilities much less than other prisoners.⁶⁰ Another study suggested that Alzheimer's patients with regular access to a garden were less troubled by negative reactions and fits of anger than patients without access to a garden.⁶¹ Despite the lack of more recent studies in this area, when taken in

conjunction with the breadth of research demonstrating the relationship between the natural spaces and health, this evidence does point towards benefits of exposure to nature in organisational settings.

Areas for further exploration: That natural spaces have a positive effect on health is largely agreed in the literature, although the *extent* to which contact with nature can contribute to human health and well-being is considered by some to need further investigation.⁶² It should be noted that the 2004 Dutch report offered some caution about the link between natural spaces and general health, stating that, with the exception of two studies, there was no methodologically sound empirical evidence, although it does concede that there are consistent 'clues' demonstrating this relationship.⁶³ It is also worth noting that the majority of the research in this area is from outside the UK and that more research in this country might strengthen the case even further.

The indirect health impacts of natural spaces (such as encouraging physical activity and social contact) are covered in section 3.2.5 below.

3.1.2 Air pollution

Between 1990 and 2005, emissions of air pollutants (for example, ammonia, particulates and sulphur dioxide) have reduced greatly. Air pollution from road transport has decreased by about 50 per cent in the last decade.⁶⁴ However, ozone levels (thought to have, along with particulates, the most significant impact on population health) have not decreased to the same extent and continue to fluctuate.⁶⁵

In spite of recent reductions, in 2005 air pollution was estimated to reduce life expectancy by about seven to eight months and cost up to £20.2 billion per annum.⁶⁶ In Great Britain in 1995/6 air pollution was estimated to have contributed to 24,000 premature deaths in vulnerable people.⁶⁷ The negative health effects of air pollution are likely to be exacerbated in the most vulnerable, including children. A review of the international evidence on the environment and children's health

and well-being shows that increased levels of air pollutants are associated with conditions such as infant mortality, lung growth problems and asthma exacerbation.⁶⁸

In UK towns and cities today, air quality is affected mainly by traffic and, in some areas, industrial emissions.⁶⁹ A systematic review by the World Health Organisation cited an extensive list of the adverse health effects of transport-related air pollution in Europe, including: mortality, asthma, rhinitis, cardiovascular disease, cancer, adverse pregnancy and birth outcomes and lower male fertility.⁷⁰ Despite citing areas in need of further research, the WHO concludes that the health benefits of a reduction in air pollution warrant immediate action, including considering the health impacts of urban planning, to reduce exposure to transport-related air pollution.⁷¹ However, they warn that, while technology and regulation can help reduce transport-related pollution, the growth of transport, expansion of urban areas and traffic congestion may offset these benefits.

A number of factors influence the level of exposure to air pollution and the relationships between them are complex. Research indicates that distance between roads, housing and workplaces, weather conditions, volume of traffic and mode of transport influence the level of exposure to air pollution.⁷² In England, the most deprived wards tend to have the highest levels of air pollution from particulates and nitrogen dioxide, pollutants commonly associated with vehicle emissions.⁷³ A similar conclusion was reached in a Canadian study that looked at air pollution, income and mortality. They found that pollution levels were higher in lower income areas and that income and air pollution levels were correlated with mortality.⁷⁴

3.1.3 Road traffic

As seen in section 3.1.2 above, road traffic makes a considerable contribution to air pollution, which has a serious impact on population health. In addition, there are risks of road traffic accidents and deaths. In 2006, 258,404 people were killed or injured in road accidents in the UK.⁷⁵ Of these 3,172 people were killed, 28,673 were seriously

injured and 226,559 were slightly injured.⁷⁶ In addition, in the same year there were 30,982 pedestrian casualties, of which 675 people were killed. In 2005, the risk of a child dying in a road traffic accident was higher as a pedestrian (61 per cent) than as a car passenger (17 per cent).⁷⁷ According to the Institute for Public Policy Research, children in the ten per cent most deprived wards in England are more than three times as likely to be hit by a car than children in the ten per cent least deprived wards.⁷⁸ A study using American, Danish, Dutch and British data sets found, contrary to the expected, that increasing the number of people cycling and walking improves road safety, as a motorist is less likely to be involved in a collision.⁷⁹ The authors suggest that this is because motorists take more care when driving in areas with more people cycling and walking.

3.1.4 Noise

In the decades between 1984/85 to 2004/05 in England and Wales, the number of complaints about noise from road works, construction and demolition increased three and a half times, and complaints about noise from industrial and commercial premises nearly doubled over the same period.⁸⁰ However, this may reflect a public tendency to complain more, as well as an increase in noise.

In addition to causing annoyance and sleep disturbance, persistent environmental noise can have negative impacts on health, for example, contributing to heart disease, hearing impairment and poor mental health.^{81 82 83} The HYENA project (Hypertension and Exposure to Noise near Airports) found that in residents living around four European airports (including Heathrow) blood pressure levels rose with higher noise levels.⁸⁴ Some evidence suggests that the negative effects of noise may be more profound in children as chronic exposure to noise can lead to poorer reading ability and reduced memory.^{85 86}

A systematic review of 11 studies examining the effects of chronic noise exposure on mental health concluded that for children the results were mixed

– some studies found an association, others did not. The evidence for an effect on specific disorders (e.g. attention deficit hyperactivity disorder) was considered equivocal.⁸⁷ This same study concluded that for adults, road traffic noise was associated with anxiety, but not depression, over a five-year period.

3.1.5 Floods

At present around five million people living in two million properties on floodplains along rivers, estuaries and coasts in England and Wales are at risk from flooding.⁸⁸ Housing developments on or close to floodplains and flood risk areas will be vulnerable to flooding, and climate change is likely to increase the risk of flooding. Foresight calculate that the number of people at high risk from future coastal and river flooding in England and Wales could double from 1.6 million today, to more than three million by 2080.⁸⁹ Increased risk of flooding means increased risk of negative health impacts from flooding. The immediate health impacts of a flood event range from risk of drowning to stress. Exposure to polluted flood water can increase the risk of respiratory illness, stomach upsets and high blood pressure.^{90 91 92}

The health impacts of flooding are often felt long after the flooding event. Damage to properties and subsequent difficult living conditions can have a major impact on an individual's health and well-being. This psychological distress may explain the increase in insomnia, depression and non-prescription drugs and alcohol use often seen after a flood event.^{93 94}

3.1.6 Climate

In 2006, the UK's carbon dioxide emissions (excluding international aviation and shipping) totalled 560.7 million tonnes.⁹⁵ These emissions contribute to global climate change, which will have health impacts in the UK. These include an increased risk of heat-related deaths, food poisoning and increased exposure to UV radiation with a subsequent increase in skin cancer and cataracts.⁹⁶ More deaths and severe injuries caused by the increased incidence of extreme weather events such as winter gales and flooding

[see section 3.1.5 above] can also be expected.⁹⁷ It has been suggested that dense urban areas may especially suffer from increased temperatures – the so-called urban heat island effect. It is estimated that central London temperatures on summer nights can be 5-6°C hotter than surrounding areas.⁹⁸

Walking, cycling and using public transport, rather than travelling by car, can reduce carbon dioxide emissions, helping to mitigate climate change and bring associated benefits such as reduced risk of obesity, fewer road traffic accidents [see section 3.1.3] and less air pollution [see section 3.1.2].⁹⁹

3.2 Aspects of the outdoor environment that influence health (indirect)

Aspects of the outdoor environment can also indirectly influence our health by, for example, making physical activity in the form of walking/cycling easy and attractive and facilitating social contact. This section looks at particular features of the outdoor environment that influence our lifestyle choices and indirectly influence our health: accessibility, safety and incivilities, mixed land-use, street design and natural spaces.

Physical activity is a current focus of the government's fight against obesity and its efforts to improve and maintain population health. Physical activity can help prevent or manage more than 20 conditions and diseases.¹⁰⁰ The health benefits of physical activity include:

- reducing the risk of developing heart disease, colon cancer and type II diabetes
- helping to prevent/reduce osteoporosis
- promoting psychological well-being, reducing stress, anxiety and feelings of depression and loneliness.¹⁰¹

In England in 2006, 60 per cent of men and 72 per cent of women were failing to achieve the recommended minimum of 30 minutes of moderate activity five times a week.¹⁰² According to the National Institute for Health and Clinical Excellence, the health impact of this inactivity in terms of coronary heart disease is comparable to that of smoking.¹⁰³ The cost of physical inactivity in

England is estimated at £8.2 billion/year, including the costs of treatment for lifestyle-related diseases and sickness absence. This is in addition to the costs of obesity – an estimated £3.3-3.7 billion/year.¹⁰⁴ It is estimated that obesity accounts for 18 million sickness absence days per year.¹⁰⁵ The Department of Health notes that if levels of inactivity were reduced by just five per cent, £300 million could be saved per year.¹⁰⁶ The Forestry Commission calculated that reducing the UK's sedentary population by one per cent could save 1,063 lives per year and deliver a social benefit of up to £1.44bn per year (£479m if people over 75 years of age were excluded from the calculation).¹⁰⁷ Seventy percent of the benefit was attributed to reduced mortality from coronary heart disease.

The Chief Medical Officer makes the connection between physical activity and the environment, 'A mass shift in current activity levels is needed. This will only be achieved if people see and want the benefits but also if opportunities are created by changing the physical and cultural landscape – and building an environment that supports people in more active lifestyles'.¹⁰⁸

This view is echoed by the World Health Organisation.¹⁰⁹ Incorporating 30 minutes of physical activity into daily routine may best be achieved through active travel – walking and cycling. For children, play is an important component of physical activity.¹¹⁰ A review of physical activity intervention programmes showed that previously sedentary adults can increase and sustain activity levels through exercise that is enjoyable, does not require attendance at a facility and can be incorporated into daily life, along with initial personal instruction and support. It concluded that walking was the activity most likely to fit these criteria. However, none of the trials examined were in the UK.¹¹¹ A Dutch study concluded that neighbourhood characteristics are associated with levels of physical activity;¹¹² a finding supported by research from the United States that found characteristics of the outdoor

environment to be associated with the frequency of walking in older people.¹¹³ There is growing agreement that an outdoor environment conducive to active travel would have neighbourhoods that are dense, mixed use, easily accessible, with a high quality green infrastructure¹¹⁴ and that are safe and attractive.^{115 116} Some of these elements are explored in more detail below.

Interest is growing in how environments can be 'obesogenic', i.e. the role environmental factors may play in determining both energy intake and expenditure.¹¹⁷ The Foresight project, *Tackling Obesities: Future Choices*, recently concluded that changes to the environment are necessary to support behaviour changes, such as increasing physical activity, to tackle obesity. They recognise that, although environmental changes such as transport infrastructure can be costly, they are more likely to reduce risks of obesity in a sustainable way. The Department of Health Public Health Research Consortium argues more strongly that an obesogenic environment is likely to be the primary cause of the recent increase in obesity, and that changes to the environment will be essential in changing behaviour and reversing this trend.¹¹⁸ The International Obesity Taskforce similarly states that, although certain individuals are genetically more susceptible to obesity, the major causes of obesity for the majority of the population are environmental; they blame the 'toxic environment' – that which simultaneously restricts mobility and stimulates high energy intake.¹¹⁹

Physical activity has been associated with reduced anxiety and depression, improved mood and self esteem and better cognitive functioning.^{120 121} Some have concluded that a programme of exercise can be as effective in treating mild to moderate depression as antidepressants.^{122 123} Participation in exercise therapy and 'green' exercise (exercise taken in natural spaces) programmes has been shown to have psychological benefits.^{124 125}

Areas for further exploration: Foresight supports the notion that the environment can have an

impact on levels of physical activity and obesity, but cautions that the evidence is limited, and that its influence is probably small in comparison to sociodemographic variables.¹²⁶ The Department of Health Public Health Research Consortium also calls for more research into the environmental determinants of obesity.¹²⁷

International research has shown that getting out and meeting people (in terms of **social contact and social capital**) can help people live longer and be healthier physically (e.g. lower risk of stroke) and mentally (e.g. lower risk of depression).^{128 129 130 131} ¹³² An American study of undergraduates found that good social relationships were necessary for happiness and that the happiest people were those with the strongest social relationships.¹³³ Conversely, people with fewer social networks and emotional support may be more likely to be obese, experience less well-being and more mental health problems and be at a greater risk of pregnancy complications.^{134 135} A study in Finland found that men with fewer social contacts were at higher risk of mortality from all causes and from heart disease.¹³⁶

The following sections examine in more detail some of the key factors of the outdoor environment that indirectly impact on human health, including those mechanisms that influence levels of physical activity and social contact.

3.2.1 Accessibility

Access to amenities, including healthcare provision, greenspace, shops, work and public transport is important to health. Accessible local facilities, such as shops, pubs, schools and libraries, can provide opportunities for social interaction and help create a sense of community.¹³⁷ By contrast, land use planning that isolates employment locations, shops and services and locates them far from housing areas with inadequate public transport can result in, and reinforce, social exclusion. For example, one in four young people have not applied for a particular job because of transport problems; six per cent of 16-24 year olds turned down further education/training opportunities because of transport difficulties; and 1.4 million people

missed, turned down or chose not to seek medical help because of transport difficulties.¹³⁸ We know that unemployment and poor education are risk factors for ill health.¹³⁹ In these situations elderly, disabled and low income groups can find themselves isolated and/or paying out a higher proportion of their income on transport, reinforcing health inequalities.¹⁴⁰

Between 1995 and 2000, Britain lost approximately one-fifth of its local services, including corner shops, post offices and banks and it is predicted that we will lose a further third over the next decade.¹⁴¹ This decline can result in greater car dependency in more isolated communities, hitting the most vulnerable in society, who are less likely to have access to a car,¹⁴² the hardest.¹⁴³

The location and accessibility of some local services may influence the 'obesogenic' environment in terms of encouraging or discouraging physical activity¹⁴⁴ and providing for a healthy diet. A recent study in northwest England looked at the association between perceptions of the local neighbourhood and physical activity. It found that the perception of access to leisure facilities was associated with physical activity, but perceptions of access to shopping facilities and public transport were not.¹⁴⁵ Another study reported that good access to leisure centres reduced the risk of being obese by 17 per cent.¹⁴⁶

The UK Low Income Diet and Nutrition Survey 2007 found that the nutrient intake for men, women and girls in deprived areas was lower than in other areas. Only 51 per cent reported having enough of the kinds of food they wanted to eat. The main reason cited for not always having the desired kinds of food was not having enough money. Poor availability or quality of food in local shops and difficulty in getting to the shops were also common reasons.¹⁴⁷ However, few associations have been found between shopping at a large supermarket and food/nutrient consumption, and supporting UK research suggests that introducing a supermarket into a deprived area has no positive or negative effect on people's diet.^{148 149}

Areas for further exploration: There is some debate in the literature about the impact of access to healthy or unhealthy food outlets on health, and in particular obesity. Research from North America suggests that the availability of affordable healthy food in low income areas is constrained and that this may be associated with poor diet and obesity.¹⁵⁰ North American evidence has also found a positive association between proximity to a supermarket and fruit and vegetable consumption in low income households.¹⁵¹ However, although there is good evidence of environmental influences on diet and obesity in North America, similar findings are not consistently observed elsewhere in the world, and the Foresight *Tackling Obesities* project calls for more research.¹⁵²

The relationship between access to shops and services and mental health is unclear. A systematic review of the evidence on the effect of the built/physical environment on mental health found it surprising that there were no peer-reviewed journal articles looking at the long-term effects on mental health of major developments such as changes to local facilities and transport infrastructure.¹⁵³

3.2.2 Safety and incivilities

Being safe and feeling safe can influence health. There is a strong correlation between crime, poverty and ill health, a relationship that is complex and entwined, with the poorest communities with high health inequalities also suffering high crime rates.¹⁵⁴ Even though the overall level of households considering crime a serious problem in their area dropped from 22 per cent in 1994/5 to 12 per cent in 2005/06, those living in social rented accommodation were twice as likely to consider it a serious problem.¹⁵⁵

The design of the built environment can influence levels of crime and feelings of safety.¹⁵⁶ Generally it is accepted that people are more likely to maximise use of outdoor space if it is considered safe.¹⁵⁷ A Greenspace Scotland report found that nearly half of the 1,017 Scots interviewed considered their local greenspace unsafe to

exercise in and an unsafe place for their children to play.¹⁵⁸ A study in northwest England found that people who felt safe in their neighbourhoods were more likely to be physically active, although no associations between actual levels of crime (e.g. vandalism, assaults, muggings) and physical activity were found; i.e. perceived rather than actual safety has the largest effect on levels of physical activity.¹⁵⁹ This study concluded that feeling safe was most likely to increase levels of physical activity. Two studies looking at perceived safety and physical activity from the same data sets across eight European cities (not including the UK) similarly concluded that perception of safety was associated with an increase in the likelihood of taking exercise.^{160 161} They also found that the more graffiti and litter present in an area, the less safe people felt, and that high levels of litter discouraged exercise. It has been calculated that residents in areas with high levels of graffiti, litter and dog mess were 50 per cent less likely to be physically active and 50 per cent more likely to be overweight/obese. Analysis of data from the 2003 Health Survey for England suggests that perception of social nuisance in the local neighbourhood increases the risk of obesity and poor self-rated health, whereas positive perceptions of the social environment were associated with higher levels of physical activity, and lower levels of obesity and poor self-rated health.¹⁶² Despite the acceptance that people in general are more likely to use outdoor space if it considered safe, an English study suggested that men's walking habits were not influenced by concerns about safety.¹⁶³

Evidence from the United States suggests that vegetation in the form of trees and grass can reduce levels of crime in poor inner-city areas, although, as the study acknowledges, it is a complex area as other studies have shown dense vegetation to be conducive to criminal activity.¹⁶⁴ The type and level of vegetation is likely to be a mitigating factor. Interventions such as street lighting can also help reduce crime¹⁶⁵ and design that promotes 'eyes on the street' and social cohesion may also help reduce incivilities.^{166 167}

There is strong evidence that greater perceived neighbourhood disorder is associated with poorer mental health.¹⁶⁸ A study looking at features of the built environment and depression in two London wards found a relationship between abundant graffiti, public open spaces and fewer private gardens and depression, although this relationship was considered too small to be statistically significant.¹⁶⁹

Safety can also include road safety – perceived and actual – and the impact this has directly (as discussed in section 3.1.3) and indirectly on health. The proportion of households who consider traffic a serious problem grew from 15 per cent to 20 per cent between 1999/2000 and 2005/06.¹⁷⁰ Perceived risk of injury/death in a road traffic accident is likely to influence choice of mode of transport and levels of physical activity.¹⁷¹ For example, the most common barrier to cycling is fear of traffic; a fear that is reportedly exaggerated in comparison with the likelihood of injury.¹⁷² An Australian study found that perceptions of the local neighbourhood, including road safety, influenced levels of activity in children.¹⁷³

3.2.3 Mixed land-use

Mixed land-use (e.g. residential, commercial and public) as a feature of neighbourhood design has been found to encourage walking and promote social cohesion. A study in Galway, Ireland, compared levels of social capital (here measured as how well residents knew their neighbours, political participation, trust/faith in other people and social engagement) between mixed use, walkable neighbourhoods and more suburban car-oriented neighbourhoods. Those living in the mixed use, walkable neighbourhoods were found to have higher levels of social capital.¹⁷⁴ As socially engaged people tend to be healthier [see section 3.2], it would be expected that this population was also healthier, although this study did not examine this relationship.

Mixed use developments can increase accessibility and feasibility of local facilities, including public transport.¹⁷⁵ People who live in mixed use developments have been found to walk more and

are at a lower risk of obesity.¹⁷⁶ However, an increase in physical activity as a result of mixed land-use will not be the only factor affecting obesity levels; other factors include availability of food stuffs and access to parks and recreational facilities.¹⁷⁷

Mixed income neighbourhoods have also been suggested as being beneficial to health. A Canadian study found that in neighbourhoods of mixed income, the less affluent have better health and quality of life compared to those living in less affluent neighbourhoods.¹⁷⁸

3.2.4 Street design

Street design can encourage people to walk and cycle and can create opportunities for social contact. Recent National Institute for Health and Clinical Excellence (NICE) guidance identifies the role of the design and layout of towns and cities in encouraging or discouraging physical activity.¹⁷⁹ People are more likely to walk or cycle if there are well-maintained and unobstructed pavements, cycle paths and traffic calming measures.¹⁸⁰ American studies comparing neighbourhoods designed around public transport systems versus car travel found that people are more likely to walk/cycle in neighbourhoods designed around a public transport system.^{181 182}

The Institute for European Environmental Policy found that car drivers walk half as much as non-car owners by a total of 56 minutes less per week. This was estimated to contribute to a potential weight gain of more than two stones over the course of a decade.¹⁸³ An American study found that, for each additional hour spent driving in a car per day, the risk of being obese rose by six per cent.¹⁸⁴ On the other hand, the study found that for each additional kilometre walked per day, the risk of being obese decreased by 4.8 per cent. Australian research suggests a similar significant association between car use and physical inactivity and a significant relationship between commuting by car and overweight/obesity; such that people who drive to work were found to be less physically active and more likely to be overweight or obese.¹⁸⁵ Walkable neighbourhoods (those that are

conducive to movement on foot and are defined by residential density, mixed land-use, and street connectivity) may help to increase levels of physical activity and decrease risk of obesity.^{186 187} This has been demonstrated in the US where residents of highly walkable neighbourhoods have been shown to be more active, engaging in 70 minutes more moderate to vigorous physical activity a week, than those in less walkable neighbourhoods. This equates to walking three miles more per week, which over one year could result in almost 1.8 kilograms of weight loss. Accordingly, 35 per cent of residents in high walkability neighbourhoods were overweight in comparison to 60 per cent in low walkability neighbourhoods.¹⁸⁸

3.2.5 Natural spaces

A review of the evidence supporting the hypothesis that accessible, usable natural spaces encourage physical activity concluded that local access to safe natural greenspace and attractive scenery is associated with high levels of physical activity within communities.¹⁸⁹ Analysis of research from eight European cities (not including the UK) showed that people who live in areas with high levels of greenery were three times more likely to be physically active and 40 per cent less likely to be overweight or obese.¹⁹⁰ A Japanese study indicated that elderly people with access to greenspace, where people could walk and socialise, were more likely to live longer.¹⁹¹ A comprehensive advisory report to the Dutch government similarly stated that nature can indirectly improve health by encouraging exercise. It concluded that there are indications that an attractive, green environment close to home and work provides the best opportunities to encourage daily physical activity through walking and cycling, and that people are more likely to exercise for longer in natural surroundings.¹⁹² A Norwegian study looking at children's play found that outdoor play is more vigorous than indoors, and that children who play regularly in natural areas showed a statistically significant improvement in fitness with better coordination, balance and agility.¹⁹³

The Commission for the Built Environment reports that the more attractive parks and urban greenspaces become, the more people are likely to use them for physical activity.¹⁹⁴ This is supported by an Australian study that found that people were 50 per cent more likely to have high levels of walking if public spaces were attractive, large and accessible.¹⁹⁵

Physical activity can confer mental health benefits, and the natural environment can directly benefit mental health. What then are the potential mental health benefits of taking physical activity in natural spaces? British research has shown that the presence of trees encourages more frequent use of outdoor space and that 'green exercise' can lead to a significant improvement in self-esteem, depression and mood.^{196 197} This finding is supported by research involving participants taking exercise on a treadmill while pleasant and unpleasant rural and urban scenes were projected on a wall in front. Results showed that both pleasant scenes significantly increased self-esteem (in addition to that gained simply by taking the exercise) and that the rural pleasant scenes had the greatest effect in reducing blood pressure.¹⁹⁸ These findings are supported by a study that found that joggers who run through urban parks report more psychological benefit than street joggers.¹⁹⁹ So it would appear that whilst taking exercise is good for your health, taking exercise in pleasant natural spaces is even better.²⁰⁰

This belief has led to the growing popularity of 'green' exercise where participants can join programmes voluntarily or have 'green' exercise prescribed by their GP. In a survey by the Mental Health Foundation of 401 people who used mental health services, 85 per cent of participants found exercise therapy (e.g. yoga, aerobic exercise) helpful or helpful at times.²⁰¹ A follow-on qualitative study similarly reported that many people found physical activity valuable in helping to alleviate mental distress.²⁰² A Japanese study found that daily walking in older people (65-79) reduced the risk of depression, although this relationship was not evident in middle aged adults (40-64).²⁰³ It has also been suggested that walking

can reduce the risk of older people developing dementia.^{204 205} Evaluation of the national Green Gym scheme concluded that overall the physical health status of Green Gym participants significantly improved, improving the most in people with the poorest physical and mental health.²⁰⁶ A survey of local Mind group participants reported that 94 per cent of people found 'green' exercise to have benefited their mental health.²⁰⁷ Mind has stated that designing for mental well-being, including natural spaces, should be recognised as good practice for architecture and town and country planning.²⁰⁸

In addition to encouraging physical activity, natural spaces also offer opportunities for relaxation, providing places to rest and meet people.²⁰⁹ As discussed in section 3.2, getting out and meeting people can benefit physical and mental health and the evidence suggests that greenspace can facilitate social contact. The evidence available indicates that natural features within urban environments, especially in underprivileged neighbourhoods, can facilitate higher levels of social contact and social integration.^{210 211} A study in Chicago reported that the presence of trees significantly increased the use of public space and therefore stimulated more social contact;²¹² findings corroborated by later research in a similar neighbourhood that found that 83 per cent more individuals engaged in social activity in green areas (with trees and grass) than in barren spaces.²¹³ The presence of nearby natural spaces has also been shown to be related to reduced crime²¹⁴ as well as increased neighbourliness.²¹⁵ Community gardens, and green activities linked to clubs or groups, have been shown to provide opportunities for socialising, helping to strengthen neighbourhood ties.^{216 217}

Areas for further exploration: It has been suggested that the more attractive parks and urban greenspaces are, the more people are likely to use them for physical activity.²¹⁸ However, the evidence on how the quality of the natural environment affects health is limited.²¹⁹ With regards to the health benefits of exercise programmes taken in the natural environment

(e.g. Green Gyms), quantitative evidence is also limited. Some commentators are also cautious about the evidence for the natural environment increasing levels of social contact, stating the lack of systematic research.²²⁰

4. Conclusion

This knowledge base has highlighted how some of the UK's biggest health challenges – such as mental illness and obesity-related diseases – are related to the outdoor environment in which we live. The key points are summarised below.

Exposure to natural spaces is good for health in and of itself and also in terms of facilitating physical activity and social contact. People are more likely to walk, cycle and play in natural spaces, enjoying the benefits of the physical activity and getting out and meeting people. A 'dose-response' relationship between exposure to natural spaces and health is suggested – the more greenspace there is in a neighbourhood, the better people's health is. Exposure to natural spaces has also been found to have a restorative function with regards to mental health and well-being, and to help improve health in organisational settings.

Air pollution in the UK is associated with a plethora of conditions from respiratory illness to heart disease, especially in vulnerable people. Road traffic makes a major contribution to air pollution, including carbon dioxide emissions, and therefore to climate change. It is also associated with significant numbers of casualties and fatalities from road traffic accidents. Transport systems designed to promote active travel, such as cycling and walking, could reap the additional benefits of increasing physical activity, reducing the risk of obesity, reducing morbidity from air pollution and reducing the risk of road traffic accidents.

Chronic exposure to noise, such as that from aeroplanes, has been shown to be associated with increased risk of heart disease, hearing impairment and impacts on mental health.

As the number of people and properties at risk from coastal or river flooding increases, the risk of

negative health impacts from flooding also increases. These include increased risk of respiratory illness, stomach upsets and high blood pressure, and longer-term mental ill-health.

Access to local shops and services promotes social inclusion and can provide opportunities for social contact, helping to build a sense of community. Considering the obesogenic environment, some evidence suggests that access to leisure facilities can determine levels of physical activity; however, no evidence has been found in the UK to link access to healthy or unhealthy food outlets with health outcomes .

Neighbourhoods with mixed land-use have been shown to have higher levels of walking and social cohesion. The layout of towns and cities and the design and quality of the street environment can also influence levels of walking and cycling. People living in neighbourhoods that are walkable and built around a public transport system, as opposed to the car, have been shown to have higher levels of physical activity and be at lower risk of obesity.

The design of the outdoor environment can influence levels of crime and feelings of safety. Perceptions of safety in turn influence levels of physical activity. Features such as graffiti and litter can make people feel less safe and less likely to be physically active. Fear of road traffic accidents also constrains levels of physical activity in terms of walking and cycling.

Creating and maintaining rural and urban environments that respect natural limits and are designed to promote strong communities, social cohesion and physical activity – in line with the principles for sustainable development - will create more opportunities for people to live healthy lives.

Glossary

Built environment: is here defined as the outdoor physical environment created or modified by people. It includes urban design, transportation systems and land-use planning and policies that affect communities in urban, rural and suburban areas.²²¹

Direct health impacts: are understood here to mean features of the environment that affect a person's health regardless of their behaviour.

Green exercise: is exercise taken in natural spaces.

Green Gym: a scheme run by BTCV to help people take green exercise. People are prescribed, or can volunteer to participate in, practical conservation activities.

Health: is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.²²²

Incivilities: here refer to graffiti, litter and dog mess.

Income distribution group:²²³ there is an uneven distribution of total income between households. ONS analysis of income distribution ranks units (households, individuals or adults) by a given income measure, and then divides the ranked units into groups of equal size.

Indirect health impacts: are here understood to be intermediate factors that affect a person's choices and behaviours, which then influence their health.

Natural environment: is here defined in a broad sense to include air, water, land, soils, biodiversity, landscapes and oceans and seas.²²⁴

Natural spaces: are here defined as a feature of the natural environment - everything from parks and open countryside to gardens and other greenspaces.

Morbidity: is the incidence of ill health in a population.

Mortality: is the incidence of death in a population.

Outdoor environment: is here defined in terms of the physical aspects of the built and natural environment, excluding the buildings themselves and the indoor environment. This includes air quality, natural spaces, urban design, transportation systems and land-use.

Poor quality environment:²²⁵ the identification of poor quality environments is based on surveyors' observed assessments of the severity of problems in the immediate environment of the home. The problems assessed fall into three groups:

- the upkeep, management or misuse of private and public buildings and space (scruffy or neglected buildings; poor condition housing; graffiti; scruffy gardens or landscaping; litter; rubbish or dumping; vandalism; dog or other excrement; nuisance from street parking)
- road traffic or other transport (presence of intrusive motorways and main roads; railway or aircraft noise; heavy traffic; ambient air quality)
- abandonment or non-residential use (vacant sites; vacant or boarded up buildings; intrusive industry; nonconforming use of domestic premises such as running car repair, scrap yard or haulage business).

A home is regarded as having a poor quality environment of a given type if it is assessed to have 'significant' or 'major' problems in respect of any of the specific environmental problems assessed and grouped under that type. The overall assessment of households with poor quality environments is based on whether the home has any of the three types of problems.

Routine and manual group: the National Statistics Socio-economic Classification is used for all official surveys. It is based on the Standard Occupational Classification 2000 and details of employment status.

It has eight classes, the first of which can be subdivided:

1. Higher managerial and professional occupations, sub-divided into:
 - 1.1 Large employers and higher managerial occupations
 - 1.2 Higher professional occupations
 2. Lower managerial and professional occupations
 3. Intermediate occupations
 4. Small employers and own account workers
 5. Lower supervisory and technical occupations
 6. Semi-routine occupations
 7. Routine occupations
 8. Never worked and long-term unemployed
- The classes can be further grouped into:
- i. Managerial and professional occupations (1, 2)
 - ii. Intermediate occupations (3, 4)
 - iii. Routine and manual occupations (5, 6, 7)
 - iv. Never worked and long-term unemployed (8)

Social capital: it is acknowledged that the definition of social capital is disputed in the literature. The Putnam definition is commonly recognised and used here: “social capital refers to features of social organisation such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit”.²²⁶ NICE navigate through the definitions by stating that “their common thread relates to the importance of positive social networks of different types, shapes and sizes in bringing about social, economic and health development between different groups, hierarchies and societies”.²²⁷

Social cohesion: the concept of social cohesion is also ill-defined. There is overlap with the concept of social capital and here the terms are used interchangeably.

Social contact: can be seen as a component of social capital – here it is taken to mean the incidence of people coming in to contact with each other.

Street connectivity: how streets connect together to enable people to get to where they want to with ease.

Urban area: an area with a population over 10,000 people.²²⁸

Well-being: is a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity. It requires that basic needs are met, that individuals have a sense of purpose, that they feel able to achieve important personal goals and participate in society. It is enhanced by conditions that include supportive personal relationships, strong and inclusive communities, good health, financial and personal security, rewarding employment, and a healthy and attractive environment’.²²⁹

References

- ¹ Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. <http://www.who.int/about/definition/en/print.html> Accessed 25/03/08
- ² Newton J (2007) *Well-being and the natural environment: A brief overview of the evidence*. <http://www.sustainable-development.gov.uk/what/documents/WellbeingAndTheNaturalEnvironmentReport.doc> Accessed 25/03/08
- ³ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁴ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁵ Department of Health (2007) *Health Profile of England 2007* http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_079716 Accessed 25/03/08
- ⁶ Department of Health (2007) *Tackling health inequalities: 2004-06 data and policy update for the 2010 national target* http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_081327 Accessed 25/03/08
- ⁷ Department of Health (2007) *Tackling health inequalities: 2004-06 data and policy update for the 2010 national target* http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_081327 Accessed 25/03/08
- ⁸ Office for National Statistics (2000) *Psychiatric morbidity among adults living in private households in Great Britain*
- ⁹ Office for National Statistics. *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ¹⁰ World Health Organization (2001) *The World Health Report 2001: Mental Health: new understanding, new hope*. Geneva: World Health Organization
- ¹¹ Stewart Brown, S (1998) Emotional well-being and its relation to health. *British Medical Journal*, 317, 1608-1609
- ¹² Jonas, B & Mussolino, M (2000) Symptoms of depression as a prospective risk factor for stroke, *Psychosomatic Medicine*, 62:4, 463-472
- ¹³ World Health Organization (2001) *The World Health Report 2001: Mental Health: new understanding, new hope*. Geneva: World Health Organization
- ¹⁴ Foresight (2007) *Tackling Obesities: Future Choices Project - Obesogenic Environments Evidence Review*. London: Department of Innovation, Universities and Skills
- ¹⁵ Department of Health (2007) *Health Profile of England 2007* http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_079716 Accessed 25/03/08
- ¹⁶ ScotPHO (2007) *Obesity in Scotland: An epidemiology briefing 2007*. Edinburgh: ScotPHO.
- ¹⁷ Department of Health, Social Services and Public Safety (2004) *Equality and Inequalities in Health and Social Care in Northern Ireland: A statistical overview*. http://www.dhsspsni.gov.uk/equality_inequalities.pdf Accessed 25/03/08
- ¹⁸ Department of Health (2007) *Health Profile of England 2007*. http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_079716 Accessed 25/03/08
- ¹⁹ Foresight (2007) *Tackling Obesity: Future Choices - Project report*. London: Department of Innovation, Universities and Skills
- ²⁰ Department of Health (2006) *Health Profile of England*. London: Department of Health
- ²¹ Yorkshire and Humber Public Health Observatory/NHS National Diabetes Support Team (2006) *Diabetes Key Facts*. http://www.yhpho.org.uk/Download/Public/356/1/Diabetes_key_facts.pdf Accessed 25/03/08
- ²² NHS Scotland (2006) *Scottish Diabetes Framework: Action Plan*. Edinburgh: Blackwell's Bookshop
- ²³ Wanless, D (2002) *Securing our future health: Taking a long-term view*. London: HM Treasury
- ²⁴ Sainsbury Centre for Mental Health (2003) *Economic and Social costs of mental health in England*. London: The Sainsbury Centre for Mental Health
- ²⁵ Sainsbury Centre for Mental Health (2003) *Economic and Social costs of mental health in England*. London: The Sainsbury Centre for Mental Health
- N.B. £64 billion/annum = £23b lost output due to inability to work; £41b reduced quality of life and loss of life
- ²⁶ House of Commons Health Committee (2004) *Obesity: Third report of session 2003-2004 Volume 1*. London: TSO
- N.B. >£1 billion/annum = Direct cost of treating obesity = £46-49 million/annum; Additional cost of treating the consequences of obesity = £945-1,750million/annum
- ²⁷ House of Commons Health Committee (2004) *Obesity: Third report of session 2003-2004 Volume 1*. London: TSO
- N.B. > £2.3 billion/annum = £1-1.1billion/annum premature death and £1.3-1.45b sickness absence
- ²⁸ Wanless, D (2002) *Securing our future health: Taking a long-term view*. London: HM Treasury
- ²⁹ HM Government (2005) *Securing the Future: delivering UK sustainable development strategy*. London: TSO
- ³⁰ Department of Health (2004) *Choosing Health: Making healthy choices easier*. London: TSO
- ³¹ Bird W (2004) *Natural Fit: Can green space and biodiversity increase levels of physical activity?* http://www.rspb.org.uk/Images/natural_fit_full_version_tcm9-133055.pdf Accessed 25/03/08
- Bird W (2007) *Natural thinking* http://www.rspb.org.uk/Images/naturalthinking_tcm9-161856.pdf Accessed 25/03/08
- ³² Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO

- ³³ Newton J (2007) *Well-being and the natural environment: A brief overview of the evidence*. <http://www.sustainable-development.gov.uk/what/documents/WellbeingAndTheNaturalEnvironmentReport.doc> Accessed 25/03/08
- ³⁴ Rao M, Prasad S, Adshead F and Tissera H (2007) The built environment and health. *The Lancet*, 370:1111-1113
- ³⁵ Barton H and Grant M (2006) A health map for the local human habitat. *J R Soc Prom Health*, 126: 252-53 [adapted from Whitehead M and Dahlgren (1991) What can be done about inequalities in health? *Lancet*, 300: 1059-63]
- ³⁶ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ³⁷ Rao M, Prasad S, Adshead F and Tissera H (2007) The built environment and health. *The Lancet*, 370:1111-1113
- ³⁸ WHO (2003) *Healthy Urban Planning in Practice: Experience of European cities. Report of the WHO City Action Group on Healthy Urban Planning*. Eds. H Barton, C Mitcham and C Tsourou. Copenhagen: WHO Regional Office for Europe
- ³⁹ WHO (1992) *Twenty Steps for Developing a Health Cities Project*. Copenhagen: WHO Regional Office for Europe
- ⁴⁰ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁴¹ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁴² United Nations (2008) *World Urbanization Prospects: The 2007 revision highlights* http://www.un.org/esa/population/publications/wup2007/2007WUP_Highlights_web.pdf Accessed 25/03/08
- ⁴³ Pretty R (2007) *The Earth Only Endures*. London: Earthscan
- ⁴⁴ Pretty R (2007) *The Earth Only Endures*. London: Earthscan
- ⁴⁵ De Vries S, Verheij R, Grenewegen P, Spreeuwenberg P (2003) Natural environments – healthy relationships? An exploratory analysis of the relationship between and health. *Environment and planning A*, 35, 1717-1731
- ⁴⁶ Pretty J, Peacock J, Hine R, Sellens M, South N, Griffin M (2007) Green exercise in the UK Countryside: Effects on Health and Physiological Well-Being, and Implications for Policy and Planning. *Journal of Environmental Planning and Management*, 50(2), 211-231
- ⁴⁷ Pretty J, Peacock J, Hine R, Sellens M, South N, Griffin M (2007) Green exercise in the UK Countryside: Effects on Health and Physiological Well-Being, and Implications for Policy and Planning. *Journal of Environmental Planning and Management*, 50(2), 211-231
- ⁴⁸ de Vries S, Verheij R, Grenewegen P, Spreeuwenberg P (2003) Natural environments – healthy relationships? An exploratory analysis of the relationship between and health. *Environment and planning A*, 35, 1717-1731
- ⁴⁹ de Vries S, Verheij R, Grenewegen P, Spreeuwenberg P (2003) Natural environments – healthy relationships? An exploratory analysis of the relationship between and health. *Environment and planning A*, 35, 1717-1731
- ⁵⁰ Maas J et al (2006) Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health*, 60, 587-592
- ⁵¹ Maller C, Townsend M, Ptyor A, Brown P, St Leger L (2005) *Healthy nature healthy people: "Contact with nature" as an upstream health promotion intervention for populations*. Oxford: Oxford University Press
- ⁵² Rohde CLE, and Kendle AD (1994) *Report to English Nature – Human Well-being, Natural Landscapes and Wildlife in Urban Areas: A Review*. Bath: Department of Horticulture and Landscape and the Research Institute for the Care of the Elderly, University of Reading
- ⁵³ Hartig, T, Mang, M & Evans, G. (1991) Restorative Effects of Natural Environmental Experiences, *Environment and Behaviour*, 23, 3-26
- ⁵⁴ Hartig, T, Evans, G, Jamner, L., Davis, D. & Garling, T. (2003) Tracking restoration in natural and urban field settings, *Journal of Environmental Psychology*, 23, 109-123
- ⁵⁵ Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. *Nature and Health. The influence of nature on social, psychological and physical well-being*. The Hague: Health Council of the Netherlands and RMNO, 2004; publication no. 2004/09E; RMNO publication nr A02ae.
- ⁵⁶ Kuo, F(2001). Coping with poverty – impacts of environment and attention in the inner city. *Environment and behaviour* 2001, 33; 5-33
- ⁵⁷ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ⁵⁸ Ulrich RS (1984) View through a window may influence recovery from surgery. *Science*, 224, 420-421
- ⁵⁹ Heerwagen JH, Heubach JG, Montgomery J, Weimer, WC (1995) Environmental design, work, and well being: managing occupational stress through changes in the workplace environment. *American Association of Occupational Health Nurses Journal*, 43(9), 458-468.
- ⁶⁰ Moore EO (1981) A prison environment's effect on health care service demands. *Journal of Environmental Systems*, 11, 17-34
- ⁶¹ Mooney P, Nicell PL (1992) The importance of exterior environment for the Alzheimer's residents. Effective care and risk management. *Health Care Management Forum*, 5(2), 23-29.
- ⁶² Maller C, Townsend M, Pryor A, Brown P and St Leger L (2005) Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*, 21(1), 45-54
- ⁶³ Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. *Nature and Health. The influence of nature on social, psychological and physical well-being*. The Hague: Health Council of the Netherlands and RMNO, 2004; publication no. 2004/09E; RMNO publication nr A02ae.

- ⁶⁴ Department for Environment, Food and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Volume 1*. London: TSO
- ⁶⁵ Department for Environment, Food and Rural Affairs (2007) *Sustainable development indicators in your pocket 2007*. Department for Environment, Food and Rural Affairs: London
- ⁶⁶ Department for Environment, Food and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Volume 1*. London: TSO
- ⁶⁷ Committee on the Medical Effects of Air Pollution (COMEAP) (1998) *The Quantification of the Effects of Air Pollution on Health in the UK*. TSO, London
- ⁶⁸ Huby and Bradshaw (2006) *A review of the environmental dimension of children and young people's well-being: report prepared for the Sustainable Development Commission*. University of York. <http://www.sd-commission.org.uk/publications/downloads/York-SDC-Wellbeing-report.pdf>. Accessed 25/03/08
- ⁶⁹ Environment Agency (2005) *Better environment, healthier people*. Bristol: The Environment Agency
- ⁷⁰ WHO (2005) *Health effects of transport-related air pollution*. Eds. M. Krzyzanowski, B Kuna-Dibbert and J Sneider. Geneva: WHO
- ⁷¹ WHO (2005) *Health effects of transport-related air pollution*. Eds. M. Krzyzanowski, B Kuna-Dibbert and J Sneider. Geneva: WHO
- ⁷² WHO (2005) *Health effects of transport-related air pollution*. Eds. M. Krzyzanowski, B Kuna-Dibbert and J Sneider. Geneva: WHO
- ⁷³ Environment Agency (2005) *Better environment, healthier people*. Bristol: The Environment Agency
- ⁷⁴ Finkelstein M, Jerrett M, DeLuca P, Finkelstein N, Verma DK, Chapman K and Sears MR (2003) Relation between income, air pollution and mortality: a cohort study. *Canadian Medical Association Journal*, 169 (5)
- ⁷⁵ Department for Environment, Food and Rural Affairs (2007) *Sustainable development indicators in your pocket 2007*. Department for Environment, Food and Rural Affairs: London
- ⁷⁶ National Statistics/Department for Transport (2007) *Transport statistics bulletin: Road casualties in Great Britain Main Results: 2006*. London: TSO
- ⁷⁷ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁷⁸ Grayling et al (2002) *Streets Ahead: Safe and Liveable Streets for Children*. London: Institute for Public Policy Research
- ⁷⁹ Jacobsen P (2003) Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention*, 9, 205-209
- ⁸⁰ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ⁸¹ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ⁸² Greater London Authority (2004) *Souder City: The Mayor's Ambient Noise Strategy*. London: Greater London Authority
- ⁸³ Stansfeld SA, Haines M et al. (2000) Noise and health in the urban environment. *Reviews of environmental health*, 15 (1-2), 43-82
- ⁸⁴ Haralabidis AS et al (2008) Acute effects of night-time noise exposure on blood pressure in populations living near airports. *European Heart Journal*. <http://eurheartj.oxfordjournals.org/cgi/content/full/ehn013v1?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=1&title=noise&andorexacttitle=and&andorexacttitleabs=or&andorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&fdate=//&resource-type=HWCIT> Accessed 25/03/08
- ⁸⁵ Stansfeld SA, Haines M et al (2000) *West London Schools Study: Aircraft noise at school and child performance and health. Final report*. London: Department of the Environment and Transport
- ⁸⁶ Matsui T, Stansfeld S, Haines M and Head J (2004) West London schools study: the effects of chronic aircraft noise exposure at home. *Noise and Health*, 7(25), 49-57
- ⁸⁷ Clark C, Myron R, Stansfeld SA and Candy B (2007) A systematic review of the evidence on the effect of the built and physical environment on mental health. *Journal of Public Mental Health*, 6(2), 14-27
- ⁸⁸ Environment Agency http://www.environment-agency.gov.uk/subjects/flood/?version=1&lang=_e Accessed 25/03/08
- ⁸⁹ Foresight (2004) *Future Flooding*. Office of Science and Technology: London
- ⁹⁰ Environment Agency (2005) *Better environment, healthier people*. Bristol: The Environment Agency
- ⁹¹ Department of Health (2001) *Health effects of climate change in the UK*. London: Department of Health
- ⁹² Reacher M et al. (2004) Health impacts of flooding in Lewes: A comparison of reported gastrointestinal and other illness and mental health in flooded and non-flooded households. *Communicable Disease and Public Health*, 7, 1-8
- ⁹³ Tapsell S.M., Penning-Rowsell E. C., Tunstall S. M. and Wilson T.L. (2002) Vulnerability to flooding: health and social dimensions. *Phil. Trans. R. Soc. Lond. A*, 360, 1511-1525.
- ⁹⁴ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ⁹⁵ Department for Environment, Food and Rural Affairs (2007) *UK Climate Change Programme: Annual report to Parliament, July 2007*. London: Defra
- ⁹⁶ Department of Health (2008) *Health Effects of Climate Change in the UK 2008*. London: Department of Health
- ⁹⁷ Department of Health (2008) *Health Effects of Climate Change in the UK 2008*. London: Department of Health
- ⁹⁸ London Climate Change Partnership (2002) *London's Warming: The impacts of climate change on London*. London:GLA
- ⁹⁹ Roberts I (2008) The economics of tackling climate change. *British Medical Journal*, 336, 165-224

- ¹⁰⁰ National Institute for Health and Clinical Excellence (2008) *Promoting and creating built or natural environments that encourage and support physical activity*. London: NICE
- ¹⁰¹ WHO Factsheet. *Benefits of physical activity* http://www.who.int/dietphysicalactivity/factsheet_benefits/en/print.html Accessed 25/03/08
- ¹⁰² The Information Centre for Health and Social Care (2008) *Statistics on obesity, physical activity and diet: England, 2008*. <http://www.ic.nhs.uk/webfiles/publications/opan08/OPAD%20Jan%202008%20final.pdf> Accessed 25/03/08
- ¹⁰³ Killoran A, Doyle N, Waller S, Wohlgenuth C and Crombie H (2006) *Transport interventions promoting safe cycling and walking: Evidence briefing*. National Institute for Health and Clinical Excellence: London
- ¹⁰⁴ House of Commons Health Committee (2004) *Obesity: Third report of session 2003-2004 Volume 1*. London: TSO
- ¹⁰⁵ DH (2004b) *At least five a week: The evidence on the impact of physical activity and its relationship to health. A report from the Chief Medical Officer, Professor Sir Liam Donaldson*. London: Department of Health
- ¹⁰⁶ DH (2004b) *At least five a week: The evidence on the impact of physical activity and its relationship to health. A report from the Chief Medical Officer, Professor Sir Liam Donaldson*. London: Department of Health
- ¹⁰⁷ CJC Consulting: Willis PK, Osman DL (2005). *Economic benefits of accessible green spaces for physical and mental health: scoping study, final report for the Forestry Commission*. Oxford: Forestry Commission
- ¹⁰⁸ DH (2004b) *At least five a week: The evidence on the impact of physical activity and its relationship to health. A report from the Chief Medical Officer, Professor Sir Liam Donaldson*. London: Department of Health
- ¹⁰⁹ World Health Organisation. *Why Move for Health*. <http://www.who.int/moveforhealth/en/> Accessed 25/03/08
- ¹¹⁰ Dietz W.H. (2001) The Obesity Epidemic in Young Children. *British Medical Journal*, 322, 313-314
- ¹¹¹ Hillsdon S, Thorogood M, Anstiss T and Morris J (1995) Randomised controlled trials of physical activity promotion in free living populations: a review. *Journal of Epidemiology and Community Health*, 49, 448-453
- ¹¹² van Lenthe FJ, Brug J, Mackenbach JP (2005) Neighbourhood Inequalities in Physical Inactivity: The role of neighbourhood attractiveness, proximity to local facilities and safety in the Netherlands. *Social Science and Medicine*, 60, 763-775
- ¹¹³ Berke EM, Koepsell TD, Vernez Moudon A, Hoskins RE, Larson EB (2007) Association of the Built Environment with Physical Activity and Obesity in Older Persons. *American Journal of Public Health*, 97(3), 486-492
- ¹¹⁴ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ¹¹⁵ Humpel N, Owen N, Leslie E (2002) Environmental factors associated with adults participation in physical activity: A review. *Am J Prev Med*, 22(3)
- ¹¹⁶ Owen N, Humpel N, Leslie E, Bauman A, Sallis J (2004) Understanding Environmental Influences on Walking. Review and Research Agenda. *Am J Prev Med*, 27(1)
- ¹¹⁷ Foresight (2007) *Tackling Obesities: Future Choices Project report*. London: Department of Innovation, Universities and Skills.
- ¹¹⁸ Department of Health Public Health Research Consortium, C Law, C Power, H Graham and D Merrick (2007) *Obesity and health inequalities. Obesity Reviews*, 8 (Suppl. 1), 19-22
- ¹¹⁹ International Obesity Task Force (2002) *Obesity in Europe. A case for action*. London: IOTF
- ¹²⁰ Biddle S, Fox K, Boutcher S (2000) *Physical Activity and Psychological Well-Being*. London: Routledge
- ¹²¹ Richardson C.R., Faulkner G., McDevitt J. et al. (2005) Integrating Physical Activity Into Mental Health Services for Persons With Serious Mental Illness, *Psychiatric Services*, 56 (3), 324-31
- ¹²² Dunn A et al. (2005) Exercise Treatment for Depression: Efficacy and Dose Response. *Am J Prev Med*, 28(1), 1-8
- ¹²³ Mind (2007) *Ecotherapy: The green agenda for mental health*. <http://www.mind.org.uk/NR/rdonlyres/5C3A20ED-F084-4958-A58D-C935DCD6732D/0/executivesummary.pdf> Accessed 25/03/08
- ¹²⁴ The Mental Health Foundation (1997) *Knowing Our Own Minds: A survey of how people in emotional distress take control of their lives*. London: The Mental Health Foundation
- ¹²⁵ BTCV (2008) *BTCV Green Gym national evaluation report: Summary of findings* http://www2.btcv.org.uk/gg_evaluation_0308.pdf Accessed 25/03/08
- ¹²⁶ Foresight (2007) *Tackling Obesities: Future Choices Project report*. London: Department of Innovation, Universities and Skills.
- ¹²⁷ Department of Health Public Health Research Consortium, C Law, C Power, H Graham and D Merrick (2007) *Obesity and health inequalities. Obesity Reviews*, 8 (Suppl. 1), 19-22
- ¹²⁸ Berkman LF, Glass T, Brissette I, Seeman TE (2000) From social integration to health: Durkheim in the new millennium. *Social Science and Medicine*, 51, 843-857
- ¹²⁹ K M Leyden (2003) Social capital and the built environment: the importance of walkable neighbourhoods. *American Journal of Public Health*, 93(9)
- ¹³⁰ Kawachi I et al (1996) A prospective study of social networks in relation to total mortality and cardiovascular disease in men in the USA. *Journal of Epidemiology and Community Health*, 50, 245-251
- ¹³¹ Islam MK et al (2006) Social capital and health: Does egalitarianism matter? A literature review. *International Journal for Equity in Health*, 5(3)
- ¹³² R Wilkinson and M Marmot (2003) *Social determinants of health: the solid facts. 2nd edition*. Denmark: WHO

- ¹³³ Diener, E. & Seligman, M. (2002) Very happy people, *Psychological Science*, 13, 80-83
- ¹³⁴ R Wilkinson and M Marmot (2003) *Social determinants of health: the solid facts. 2nd edition*. Denmark: WHO
- ¹³⁵ The Institute of Public Health in Ireland (2006) *Health Impacts of the Built Environment: A review*
- ¹³⁶ Kaplan GA et al (1998) Social connections and mortality from all causes and from cardiovascular disease: prospective evidence from eastern Finland. *American Journal of Epidemiology*, 128 370-380
- ¹³⁷ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ¹³⁸ Social Exclusion Unit (2003) *Making the connections: Final report on transport and social exclusion*. London: Social Exclusion Unit
- ¹³⁹ WHO Commission on Social Determinants of Health (2007) *Achieving health equity: from root causes to fair outcomes*. http://whqlibdoc.who.int/publications/2007/interim_statement_eng.pdf Accessed 25/03/08
- ¹⁴⁰ The Institute of Public Health in Ireland (2006) *Health Impacts of the Built Environment: A review*
- ¹⁴¹ New Economics Foundation (2002) *Ghost Town Britain: The treat from economic globalisation to livelihoods, liberty and local economic freedom*. London: New Economics Foundation
- ¹⁴² Office for National Statistics. *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ¹⁴³ New Economics Foundation (2002) *Ghost Town Britain: The treat from economic globalisation to livelihoods, liberty and local economic freedom*. London: New Economics Foundation
- ¹⁴⁴ National Institute for Health and Clinical Excellence (2008) *Promoting and creating built or natural environments that encourage and support physical activity*. London: NICE
- ¹⁴⁵ Harrison RA, Gemmell I and Heller RF (2007) The population effect of crime and neighbourhood on physical activity: an analysis of 15,461 adults. *Journal of Epidemiology and Community Health*, 61, 34-39
- ¹⁴⁶ Poortinga W (2006) Perceptions of the environment, physical activity and obesity. *Social Science and Medicine*, 63, 2835-2846
- ¹⁴⁷ Food Standards Agency (2007) *Low income diet and nutrition survey volume 3: Nutritional status, physical activity, economic, social and other factors*. Norwich: TSO
- ¹⁴⁸ Cummins S, Pettigrew M, Higgins C et al (2005) Large-scale food retailing as health intervention: Quasi-experimental evaluation of a natural experiment. *Journal of Epidemiology and Community Health*, 59, 1035-1040
- ¹⁴⁹ Food Standards Agency (2007) *Low income diet and nutrition survey volume 3: Nutritional status, physical activity, economic, social and other factors*. Norwich: TSO
- ¹⁵⁰ Cummins S and Macintyre S (2006) Food environments and obesity: neighbourhood or nation? *International Journal of Epidemiology*, 35, 100-104
- ¹⁵¹ Rose D and Richards R (2004) Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public Health and Nutrition*, 7, 1081-1088
- ¹⁵² Foresight (2007) *Tackling Obesities: Future Choices Project - Obesogenic Environments Evidence Review*. London: Department of Innovation, Universities and Skills
- ¹⁵³ Clark C, Myron R, Stansfeld SA and Candy (2007) A systematic review of the evidence on the effect of the built and physical environment on mental health. *Journal of Public Mental Health*, 6(2), 14-27
- ¹⁵⁴ McManus J (2001) *Better health, lower crime: A briefing for the NHS and partner agencies*. London: Nacro Crime and Social Policy Section
- ¹⁵⁵ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ¹⁵⁶ Cave B (2001) *Rapid review of health evidence for the draft London Plan; Based on 'Towards the London Plan: initial proposals for the Mayor's Spatial Development Strategy'*. London: Greater London Authority and the London Health Observatory
- ¹⁵⁷ World Health Organisation Europe (2007) *A European framework to promote physical activity for health*. WHO:Denmark
- ¹⁵⁸ Progressive Scottish Opinion (2007) *Scotland - Omnibus Survey*. Edinburgh: Progressive Partnership
- ¹⁵⁹ Harrison RA, Gemmell I and Heller RF (2007) The population effect of crime and neighbourhood on physical activity: an analysis of 15,461 adults. *Journal of Epidemiology and Community Health*, 61, 34-39
- ¹⁶⁰ Shenassa E D, Liebhaber A and Ezeamama A (2006) Perceived safety of area of residence and exercise: A pan-European study. *American Journal of Epidemiology*, 163 (11), 1012-1017
- ¹⁶¹ Ellaway A, Macintyre S, Xavier B (2005) Graffiti, greenery and obesity in adults: secondary analysis of European cross sectional survey. *British Medical Journal*, 331, 611-612
- ¹⁶² Poortinga W (2006) Perceptions of the environment, physical activity and obesity. *Social Science and Medicine*, 63, 2835-2846
- ¹⁶³ Foster C, Hillsdon M and Thorogood M (2004) Environmental perceptions and walking in English adults. *Journal of Epidemiology and Community Health*, 58, 924-928
- ¹⁶⁴ Kuo FE, Sullivan WC (2001) Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behaviour*, 33(3), 343-367
- ¹⁶⁵ Cave B (2001) *Rapid review of health evidence for the draft London Plan; Based on 'Towards the London Plan: initial proposals for the Mayor's Spatial Development Strategy'*. London: Greater London Authority and the London Health Observatory
- ¹⁶⁶ The Institute of Public Health in Ireland (2006) *Health Impacts of the Built Environment: A review*

- ¹⁶⁷ Dannenberg AL, Jackson RJ, Frumlin H, Schieber RA, Pratt M, Kochtizky C et al. (2003) The impact of community design and land-use choices on public health: a scientific agenda. *Am J Public Health*, 93(9)
- ¹⁶⁸ Clark C, Myron R, Stansfeld SA and Candy B. (2007) A systematic review of the evidence on the effect of the built and physical environment on mental health. *Journal of Public Mental Health*, 6(2) 14-27
- ¹⁶⁹ Weich S, Blanchard M, Prince M, Burton E, Erens B, Sprouston K (2002) Mental Health and the Built Environment: Cross-sectional survey of individual and contextual risk factors for depression. *Br J Psychiatry*, 428-433
- ¹⁷⁰ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ¹⁷¹ Crombie H (2002) *Impact of transport and road traffic speed on health*. <http://www.nice.org.uk/page.aspx?o=502321> Accessed 25/03/08
- ¹⁷² Carnall D (2000) Cycling and health promotion: A safer, slower urban road environment is the key. *British Medical Journal*, 320, 888
- ¹⁷³ Timperio A et al (2004) Perceptions about the local neighbourhood and walking and cycling among children. *Preventive Medicine*, 38, 39-47
- ¹⁷⁴ Leyden K, (2003) Social Capital and the Built Environment: The importance of walkable neighbourhoods. *American Journal of Public Health*, 9(9)
- ¹⁷⁵ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ¹⁷⁶ National Heart Forum (2007) *Building health: Creating and enhancing places for healthy, active lives*. London: National Heart Forum
- ¹⁷⁷ Frank L, Andersen M, Schmid T. (2004). Obesity relationships with community design, physical activity and time spent in cars. *American Journal of Preventative Medicine*, 27(2), 87-96
- ¹⁷⁸ Hou F, Myles J (2004) *Neighbourhood Inequality, Relative Deprivation and Self-perceived Health Status*. Statistics Canada No. 11F0019 No.228. <http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2004228.pdf> Accessed 25/03/08
- ¹⁷⁹ National Institute for Health and Clinical Excellence (2008) *Promoting and creating built or natural environments that encourage and support physical activity*. London: NICE
- ¹⁸⁰ Frank LD, Engelke P. *How Land Use and Transportation Systems Impact Public Health: A Literature Review of the Relationship Between Physical Activity and Built Form*. ACES: Active Community Environments Initiative Working Paper #1. Georgia: Georgia Institute of Technology.
- ¹⁸¹ Cervero R, Gorham R (1995) Commuting in transit versus automobile neighbourhoods. *Journal of the American Planning Association*, 61, 210-225
- ¹⁸² Khattak A, Rodriguez D (2005): Travel behaviour in neo-traditional neighbourhood developments: A case study in USA. *Transportation Research Part A*, 39(6), 481-500
- ¹⁸³ Institute for European Environmental Policy (2007) *Unfit for Purpose: How car use fuels climate change and obesity*. London: IEEP
- ¹⁸⁴ Frank L, Andersen M, Schmid T (2004) Obesity relationships with community design, physical activity and time spent in cars. *American Journal of Preventative Medicine*, 27(2), 87-96
- ¹⁸⁵ Wen L, Orr N, Millett C, Rissel C (2006) Driving to work and overweight and obesity: findings from the 2003 New South Wales Health Survey, Australia. *International Journal of Obesity*, 30(5), 782-786.
- ¹⁸⁶ Foresight (2007) *Tackling Obesity: Future Choices – Project report*. London: Department of Innovation, Universities and Skills
- ¹⁸⁷ Frank LD, Schmid TL, Sallis JF, Chapman J, Saelens BE (2005) Linking objectively measured physical activity with objectively measured urban form. *American Journal of Preventative Medicine*, 28(2S2), 117-125
- ¹⁸⁸ Saelens BE, Sallis JF, Black JB, Chen D (2003) Neighbourhood-based differences in physical activity: an environment scale evaluation. *Am J Public Health*, 93, 1552- 8
- ¹⁸⁹ Bird, W. (2007) Natural Fit: Can green space and biodiversity increase levels of physical activity? RSPB
- ¹⁹⁰ Ellaway A, Macintyre S, Xavier B (2005) Graffiti, greenery and obesity in adults: secondary analysis of European cross sectional survey. *British Medical Journal*, 331, 611-612
- ¹⁹¹ Takano T, Nakamura K, and Watanabe M. (2002) Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. *Journal of Epidemiology and Community Health*, 56, 913-18
- ¹⁹² Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. *Nature and Health. The influence of nature on social, psychological and physical well-being*. The Hague: Health Council of the Netherlands and RMNO, 2004; publication no. 2004/09E; RMNO publication nr A02ae.
- ¹⁹³ Fjortoft I (2004) Landscape as Playscape: the effects of natural environments on children's play and motor development. *Children, Youth and Environments*, 14(2), 21-44
- ¹⁹⁴ National Heart Forum (2007) *Building health: Creating and enhancing places for healthy, active lives*. London: National Heart Forum
- ¹⁹⁵ Giles-Corti B, et al (2005) Increasing walking: how important is distance to, attractiveness and size of public open space. *American Journal of Preventative Medicine*, 28, 169-176.

- ¹⁹⁶ Pretty J, Peacock J, Hine R, Sellens M, South N, Griffin M (2007) Green exercise in the UK Countryside: Effects on Health and Physiological Well-Being, and Implications for Policy and Planning. *Journal of Environmental Planning and Management*, 50(2), 211-231
- ¹⁹⁷ Mind (2007) *Ecotherapy: The green agenda for mental health*. <http://www.mind.org.uk/NR/rdonlyres/5C3A20ED-F084-4958-A58D-C935DCD6732D/0/executivesummary.pdf> Accessed 25/03/08
- ¹⁹⁸ Pretty J, Peacock J, Sellens M, Griffin M (2005) The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*. 15(5), 319-337
- ¹⁹⁹ Bodin M, Hartig T (2003) Does the outdoor environment matter for psychological restoration gained through running? *Psychology of Sport and Exercise*, 4, 141-153.
- ²⁰⁰ Pretty J, Peacock J, Sellens M, Griffin M (2005) The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*. 15(5), 319-337
- ²⁰¹ The Mental Health Foundation (1997) *Knowing Our Own Minds: A survey of how people in emotional distress take control of their lives*. London: The Mental Health Foundation
- ²⁰² The Mental Health Foundation (2000) *Strategies For Living: A Report Of User-Led Research Into People's Strategies For Living With Mental Distress*. 2000. London: The Mental Health Foundation
- ²⁰³ Fukukawa et al (2004) Age differences in the effect of physical activity on depressive symptoms. *Psychology and Aging*, 19(2)
- ²⁰⁴ Abbott et al (2004) Walking and dementia in physically capable elderly men. *Journal of the American Medical Association*, 292, 1447-1453
- ²⁰⁵ Larson et al (2006) Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older, *Annals of Internal Medicine*, 144(2), 73-81
- ²⁰⁶ BTCV (2008) *BTCV Green Gym national evaluation report: Summary of findings* http://www2.btcv.org.uk/gg_evaluation_0308.pdf Accessed 25/03/08
- ²⁰⁷ Mind (2007) *Ecotherapy - the green agenda for mental health*. <http://www.mind.org.uk/NR/rdonlyres/D9A930D2-30D4-4E5B-BE79-1D401B804165/0/ecotherapy.pdf> Accessed 25/03/08
- ²⁰⁸ Mind (2007) *Ecotherapy - the green agenda for mental health*. <http://www.mind.org.uk/NR/rdonlyres/D9A930D2-30D4-4E5B-BE79-1D401B804165/0/ecotherapy.pdf> Accessed 25/03/08
- ²⁰⁹ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO
- ²¹⁰ Pretty J, Peacock J, Hine R, Sellens M, South N, Griffin M (2007) Green exercise in the UK Countryside: Effects on Health and Physiological Well-Being, and Implications for Policy and Planning. *Journal of Environmental Planning and Management*, 50(2), 211-231
- ²¹¹ Sullivan WC, Kuo FE, Depooter SF (2004) The Fruit of Urban Nature: Vital Neighborhood Space. *Environment and Behaviour*, 36(5), 678-700
- ²¹² Coley RL, Kuo FE, Sullivan WC (1997) Where does community grow? The social context created by nature in Urban Public Housing. *Environment and Behavior*; 29(4), 468-494
- ²¹³ Sullivan WC, Kuo FE, Depooter SF (2004) The Fruit of Urban Nature: Vital Neighborhood Space. *Environment and Behaviour*; 36(5), 678-700
- ²¹⁴ Kuo FE, Sullivan WC. (2001) Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behaviour*, 33, 343-367
- ²¹⁵ Kuo FE, Sullivan WC, Coley RL, Brunson L (1998) Fertile ground for community: Inner-city neighbourhood common spaces. *Am J Community Psychol*, 26, 825-851
- ²¹⁶ Lewis CA (1996) *Green Nature/Human Nature: The Meaning of Plants in our Lives*. Chicago: University of Illinois Press
- ²¹⁷ Maller C, Townsend M, Pryor A, Brown P and St Leger L (2005) Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*, 21(1), 45-54
- ²¹⁸ National Heart Forum (2007) *Building health: Creating and enhancing places for healthy, active lives*. London: National Heart Forum
- ²¹⁹ Newton J (2007) *Well-being and the natural environment: A brief overview of the evidence*. <http://www.sustainable-development.gov.uk/what/documents/WellbeingAndTheNaturalEnvironmentReport.doc> Accessed 25/03/08
- ²²⁰ Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. *Nature and Health. The influence of nature on social, psychological and physical well-being*. The Hague: Health Council of the Netherlands and RMNO, 2004; publication no. 2004/09E; RMNO publication nr A02ae
- ²²¹ Rao M, Prasad S, Adshead F and Tissera H (2007) The built environment and health. *The Lancet*, 370, 1111-1113
- ²²² Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. <http://www.who.int/about/definition/en/print.html> Accessed 25/03/08
- ²²³ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan
- ²²⁴ HMT (2007) *PSA Delivery Agreement 28: Secure a healthy natural environment for today and the future*

http://www.hm-treasury.gov.uk/media/1/3/pbr_csr07_psa28.pdf Accessed 25/03/08

²²⁵ Office for National Statistics (2007) *Social Trends No.37 2007 Edition*. Hampshire: Palgrave Macmillan

²²⁶ Putnam R (1995) Bowling Alone: America's Declining Social Capital. *Journal of Democracy*, 6(1), 65-78

²²⁷ Health Development Agency (2004) *Social capital for health: issues of definition, measurement and links to health*.

http://www.nice.org.uk/niceMedia/documents/socialcapital_issues.pdf Accessed 25/03/08

²²⁸ Royal Commission on Environmental Pollution (2007) *The Urban Environment*. London: TSO

²²⁹ Newton J (2007) *Well-being and the natural environment: A brief overview of the evidence*. <http://www.sustainable-development.gov.uk/what/documents/WellbeingAndTheNaturalEnvironmentReport.doc> Accessed 25/03/08