Sustainable development:

The key to tackling health inequalities

Sustainable
Development Commission

Sustainable development:

The key to tackling health inequalities

Sustainable
Development Commission

Contents

Foreword: A call to action

When it comes to causing health inequalities, environmental considerations play a significant role. Food, transport, green space and the built environment are all factors which can narrow or widen the health gap between rich and poor communities.

But the Sustainable Development Commission believes that the environmental causes of health inequalities are still being under-appreciated. And that means policy makers are missing the co-benefits available from a holistic approach that can create a better environment and healthier people at the same time.

This is not just wishful thinking; the evidence is clear. Drawing on a significant body of research from a range of disciplines, this report sheds light on the close links between unsustainable development and health inequalities and promotes the co-benefits of spreading responsibility for health beyond the health care community.

Such an approach is the only way forward. As well as established environmental causes of ill health such as air pollution, noise and poor quality urban design, climate change presents a serious risk to health and wellbeing and will have a disproportionate impact on already disadvantaged groups. Without careful consideration, responses to climate change may increase negative effects on poorer groups. At the same time, traditional income-driven approaches to tackling inequalities may increase carbon emissions.

If we are to reduce health inequalities and tackle climate change, we need a new political approach, built around the insights of sustainable development, in which everybody has equal chances to flourish, within the bounds of finite ecological resources and an expanding global population. Economic, environmental and social policies should be co-ordinated proactively by government so they work together to promote a supportive ecosystem and social justice, and reduce health inequalities.

As so often, prevention and shared responsibility are key. The Sustainable Development Commission calls upon policy makers and practitioners in central and local government – whether or not they have 'health' or 'sustainable development' in their job title – to start thinking about how their work can reduce health inequalities and promote sustainable development

We hope this report provides you with the evidence you need to make the change, and we welcome your feedback.

Sustainable Development Commission
February 2010

This report

In November 2008, Professor Sir Michael Marmot was asked to advise the Secretary of State for Health on the future development of a health inequalities strategy in England post-2010. The review, entitled The Marmot Review Fair Society, Healthy Lives[1] (The Marmot Review) established nine task groups to identify relevant evidence in the areas of:

- Early Child Development and Education
- Employment Arrangements and Working Conditions
- Social Protection
- the Built Environment
- Sustainable Development
- Economic Analysis
- Delivery Systems and Mechanisms
- Priority Public Health Conditions; and
- Social Inclusion and Social Mobility.

This report is not intended to replicate the detailed discussion of health inequalities and the policy context put forward in the Marmot Review. Instead, Sustainable Development: The key to tackling health inequalities is intended to reinforce the relevant messages developed by the Review's Sustainable Development and Built Environment task groups and share them with a wider audience.

Addressing both national and local decision makers, and with relevance to UK-wide, not just English, policy development, this report offers a comprehensive picture of how sustainable development and health equity are complementary and mutually reinforcing. It emphasises the importance of the environmental determinants of health, all too often underappreciated by those policy makers with no explicit environmental remit, and specifically highlights the challenge of climate change. And it sets out the evidence for sustainable solutions to health inequalities, providing environmental and health co-benefits at a single stroke.

Much of the material within this report was developed as a submission to the Sustainable Development and Built Environment Task Groups, whose members were:

Sustainable Development Task Group
Jonathon Porritt (Chair) – formerly Sustainable Development Commission (SDC)
David Colin-Thomé – Department of Health
Anna Coote – New Economics Foundation (nef)
Sharon Friel – University College London & the Australian University
Tord Kjellstrom – University College London & the Australian University
Paul Wilkinson – London School of Hygiene and Tropical Medicine (LSHTM)

Research support
Maria Arnold – SDC
Helen Clarkson – Forum for the Future
Sue Dibb – SDC
Jane Franklin – nef
Tara Garnett – Food Climate Research Network, University of Surrey
Jemima Jewell – Forum for the Future
Duncan Kay – SDC
Shivani Reddy – SDC
Cathryn Tonne – LSHTM
Ben Tuxworth – Forum for the Future
James Woodcock – LSHTM

Built Environment Task Group
Professor Anne Power (Chair) – London School of Economics (LSE)
Jonathan Davis – Commission for Architecture and the Built Environment (CABE)
Paul Plant – Department of Health
Tord Kjellstrom –University College London & the Australian University

Research support
Catalina Turcu – LSE Housing
Helen Eveleigh – CABE/SDC

The Commission has always sought to make clear in its advice to government that health cannot be addressed in isolation, and as such this report also reinforces material within the following publications, all of which are available at www.sd-commission.org.uk

Stock take: Delivering improvements in existing housing

Building Houses or Creating Communities? – A review of Government progress on Sustainable Communities

Every Child's Future Matters – Why the environment should be a key consideration in child wellbeing

Health, place and nature – How outdoor environments influence health and wellbeing: a knowledge base

Setting the Table – Advice to Government on Priority Elements of a Sustainable Diet, (published as part of Defra's Food 2030 project)

Smarter Moves – How information communications technology can promote sustainable mobility.

The Sustainable Development Commission is the Government's independent adviser on sustainable development, reporting to the Prime Minister, the First Ministers of Scotland and Wales and the First Minister and Deputy First Minister of Northern Ireland. Through advocacy, advice and appraisal, we help put sustainable development at the heart of Government policy.

To follow up on this report, please contact maria.arnold@sd-commission.org.uk

1
Summary

While the health of the nation's population has markedly improved over the last 150 years, significant health inequalities – defined as 'systematic differences in health status between different socio-economic groups' – remain.

Health inequalities are a symptom of other forms of inequity and unfairness in our society, and achieving health equity is therefore a matter of social justice.

Sustainable development provides a logical starting point and an essential analytical framework for finding ways to reduce health inequalities. This report explains what sustainable development is, why it matters for health inequalities, and how it can lead to practical implications for policy-making.

Sustainable development is understood in terms of the five Guiding Principles set out by Government. These concern environment, society, economy, governance and knowledge.

These guiding principles offer a **systemic framework** which is extremely relevant for tackling health inequalities. It is consistent with the **'social model'** of health, but extends and strengthens it by emphasising:

- A **long-term** perspective, drawing attention to the needs and claims of future generations and **inter-generational equity**

- A focus on the **environmental** determinants of health and health inequalities, especially the effects of climate change

- A concern with **alternatives to today's economic growth** in order to achieve long-term sustainability, equity and improved wellbeing

- Opportunities for investing in **synergistic** measures or co-benefits that reduce environmental damage, promote social justice and narrow health inequalities at one stroke

- Policies and actions that improve life for the **poorest people** in the global population

- The importance of having a clear **vision** of where we want to be by 2025.

Against the background of the 'big picture' challenges of climate change and an unsustainable economy, this report provides detailed evidence for the health equity and sustainable development co-benefits available in four sectors: food, transport, green space and the built environment. The report concludes with recommendations for central and local government and an outline of the way ahead for a prevention-driven health system in the future.

A preventative approach to health

Unhealthy living, noisy, polluted and 'obesogenic' environments create a vicious circle of chronic ill-health, which reduces individual and collective wellbeing. These issues also serve to increase the carbon footprint of individuals and the NHS and undermine the long-term viability of the health system.

In the developed world, healthcare services tend to be highly resource-intensive. If people in lower socio-economic groups enjoyed the same level of health as those in higher groups, there would be fewer people leading unhealthy lives and requiring healthcare. This would help to reduce healthcare costs and the carbon footprint of the NHS, and save money for treating unavoidable illness and tackling the causes of health inequalities. An approach to healthcare which, for example, favours community-based primary care and embraces the principles of good corporate citizenship, can help to address the root causes of inequalities and thus in the long term lower the resource intensity of healthcare.

Investing public funds in measures such as active travel, promoting green spaces and healthy eating will yield co-benefits for both health and carbon emissions. But opportunities for healthy, low-carbon living should be distributed in ways that favour people with low incomes and so help to reduce their vulnerability to ill-health.

Success requires strong local partnerships, a broader sense of responsibility for health and wellbeing and systematic engagement between the NHS and regional development agencies, local and regional government and social care.

Area inequalities

Area inequalities suggest that where a person lives affects how well that person lives now and in the future, and even their life expectancy. A neighbourhood's physical (pollution, traffic, noise, access to amenities) and social (individual and collective attitudes and behaviours) infrastructures all impact on health.

There is a powerful relationship between local measures of deprivation and reduced life expectancy; the gap between rich and poor areas increasing in the 1980s and 1990s. Vulnerable groups such as children and ethnic minorities suffer particularly in urban communities, as do people living in deprived rural areas.

Climate change

Climate change presents serious risks to health and wellbeing for all, as highlighted recently by the Lancet and the WHO. Poorer social groups are more likely to be more exposed to these risks, to have fewer resources to cushion their effects, and to lack insurance against them.

Responses to climate change must be carefully considered, since they may affect health positively or negatively. Poorer groups will suffer disproportionately from regressive taxing and pricing regimes, and they often tend to be less able to respond readily to campaigns that encourage behaviour change. Measures intended to respond to climate change must not widen health inequalities. Similarly, efforts to reduce health inequalities should seek to reduce carbon emissions.

Sustainable economy

A sustainable economy cannot be achieved through continuing economic growth as we know it, at least not in developed countries such as the UK. An immediate transformation in the nature of growth and consumption is required. Growth cannot be sufficiently 'decoupled' from its social and environmental externalities, and from emissions of CO_2 in particular. These two aspects of achieving a sustainable economy pose important challenges to economic policy.

As previous work from the Sustainable Development Commission has argued, prosperity does not depend on constant increases in economic growth, but is best defined by people's capability to flourish physically, psychologically and socially. Prosperity has undeniable material dimensions, but the current culture of consumption acts as a barrier to enabling people to flourish in less materialistic ways. Tackling these barriers can help to reduce many of the social and economic variables that determine health inequalities.

Routes to improving health and reducing health inequalities are found through creating conditions that allow everyone equal opportunity to flourish, within limits set by finite ecological resources and an expanding global population. Social, environmental and economic policies are interdependent and mutually reinforcing, and need to be co-ordinated proactively by government so that they work together to reduce health inequalities and promote social justice at national and international levels.

Food
Food is a key contributor to health inequalities and carbon emissions. Poorer social groups are less likely to have access to a healthy diet. Food accounts for 19 per cent of total consumption-related greenhouse gas emissions in the UK. Energy-intensive foods tend to have more negative health impacts. Reducing the energy intensity of production systems and supply chains will help to address climate change, increase food security and reduce vulnerability to price increases to which poorer social groups are particularly exposed. Sustainable food policy can therefore bring multiple benefits in regard to health and to climate change mitigation.

Issues of affordability and physical accessibility are also important when considering health inequalities. Corporate practices within the food system and government policies must encourage and enable healthy and sustainable food choices – through public procurement but also using fiscal and other policy mechanisms. Local food initiatives should be encouraged. A sustainable food system that can supply safe, healthy food with positive social benefits and low environmental impacts is vital for increased health equity.

Transport
Modern society's dependence on motorised transport is detrimental to health and wellbeing, health equity, and the environment. Transport accounts for approximately 29 per cent of the UK's carbon dioxide emissions, and contributes significantly to some of today's greatest challenges to public health in England. These include the burden of road traffic injuries; physical inactivity, with all the consequent effects on obesity, chronic disease and mental ill health; the adverse effect of traffic on social cohesiveness; and the impact of outdoor air and noise pollution. Recent analysis in Sweden shows how drastically the negative health impacts of road transport systems are currently underestimated.

Many of these risks are strongly linked to socio-economic status. Road traffic injuries have one of the steepest gradients in relation to poverty and unemployment, and many of the environmental impacts, including air pollution and community dislocation, tend to fall disproportionately on poorer populations. Because of this, national or city-wide initiatives must be designed to benefit the whole population, but prioritise those from lower socio-economic groups.

There are many other measures of proven efficacy which may help to reduce inequalities if appropriately targeted. Urgent and profound changes in the transport sector therefore represent an opportunity to improve public health and reduce health inequalities, while reducing both carbon emissions and dependence on continued economic growth.

Green spaces
Access to green spaces will directly and indirectly benefit health and wellbeing, especially for lower socio-economic groups. Proximity to, and time spent in, the natural environment has a strong positive impact on factors such as number of health

complaints, perceived general health, stress, blood pressure, mental health and rates of recovery from surgery. The presence of green space also has indirect benefits, by encouraging physical activity, social contact and integration, and children's play; by improving air quality; and by reducing urban heat island effects.

Green spaces are unequally distributed across socio-economic groups, with poorer social groups having, in general, lower access. Recent research suggests that, across England, income-related inequality in health (from all-cause mortality and mortality from circulatory disease) is less pronounced in populations with greater exposure to green spaces. The types of health determinants and conditions that are most influenced by green space (such as physical activity, obesity, mental health, circulatory disease and asthma) are very significant for health inequalities. More equal access to green space could thus be key to reducing health inequalities – a preventative and synergistic approach that has social, environmental and economic benefits.

The Built Environment

In addition to transport and green space, a focus on the built environment offers particular health equity and sustainable development co-benefits through improving domestic energy efficiency and other household conditions e.g. damp. Retrofitting existing homes will improve heart and respiratory illness, lower the number of cold-related deaths, lift poor people out of fuel poverty, improve wellbeing and help reduce carbon emissions.

Accessible local facilities, such as shops, pubs, schools and libraries, can provide opportunities for social interaction, help create a sense of community and provide employment, all factors in health inequalities. Evidence consistently shows that people who have easy access to facilities for physical activity – cycle paths, local parks and other green spaces, beaches, or recreation centres – are more likely to be active than those who don't. The particular access requirements of disabled people should also be considered.

The design of the built environment can influence levels of crime and feelings of safety and there is a strong correlation between crime, poverty and ill health. Landscaping, street lighting and improvements to local parks and playgrounds all encourage people onto the street, increasing natural surveillance and social cohesion.

A Sustainable Health System

A sustainable health system must embrace the framework set out in this paper and focus on prevention, with a broader accountability for health at all levels of delivery. The English health service, in partnership with other public, private and voluntary sector organisations, can work to reverse the trend towards obesogenic environments and instead encourage sustainable communities. This will bring multiple benefits for climate change as well as other environmental issues such as air pollution which influence health and wellbeing, and health inequalities.

There is a strong relationship between primary care, income inequality and mortality, and levels of provision are currently unequally distributed. There is a powerful case for community-based services gaining much more prominence, leading to improved access to health services, increased social capital, low carbon pathways and a robust model in terms of ensuring the long-term viability of the health system. Self-care also represents a low carbon care pathway with very strong evidence for health benefits resulting in reduction in visits to GPs and in use of medicines.

NHS organisations can show the wider public sector – indeed, all sectors – how to embrace sustainable development and tackle the determinants of health inequalities through their day-to-day business – an approach known as 'good corporate citizenship'. Successful outcomes have been demonstrated, for example through employment programmes, local food procurement and GP referral to time banks.

A sustainable health system in a sustainable, low-carbon economy will promote wellbeing for all, focus on prevention, make better use of human resources, promote equitable, low-carbon living and 'good corporate citizenship', and judge success in terms of medium and long-term effects on society, economy and environment. Bristol City Council's innovative approach embedding a public health expert in the transport department shows the benefits of a shared responsibility for health inequalities and smarter partnership working.

2
Health inequalities: A timely agenda

2.1 Introduction

While the health of the nation's population has significantly improved over the last 150 years, huge health inequalities – defined as 'systematic differences in health status between different socio-economic groups' – remain. Life expectancy and infant mortality indicators reveal the health gap persists and has even in some cases increased,[2][3] although there are some welcome recent signs of stabilisation.[4]

Life expectancy for males in Kensington and Chelsea was 84 years in 2005-07 while in Greenwich it was 75. There are even greater inequalities evident at ward level with male life expectancy in Tottenham Green in Haringey being 17 years less than the 88 years in Queen's Gate in Kensington and Chelsea (based on 2002-2006 data).[5]

Examining a broader range of indicators reveals a similar pattern, with inequalities evident not only in length of life but also *quality* of life. Mental health, self-reported health, morbidity and disability-free life expectancy also demonstrate social gradients.

While socio-economic group (income) is used to define health inequalities, these gradients (differences) exist across a number of social and demographic factors such as social class, occupation and parental occupation, level of education, housing conditions, neighbourhood quality, geographic region, gender and ethnicity.

Health inequalities are a symptom of other forms of inequity and unfairness in our society, and achieving health equity is therefore a matter of social justice.

2.2 The Marmot Review (2010) Fair Society, Healthy Lives[6]

In November 2008, Professor Sir Michael Marmot was asked to advise the Secretary of State for Health on the future development of a health inequalities strategy in England post-2010 which was published in February 2010. It includes a comprehensive discussion of the extent and nature of health inequalities, and as previously noted, the intention of this SDC report is not to replicate this.
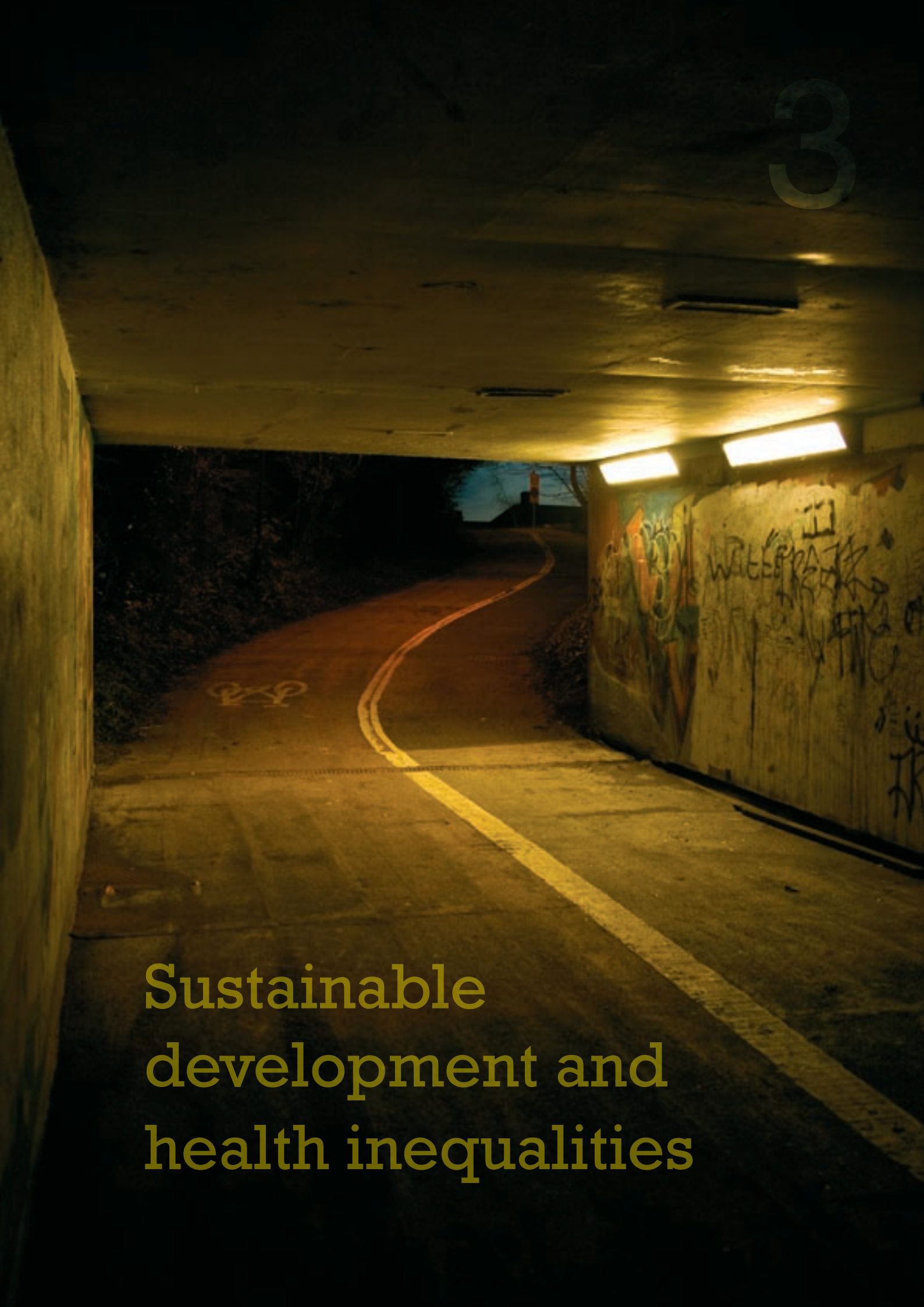
Social determinants of health
The Marmot Review follows the 2008 publication of *Closing the Gap in a Generation*, the report from the Global Commission on Social Determinants of Health (CSDH), also chaired by Professor Sir Michael Marmot. It draws on the approach of the CSDH which argues that *"health inequities are the result of a complex system operating at global, national, and local levels which shapes the way society, at national and local level, organises its affairs and embodies different forms of social position and hierarchy. The place people occupy on the social hierarchy affects their level of exposure to health-damaging factors, their*

vulnerability to ill health, and the consequences of ill health."[7]

The Marmot Review sets out recommendations to reduce health inequalities and achieve two significant policy goals, which are to 'create an enabling society that maximises individual and community potential' and to 'ensure social justice, health and sustainability are at the heart of all policies'.

Prevention
Whilst the importance of ill health prevention is widely accepted in theory, in practice only four per cent of the NHS budget is dedicated to that end.[8] The Marmot Review certainly argues that ill health prevention must be strengthened and tailored to address health inequalities. It also places great emphasis on the importance of developing effective delivery mechanisms to address health inequalities across the whole system, beyond just the NHS. A more detailed outline of how the NHS and partners can take a preventative approach to health inequalities is included in Section 5.2.

3

Sustainable
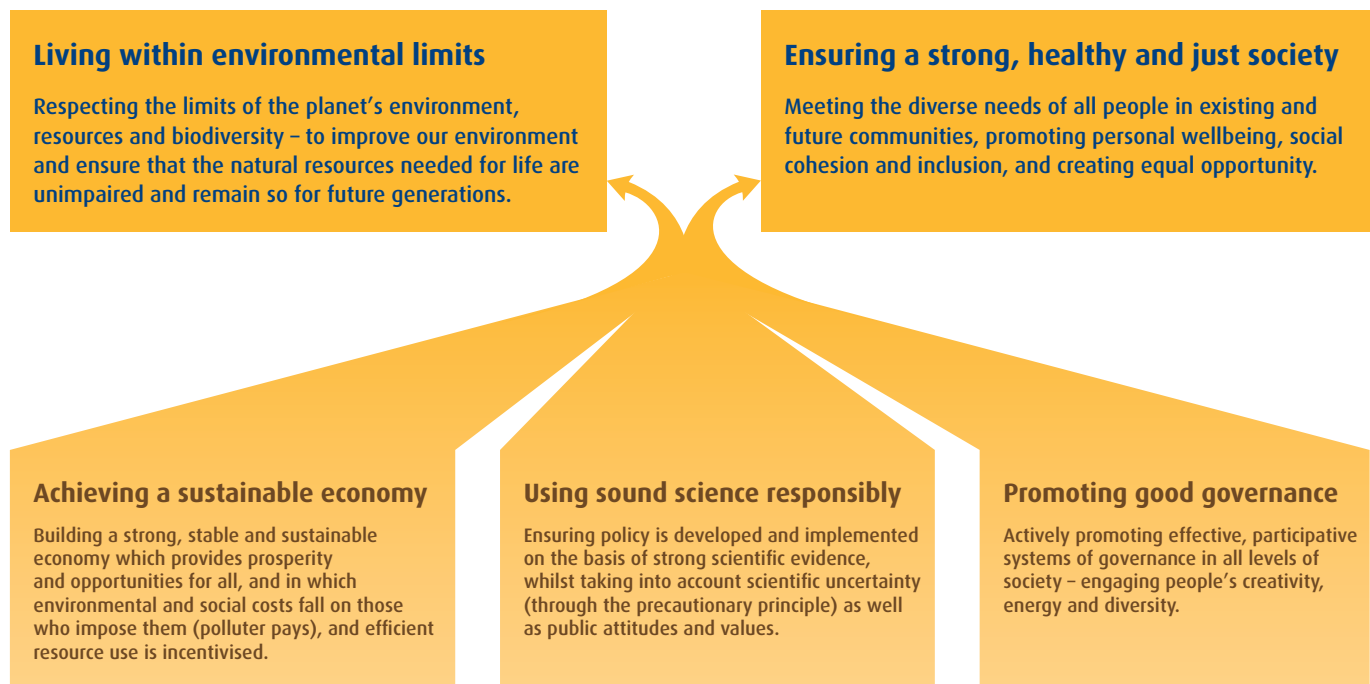development and
health inequalities

3.1 What is sustainable development?

Sustainable development provides a logical starting point and an essential analytical framework for finding ways to reduce health inequalities. The rest of this report explains what sustainable development is, why it matters for health inequalities, and how it can lead to practical implications for policy-making.

There is a focus on inequalities between different socio-economic groups, on the grounds that socio-economic status strongly influences and often compounds inequalities related to ethnicity, gender, age and disability.

Figure 1 **Five Guiding Principles of sustainable development.**[9]

Living within environmental limits

Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Ensuring a strong, healthy and just society

Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity.

Achieving a sustainable economy

Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

Using sound science responsibly

Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

Promoting good governance

Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

Sustainable development is understood in terms of five principles set out by government. These offer a systemic approach that is consistent with the 'social model' of health (which considers how factors beyond the presence or absence of disease affect people's health) and also extends and strengthens it.

By stressing the need to take a long-term view, move away from the assumption of continued economic growth, and to focus on the environmental determinants of health and health inequalities,

sustainable development opens up opportunities to invest in 'synergistic' measures, or co-benefits, that reduce environmental damage, promote social justice and narrow health inequalities. It draws attention to the needs and claims of future generations, and inter-generational equity.

Two 'big picture' dimensions of sustainable development – climate change and a sustainable economy – are explored in more detail from Section 3.5 below.

3.2
Healthier people, healthier environment

Unhealthy living and illness create a vicious circle, which reduces individual and collective wellbeing, damages the environment and undermines the long-term viability of the health system. This is not a judgment on individuals; unequal distributions of social, economic and environmental resources strongly influence and constrain the choices people can make about how they live.

But unhealthy lifestyle choices can cause more damage to the environment than healthier ones e.g. driving not walking, and eating carbon-intensive processed foods. A report for the Food Standards Agency showed that low income groups eat less healthy food and engage in less physical activity than the average population.[10] Rising overweight and obesity has serious implications not only for health but also for greenhouse gas emissions; people who are overweight and/or obese consume more food, and food production accounts for approximately 19 per cent of the UK's consumption-related greenhouse gas emissions.[11, 12]

In addition, ill health usually requires healthcare, which can contribute to the National Health Service's very substantial carbon footprint. In 2007, NHS England produced 21.2 million tonnes of carbon dioxide, a quarter of all English public sector emissions.[13, 14] The majority of the carbon footprint is associated with procurement of goods and services, as Figure 2 illustrates. NHS England also produces 600,000 tonnes of waste – more than one per cent of all domestic waste produced in the UK – and consumes 50 billion litres of water a year.[15]

Figure 2 **_NHS England 2007 CO$_2$ emissions – primary sector breakdown._**[16]

Building energy use 24%

Travel 17%

Procurement 59%
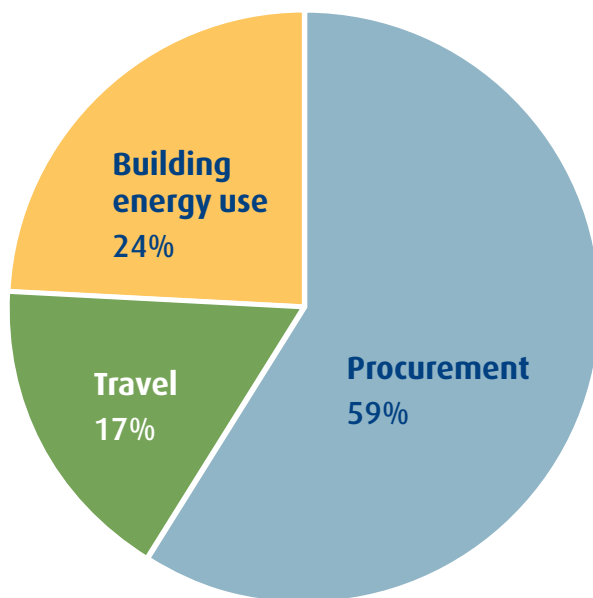
Tackling social and health inequalities is therefore important not only because they are unethical, unjust and both socially and economically dysfunctional, but because they contribute to environmental damage. So how would the overall level of ill-health in the UK change if people in lower socio-economic groups enjoyed the same standards of health as those in higher groups? And how would that impact on the carbon footprint of the NHS? For spending on obesity and overweight related ill-health in particular, a National Heart Forum study using modelling from the Foresight Programme, revealed NHS cost savings of around 50 per cent that would result if those in lower social classes had the same BMI distribution as those in social class one (see box on page 29 for more detail). Putting this information in the context of the carbon footprint of the NHS, these cost savings might also represent a reduction of over 522,000 tonnes of CO$_2$.

In general, if there were far fewer people leading unhealthy lives and requiring healthcare, this would constrain or reduce the burden of demand on the health system, which in turn would reduce its carbon footprint. It would also enable the long-term financial viability of the NHS, which is particularly important in times of little or no economic growth.

The public resources saved by preventing avoidable diseases could be put to better use in helping to reduce inequalities, for example by increasing spending on public transport systems, education, 'green' skills and jobs, affordable housing and sustainable living spaces.

3.3
Prevention and co-benefits: Promoting health and sustainable development

Preventative strategies that are consistent with the principles of sustainable development offer co-benefits – they will reduce both illness and environmental damage across social and ethnic groups. There are strong synergies between these policy areas, suggesting it is cost-effective as well as sustainable to invest in measures that can achieve positive outcomes on both fronts.[17]

Healthcare and prevention

At the moment, almost all of the NHS budget in England is spent – directly or indirectly – on the treatment and care of illness. Only four per cent of the £92.3 billion it received from taxpayers in 2006–7 was spent on prevention and public health,[18] namely disease prevention, maternal and child health, family planning and school health services. While this is high in comparison with the OECD prevention expenditure average of 2.8 per cent, it is still not enough to prevent illness and reduce health inequalities.

The SDC believes preventing disease, prolonging life and promoting health through the organised efforts of society should be the first aim of health policy; the second being to ensure the population can get high-quality, safe treatment and care when they are unavoidably ill.

This goes hand in hand with a 'social determinant' approach to health and with the findings of evidence-based reviews such as the *Black Report*,[19] the *Acheson Report*[20] and the *Wanless Reports*.[21, 22]

A new approach to prevention

The definition of preventative public health should be revisited in order to encompass the root causes of health inequalities. But the NHS cannot improve the health of the population single-handedly. Instead, preventative public health needs to be a shared responsibility, with a range of different sectors and services working together – education, employment, planning, housing, benefits, transport, sport and leisure, and environment.

Vascular disease is just one illness for which responsibility needs to spread beyond the formal health sector. Vascular disease affects 4.1 million people, kills 170,000 people every year and is responsible for a fifth of all hospital admissions. It is the largest single cause of long term ill health and disability and accounts for more than half the mortality gap between rich and poor.[23]

The burden of disease falls disproportionately on people living in deprived conditions and on particular ethnic groups, such as South Asians (see Section 3.4, Area inequalities). In addition to the 2009 introduction of vascular screening for the over-40s, the health system can and should work harder to influence the root causes, for example by working with partners to alter the 'obesogenic environment' (defined as "an abundance of energy-dense food, motorised transport and sedentary lifestyles"[24]) that has become the norm in some areas.

As outlined in more detail in relation to food, transport, green space and the built environment (see Section 4), such an approach will achieve the co-benefits of a long term reduction in health inequalities and environmental, social and economic gains. Growing and eating local food, swapping car journeys for public transport or 'active travel' on foot or by bike, making more of green spaces and

bringing healthcare and prevention literally closer to home all yield co-benefits that reflect intrinsic (e.g. sense of community belonging) rather than extrinsic (e.g. materialistic) values[25, 26] and redistribute income and level of carbon emissions across socio-economic groups.

However, success requires strong local partnerships, a broader sense of responsibility for health and wellbeing and systematic engagement between the NHS and regional development agencies, local and regional government and social care. An understanding and articulation of how every organisation involved can access the appropriate synergistic co-benefits – whether their formal remit be food, transport, planning, green space etc. – is likely to facilitate such relationships.

Prevention in action

Tomorrow's People in-house employment service: Recognising the links between employment and health, Roy Macgregor and his partners at the James Wigg GP Practice in London's Kentish Town have been making referrals to an in-house employment service. At the end of a three year pilot between 2001–4, nearly 200 patients had seen its advisor. Of those who completed the programme, 87 per cent had returned to employment or were back in education and training. The practice estimates that the pilot helped save an average of five GP consultations per patient, already saving the surgery thousands of pounds.[27]

3.4
Area inequalities

In inner London, the relationship between the spatial distribution of social deprivation and mortality is the same now as a century ago.[28]

The local dimension of preventative public health is particularly important. A persuasive body of research[29, 30, 31] demonstrates that where a person lives affects how well that person lives now and in the future, and even their life expectancy. Whilst it encompasses the quality of the built environment, it also extends beyond it to the quality of the neighbourhood's social infrastructure.

But it is almost a truism to suggest that where you live determines whether or not you are exposed to air and industry pollution, traffic, noise and infections. It determines your access to good housing, cheap, healthy food, open spaces and quality employment, education, exercise and health opportunities. And it determines your beliefs, attitudes and expectations about yourself and those around you, which in turn affects behaviour and wellbeing, both individually and collectively.

An area's physical and social infrastructures are intimately connected (see Section 4). But not all areas are equal. And area inequalities lead to health inequalities, prompting serious gaps in both length and quality of life.

Health and area inequalities

Living in a deprived urban area increases a person's risk of poor health even after taking account of individual characteristics.[32, 33] The gap between rich and poor areas increased in the 1980s and 1990s.[34]

There is a powerful relationship between local measures of deprivation and reduced life expectancy: the more affluent your neighbourhood, the longer you will live. In 2001–2003 in the North West, men and women living in the nation's most deprived fifth of areas could expect a shorter life by 6.8 per cent and 5 per cent respectively, compared with the average for England and Wales. By contrast, men and women living in the most affluent fifth of areas nationally could expect to live 3–4 per cent longer than the national average.

Is it the area that has caused this lower life expectancy, as against the poverty of people living in the poor neighbourhoods? Whilst this report highlights the complexity of factors that lead to health inequalities, it has been found that in countries where the gap between rich and poor areas is narrower, this effect is less pronounced.[35]

People living in the UK's most deprived areas are between three and ten times more likely to suffer from self-harm, violence, chronic obstructive pulmonary disease, alcohol-related conditions and births to lone mothers, and to claim disability living allowance and incapacity benefits. Residents in deprived areas are two or three times more likely to face asthma, lung cancer, respiratory conditions and smoking-related deaths, diabetes and heart disease, alcohol-related deaths and poor mental health, epilepsy, self-rated poor health and frequent emergency hospital admissions.[36]

Vulnerable groups and area inequalities

Vulnerable groups such as children and young people, women, older people, ethnic minority groups and disabled people can suffer particularly from area inequalities. Lower socio-economic groups are concentrated in deprived areas and tend to have higher levels of disability due to poorer health, more accidents and more mental health problems,[37] with psychiatric illness and psychoses closely mapping deprivation.[38, 39]

A recent study explored the impact of the built environment and local neighbourhoods on school age children. The research showed that the quality of the

physical environment affected children's behaviour and attitudes to schools, and that schools were adversely affected by the poor physical condition of their surrounding neighbourhoods.[40]

Department of Health research also shows that some ethnic minority groups experience poorer health than others, undertake less physical activity than the general population and also experience poorer access to facilities and poorer quality of services.[41]

This research found that coronary heart disease and diabetes is five times higher amongst South Asians and three times higher amongst people from African and Caribbean backgrounds than the general population. Only 11 per cent of Bangladeshi and 14 per cent of Pakistani women were reported to have done the recommended amounts of physical activity, compared with 25 per cent in the general population.

Rural area inequalities

Much of the research on health inequalities focuses on deprived urban communities. But what about the 20 per cent of the population who live in the countryside? Whilst on average most people there live longer, have better physical and mental health and enjoy healthier lifestyles, the plight of the poorest and most disadvantaged rural residents can remain hidden, masked by the prevailing affluence of many rural areas.

Cost, national targets and economies of scale are all weighted against rural services provision. Where services do exist, distance, travel times and transport availability can create health inequalities, particularly for people without private transport. Older people can be particularly disadvantaged and the proportion of older people in rural areas is increasing faster than in urban areas, particularly in respect of people over 85. The median age of rural residents is nearly six years older than their urban counterparts.[42]

3.5
Big picture issue: Climate change

"The policies needed to mitigate climate change will exert health effects by acting on many of the determinants of health and health inequality."[43]

Risks to human health and wellbeing

Climate change is one particular challenge that threatens to widen health inequalities between rich and poor populations. Unsustainable development that damages the natural environment will certainly increase risks to health for all social groups. But in important respects, they will also widen health inequalities, both globally and within the UK.[44] There is substantial evidence that climate change results from carbon and other greenhouse gas emissions, as illustrated in Figures 3 and 4, and poses potentially catastrophic risks to human health.

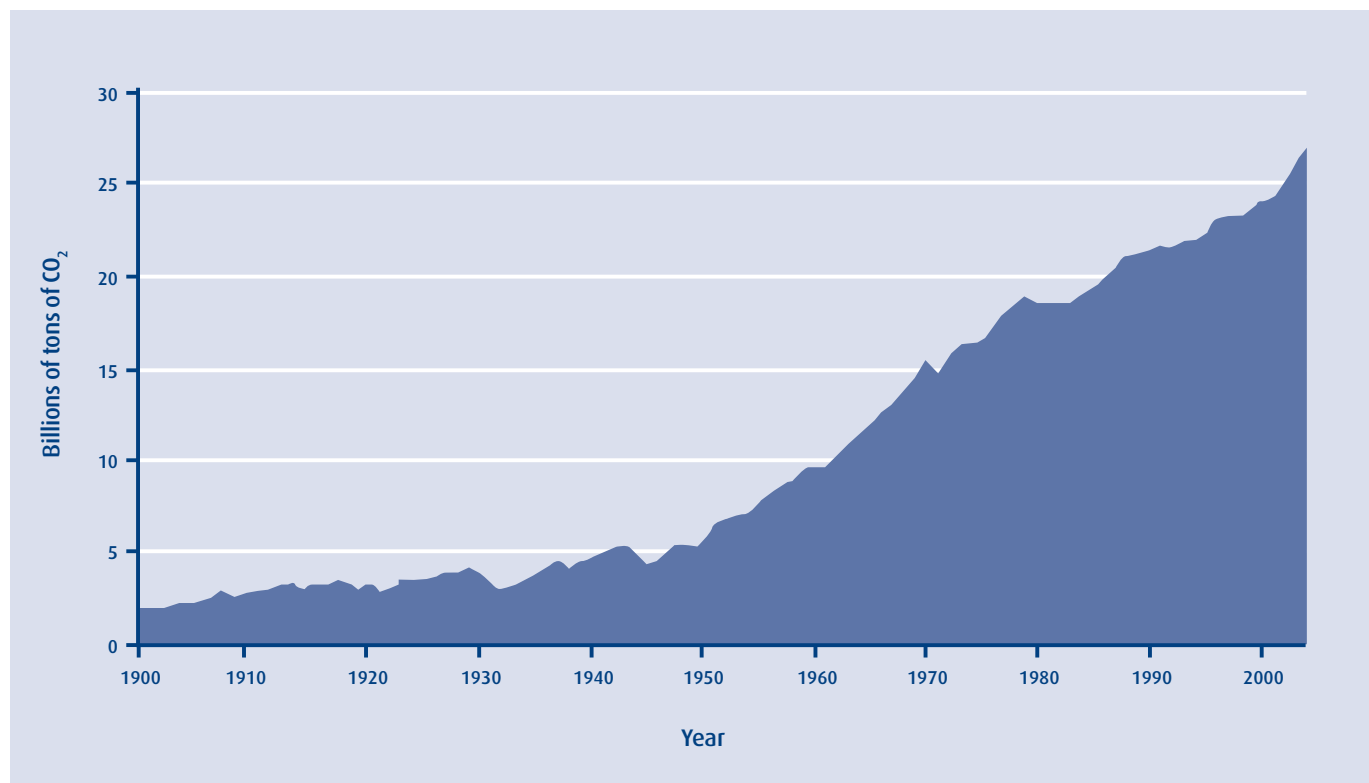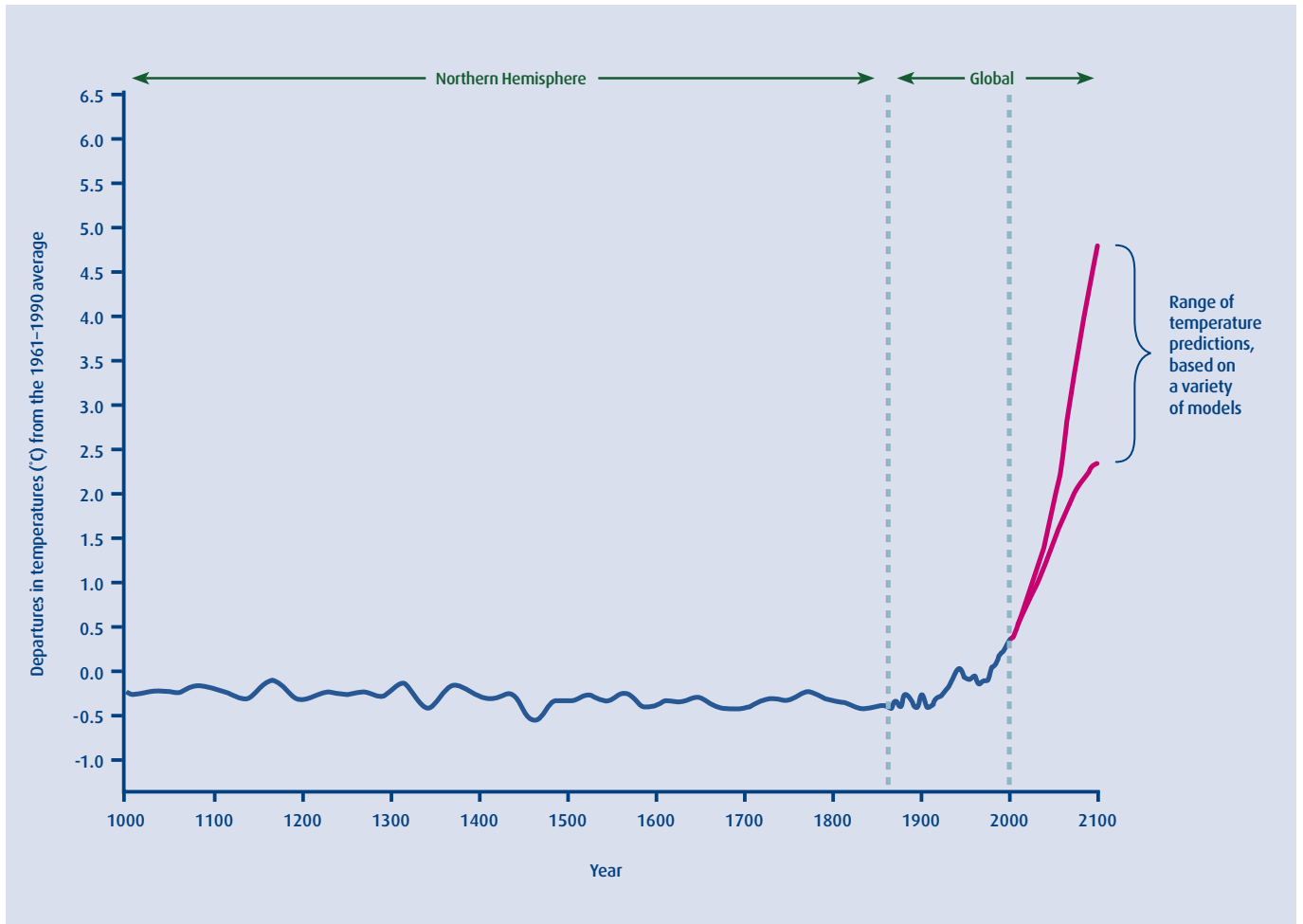Figure 3 *Global carbon emissions since 1850 from fossil-fuel burning and cement.*[45]

Figure 4 *Variations in the Earth's surface temperature since 1000, and predicted until 2100.* [46]

The Intergovernmental Panel on Climate Change projects that malnutrition, diarrhoeal disease, cardio respiratory disease, infectious diseases and extreme weather events will all increase due to climate change. In Europe, the most prevalent health effects will include excess heat-related mortality, changes in infectious disease vectors and increased seasonal production of allergenic pollen in high- and mid-latitudes.[47]

Climate change will also affect health indirectly through its impacts on social and economic systems. Resource shortages, dislocation, migration and conflict are likely to substantially increase levels of stress, anxiety and depression, impairing mental as well as physical health.

Climate change may bring some health benefits – for example by reducing cold-related mortality in temperate areas[48] – but these will be outweighed by the detrimental impacts on the health of millions of people.[49]

Despite being the least likely to cause climate change, disadvantaged populations are more likely to be exposed to its health threats.

The poorest people are most at risk

Climate change, left unchecked, will also increase health inequalities between and within countries. Deprivation often increases vulnerability to climate change and climate change increases deprivation. People already facing health, income and housing inequalities will be vulnerable to the physical and mental health impacts of climate change.[50] In rich as well as in poor countries, factors that predispose individuals to suffer earlier or more severely include having a low income,[51] living or working in a geographical location that is at high risk, social isolation, old age, very young age and chronic illness.[52]
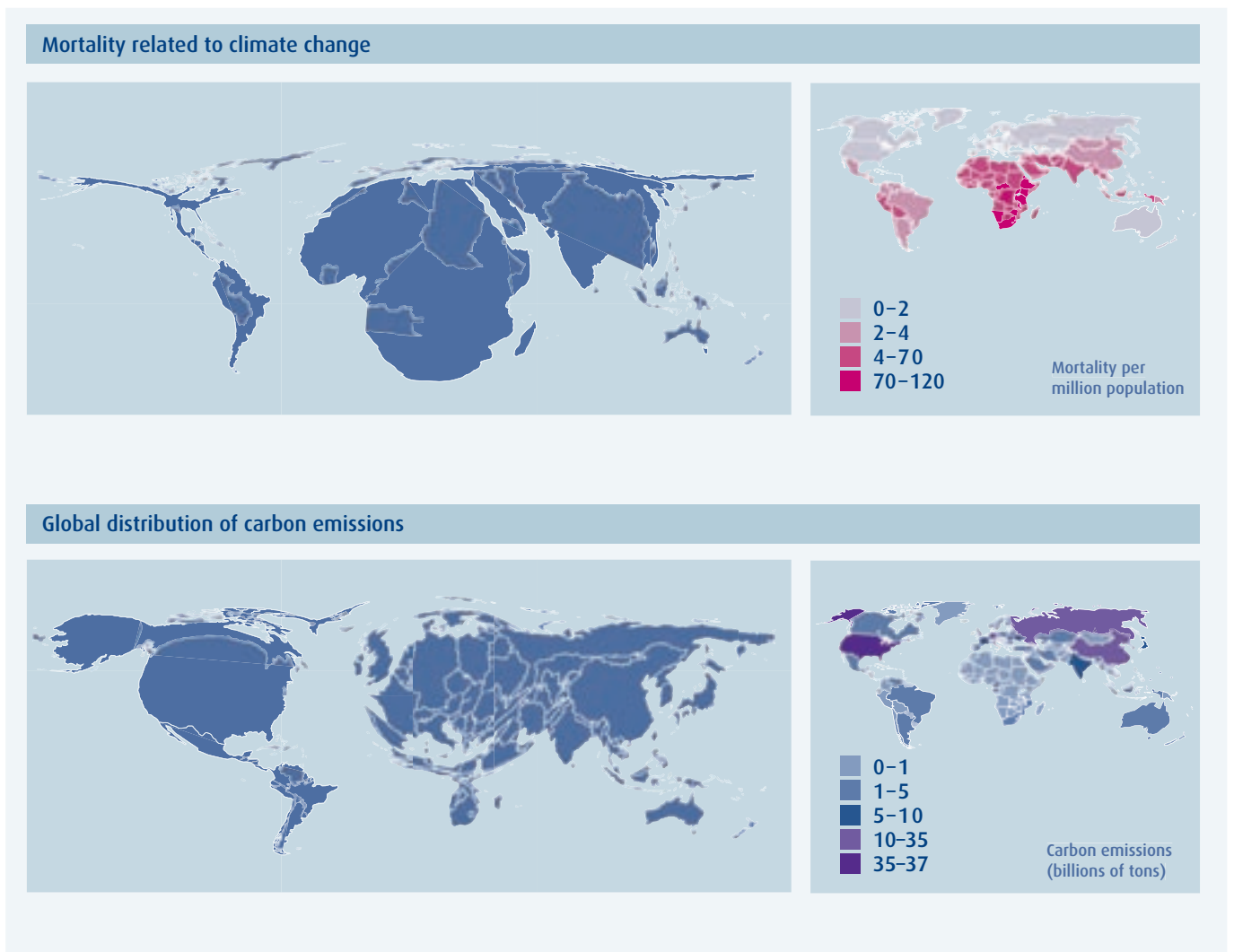
People on low incomes are more likely to live in 'urban heat islands'[53] (whereby the density of urban buildings raises the local temperature higher than the surrounding area) and because of this are at higher risk of heat stroke.[54] They are more likely to live in homes that are less well protected[55] and in areas that are more exposed to weather extremes and flooding.[56] They are more likely to be adversely affected by homelessness and migrations triggered by climate change.[57]

Crucially, they are less likely to have access to insurance against climate change risks such as storm and flood damage.[58] Although low-income countries will suffer most acutely, in all countries the risks associated with climate change will fall disproportionately on "the urban poor, the elderly and children, traditional societies, subsistence farmers, and coastal populations."[59]

Despite being the least likely to cause climate change, disadvantaged populations are not only more likely to be exposed to its health threats, but are more vulnerable to becoming ill and less able to respond effectively to ill health, as Figure 5 illustrates and other studies concur.[60]

As Margaret Chan, Director-General of the World Health Authority, powerfully puts it in her introduction to The Lancet's 2009 Health and Climate Change series,[61] "The contagion of our mistakes shows no mercy and makes no exceptions on the basis of fair play. For example, countries that have contributed least to greenhouse gas emissions will be the first and hardest hit by climate change."

Figure 5 *Global distribution of carbon emissions and mortality related to climate change (increase in diseases attributable to temperature rise in the past 30 years).*[62]

Mortality related to climate change

0–2	
2–4	
4–70	
70–120	Mortality per million population

Global distribution of carbon emissions

0–1	
1–5	
5–10	
10–35	
35–37	Carbon emissions (billions of tons)

Policy interventions: Lower carbon, fairly

Despite the disappointing outcome at Copenhagen, national and international policy makers are increasingly focused on the need to mitigate climate change. To cap global temperature increase between 2.0°C and 2.4°C (and global sea rise due to thermal expansion below 1.4 metres), the atmospheric CO_2 equivalent concentration must be stabilised at 445-490 parts per million. This will require global emissions cuts of 50-85 per cent between 2000 and 2050.[63] The UK's Committee on Climate Change set a target of 42 per cent by 2020, against a 1990 baseline.[64]

Reducing carbon emissions will mean increasing energy efficiency, developing renewable and low-carbon sources of energy, changing to low-carbon modes of production and transport, and encouraging low-carbon behaviour.

Many of these measures will have positive effects on health, for example, by encouraging healthy eating and active travel (see Section 4). But if people in higher socio-economic groups do more to change their behaviour (e.g. moving to low carbon living and alternative consumption patterns) than people in lower socio-economic groups and do it sooner (which tends to be the pattern for public health behaviour change), health and social inequalities will simply widen.[65] Instead, low-carbon living must be developed and spread in ways that are equitable and empowering for all social groups, especially those who are poor and disadvantaged.

While poverty is strongly associated with ill-health, people with lower incomes tend to have smaller carbon footprints than richer people, because of the strong links between levels of affluence, consumption and carbon emissions.[66, 67] So whilst raising poorer people's incomes may generate medium term health equalities, without a change in current consumption patterns carbon emissions will also increase.

However, a carbon tax imposed equally on richer and poorer households "would be very regressive and would add to the unfair price burden these households are already experiencing."[68] This effect could be offset by introducing a compensation package for low-income households through the benefits system.[69] which could build on or adapt the policy measures that already exist in the UK, such as the fuel poverty schemes (to improve household energy efficiency) or income supplements via the winter fuel payments.

In theory, some carbon rationing and trading schemes may produce more equitable results;[70] the 'contraction and convergence' regulatory framework has potential health benefits. In this approach, every individual gets an equal allocation of carbon, with the total capped and reduced year on year to eventually meet an overall target limit. One expert argues: "Those who don't use their allocation – mainly the poor – will be able to sell it at market rates to those who wish to use more than their allocation – mainly the rich. This redistribution of wealth will reduce disparity, a crucial measure if we really wish to improve public health."[71] Further work is needed on the appropriate measures to reduce carbon and health inequalities in an equitable manner.

But mitigation alone will not be enough. The world is already facing unavoidable climate change and must take action to adapt to the resulting health impacts, for example through monitoring of climate risks to health,[72] heat-health action plans,[73] protection programmes for occupational heat exposure,[74, 72] flood management policies,[76] more efficient use of water and other resources,[77] relocation of some coastal populations, and dietary changes.

Both mitigation and adaptation measures will affect health and health inequalities, by reducing the negative health impacts of climate change and by influencing other health determinants. For example, building the capacity of communities to adapt to climate change may also build stronger social connections that are likely to have positive effects on health.[78] The Lancet has set out the quantitative public health benefits of strategies to reduce greenhouse gas emissions from household energy, transport, food and agriculture, and electricity generation.[79]

But as low-income groups have fewer material resources to enable them to adapt to climate change and benefit from adaptation strategies, these will widen health inequalities unless they go hand-in-hand with strategies to reduce social and economic inequalities.

3.6
Big picture issue: The economy

In the UK the percentage of people reporting themselves 'very happy' declined from 52 per cent in 1957 to 36 per cent in 2007, even though real incomes more than doubled during that time.[80]

Achieving a sustainable economy

There are now persuasive arguments that a sustainable economy cannot be achieved through continuing economic growth as we know it, at least in developed countries such as the UK.

Economic growth drives and is driven by the increasing consumption of goods and services.[81] Producing most of these goods and services requires natural resources, including fossil fuels and other non-renewable materials, and causes the emission of greenhouse gases and other pollutants.

The 'dilemma of growth' is that it increasingly depletes the finite resources on which the economy depends. A common response is to argue that economic growth can be 'decoupled' from the depletion of natural resources and the production of greenhouse gases through more efficient methods of production. But this is not the case.

There is some evidence of relative decoupling, where the rate of depletion slows in relation to the rate of economic growth. But as the economy grows, so does the overall use of resources and emissions. As a result, "for decoupling to offer a way out of the dilemma of growth, resource efficiencies must increase at least as fast as economic output."[82]

But at a global level, all the key indicators point in the opposite direction: carbon emissions, resource extraction, waste generation and species loss are increasing. Not only is there a failure to achieve the necessary efficiencies, but increasing consumption of resources remains a necessary driver of growth.

By 2050, with an estimated nine billion people across the world all aspiring to incomes that match the two per cent annual average growth in today's European Union, carbon intensity per unit of economic output would have to fall on average by more than 11 per cent a year to stabilise the climate. The global carbon intensity would need to be just six grams per dollar of output, almost 130 times lower than it is now.[83]

In short, the idea that capitalism's propensity for efficiency will allow us to stabilise the climate or protect against resource scarcity is "nothing short of delusional."[84] We cannot rely on technology alone to deliver the carbon reductions necessary to meet the targets agreed at national and international levels. However, just as economic growth is unsustainable in its current form the alternative of 'de-growth' is unstable at least under present conditions. Declining consumer demand leads to rising unemployment, falling competitiveness and a spiral of recession. This dilemma cannot be avoided and has to be taken seriously.

Green Well Fair[85] sets out the case for a new social settlement that makes no assumption that the market economy will grow. Instead, such a societal system values and nurtures two other economies – the resources of people and the planet. The challenge is to find a different economics and a different economic structure to ensure stability, maintain employment and deliver sustainability. Although this challenge is great, there is a growing body of evidence to show that meeting it is both essential and possible.[86]

Prosperity does not depend on constant increases in economic growth, but has to do with our ability to flourish and participate meaningfully in the life of society.

Implications for health inequalities

However society decides to address this central challenge, the implications for health inequalities are considerable.

The role of investment will be crucial, given the need to both enhance investment in public infrastructures, sustainable technologies and ecological protection whilst protecting and improving public services such as health and education. For economic policy, that will almost certainly require a re-thinking of the balances between consumption and investment, and between public and private investment.

If people who are poor are to have better education, health care and other public services to counteract the negative effects of their economic disadvantage on their health, smarter ways must be found to improve the design and delivery of these services.

Most fundamentally, overcoming the growth dilemma offers little opportunity for the current political approach, which tries to narrow social and health inequalities by simply raising poor people's incomes. A new definition of prosperity is required.

Redefining prosperity

As set out in *Prosperity Without Growth?*, prosperity does not depend on constant increases in economic growth, but "has to do with our ability to flourish: physically, psychologically and socially" and "hangs on our ability to participate meaningfully in the life of society."[87] It reflects our wellbeing, which is best understood in dynamic terms, connecting how we feel with what we do and what we are able to do, and with the material and non-material conditions of our lives.[88, 89]

Prosperity has undeniable material dimensions but there is strong evidence that beyond a certain point, an increase in material consumption ceases to be matched by increasing wellbeing. [90, 91, 92, 93, 94] In the UK the percentage of people reporting themselves 'very happy' declined from 52 per cent in 1957 to 36 per cent in 2007, even though real incomes more than doubled during that time.[95]

If growth is driven by and drives increasing material consumption, and if continually expanding consumption can undermine wellbeing and future

prosperity, it is imperative we find routes to better physical and mental health for all by focusing not on economic growth but on enabling people to flourish. The conditions for human flourishing are common to most societies.[96] The challenge for society is not only to create the conditions in which these basic entitlements are possible, but to distribute them evenly across socio-economic groups.

Policy makers face many considerations when trying to reduce health inequalities in an economy that is confronting the challenge set out above. These include:

- Capabilities that enable people to flourish are bounded by the finite nature of ecological resources and an expanding global population[97]

- Flourishing within sustainable limits will involve replacing the current culture of consumerism, which can help to reduce the social and economic variables that determine health inequalities

- Income inequality affects health – even after adjusting for people's individual incomes – and unequal societies are almost always unhealthy societies.[98] So strategies to reduce health inequalities will need to address the gradient across social groups.

- Integrating social and environmental policies – both because social policies will have to address a negative range of environmental pressures and impacts (including climate change), and because social policies can help to enable individuals and groups to mitigate and adapt to climate change.[99]

- Planning for a sustainable, low-carbon economy will involve transforming systems and services that safeguard and improve health and wellbeing for all social groups.[100]

Sustainable development policy implications

- The five Guiding Principles of sustainable development should be used as the central framework for designing and implementing policies for reducing health inequalities, across government, nationally and locally. Particular attention must be paid to intergenerational equity.

- Priority should be given to investing public resources in such a way as to achieve synergistic outcomes for both health inequalities and other environmental sustainability issues especially carbon reduction (on physical activity, for instance, or local food production schemes).

- Methods for appraising the impact of policymaking and procurement across government should be reviewed, to ensure that success is measured in terms of health, environmental and economic outcomes. Appropriate mechanisms should be put in place to ensure that health inequality and sustainable development are mandatory considerations at all levels of decision-making.

- High priority must now be given to reducing emissions of greenhouse gases across the entire health sector. All NHS workers should be acting as champions for action to reduce the adverse effects of climate change on health. However, even with extensive action to reduce future emissions we will still experience a range of climate impacts due to existing emissions. Action to adapt to climate change is therefore equally important to help reduce future health inequalities.

- The potential impacts of climate change (and of measures taken to address those impacts) should be taken fully into account when planning action for reducing health inequalities, with particular attention paid to low-income groups.

- Planning needs to start now for a sustainable, low-carbon economy, focusing on creating conditions that enable people to flourish physically, socially and psychologically.

4

A sustainable approach to tackling health inequalities

4.1
Introduction

Sustainable development is entirely consistent with the social determinants approach to improving health and provides an essential framework for finding ways to reduce inequalities. It opens up opportunities to invest in measures that have a number of co-benefits – reducing environmental damage, promoting social justice and improving health inequalities.

This section applies the framework of sustainable development to four determinants of health – food, transport, green space and the built environment. It demonstrates how a sustainable approach to health inequalities would work in practice. These four areas have been chosen because they exemplify the themes of low carbon and a sustainable economy; as well as the central concept that measures to mitigate climate change also help reduce health inequalities. They can make a big impact on the growing problems of obesity and mental health, both of which are more prevalent among people on low incomes as highlighted in the box opposite.

The examples of food, transport, green space and the built environment also serve to illustrate that, while the NHS needs to give far higher priority to preventing ill health, it cannot do the job alone. This is discussed in more detail in Section 5.2. In accepting that social, environmental and economic factors determine health, a compelling case is made for all the different sectors and services in our society to share responsibility – and work together – to address the underlying causes of illness and health inequalities. Recent policy developments have also recognised this need, for example the emerging guidance from the National Institute for Clinical Excellence (NICE) on spatial planning for health,[101] as well as DCSF's Play Strategy.[102] It is particularly important in the current economic climate not to retreat to the comfort of familiar professional boundaries but to acknowledge and exercise a much broader responsibility for health and wellbeing.

A 21st century challenge

Mental health and lifestyle-related inequalities such as obesity are widening significantly.[103]

Obesity and health inequalities

- Obesity is of epidemic proportions – over half of all adults in England are now considered overweight or obese.[104] The UK Government's Foresight Programme highlighted the fact that in 2009 alone excess weight and obesity cost the NHS £4.8 billion. It has predicted that costs could continue to escalate without radical changes across society and indicates that by 2050, 60 per cent of adult men, 50 per cent of adult women and about 25 per cent of all children under 16 may be obese.[105]

- The poorest in society are bearing the brunt of this ill health. People from low income households are the least likely to meet the recommended levels of physical activity. They are also the most likely to be sedentary – achieving less than 30 minutes of physical activity per week. For example, 44 per cent of women and 34 per cent of men in the poorest households in England are sedentary, compared to only 33 per cent of women and 28 per cent of men in the wealthiest households. These low physical activity levels are a significant cause of health inequalities, with inactive groups suffering poorer health and living shorter lives than the general population.

- A recent study from the National Heart Forum**[106]** showed that if class inequalities in obesity were eliminated, levels would drop dramatically, halving the NHS's 2009 obesity bill of £4.8 billion and reducing the 2025 estimate from £8.9 billion to £4.1 billion, given the predicted rise in obesity especially among the manual classes. For this to happen, a radical shift needs to take place across a wide range of sectors. In 2006 NICE published a clinical guideline on the prevention, identification, assessment and management of overweight and obesity in adults and children. It advised local authorities to work with local partners, such as industry and voluntary organisations, to create and manage more safe spaces for incidental and planned physical activity, such as parks, and to address as a priority any concerns about safety, crime and inclusion. In particular, they were advised to provide facilities and schemes such as cycling and walking routes, cycle parking, area maps and safe play areas.[107]

Mental health and inequalities

Mental Health, Resilience and Inequalities from the Mental Health Foundation[108] argues that mental health is the lynchpin between economic and social conditions. Poor mental health experienced by individuals is a significant cause of wider social and health problems, including: low levels of educational achievement and work productivity; higher levels of physical disease and mortality and violence, relationship breakdown and poor community cohesion. In contrast, good mental health leads to better physical health, healthier lifestyles, improved productivity and educational attainment and lower levels of crime and violence.

- In Britain, one in four adults will have a mental health problem in the course of a year.[109] The economic costs of this are clear: mental ill health costs England over £77 billion every year.[110] Foresight set out how some mental disorders could grow substantially in the future, although the wide range of influencing factors makes prediction problematic.[111]

- Within urban areas, rates of psychiatric illness are greatest in the most deprived areas. The rates for psychoses map closely those for deprivation. The size of a city also matters; schizophrenia rates in London are about twice those in Bristol or Nottingham.[112, 113]

4.2
Food systems

4.2.1 Food and sustainable development

People on low incomes eat the least amount of fruit and vegetables.[114]

The performance of 11-year-old pupils eating Jamie Oliver's school meals improved by up to eight per cent in science and as much as six per cent in English, while absenteeism due to ill-health fell by 15 per cent. [115]

A sustainable food system which provides safe, healthy food with positive social benefits and low environmental impacts is vital for a strong, healthy and just society. In the UK, richer people are more likely than poorer people to have diets that give them better health.[116, 117] In its *Food 2030* strategy,[118] the Government set out its vision for a sustainable and secure food system. It identified as a key priority encouraging and enabling people to eat a healthy, sustainable diet.

Climate change not only has a negative impact on health effects as discussed in Section 3, but will also increasingly affect food yield, nutritional quality, food safety and affordability.[119, 120, 121] While these will affect everybody, there will be disproportionate harm to socially disadvantaged populations.[122] Sustainable development and health equity are therefore firmly intertwined and mutually reinforcing.

The less healthy diets of poorer social groups in the UK also tend to be characterised by high-carbon patterns of consumption. A sustainable food system can therefore bring multiple benefits to health and climate change.

But clearly cost and physical accessibility must be addressed first. Government food policies and corporate practices must encourage and enable healthy, affordable and sustainable food choices, both through public procurement and fiscal and other policy mechanisms.

Reducing our food footprint

Food accounts for nearly a fifth of our total consumption-related greenhouse gas emissions in the UK.[123, 124] Almost half of food's greenhouse gas emissions are attributable to the agricultural stage, with livestock and their associated inputs contributing the most.[125, 126, 127, 128, 129, 130, 131, 132]

Greenhouse gas emissions post-farm gate are fairly evenly distributed between food manufacturing, transport, retailing, catering and food preparation and storage in the home. In high and middle-income societies, the type and quantity of food that reaches consumers is largely determined by supermarkets and the food services sector.[133] Within the sector, there is a high content of energy-dense, nutrient-poor foods that are highly processed, packaged and have a long shelf-life.[134, 135] These same water-and energy-intensive foods have high environmental production costs.[136]

Figure 6 *Projected global trends in meat and dairy consumption.*[137]
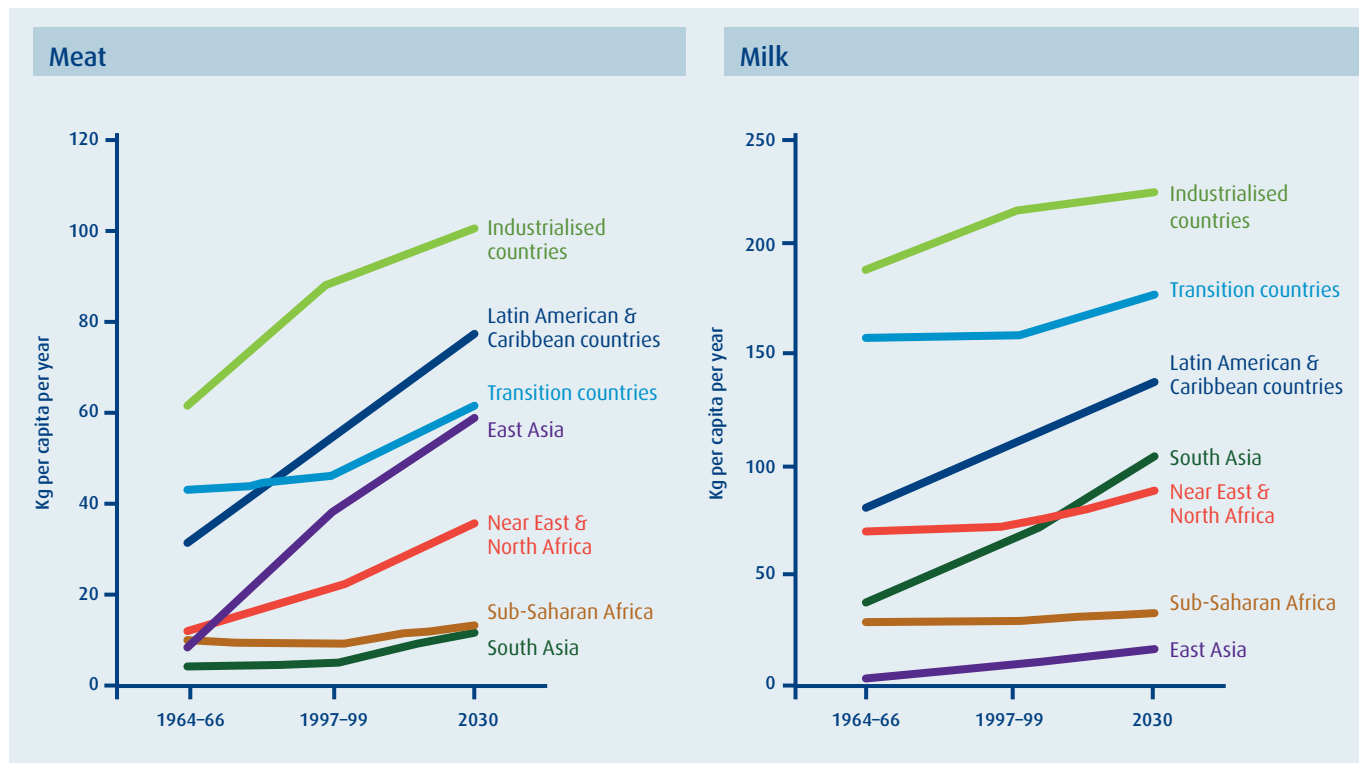
As Figure 6 above shows, global demand for foods such as meat and dairy is rising, with serious ramifications for environmental sustainability.[138, 139] Whilst there is certainly scope to reduce the greenhouse gas intensity of agriculture,[140, 141] given projected growth in demand for meat and dairy products, these gains are likely to be cancelled out by growth in livestock numbers.

We consume on average an estimated 83kg of meat a year and 243kg of milk and related products excluding butter. This is more than three times the average level of meat consumption in the developing world and five times its per capita consumption of milk.

To cut greenhouse gases and live within our environmental limits we need to change our diet;[142, 143] in particular we need to consume fewer livestock products. Reducing meat and dairy consumption, eliminating food waste and cutting fatty and sugary foods would make the biggest contribution towards improving health and reducing the environmental impacts of the food system.[144]

Cutting consumption of saturated fat – particularly from meat and dairy products – is well established health advice to reduce diet-related preventable disease.[145, 146] However, the exact levels need to take account of factors such as iron consumption, building on evidence from the current consultation from the Scientific Advisory Committee on Nutrition.[147]

4.2.2 Food, health and inequalities

An estimated 963 million people worldwide do not have enough food.[148] Yet, at the same time, a 'nutrition transition' to highly refined foods and animal source foods high in saturated fats is occurring around the world. This is contributing to obesity and associated diseases, particularly among many socially disadvantaged groups, in all but the poorest countries.[149, 150, 151, 152, 153]

Food systems have the potential to provide direct health benefits through the nutritional quality of the foods they supply. Food systems can also deliver community and health benefits through employment, income and ensuring the viability of rural communities. However, living within environmental limits is also pivotal to health,[154] in particular with regard to climate change.

Obesity is an area of widening health inequality, and a French project offers insights into local, joined-up action to tackle it.

EPODE ('Ensemble prévenons l'obésité des enfants', or 'Together, let's prevent obesity in children') is a community-based, family-oriented nutrition and lifestyle education programme. It aims to prevent child obesity at community level by bringing together influential individuals and groups – including education and health professionals, retailers and the media – promoting physical activity and healthy eating initiatives for both children and their parents.[155] The project's results in participating towns were staggering. The proportion of overweight boys almost halved from 19 per cent and the rate among girls dropped from 10 per cent to seven per cent.[156]

Affordable, sustainable food

In most countries, low income households spend a higher proportion of their income on food than the more affluent. Such households are the hardest hit by food price fluctuations – five per cent of people on low incomes report skipping meals for a whole day.[157] A tight budget is also a barrier to making dietary changes or experimenting with unfamiliar or perishable fresh foods.[158]

It is highly likely that rises in food and fuel prices will exacerbate diet-related health inequalities. Those people on low incomes will only be able to purchase the cheapest sources of calories – often energy-dense, highly-processed products that increase the risk of obesity and diabetes. Globally many millions will be unable to afford even that.[159]

Internationally, studies have shown that among low income groups price is the greatest motivating factor of food choice. In the USA, price reductions have seen positive increases in the sales of low-fat foods and fruit and vegetables.[160] The era of cheap food is coming to an end, but price signals and health messages are not always congruent.[161] Consumer expectations are still of low prices, which fail to internalise the full environmental costs.[162]

While considering ways to improve the affordability of healthy and sustainable food, we therefore need to determine the real cost of a healthy and sustainable diet, and make sure that social protection schemes and national wage agreements reflect this.[163, 164, 165]

Good food on the doorstep

Price is clearly one barrier, but tackling health inequalities also means ensuring that that all groups in society have adequate physical access to nutritious food, and that it is socially and culturally relevant to them. UK research indicates that the shops most used by low-income groups are less likely to stock healthy options. When they do, they are often more expensive than in other outlets.[166]

Projects in the UK aiming to improve access to nutritious and sustainable food include community growing schemes, gardeners' clubs and allotments, but there has been no comprehensive evaluation of their effectiveness. Public sector food procurement, however, provides a proven and significant opportunity to influence access to quality and sustainability. There are successful examples across the public sector,[167][168] but there is far from comprehensive engagement. The Healthier Food Mark, a scheme to encourage and recognise public sector best practice in delivering healthy and sustainable food, is being developed by Defra, the Department of Health and FSA. This is a promising initiative, although the level of ambition it will set remains to be seen.[169]

A recent evaluation of Jamie Oliver's *Feed Me Better* campaign in Greenwich Schools in 2004 showed "substantial" positive effects on Key Stage 2 scores in both English and Sciences. The performance of 11 year old pupils eating Oliver's meals improved by up to eight per cent in science and as much as six per cent in English, while absenteeism due to ill health fell by 15 per cent.[170] Considering the importance of education as a determinant of health, this is could be a powerful mechanism when targeted at areas of social disadvantage.

Qualitative and quantitative research methods have been developed to help better define, describe and spatially map the patterns of food access in deprived communities across the UK. Measuring access to healthy food in Sandwell,[171] an area of deprivation in the West Midlands, is one example of community led food mapping research. Like the rest of the UK, Sandwell has experienced a major shift in food retailing with the growth of large superstores located in suburban areas. People without access to cars must choose between using limited public transport to get to superstores or buying from increasingly inadequate local shops.

The research[172] found that there were large networks of streets and neighbourhoods in Sandwell where no shops selling fresh fruit and/or vegetables exist or where they did exist they were expensive. Reasonably priced, good quality food, including fresh fruit and vegetables, is available in small, concentrated shopping areas, to which the majority of the population would have to travel by car or public transport. Also, small retailers struggle to survive in the town, especially if they try to offer "healthy" food and perishable goods, against competition from larger stores. The results of the research are contributing to local baseline indicators of conditions and needs, and to the development of strategies to address inadequate access to healthy foods, and the development of local food policy.

Food policy implications

- Priority must be given to reducing greenhouse gas emissions from the food and agriculture sector, with an emphasis on the need for a reduction in the consumption of animal source foods.

- New fiscal policies are required to improve affordability of healthy and sustainable food choices. The cost of ensuring a nutritious and sustainable diet should be reflected in setting minimum wage and benefit levels.

- Policy should be informed by successful public sector food procurement programmes, in particular those which exceed statutory nutrition standards (e.g. Jamie's School Dinners) as mechanisms to 'choice edit' out less healthy/sustainable foods and encourage access to more nutritious and sustainable foods through schools, hospitals, social care and prisons.

- Indices should be developed to show geographic variations in price and availability of healthy food and health outcomes, and these data sources used to develop remedial strategies including encouraging community-led responses as with the Sandwell Food Access Project.

- Work needs to be carried out to understand fully the social, environmental and economic benefits of existing sustainable food projects (such as market gardens, allotments, gardeners' clubs, community growing schemes etc) to guide policy development in future.

4.3
Transport

## 4.3.1 Transport and sustainable development

Children in the most deprived 10 per cent of wards in England are four times as likely to be hit by a car as children in the least deprived 10 per cent of wards.[173]

A study by the London School of Hygiene and Tropical Medicine showed that 20mph speed zones in London had reduced road injuries by more than 40 per cent between 1986 to 2006.[174]

Modern society's dependence on motorised transport is detrimental to the environment, wellbeing and health equity. The transport sector offers a clear illustration of how the principles of sustainable development can be used to reduce health inequalities and deliver environmental, social and health benefits.

The distances people travel and the ownership and use of private motor vehicles have increased dramatically over time, as Figure 7 shows. Yet the number of destinations reached, and the time spent travelling, has remained relatively constant.[175] Provided people are able to meet their basic needs, there is little evidence that further increases in mobility result in greater wellbeing.[176, 177, 178]

Figure 7 *Distance travelled by mode.*

Source: TSGB data
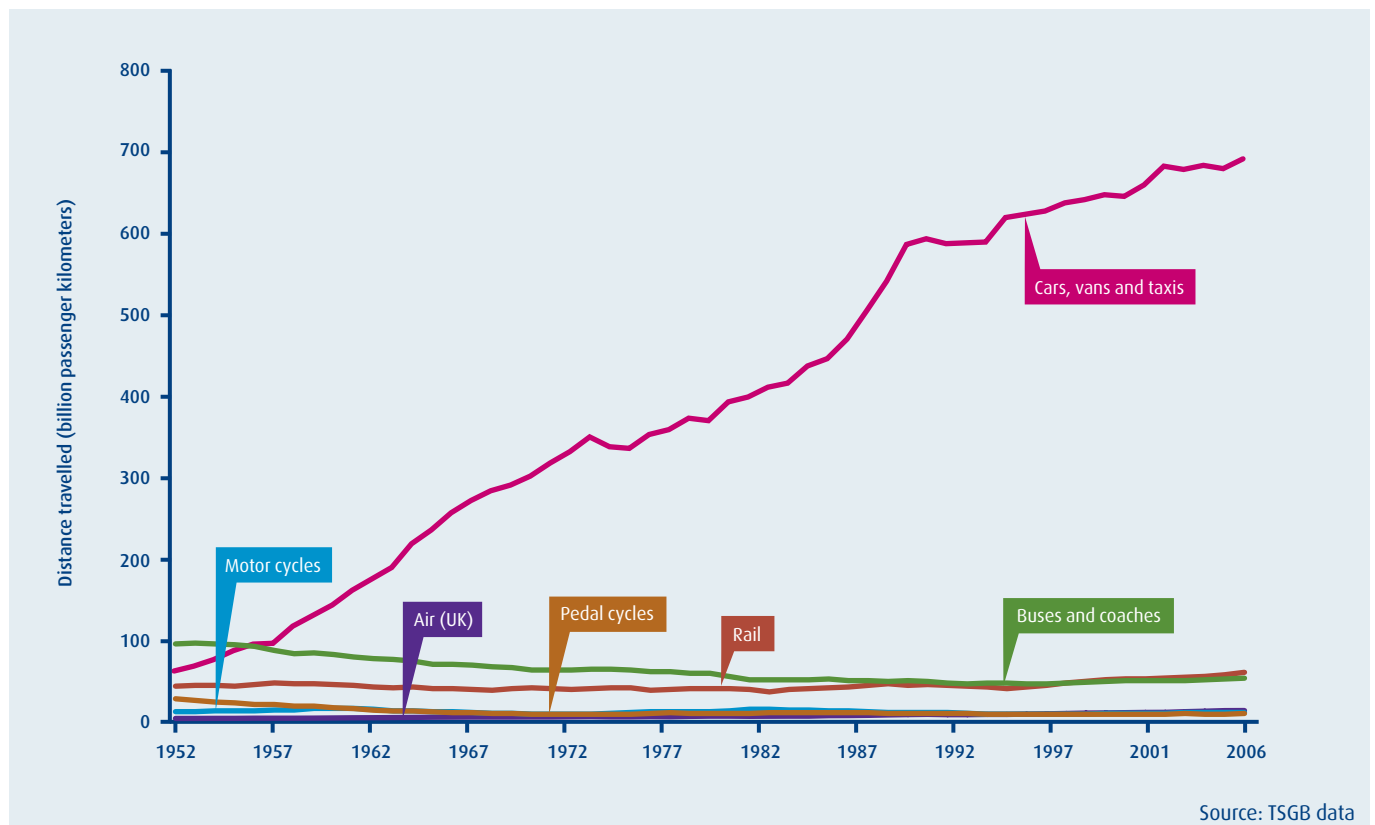
A major shift in transport policy that addresses environmental issues and supports equitable and sustainable communities will also have a positive impact on health and health inequalities. In particular, there is an urgent need to reduce transport-related greenhouse gas emissions by reducing the use of motorised transport, switching away from fossil fuels, and promoting low-CO_2 emitting means of transport.

There is a need both to reduce the unsustainable growth in traffic volumes that adversely affect the quality of life of those living close to busy roads – particularly in towns and cities – as well as tackling the major public health burdens arising from over-dependence on motorised transport including road injuries, air pollution, noise and physical inactivity.

4.3.2 Transport, health and inequalities

Transport is a major contributor to climate change, which represents one of the greatest threats to future human wellbeing.[179, 180, 181, 182, 183] Its adverse effects are likely to affect poorer populations disproportionately, because they have fewer resources to help them adapt, as already discussed in Section 3.5 above.

This raises bigger issues of inter- and intra-generational equity. An innovative health impact assessment of road transport in Sweden[184] made a first attempt to bring together the different hazards associated with road transport. It analysed fatalities and injuries, disease cases due to exposure to road transport and the likely future health effects of

greenhouse gas emissions from motor vehicles in Sweden. It found the total health impact in Sweden, as measured in disability-adjusted life years, could be four times greater than the injury impact.

It also found that the health impacts suffered in developing countries as a consequence of emissions of greenhouse gases from the Swedish road transport system may be three times greater than the mortality from road traffic accidents in Sweden itself (based on estimated disease burden related to global climate change). The study emphasises the need for a new approach to cost-benefit analysis of transport, and other investments that take into account all health costs and the implications for health equity.

Poorer people suffer most from traffic

The connections between transport and health are multiple, complex,[185] and socio-economically mixed. Poorer families tend to have lower mobility. Households in the lowest income quintile travel 4,124 miles compared with 11,588 miles for the highest income quintile households.[186]

Yet poorer families tend to face greater exposure to adverse environmental conditions, such as local traffic and outdoor air pollution. They are also more susceptible to the adverse health effects from transport because they bear greater burdens of pre-existing illness or other forms of vulnerability. That such differentials exist is, in part, a consequence of affluent groups having greater opportunity to move away from unhealthy environments.

The impact of transport on health inequalities include:

Road deaths and injuries
Almost 3,000 people a year are killed and 28,000 seriously injured in road traffic incidents in England. Very wide socio-economic differentials have been repeatedly reported in children[187] and adults.[188, 189, 190]

Children in the most deprived 10 per cent of wards England are four times as likely to be hit by a car as children in the least deprived 10 per cent of wards.[191] Road deaths, especially among pedestrians and cyclists, are particularly high among children of parents classified as never having worked or as long term unemployed (National Statistics Socio-economic Classification (NS-SEC) group 8), as shown in the figure below.[192]

Figure 8 **Relationship between road injury-related deaths and socio-economic group based on the National Statistics Socio-economic Classification (NS-SEC).(7).**

Source: Edwards P et al., 2006[193]
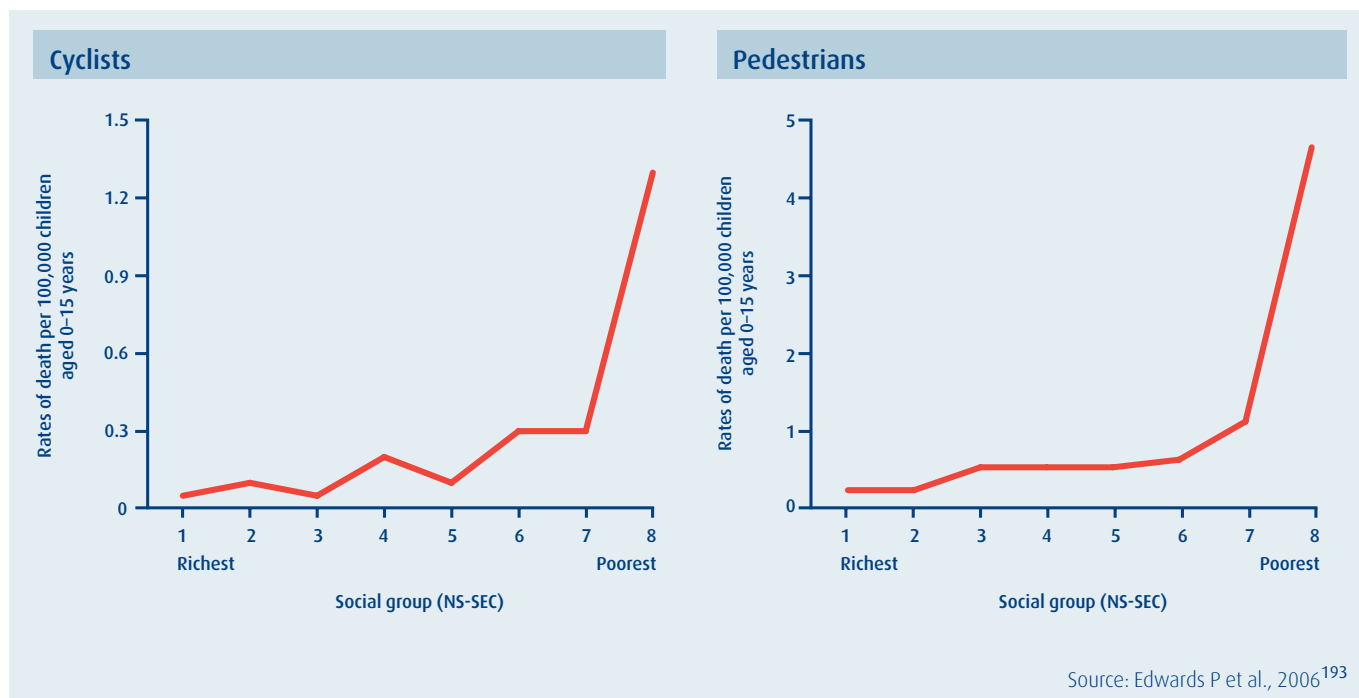
Physical inactivity and associated ill health

Over-dependence on motorised transport is contributing to lower levels of physical activity,[194] lack of fitness, obesity, chronic disease such as cardiovascular disease, stroke, diabetes and some cancers,[195] [196] and poorer mental wellbeing.

People from the poorest households are least likely to meet the recommended levels of physical activity, mainly because of differences in recreational and sports activity. The differentials in activity are paralleled by differentials in obesity.[197, 198, 199, 200] There are many complex reasons behind the observed variations, but environmental factors and transport systems may play a role.[201, 202, 203, 204, 205, 206, 207, 208, 209]

Figure 9 shows how over a fairly short space of time – fifteen years – the ratio of car use has increased compared with cycling and walking. Car ownership is directly related to the amount that children walk – those with two-plus cars walk very much less than those with one or no cars. Considering that car ownership increases with income level, this element may have some positive impact on health inequalities despite the general pattern of those from poorer households being less physically active.

If, by 2015, the number of cycle trips returned to 1995 levels, the savings in health, pollution and congestion would be around £500 million.

Figure 9 *Annual distances walked by children from families with and without cars.*

Mode of travel ratio compared with 1985 levels.

Miles walked in relation to car ownership

Source: Sonkin, B et al, 2006 [210]
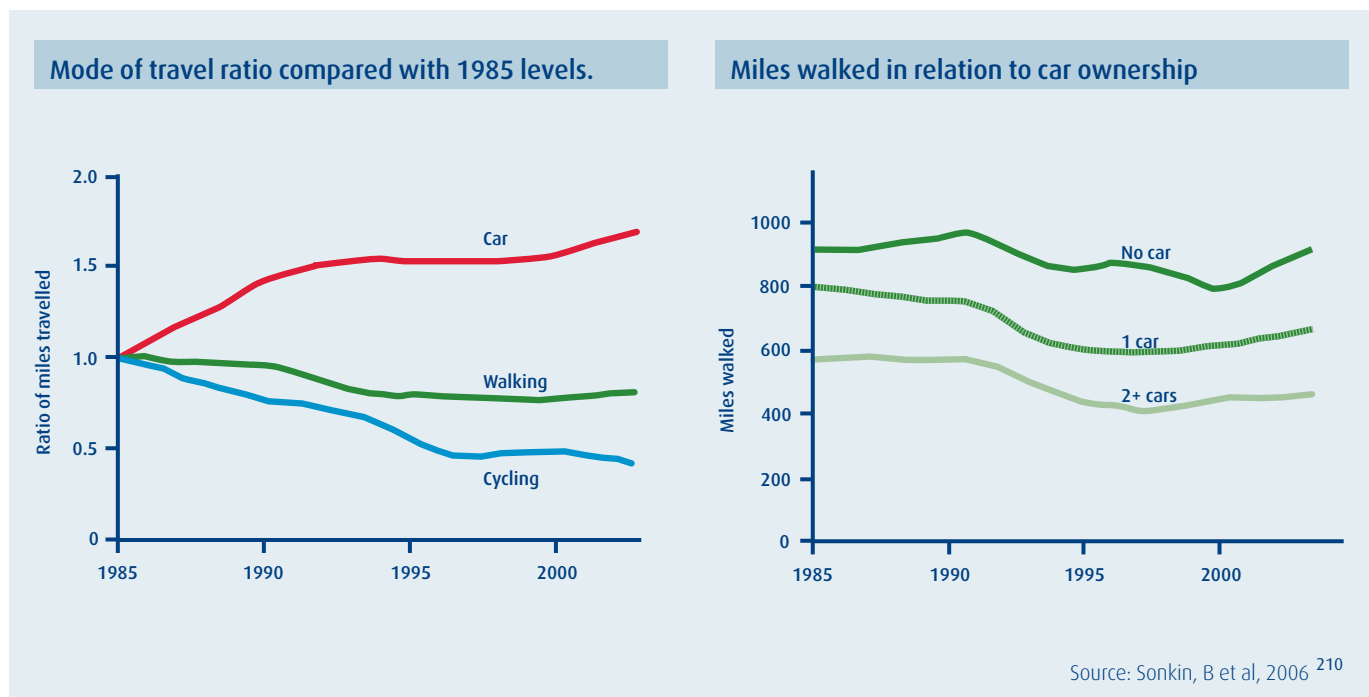
Since 1950, there has been a five-fold reduction in cycling across Great Britain, primarily due to concerns about safety. Survey results from the CTC (national cyclists' organisation) *Safety in Numbers* campaign found that 85 per cent of women and 61 per cent of men agreed with the statement that "the idea of cycling on busy roads frightens me."
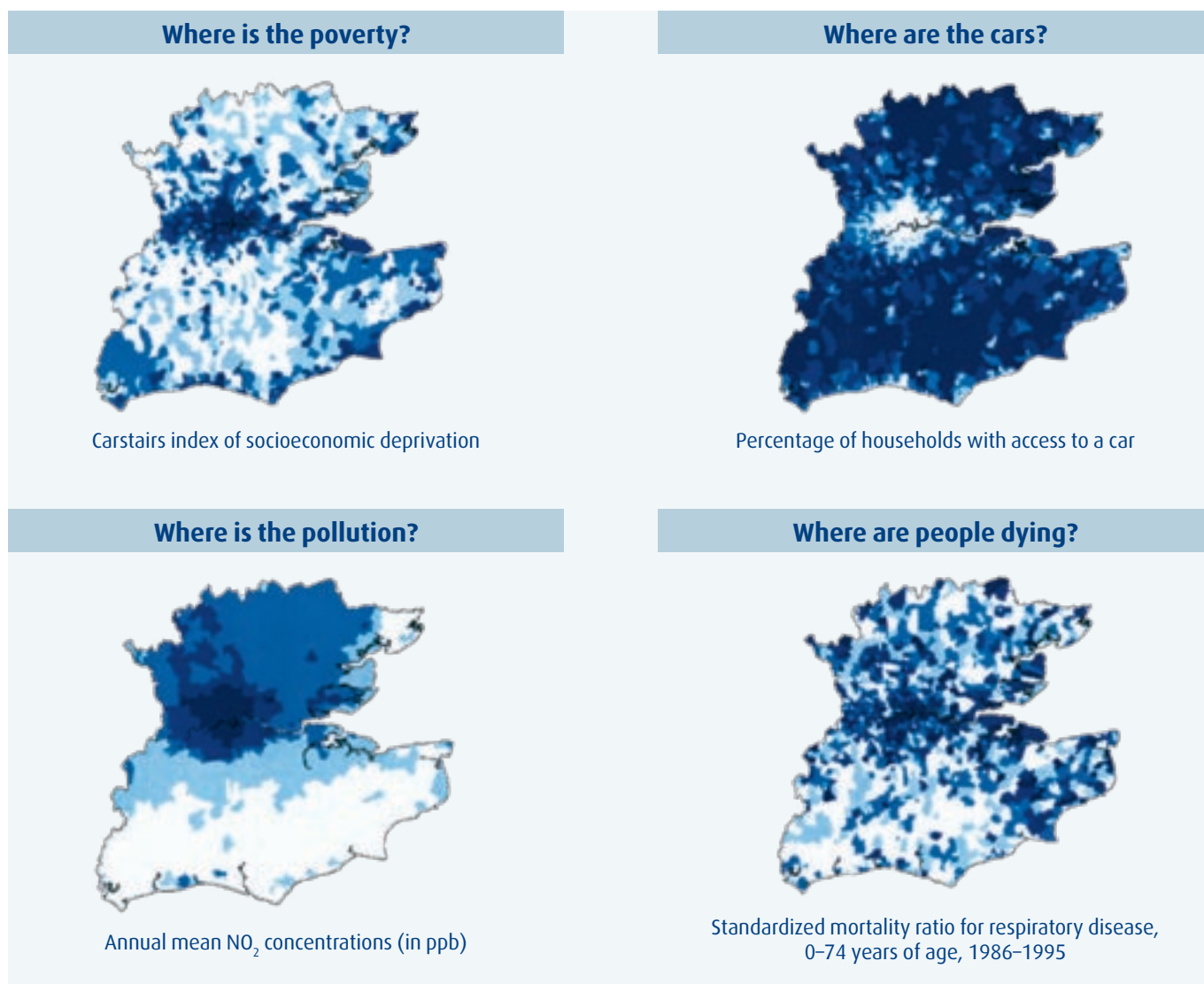
Air pollution

Evidence for the adverse effects of outdoor air pollution is very clear,[211] especially for cardio-respiratory mortality and morbidity.[212, 213, 214, 215, 216] Road transport is a major contributor to fine particle pollution, nitrogen dioxide, carbon monoxide, volatile organic compounds and, indirectly, ozone.[217] Those living close to busy roads have a 50 percent increased risk of respiratory illness.[218, 219]

The standardised mortality ratio for respiratory illness, (the ratio of observed deaths to expected deaths) tends to be highest in areas of greatest nitrogen dioxide levels.[220] Poorer communities tend to suffer greater burdens of air pollution-related death and sickness, both because they tend to experience higher concentrations of pollution,[221] and because of their higher prevalence of cardio-respiratory and other disease.

There is a close link between areas of high multiple deprivation and pollution – the poorer the area the higher the nitrogen dioxide levels.[222] There are also important urban-rural differentials, as illustrated for south east England in Figure 10. Those in urban settings tend to have less access to (and need for) private motor vehicles – yet they experience the greater burden of traffic-related pollution.

Figure 10 *Ward-level maps for south east England showing quintiles* [223]

Where is the poverty?

Carstairs index of socioeconomic deprivation

Where are the cars?

Percentage of households with access to a car

Where is the pollution?

Annual mean NO_2 concentrations (in ppb)

Where are people dying?

Standardized mortality ratio for respiratory disease,
0–74 years of age, 1986–1995

Noise

Noise is a problem for one in three households in the UK and has a major impact on the wellbeing of one in a hundred people. Opinion poll research conducted in 2003 found that problems are worse in areas of high density housing, rented accommodation (both social and private sectors), areas of deprivation and areas which are highly urbanised.[224, 225] Traffic is by far the main cause of noise pollution. Over 40 per cent of the population are bothered by road traffic noise although many are also affected by aircraft and industrial sources.[226]

A significant body of research has focused on noise

impact on children's behaviour, educational outcomes as well as general levels of stress. Transport-related noise has been linked to sleep disturbance and increased cardiovascular risk,[227, 228, 229, 230] and may have a negative effect on learning [231, 232, 233] and mental health.[234, 235] Noise from aircraft and airports significantly elevates stress among children far below those necessary to produce hearing damage.[236]

Social cohesion and community severance

Transport systems and increased mobility also have adverse effects on social interactions and on the cohesiveness of communities, which in turn have negative impacts on health. It has been suggested that people who are socially disconnected are between two and five times more likely to die than matched individuals who have close ties with family, friends, and the community.[237]

Residents of busy streets have less than one quarter the number of local friends than those living on similar streets with little traffic.[238] It has been suggested that the damage that traffic does to social systems in urban areas is the most serious of all the problems it causes, yet there has been little or no attempt to quantify this.[239]

Increased mobility has led to reduced neighbourhood interaction and families becoming dispersed. It has also led to local shops and services losing out to retail chains and out-of-town retail parks, with knock-on effects on the quality and affordability of sustainable and healthy food, as discussed in section 4.2. Noisy, congested or fast traffic routes can also impair community cohesion, with consequences for health and wellbeing.[240, 241, 242, 243, 244, 245]

Making the Connections: Final Report on Transport and Social Exclusion (2003) highlighted how those households without access to a car and with poor public transport alternatives suffered reduced life chances.

Transport and active travel

The greatest health benefits are likely to arise from the promotion of 'active travel' such as cycling and walking as recommended to the Government by Sustrans.[246] In its report on health inequalities, the Government's Health Committee has recommended a Planning Policy Statement on health that would create a built environment to encourage walking and cycling. It would also make primary care trusts statutory consultees for local planning procedures.[247]

The Sustainable Development Commission supports policy interventions in the following areas:

Urban design

Well planned and managed local environments are likely to increase physical activity,[248, 249, 250] with consequent benefits to physical and mental wellbeing.[251] There are a range of measures that can be used from provision of high quality, safe and attractive routes for cycling and walking through to restricting vehicle access and parking. In Copenhagen such changes have resulted in 55 per cent of all residents now cycle commuting.[252]

A review by the National Institute for Clinical Evidence (NICE) found that traffic calming interventions may be useful in enabling children to benefit from physical activity through play outdoors in the short and long term. It also concluded that closing or restricting roads can lead to long term increases in walking and cycling and a decrease in road traffic accidents. Additionally, provision of cycling infrastructure can also lead to a long term increase in cycling and a reduction in cycle casualties.[253]

Walkable neighbourhoods

'Walkable' neighbourhoods are associated with higher levels of physical activity and lower levels of obesity. Although walkability is conceptualised in various ways, a typical 'walkable' neighbourhood will have high residential density, a variety of land use, good connectivity and accessibility to a variety of destinations such as retail facilities. It has been shown that residents in high walkable neighbourhoods reported approximately two times more walking trips each week than residents of low walkable neighbourhoods.[254, 255]

People are also more likely to be physically active if they live in neighbourhoods with many destinations, as well as street intersections between residential and commercial districts.[256] Neighbourhoods that are perceived to have high levels of functionality are associated with more walking, for example walking to work, walking for recreation or tasked related walking.[257]

Public transport

Better public transport has been shown to result in significant changes in travel patterns. A health impact assessment in Edinburgh compared how three transport scenarios would impact differentially on deprived and affluent populations, in terms of accidents, pollution, physical activity, access to goods and services and community network. The study found that disadvantaged groups bear the heaviest burden of negative impacts and have most to gain from the positive impacts, and suggested that greater spend on public transport and supporting sustainable modes of transport was beneficial to health, and offered scope to reduce inequalities.[258]

Road measures

Evidence suggests that traffic calming, for example 20 mph zones, is associated with absolute reductions in injury rates and, if appropriately targeted, can help achieve relative reduction in inequalities in road-injuries and deaths.[259] The introduction of 20mph speed limits in London has been shown to have reduced road injuries by more than 40 per cent between 1986 to 2006. And it was children that benefited the most – death or serious injury was cut in half for this group. The study also highlighted how injuries to pedestrians were reduced by just under a third and causalities to cyclists were down by 16.9 per cent.[260]

Area-wide 20mph speed limits for residential areas, as demonstrated in Portsmouth, below, have the potential for a much wider impact, by virtue of the fact they cover a much greater geographical area. Schemes such as these can also have a positive impact on social cohesion as they draw on community engagement to set them up and ensure compliance.

In general, reductions in traffic speeds have numerous sustainability, health and equality benefits. They can lead to reductions in both carbon dioxide emissions and other air pollutants. They also create a safer environment with fewer deaths and injuries and can promote more walking and cycling. A safer environment also helps to promote children's independent travel, providing physical and mental health benefits. Finally lower speeds help reduce traffic noise.

Studies have suggested that the London Congestion Charging Scheme has reduced levels of air pollution-related loss of life and road injuries,[261, 262, 263] but the health effects through walking and cycling have not yet been quantified.

> While a number of London councils have introduced 20 mph speed limit zones in parts of their boroughs, Portsmouth was the first city in Britain to have a 20mph limit on almost all residential roads. The new speed limit designed to protect pedestrians and cyclists in residential roads became citywide in 2008. Initial findings indicate that already the limit on traffic speeds is having a positive impact on safety with casualties falling by 15 percent and total accidents by 13 per cent.[264]

> Homes Zones also improve residents' health by slowing down as well or reducing traffic. In particular the health of children is improved due to the reduction in accidents and the opportunity for more outdoor play and increased physical activities.[265]

Cycling

Cycling offers the opportunity to incorporate physical activity into daily life at a low cost. It also offers the opportunity to reduce carbon dioxide emissions and replace more motorised journeys than walking alone. Research calculates that each additional cyclist boosts the economy by around £600 a year, and that if, by 2015, the number of cycle trips returned to 1995 levels, the savings in health, pollution and congestion would be around £500 million.[266]

The UK is one of only four countries in Western Europe where an injured pedestrian or cyclist has to show that a driver who hit them is liable for their injuries before they can claim compensation.[267] If pedestrians and cyclists injured on the road were presumed entitled to civil compensation (assuming their actions were not negligent or illegal) it could help promote improved driver behaviour and a shift to these more sustainable modes of transport.

Smarter choices

Measures such as developing a school 'walking bus', have reduced levels of car travel to school by up to 20 per cent.[268] Work-based travel plans have also proven effective, as have car clubs which can tackle social exclusion by providing low cost access to a car.

With more than 18000 traffic movements each day Addenbrooke's Hospital is the largest single generator of traffic in Cambridgeshire. To cope it has developed an access strategy to help reduce car parking demand and traffic congestion. At peak times more than 60 buses now stop at Addenbrooke's per hour. Bicycle use has been promoted through interest free loans, 300 bicycle parking spaces and a repair service. The trust also operates pool cars and a car share scheme. Bus use has now almost doubled at 23 per cent and cycling is at 25 per cent. [269]

Transport policy implications

- In line with *Take action on active travel*,[270] ambitious targets should be set for a growth in walking and cycling – and should be met.

- The use of 20mph speed limits should be greatly increased, preferably through the use of area-wide 20mph limits, in line with the proposed revised guidance recently published by the Department for Transport.[271] Such limits should cover all streets which are primarily residential in nature as well as town or city streets where pedestrian and cyclist movements are high, such as around schools, shops, markets, playgrounds and other areas.

- Ambitious targets should be set for year-on-year improvements in control of road-traffic pollution through measures to reduce the need for travel and to promote a shift to less polluting modes of transport.

- A programme of initiatives should be developed through places of employment and education, including Children's Centres, to promote healthy behaviour in transport. Every school and major employer should have in place a travel plan which is properly implemented, monitored and regularly reviewed. This could include measures such as 'green travel-to-work' schemes, cyclist training and support schemes; and 'walking buses' for primary school children. Provision also needs to be included for unemployed people.

4.4
Green Space

4.4.1 Green space and sustainable development

Only 50 per cent of children in England rate their local green space as fairly good, and only 29 per cent of children today enjoy most of their adventures in the natural outdoors, compared with 70 per cent of adults as children. [272]

Income-related health inequalities are lower in populations living in the greenest areas. [273]

Natural resources are vital to our existence and to the flourishing of communities. Green spaces, or open, undeveloped land with natural vegetation,[274] have been shown to have physical and mental health benefits. Most fundamentally, they may help to reduce long-term stress, a major determinant of health inequalities.

Living within environmental limits is one of the principles of sustainable development [275] and promoting more equitable access to green spaces is a preventative and synergistic approach with economic, environmental, social and health benefits. The concept of biophilia – love of living systems – proposes an instinctive bond between humans and nature. Most people know from firsthand experience how reconnecting with the world outdoors is one of life's small but important pleasures.

In *Health, Place and Nature*,[276] the Sustainable Development Commission highlights the links between health and green and open spaces. This builds on previous evidence bases by, for example the Royal Society for the Protection of Birds (2004, 2007),[277][278] the Royal Commission on Environmental Pollution (2007)[279] and Newton (2007).[280] Other literature reviews[281][282] have continued to support the direct and indirect links between green space and health.

4.4.2 Green space, health and inequalities

Numerous studies point to the many benefits of green space for both physical and mental health and wellbeing.[283][284][285][286][287] This has been expressed in terms of a decrease in health complaints,[288] blood pressure, cholesterol, stress levels,[289][290] restoration,[291][292] perceived general health[293] and ability to face problems.[294]

A number of studies have focused on the effect of exposure to nature in organisational settings such as hospitals and prisons, with positive effects being observed in recovery time and painkiller requirements,[295] stress levels of patients,[296] negative reactions,[297] and a lower need for healthcare for prisoners with access to a garden.[298]

Green space and obesity

Local access to safe natural green space is associated with high levels of physical activity[299 300 301] and lower levels of obesity within communities.[302] Some studies have suggested that the higher the quality and accessibility of the green space, the more likely it is to encourage high levels of walking and other physical activity.[303 304]

Recent research in the USA has studied the effect of neighbourhood greenness on two-year changes in the body mass index of children and young people, finding that greenness is inversely associated with BMI. This study supports the exploration of the promotion and preservation of green space within neighbourhoods as a means of addressing childhood obesity.[305]

Green space and mental health

The increased level of physical activity associated with green space also has mental health benefits.[306] [307] There is a well established relationship between physical activity and mental health,[308 309 310 311 312] but studies also suggest that 'green exercise' can have more positive mental health benefits than other kinds of exercise.[313 314] For example, the psychological benefits of jogging in an urban park outweigh those of street jogging.[315] 'Green gyms' have been shown to result in positive physical and mental health outcomes.[316]

A study by Mind found that self-esteem levels increased and depression levels decreased following a green walk.[317] It has proposed that design for mental wellbeing, including natural spaces, should be recognised as good practice for architecture and town and country planning.[318]

There is growing evidence that many diseases, such as coronary heart disease,[319] depression,[320] diabetes[321] and cognitive decline are related to inflammatory processes in the body. Chronic stress is known to increase these inflammatory processes and is more prevalent in deprived communities. The increased physical activity[322 323] and social cohesion,[324 325] associated with access to green space are known to increase resilience to stress.

The importance of outdoor play

Outdoor play is a vital part of childhood, and as such is an important aspect of the government's aim to make England the best place in the world to grow up, as stated in the Department for Children, Schools and Families' (DCSF) Children's Plan.[326] Lack of outdoor play[327] has been identified as a causative factor in increased mental health problems amongst children and young people[328] and in the current high levels of child obesity.[329] Studies examining children's contact with natural environments have shown that, as with adults, it can reduce stress.[330] Access to green spaces improves concentration in children with attention deficit disorder and self-discipline among inner city girls.[331 332] It has also been shown to enhance the emotional development of schoolchildren.[333]

There is a great deal of evidence on the health and wellbeing value of children playing in a natural setting; this was particularly noted in a review of natural play commissioned by the Children's Play Council, *Play Naturally*,[334] and in *Natural Thinking* by William Bird for the RSPB.[335] Benefits include improvements in motor fitness, co-ordination, balance, agility,[336 337] self confidence and social skills.[338]

In *Every Child's Future Matters*,[339] the Sustainable Development Commission has argued that it may not be possible to deliver the goals of government's *Every Child Matters* white paper unless the environment

becomes one of its leading considerations. This report identifies green space as one of five priority areas because of the negative effects on physical and emotional health associated with reduced time spent in the natural environment, and the positive effects of increased time spent in green spaces.

Rising to the challenge of creating safe, welcoming, interesting and free places to play in every residential community, the DCSF's Play Strategy commits to develop such play areas, improve safer access to them and encourage local partners to develop child-friendly communities and public spaces beyond segregated play areas alone. The strategy also emphasises the need to facilitate better working relationships between local play, transport and planning partners.

Green space and social cohesion

Natural spaces offer opportunities for relaxation[340] and have been shown to facilitate higher levels of social contact and social integration,[341][342] particularly in underprivileged neighbourhoods.[343][344] Studies have shown that access to a natural environment provides a meeting place for all ages and has a positive effect on social interaction and cohesion for different age groups.[345]

The presence of nearby natural spaces has also been related to reductions in crime[346] as well as to increased neighbourliness.[347] Community gardens and green activities linked to clubs or groups have been shown to provide opportunities for socialising, helping to strengthen neighbourhood ties.[348][349] As discussed in Section 4.3.2, a lack of social ties can have detrimental impacts on health. Building communities through participation in local nature activities has also been shown to increase a sense of community strength and pride. [350][351]

Green space and air quality

Green space and vegetation have a proven positive effect on air quality. For example, there is evidence that urban trees remove large amounts of air pollution and consequently improve urban air quality. [352] Columbia University researchers [353] found that asthma rates among children aged four and five fell by a quarter for every additional 343 trees per square kilometre. The UK has one of the highest prevalences of childhood asthma internationally, with about 15 per cent of children affected [354] and a higher prevalence in lower socio-economic groups in urban areas.

Urban areas will be particularly vulnerable to rising temperatures due to the urban heat island effect,[355] which in turn will have a detrimental impact on health and health inequalities. One study [356] found that an additional ten green spaces can mitigate urban heat islands by up to 4°C, offering help with climate change adaptation.

Green space and health inequality

A recent study[357] in the Lancet suggested that income-related inequality in health would be less pronounced in populations with greater exposure to green space. By classifying the population of England on the basis of income deprivation and exposure to green space, the researchers were able to show that health inequalities related to income deprivation were lower in populations living in the greenest areas. The effect held for all-cause mortality and mortality from circulatory diseases, but no effect was found for causes of death unlikely to be affected by green space, such as lung cancer and intentional self-harm.

Dutch research found not only that the percentage of green space in a person's residential area was positively associated with their perceived general health, but that this relationship was strongest for lower socioeconomic groups.[358] An American analysis of how residents in low-income, minority communities use public, urban, neighbourhood parks and how parks contribute to physical activity found that public parks are critical resources for them.[359] Evaluation of the national Green Gym scheme concluded that the overall physical health status of participants improved significantly, with a stronger effect for people with the poorest physical and mental health.[360]

In addition to this evidence directly relating to health inequalities, it would seem that green space is particularly influential on conditions which are significant contributors to health inequalities, such as obesity, circulatory disease, mental health, chronic stress and asthma.[361]

> The Green Gyms programme run by BTCV helps people to take exercise outdoors while participating in activities that improve the environment. Nine out of ten participants with poor mental or physical health show an improvement within seven months. One participant said: "I used to get depressed about the future but now that is not the case. I have been on medication for 18 years but since doing this I have halved the amount I take. My life is a lot better".[362]

Green space policy implications

- The NHS, social care, local and regional authorities, schools, private sector etc should recognise the extensive benefits of contact with the natural environment and take an active role in promoting this in their local community as well as on their own estate.

- There should be increased investment in the creation of quality green spaces, especially in deprived areas, including tree planting programmes for residential streets.

- An increase in GP referrals to initiatives like Green Gyms, Blue Gyms and Health Walks should be actively encouraged; NICE should be required to evaluate the effectiveness of these interventions.

4.5
The Built Environment

4.5.1 The built environment and sustainable development

Over 3 million households in the UK were in fuel poverty in 2006 – latest estimates predict that the problem had worsened in recent years.[363]

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.[364]

As this report highlights above, there is a close link between the built environment, health outcomes and inequalities in health. For example, air pollution, traffic accidents, noise, obesity and mental health are all aspects of the built environment particularly affecting disadvantaged communities. Lack of play and green space impacts on children's health and wellbeing.[365] Tackling heavy traffic and promoting social contact and cohesion are also significant when looking at how the built environment can help improve health inequalities (see Sections 4. 3 on transport and 4.4 on green spaces).

In *Health, Place and Nature*,[366] the Sustainable Development Commission highlights how the location of shops and services, and the travel connections to them, can influence levels of physical activity and social contact. The environmental quality and perceived safety of an area also influence this – the higher the perceived level of crime and the more litter and graffiti an area has, the lower the level of physical activity.

4.5.2 The built environment, health and inequalities

Fuel poverty

Most of the UK's housing stock consists of older properties, many of which are occupied by low income households. Existing homes are responsible for 27 per cent of the UK's total CO_2 emissions, and around 80 per cent of the homes we will inhabit in 2050 already exist today. The need for urgent action to upgrade existing housing stock is now widely recognised.[367]

But whilst the government has a number of programmes in place to tackle poor housing stock, it requires more investment in a more integrated way.[368] For example, the investment in energy efficiency measures can help with neighbourhood renewal by creating more local jobs and improving the local economies.[369] Area based approaches such as the Community Energy Savings Programme currently being trialled throughout the UK could help to deliver this.

Poor housing stock is harder to heat and cold weather is believed to be the main factor underlying the extra deaths between December and March compared with the death rate for the rest of the year. Children, older people and people with long term illness are the most vulnerable groups in cold weather.[370][371]

For many vulnerable people heating is simply too costly, and fuel poverty can force the stark choice of 'eat or heat'. Fuel poverty is defined as 'when in order to heat its home to an adequate standard of warmth a household needs to spend more than 10 per cent of its income on total fuel use.'[372] In 2006, approximately 3.5 million households in the UK were in fuel poverty, including almost a quarter of households in Wales and a third of households in Northern Ireland and Scotland. More recent estimates predict that the problem had increased by 2008.[373] Rising fuel prices exacerbate problems for people living in poorly insulated and energy-inefficient homes, causing more serious fuel poverty and related poor health.

A Greenspace Scotland report found that nearly half the Scots interviewed were afraid to use their local green space for exercise or children's play.

The government runs a number of programmes to combat fuel poverty, such as the Warm Front Scheme and the Decent Homes Standard, to which all council-owned and managed properties should conform by 2010. Forty per cent of the Carbon Emissions Reduction Target Programme is also prioritised towards low income groups[374][375] and the Community Energy Savings Programme focuses entirely on people in deprived neighbourhoods.

> A report found that Sheffield's Decent Homes Programme had a major impact on the health and quality of life of residents – reducing heart and respiratory disease, reducing the number of accidents in the home and giving greater security and mental wellbeing.[376]

Access to facilities for everyone

Easy or poor access to every day amenities such as shops, workplaces, healthcare, green space, and public transport can reduce or exacerbate health inequalities, particularly in rural areas. Accessible local facilities, such as schools, libraries, shops and cafés provide opportunities for social interaction and help create a sense of community,[377] promoting good mental health and wellbeing. By contrast, land use planning that isolates employment locations, shops and services and locates them far from residential areas without adequate public transport can result in, and reinforce, social exclusion and health inequalities. Elderly, disabled and low income groups in particular can find themselves isolated and/or paying out a higher proportion of their income on transport, reinforcing health inequalities.[378]

Inadequate transport can lead to unemployment and poor education, both risk factors for ill health.[379] Poor transport is the key factor in one in four young people not applying for a particular job; six per cent of 16–24 year olds turning down further education and training opportunities and 1.4 million people missing, refusing or choosing not to seek medical help.[380]

But even if local public transport is good, you still need a destination worth travelling to, and local amenities are disappearing. Between 1995 and 2000, Britain lost approximately one-fifth of local services such as corner shops, post offices and banks, and a

further third are expected to disappear over the next decade.[381] Reduced access to healthy, reasonably priced food and daily opportunities for social contact is likely to exacerbate diet-related and mental health inequalities and can lead to greater car dependency in more isolated communities. This will increase carbon emissions and further disadvantaging the most vulnerable in society, who are less likely to have access to a car.[382][383]

The location and accessibility of some local services may help or hinder the rise of obesity in terms of encouraging or discouraging physical activity[384] and providing a healthy diet. One study has found that good access to leisure centres reduced the risk of being obese by 17 per cent.[385] A recent study in north west 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.[386]

Evidence consistently shows that people who have easy access to facilities for physical activity - cycle paths, local parks and other green spaces, beaches, or recreation centres - are more likely to be active than those who do not.[387] Inadequate facilities, or barriers to access such as steep hills or busy roads, have a negative impact on physical activity.[388] US studies

have shown that populations in geographic areas with lower economic status had reduced access to facilities; this in turn was associated with decreased physical activity and increased levels of obesity.[389]

Levels of physical activity amongst disabled people are limited or promoted by built environment factors, particularly building design. Barriers include lack of curb cuts, inaccessible access routes, doorways too narrow for wheelchair access, reception desks that are too high for good communication, and lack of lifts, slippery floors and the absence of handrails on stairs. Facilitators include accessible parking spaces, push-button operated doors, multilevel front desks, wheelchair and ramp access.

The built environment and crime

Mental health inequalities in particular can be influenced by being safe and feeling safe. There is a strong if complex correlation between crime, poverty and ill health, with the poorest communities suffering high health inequalities also suffering high crime rates.[390] Despite a drop in the proportion of households considering local crime to be a serious problem from 22 per cent in 1994-5 to 12 per cent in 2005-06, tenants in social rented accommodation were twice as likely to consider it a serious problem.[391]

The local built environment's design can influence levels of crime and feelings of safety,[392] and people are more likely to make the most of local outdoor space if they consider it safe.[393] A Greenspace Scotland report found that nearly half of the 1,017 Scots interviewed were afraid to use their local green space for exercise or children's play.[394]

A study in north west 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.[395] This study concluded that feeling safe, rather than actually being safe, was most likely to increase levels of physical activity.

This link between increased exercise and feeling safe was also found in two studies looking at perceived safety and physical activity from the same data sets across eight European cities (not including the UK).[396] [397] In addition, these studies found that the more graffiti and litter present in an area, the less safe people felt, and that high levels of litter discouraged exercise. 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.

Evidence from the 2003 Health Survey for England also shows that perception of social nuisance (such as graffiti, litter etc.) 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.[398]

Litter and graffiti may blight the local environment, but greenery can enhance it. And evidence from the United States suggests that trees and grass can reduce levels of crime in poor inner-city areas, although the type and level of vegetation is important, since other studies have shown dense vegetation to be conducive to criminal activity.[399] Other interventions such as street lighting can also help reduce crime,[400] and design that increases footfall and social cohesion may also help reduce social nuisance.[401] [402]

The University of Huddersfield and West Yorkshire Police conducted an evaluation of Secured by Design (SBD) housing within West Yorkshire. They found that two of the refurbished housing estates recorded 67 per cent and 54 per cent reductions in crime rates and a significant improvement in perception of safety post-SBD improvements.[403]

Similar results were found for the Northview estate in Swanley, Kent, which focused on external landscaping and residential security features as part of a regeneration programme. Landscaping was used to define public and private space, natural surveillance across the estate was maximised, secure areas were provided for bikes and rubbish, and other areas such as children's playgrounds were given clear delineation. Figures reveal an 80 per cent reduction in crimes including theft and criminal damage since the works were completed.[404]

The built environment policy implications

- The planning system should require all significant developments (or changes to existing developments) to be able to demonstrate a meaningful positive impact on health.

- Successful area pilots targeting specific problems such as crime, graffiti, school meals, pre-school programmes (e.g. Sure Start) and play areas, which can transform conditions, particularly for children and young people (see the forthcoming evaluation of the Department for Children, Schools and Families' Play Strategy) should be sustained and expanded.

- Informal as well as formal neighbourhood supervision will help people in poor areas feel safe, increase children's ability to play freely outside and reduce stress. Local authorities should instigate regular street and park policing alongside local neighbourhood management.

- There needs to be a recognition that improving derelict places reduces crime and makes them more attractive, encouraging increased footfall, social contact, and a sense of security that helps prevent disorder and enhances people's wellbeing. Neighbourhood renewal programmes must continue on an ongoing basis. Regeneration programmes should be integrated with work to upgrade the energy efficiency of existing homes.

- Home upgrading in poorer areas brings many benefits, including greater energy and water efficiency, tackling fuel poverty, helping attract more mixed communities and mitigating the impact of climate change. Government must develop a comprehensive programme to implement energy efficiency measures, targeting deprived areas through programmes such as the Community Energy Savings Programme and a follow up programme to Decent Homes. Funding mechanisms must be in place to enable households across all tenures to upgrade their homes.

5

A sustainable health system

5.1
A more sustainable NHS

Despite emphasising other organisations' role in reducing health inequalities, the NHS will still have a vital role to play in realising the health system of the future. But the balance of the services it delivers and the ways in which it delivers them will have to change. Already, parts of the NHS are starting to take a more sustainable approach to health and health inequalities, with efforts to move to more community-based services, to lower its carbon footprint and to prevent problems rather than treat symptoms. A closer look at examples of these developments offers powerful lessons to the public sector in how an organisation can create a new, more sustainable vision of its remit and develop services and operations to match.

How services are delivered

Primary care

Primary care will have a vital role to play in creating a sustainable health system. International evidence[405] suggests that a first contact primary care service – as in the UK – has multiple benefits. Universal access to primary care is associated with reduced inequalities in health outcomes and the quantity and quality of primary care is associated with lower and better use of hospitals. Health care systems with a greater orientation towards primary care are also associated with lower overall system costs.

Whilst differing significantly from the UK's free public health service model, insights from America can be useful. A study examining the relationship between primary care, income inequality and mortality in the US[406] found that the impact of a greater primary care physician supply is greater in areas of high income inequality. The greater the supply of primary care physicians, the lower the total mortality, heart disease mortality, and stroke mortality at US county level. In 35 analyses dealing with differences between seven types of area and five rates of mortality (total, heart, cancer, stroke and infant), 28 found the greater the primary care physician supply, the lower the mortality.

To ensure a healthy, strong and just society, there must be equal provision of and access to health services across the UK. But currently there are 20 per cent more GPs per 100,000 people in the most affluent fifth of primary care trusts, in comparison to the poorest fifth.[407] There is also evidence of an 'inverse care law'[408] operating, with shorter consultations with working class patients[409][410] and higher list sizes in poorer neighbourhoods.

An IPPR report entitled *Public Services At The Crossroads*[411] explores British attitudes to public services and shows that the more affluent and better educated a person is, the greater the health benefits they gain from the NHS. Primary care policy needs to be developed to ensure that lower socio-economic groups – and particularly socially excluded groups (for example the homeless) – gain equal benefits from public services as higher socio-economic groups.

Commissioning is an aspect of primary care trust activity with the potential to improve health by creating positive impacts on the determinants of health, as illustrated by NHS Manchester in the example of good practice on page 55.

Community-based services

When it comes to a sustainable health system, there is a strong case for increasing community-based treatment services. 'Care closer to home' implies less distance to travel and fewer barriers to equal access, and is a robust model for ensuring long term viability of the health system. Much high-carbon hospital care can be undertaken in community settings, reducing the NHS's carbon footprint.

Health visitors can take a strong role in leading and delivering initiatives such as the 'Healthy Child Programme' (for which there is a good evidence base[412]) using a family-focused public health approach, or delivering intensive programmes for the most vulnerable children and families.

Another good example is the Family Nurse Partnerships, which have been shown to achieve significant and consistent short and long term improvements in the health and wellbeing of the most disadvantaged children and their families.

The development of school health services is pivotal to the health and wellbeing of the school community, and could help to spread knowledge about public, as well as personal, health issues.

Work-based nursing services could play a more significant role in communicating child health messages and supporting employees as parents, with a particular focus on low income settings such as post offices, factories, and call centres.

But community based services, particularly health visiting, could also extend to include a 'shift' based option. Normalising community provision to 7am-10pm could work well for health visitors who have had to give up work because of their own childcare needs, and for working parents who lose income when they access day-time public services.

As well as health professional-led community services, social capital-based health promotion and intervention initiatives such as 'community mothers',[413] [414] formally identified 'health trainers' and the expert patient programme could be expanded, improving health and creating employment opportunities. Local authorities and the NHS can also support and sponsor 'Sure Start' programmes (the long term benefits of US 'Head Start' programme have been reported[415]).

Self care

Enabling people with existing long term conditions to take care of themselves is a new and more sustainable approach to health service delivery. It puts individuals in charge of their own health care and reduces health inequalities. Personal health services have a relatively greater impact on severity (including disability and death) than on incidence of health problems, and severity is even more instrumental in health inequalities than incidence.

There is a very strong evidence base for the benefits of self care, suggesting a huge reduction in visits to GPs and in use of medicines,[416 417 418 419 420 421 422 423 424] and up to 12:1 savings-cost ratio.[425 426] Studies suggest that self-monitoring results in high levels of satisfaction, and medicines utilisation can improve by 30 per cent.[427] It also represents a low-carbon care pathway.

Good Corporate Citizenship

The way the NHS operates, as well as the services it delivers, can have a powerful impact on reducing health inequalities and delivering sustainable development (see Section 3.2 Healthier people, healthier environment).

Building on the strong case set out by the Kings Fund in *Claiming the Health Dividend*,[428] the *Choosing Health* public health white paper (2004) set out the NHS's role as a 'good corporate citizen'. This term describes how NHS organisations can embrace sustainable development and tackle health inequalities by making sure that they are having a positive impact on the determinants of health through their day-to-day business, as set out in Figure 11 below.

There has been a growing recognition of the importance of sustainable development within the NHS. Over 50 per cent of all NHS trusts and primary care trusts have registered with the NHS Good Corporate Citizenship Assessment Model (www.corporatecitizen.nhs.uk). The NHS also established a Sustainable Development Unit and published an NHS Carbon Reduction Strategy in January 2009.[429]

Such an assessment model need not apply solely to the NHS, but could be applied to all public sector organisations. And indeed to all private and voluntary sector organisations, too. Every organisation creates a host of direct and indirect impacts – social, environmental and economic – through its operations, over and above its core product or service delivery. As part of sharing responsibility for health inequalities, every organisation involved will need to behave as a 'good corporate citizen', ensuring that its own operational choices support, rather than undermine, the transition to a more sustainable future for all.

Employment and skills, community engagement, transport, procurement, new buildings and facilities management are issues most organisations face. The following good practice examples from the NHS show how those issues can be managed for maximum co-benefits by any organisation.

NHS organisations can embrace sustainable development and tackle health inequalities by making sure they are having a positive impact on the determinants of health.

Figure 11 **The virtuous circle of good corporate citizenship.**[430]
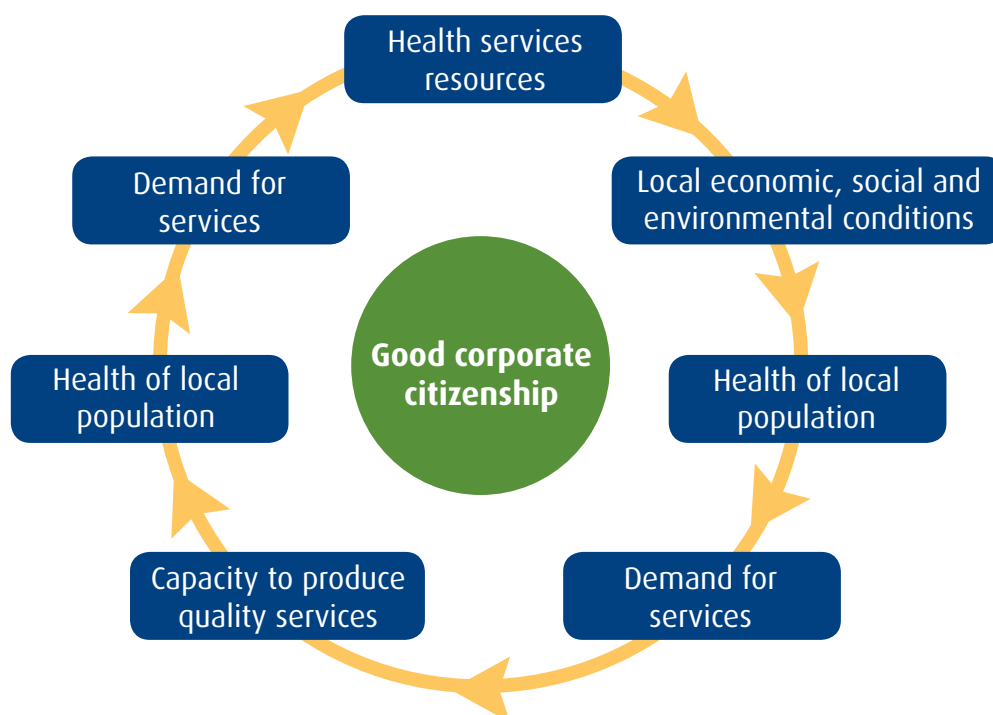
ACTIVATE programme: Developed by the University Hospital Birmingham in 2002, this programme focuses on entry level jobs and training for the unemployed in targeted disadvantaged areas. It works with partner NHS trusts to provide three weeks direct training followed by three weeks placement. In its first five years, ACTIVATE trained more than 600 people, with 65 per cent of participants gaining a job or moving on to further education.[431]

Rushey Green Time Bank: Rushey Green GP Practice in Catford, south London, is also a fully operational time bank – whereby members exchange skills using time rather than money as currency – with 55 individual members and five local organisations. Members have visited the GP less as a result of participation.[432] One of its GPs, Dr Richard Byng says:

"This alternative method of treatment has led to a lot of patients being taken off antidepressants. Too often in the past, doctors would give people drugs or nothing at all. Now we have this new method, and the results I have seen have been remarkable."

Cornwall NHS Food Programme: This programme not only provides patients with healthy, nutritious meals, but has cut carbon emissions from road transport by two-thirds. Over 80 per cent of the trust's food budget is now spent with local companies, with more than 40 per cent of that going on Cornish produce.[433]

Green GP surgery: The Plowright Surgery in Swaffham was built using a timber frame and low-energy, benign materials where possible. It has large overhanging eaves to prevent overheating in

summer, and offers full accessibility for people using wheelchairs. It uses just 54 kWh of electricity and 90 kWh of gas per square metre per year, or 15.2 GJ/100m^3; a third of Department of Health new build targets.

Carbon Trust NHS Carbon Management Programme[434, 435] This programme was launched in 2006, and is now in the fourth year of operation. From the 42 trusts it has worked with, over 800,000 tonnes of annual CO_2 savings have been identified.

Implemented measures have already led to annual savings of over £20 million.

Commissioning: NHS Manchester includes clauses on good corporate citizenship in all its contract specifications. This communicates a strong message that good corporate citizenship is at the heart of providing quality healthcare, although further policy interventions could ensure a more comprehensive engagement with this agenda.

Policy implications

- The percentage of NHS monies for all primary care services should be increased significantly and urgently, with the emphasis on equality of provision and care provided within the community. The percentage of expenditure on prevention and public health services should be increased steadily year on year over the next 10 years, in line with the recommendation made in the SDC's Breakthroughs report.[436]

- The Secretary of State for Health should report annually to Parliament on progress in reducing health inequalities and improving healthcare, and ensuring the long-term viability of the health system in the face of climate change and pressure on energy resources, with evidence of involving Local Strategic Partnerships.

- NHS and Social Services should explicitly account for improving the public's health and health equity. This would involve mechanisms such as:

  - PCTs and Social Care Departments (Adult and Children) to be judged according to outcome of Comprehensive Area Assessments

  - All Commissioners and Purchasers to be held to account for their contribution to reducing emissions of greenhouse gases

  - NHS organisations to report progress on Good Corporate Citizenship categories in their annual quality accounts, and social care organisations to report similar progress.

5.2

Conclusions: A new, partnership approach to prevention

A sustainable health system based on prevention would support a long term reduction in health inequalities, building on and strengthening the social model of health and delivering environmental benefits. Aspects of such an approach include: promoting wellbeing for all; focusing on preventing illness; valuing the human resources involved in health and care; promoting low-carbon living; and judging success in terms of medium and long-term effects on society, the environment and the economy.

In order to achieve this, the concept of preventative and public health must be expanded beyond the current narrow definition of ill health prevention by the NHS. The NHS cannot single-handedly improve the health of the population, certainly not if it means tackling the complex causes of ill health (see Section 3.3 Prevention and co-benefits: Promoting health and sustainable development).

As the research evidence throughout this report overwhelmingly demonstrates, for a preventative approach to health inequalities to take root, ownership for health issues must be spread beyond health professionals and indeed, at times, even

beyond the public sector e.g. private sector workplace transport schemes and health advice.

But our evidence about the co-benefits available from adopting a sustainable, preventative approach to reducing health inequalities suggests that, rather than an additional burden, such an approach is a successful way of making budgets work harder and achieving wide-ranging improvements in health, environmental and economic terms.

Systematic methods of engagement need to be developed between the NHS and regional development agencies, local and regional government and social care, with a range of different sectors and services working together – education, employment, planning, housing, benefits, transport, sport and leisure, and environment.

Spatial Planning for Health Guidance being developed by NICE[437] and aimed at local authorities and PCTs exemplifies the approach needed, recognising the impact spatial planning could have by addressing the wider determinants of health. Encouragingly, such smart partnership working has already begun to happen in cities such as Bristol.

Funded by NHS Bristol and monitored by the city's local strategic partnership, a new post has been created placing the first public health expert in the country in a council transport department in Bristol City Council's City Development directorate.

This part time post is to help planners and transport engineers understand how they influence public health challenges such as obesity, mental health and cardiovascular disease, and

how they can create environments which encourage people to walk or cycle instead of driving cars.

The post also contributes health evidence to transport consultations and bids and helps facilitate programmes for Bristol's Department of Public Health to reduce injuries and fatalities on the roads.[438]

Endnotes

1 The Marmot Review (2010) *Fair Society, Healthy Lives London*: The Marmot Review.

2 Shaw, M., Smith, G. D. & Dorling, D. (2005). Health inequalities and New Labour: how the promises compare with real progress. *British Medical Journal* 330:1016-1021.

3 Department of Health (2009). *Tackling Health Inequalities: 10 Years On – A review of developments in tackling health inequalities in England over the last 10 years*.

4 Sassi, F. (2009). *Health inequalities: a persistent problem*. In: J. Hills, T. Sefton and K. Steward (Eds.), Towards a more equal society? Poverty, inequality and policy since 1997. Bristol: The Policy Press.

5 Greater London Authority (2009) The London Health Inequalities Strategy (Draft for public consultation)

6 The Marmot Review (2010) *Fair Society, Healthy Lives London*: The Marmot Review.

7 Commission for the Social Determinants of Health (2008). *Closing the Gap in a Generation: health equity through action on the social determinants of health*. Final Report of the Commission on Social Determinants of Health. Geneva: World Health Organization.

8 Health England (2004). *Public Health and Prevention Expenditure in England*. Report No. 4.

9 HM Government (2005). *Securing the Future: delivering the UK sustainable development strategy*. London: The Stationary Office.

10 Food Standards Agency (2007). *Low income diet and nutrition survey*. London: The Stationary Office. http://tiny.cc/cfE9U

11 Edwards, P. & Roberts, I. (2009). Population adiposity and climate change. *International Journal of Epidemiology*: April 1-4.

12 Garnett, T. (2008). *Food, greenhouse gas emissions and our changing climate*. Surrey: Food Climate Research Network.

13 Sustainable Development Commission, NHS Sustainable Development Unit & Stockholm Environment Institute (2008). *NHS England Carbon Emissions Carbon Footprinting Report*. http://tiny.cc/NGfPP

14 NHS Sustainable Development Unit, ARUP & Stockholm Environment Institute (2010) *NHS Carbon Footprint: GHG emissions 1990-2020 baseline emissions update*. http://tiny.cc/s1EHP

15 NHS Sustainable Development Unit (2009). *NHS Board Level Sustainable Development Management Plan Guidance*. http://tiny.cc/IAlgD

16 Sustainable Development Commission, NHS Sustainable Development Unit & Stockholm Environment Institute (2008). *NHS England Carbon Emissions Carbon Footprinting Report*. http://tiny.cc/NGfPP

17 Coote, A. (2008). Prevention is better than cure. *Asian Hospital and Healthcare Management*: 15. http://tiny.cc/RWBtp

18 Health England (2009). Public Health and Prevention Expenditure in England. Report No. 4. http://tiny.cc/eFlA9

19 Department of Health and Social Security (1980). *The Black Report - Inequalities in health*. Report of a Research Working Group. London: DHSS.

20 Department of Health (1998). *The Acheson report: Independent inquiry into inequalities in health report*. London: The Stationary Office.

21 Wanless, D. (2002). *Securing our future health: taking a long-term view*. Final report. London: HM Treasury.

22 Wanless, D. (2004). *Securing good health for the whole population*. Final report. London: HM Treasury.

23 Department of Health (n.d.). *Vascular Disease*. http://tiny.cc/1BiYX

24 Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., et al. (2007). *Foresight. Tackling Obesities: Future Choices – Project Report*. 2nd Edition. London: Government Office for Science.

25 Kasser, T. (2002). *The High Price of Materialism*. Cambridge, Mass: MIT Press.

26 Kasser, T. (2007). A vision of prosperity: think piece for the Sustainable Development's Redefining Prosperity project, London, Sustainable Development Commission. In Jackson, T. (2009). *Prosperity without Growth*, London: Sustainable Development Commission; Chapter 9, p 88.

27 Kmietowicz, Z. (2006). Where GPs go, politicians will follow. *British Medical Journal*: 332:258.

28 Dorling, D., Mitchell, R., Shaw, M., Orford, S., & Davey Smith, G. (2000). The Ghost of Christmas Past: Health effects of poverty in London in 1896 and 1991. *British Medical Journal*, 321:1547-1551.

29 Lupton, R. & Power, A. (2005). *Disadvantaged by where you live? New Labour and neighbourhood renewal*. In Hills, John and Stewart, Kitty, (eds.) A more equal society? New labour, poverty, inequality and exclusion. Bristol: Policy Press: 199-142.

30 Power, A. (2007). *City survivors: bringing up children in disadvantaged neighbourhoods*. Bristol: Policy Press.

31 Power, A. & Mumford, K. (2003). *Boom or abandonment: resolving housing conflicts in cities*. Coventry, UK: Chartered Institute of Housing.

32 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health*. London: The Stationary Office.

33 Royal Commission on Environmental Pollution (2007b). *The Urban Environment*. London: The Stationary Office.

34 Shaw, M., Smith, G.D. & Dorling, D. (2005). Health inequalities and New Labour: how the promises compare with real progress *British Medical Journal*, 330:1016-1021.

35 Pickett, K. E., & Pearl, M. (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology and Community Health*, 55:111-122.

36 Wood, J., Hennell, T., Jones, A., Hooper, J., Tocque, K., & Bellis, M. A. (2006). *Where wealth means health: illustrating inequality in the North West*. Liverpool: Liverpool John Moores University.

37 Hills, J. (2007). *Ends and Means: The Future Roles of Social Housing in England*. London: CASE/LSE.

38 Royal Commission on Environmental Pollution (2007a). *Study on Urban Environments Wellbeing and Health*. London: The Stationary Office.

39 Royal Commission on Environmental Pollution (2007b). *The Urban Environment*. London: The Stationary Office.

40 Perpetuity Group (2009). *One More Broken Window: The Impact of the Physical Environment on Schools*. Leicester: NASUWT Teaching Union.

41 Department of Health (2009). *Be active Be healthy: A plan for getting the nation moving*. London: Department of Health.

42 Social ExclusionTask Force (2009). *Working together for older people in rural areas*. http://tiny.cc/PPlLB

43 Commission on Social Determinants of Health. *Closing the gap in a generation; Health equity through action on the social determinates of health*. Final Report of the Commission on Social Determinants of Health.Geneva: World Health Organization. http://tiny.cc/xctPx

44 Chartered Institute of Environmental Health (2008). *Climate Change, Public Health and Health Inequalities*, p3.

45 Stern, N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury; chapter 7, p 175.

46 Tyndall Centre, Effective and Equitable Responses to Climate Change, presentation. http://tiny.cc/CHKTC (Slide 6)

47 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment*. Geneva: Intergovernmental Panel on Climate Change, p33.

48 Stern, N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury; chapter 5, p. 7.

49 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment*. Geneva: Intergovernmental Panel on Climate Change p48.

50 CAG Consulting (2009). *Differential Social impacts of Climate Change in the UK*: SNIFFER.

51 Stern, N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury; chapter 5, p. 10.

52 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment.* Geneva: Intergovernmental Panel on Climate Change p 53.

53 Stern, N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury.

54 Ibid.

55 Ibid.; chapter 5, p10.

56 Environment Agency (2006). *Addressing environmental inequalities: flood risk*, Bristol: Environment Agency.

57 Stern, N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury; part II p 16, 92.

58 Pitt, M. (2008). *The effect of the summer 2007 floods on individuals and communities. The Pitt Review: Lessons learned from the 2007 floods*. The Cabinet Office; chapter 2.

59 Intergovernmental Panel on Climate Change (2007). *Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press; 393.

60 McMichael, A., Campbell-Lendrum, D., Kovats, R., et al. (2004). Climate change. In Ezzati, M., Lopez, A., Rodgers, A., Murray, C., eds. Comparative quantification of health risks: global and regional burden of disease due to selected major risk factors. Geneva: World Health Organization.

61 Chan, M. (2009). Cutting carbon improving health. *Lancet* 374, 9705. In: the Health and Climate change series. http://tiny.cc/GMadc

62 Patz J, Gibbs H, Foley J, Rogers J, Smith K. (2007). Climate change and global health: quantifying a growing ethical crisis. *EcoHealth*; 4:397-405.

63 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment*. Geneva: Intergovernmental Panel on Climate Change; p 67.

64 Committee on Climate Change (n.d.). *Carbon Budgets*. http://tiny.cc/kyHTk.

65 Environment Agency (2006). *Addressing Environmental Inequalities*: *Flood Risk*. http://tiny.cc/tnINF

66 Jackson, T. (2009). *Prosperity without Growth*, London: Sustainable Development Commission; chapter 5.

67 Brand, C. & Boardman, B. (2008). *Taming of the few – the unequal distribution of greenhouse gas emissions from personal travel in the UK*, Energy Policy, 36:224-238.

68 Ekins, P. & Dresner, S. (2004). *Green taxes and charges. Reducing their impact on low-income households*. http://tiny.cc/eg624

69 Ibid.

70 Stott, R. (2005). *Implications for health*. In: Living in a low carbon world: The policy implications of rationing. Policy Studies Institute, London.

71 Ibid.

72 Haines, A., Kovats, R.S., Campbell-Lendrum, D. & Corvalan, C. (2006). Climate change and human health: impacts, vulnerability, and mitigation. *The Lancet* 367(9528):2101-2109.

73 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment*. Geneva: Intergovernmental Panel on Climate Change.

74 Kjellstrom, T., Holmer, I. & Lemke, B. (2009a). Workplace heat stress, health and productivity – an increasing challenge for low and middle income countries during climate change. *Global Health Action* (www.globalhealthaction.net). DOI 10.3402/gha.v210.2047.

75 Kjellstrom, T., Gabrysch, S., Lemke, B. & Dear, K. (2009b). The "Hothaps" program for assessment of climate change impacts on occupational health and productivity: An invitation to carry out field studies. *Global Health Action* (www.globalhealthaction.net). DOI 10.3402/gha.v210.2082.

76 Stern, N. (2006). *The Economics of Climate Change*; The Stern review. London: HM Treasury; chapter 5, p.7.

77 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: Synthesis report of 4th assessment*. Geneva: Intergovernmental Panel on Climate Change.

78 Johnson, V., Simms, A., Walker, P., Ryan-Collins, J. (2009). *Bridging the gap between climate change, resource scarcity and social justice: the future role of civil society association, report by new economics foundation for the Carnegie Trust; chapter 3.*

79 Health and Climate change series (2009). *The Lancet.* http://tiny.cc/AbGvJ

80 Veenhoven, R. (2002). *Freedom and happiness: a comparative study in 46 nations in the early 1990's, World Happiness Database.* http://tiny.cc/9WqKC

81 Jackson, T. (2009). *Prosperity without Growth?* London: Sustainable Development Commission; chapter 5.

82 Ibid.

83 Ibid.

84 Ibid.

85 Coote, A, & Franklin, J. (2009). new economics foundation. http://tiny.cc/CjU4t

86 Jackson, T. (2009). *Prosperity without Growth?* London: Sustainable Development Commission; chapter 5.

87 Ibid.; chapter 9, p 86.

88 Department for Environment, Food and Rural Affairs (2007). *Sustainable Development Indicators In Your Pocket 2007.* London: HMSO; 111.

89 Thompson, S & Marks, N. (2008). *Measuring Wellbeing in Policy: Issues and Applications, report to the Foresight Project on Mental Capital and Wellbeing.* new economics foundation.

90 Marks, N. et al. (2007). *Exploring the relationship between sustainable development and wellbeing and its policy implications: Project 3B - SD12007.* new economics foundation/Department for Environment, Food and Rural Affairs.

91 Burroughs, J.E. & Rindfleisch, A. (2002). Materialism and wellbeing: A conflicting values perspective. *Journal of Consumer Research* 29(3):348-370.

92 Kasser, T. & Ryan, R. M. (1993). The dark side of the American Dream: Correlates of Financial Success as a Central Life Aspiration. *Journal of Personality and Social Psychology* 65(2):410-422.

93 Hamilton, C. (2002). *Overconsumption in Australia: The rise of the middle-class battler.* Discussion Paper Number 49. The Australia Institute.

94 Hamilton, C. & Mail, E. (2003). *Downshifting in Australia: a sea-change in the pursuit of happiness,* Discussion Paper Number 50, The Australia Institute.

95 Veenhoven, R. (2002). *Freedom and happiness: a comparative study in 46 nations in the early 1990's,* World Happiness Database 2002. http://tiny.cc/ajoA5

96 Jackson, T. (2009). *Prosperity without Growth?* London: Sustainable Development Commission

97 Ibid

98 Wilkinson R. & Pickett, K. (2009). *The Spirit Level: Why More Equal Societies Almost Always Do Better:* p87. London: Penguin Books Ltd.

citing, inter alia, SV Subramanian and I Kawachi. Income inequality and health: what have we learned so far? Epidemiologic Review 2004, 26: 78-91

99 Gough, I., Meadowcroft, J., Dryzek, J., Gerhards, J., Lengfeld, H., Markandya, A. & Ortiz, R (2008). Symposium: Climate change and social policy. *Journal of European Social Policy*, 18(4):325-344.

100 Coote, A. & Franklin, J. (2009). Green Well Fair: Three economies for social justice. new economics foundation.

101 National Institute for Health and Clinical Excellence (2010). *Spatial planning for health.* http://tiny.cc/z24cO

102 Department for Children, Schools and Families (2008). *The Play Strategy.* http://tiny.cc/JFQkE

103 Sassi, F. (2009). Health inequalities: a persistent problem. In: J. Hills, T. Sefton & K. Steward (Eds.), *Towards a more equal society? Poverty, inequality and policy since 1997.* Bristol: The Policy Press.

104 The NHS Information Centre (2007). Health Survey for England 2007.

105 Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., et al. (2007). *Foresight. Tackling Obesities: Future Choices – Project Report.* 2nd Edition. London: Government Office for Science.

106 National Heart Forum (2010). *Social Class and Obesity – Effects on disease and health service treatment costs.* To be available at www.heartforum.org.uk

107 National Institute for Clinical Excellence. (2006). *Obesity: guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children.*

108 Mental Health Foundation (2009). *Mental health, resilience and inequalities.* http://tiny.cc/xLQvl

109 The Office for National Statistics (2001). *Psychiatric Morbidity report.*

110 The future vision coalition (2009). *A future vision for mental health.* http://tiny.cc/jSfWK

111 Foresight (2008). *Mental Health: Future challenges Government.* Office for Science. http://tiny.cc/JVpIa

112 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health.* London: The Stationary Office

113 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

114 Department for Environment, Food and Rural Affairs. (2000). National Food Survey 2000. http://tiny.cc/nSjlV

115 Belot, M., James, J. (2009). *Healthy School Meals and Educational Outcomes.* Oxford: Institute for Social and Economic Research.

116 Dowler, E. (2008). Food and health inequalities: the challenge for sustaining just consumption. *Local Environment 13*(8):759-772.

117 Food Standards Agency (2007). *Low income diet and nutrition survey.* London: The Stationary Office.

118 Department for Environment, Food and Rural Affairs (2010). *Food 2030.* London: Defra.

119 Ibid.

120 Intergovernmental Panel on Climate Change (2007). *Climate change 2007: The Physical Science Basis*. New York: Cambridge University Press.

121 United Nations Development Programme (2007). *Human Development Report: Fighting climate change: human solidarity in a divided world*. New York: United Nations Development Programme.

122 Friel, S., Marmot, M., McMichael, A.J., Kjellstrom, T. & Vågerö, D. (2008). Global health equity and climate stabilisation - need for a common agenda. The Lancet, 372(9650):1677-1683.

123 Garnett T. (2008). *Food, greenhouse gas emissions and our changing climate*. Surrey: Food Climate Research Network.

124 Department for Environment, Food and Rural Affairs (2009). *Information bulletin: Anaerobic digestion: new Task Group to deliver shared goals*. London: Defra.

125 Garnett, T. (2008). *Food, greenhouse gas emissions and our changing climate*. Surrey: Food Climate Research Network.

126 Food and Agricultural Organisation (2006). *Livestock's Long Shadow—Environmental Issues and Options*. Rome: Food and Agriculture Organisation.

127 Casey, J.W. & Holden, N.M. (2005). The relationship between greenhouse gas emissions and the intensity of milk production in Ireland. *Journal of Environmental Quality*, 34:429–436.

128 Casey, .J.W. & Holden, N.M. (2006). Quantification of greenhouse gas emissions from suckler-beef production in Ireland. *Agricultural Systems*, 90:79-98.

129 Cederberg, C. & Mattson, B. (2000). Life cycle assessment of milk production — a comparison of conventional and organic farming. *Journal of Cleaner Production*, 8:49-60.

130 Cederberg, C. & Stadig, M. (2003). System expansion and allocation in life cycle assessment of milk and beef production. *International Journal of Life Cycle Assessment*, 8(6):350-356.

131 Lovett, D.K., Shalloo, L., Dillon, P. & O'Mara, F.P. (2006). A systems approach to quantify greenhouse gas fluxes from pastoral dairy production as affected by management regime. *Agricultural Systems*, 88(2-3):156-179.

132 Basset-Mens, C., van der Werf, H.M.G (2005). Scenario-based environmental assessment of farming systems: the case of pig production in France. *Agriculture, Ecosystems and Environment*, 105:127-144.

133 Dixon, J., Omwega, A., Friel, S., et al. (2007). The Health Equity Dimensions of Urban Food Systems. *Journal of Urban Health*, 84(1S):118-129.

134 Hawkes, C. (2006). Uneven dietary development: linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases. *Globalisation and Health 2*(4). doi:10.1186/1744-8603-2-4.

135 Hawkes, C., Chopra, M. & Friel, S. (2008). Globalization, Trade and the Nutrition Transition. In: Labonte, R., Schrecker, T., Packer, C., Runnels, V, eds. *Globalization and Health: Pathways, Evidence and Policy*. New York: Routledge.

136 Pretty, J., Ball, A., Lang, T. & Morison, J. (2005). Farm costs and food miles: An assessment of the full cost of the UK weekly food basket. *Food Policy*, 30(1):1-20.

137 Food and Agricultural Organisation (2003). *World agriculture: towards 2015/2030. An FAO perspective*. Rome: Food and Agricultural Organisation/Earthscan.

138 McMichael, A.J., Powles, J.W., Butler, C.D. & Uauy, R. (2007). Food, livestock production, energy, climate change and health. *The Lancet*, 370, 55–65.

139 Delgado, C.L. (2003). Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution. *Journal of Nutrition, 133*(11):3907S-3910.

140 Garnett, T. (2008). *Food, greenhouse gas emissions and our changing climate.* Surrey: Food Climate Research Network.

141 Committee on Climate Change (2008). *Building a low-carbon economy – the UK's contribution to tackling climate change: The First Report of the Committee on Climate Change.* London: UK Government.

142 Gerbens-Leenes, P.W. & Nonhebel, S. (2002). Consumption patterns and their effects on land required for food. *Ecological Economics, 42S,* 185-199.

143 Gold, M. (2004). *The Global Benefits of Eating Less Meat*. Petersfield, UK: Compassion in World Farming Trust.

144 Sustainable Development Commission (2009). *Setting the Table: Advice to Government on priority elements of sustainable diets.*

145 Gold, M. (2004). *The Global Benefits of Eating Less Meat.* Petersfield, UK: Compassion in World Farming Trust.

146 World Health Organisation (2002). *Food and The Food and Agriculture Organisation of the United Nations Diet, nutrition and the prevention of chronic diseases.* Draft report of the joint WHO/ FAO expert consultation,

147 Scientific Advisory Committee on Nutrition (2009). Draft Iron and Health report Scientific Consultation. http://tiny.cc/cP7Eh

148 Food and Agricultural Organisation (2008). *The State of Food Insecurity in the World 2008*. Rome: Food and Agriculture Organisation.

149 Doak, C.M., Adair, L.S., Bentley, M., Monteiro, C. & Popkin, B.M. (2004). The dual burden household and the nutrition transition paradox. *International journal of obesity and related metabolic disorders,* 29(1):129-136.

150 Drewnowski, A. & Specter, S. (2004). Poverty and obesity: the role of energy density and energy costs. *American Journal of Clinical Nutrition, 79*(1):6-16.

151 Friel, S., Chopra, M. & Satcher, D. (2007). Unequal weight: equity oriented policy responses to the global obesity epidemic. *British Mentoring Journal, 335*(7632):1241-1243.

152 Hawkes, C. (2006). Uneven dietary development: linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases. Globalisation and Health.

153 Popkin, B.M. (2006). Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases. *American Journal of Clinical Nutrition, 84*(2):289-298.

154 McMichael, A.J., Powles, J.W., Butler, C.D. & Uauy, R. (2007). Food, livestock production, energy, climate change and health. *The Lancet*, 370, 55–65.

155 Department of Health (2008). *Healthy Weight, Healthy Lives: A cross-government strategy for England 2008*. London.

156 Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., et al. (2007). *Foresight. Tackling Obesities: Future Choices – Project Report*. 2nd Edition. London: Government Office for Science.

157 Food Standards Agency (2007). *Low Income and Diet Survey.* London: Food Safety Authority.

158 Dowler, E. & Dobson, B. (1997). Nutrition and poverty in Europe: an overview. *Proceedings of the Nutrition Society,* 56:51-62.

159 Friel, S., Marmot, M., McMichael, A.J., Kjellstrom, T. & Vågerö, D. (2008). Global health equity and climate stabilisation - need for a common agenda. *The Lancet*, 372(9650):1677-1683.

160 Institute of Agriculture and Trade Policy (2006). *Food without Thought: How U.S. Farm Policy Contributes to Obesity*. Minneapolis, Minnesota: Institute of Agriculture and Trade Policy.

161 Health Committee (2004). Obesity: *Third Report of Session 2003-03*. London: The Stationary Office.

162 Barling, D., Lang, T. & Sharpe, R. (2008). The root of the problem. *RSA Journal*, Spring, 29. http://tiny.cc/UFnVw

163 Morris, J., Donkin, A., Wonderling, D., Wilkinson, P. & Dowler, E. (2000). A Minimum Income for Healthy Living. *Journal of Epidemiology and Community Health*, 54, 885-889.

164 Saunders, P. (1998). *Global pressures, national responses: The Australian welfare state in context*. Social Policy Research Centre, Sydney.

165 Friel, S., Walsh, O. & McCarthy, D. (2006). The irony of a rich country: Issues of access and availability of healthy food in the Republic of Ireland. *Journal of Epidemiology and Community Health*, 60, 1013-1019.

166 Ibid.

167 Food for Life. www.foodforlife.org.uk

168 Good Food on the Public Plate. Sustainweb. http://tiny.cc/F8rD3

169 Department of Health (n.d.). Healthier Food Mark - Promoting healthier, more sustainable food. http://tiny.cc/Lz2Qp

170 Belot, M. & James, J. (2009). *Healthy School Meals and Educational Outcomes*. Oxford: Institute for Social and Economic Research.

171 Dowler, E., Rex, D., Blair, A., Donkin, A. & Grundy, C. (2001). *Measuring Access to Healthy Food in Sandwell.* Sandwell: Sandwell Health Authority.

172 ICLEI Local Governments for Sustainability (n.d.). http://tiny.cc/bzRRV.

173 Department for Transport (2009). *A Safer Way – Making Britain's Roads the Safest in the World*. http://tiny.cc/roZEW

174 Grundy, C. et al. (2009). Effect of 20 mph traffic speed zones on road injuries in London, 1986-2006: controlled interrupted time series analysis. *British Medical Journal*, 339:b4469.

175 Metz, D. (2008). *The Limits to Travel*. Earthscan.

176 Adams,J. (2001). *The Social Consequences of Hypermobility*. RSA lecture. http://tiny.cc/GuE8s.

177 Layard, R. (2006). *Happiness: Lessons from a New Science.* London: Penguin.

178 Sloman, L. (2006). *Car Sick – Solutions for our car addicted culture*. Devon, England: Green Books Ltd.

179 Haines, A., Kovats, R.S., Campbell-Lendrum, D. & Corvalan, C. (2006). Climate change and human health: impacts, vulnerability, and mitigation. *Lancet*, 367(9528):2101-9.

180 Patz, J.A., Campbell-Lendrum, D., Holloway, T. & Foley, J.A. (2005). Impact of regional climate change on human health. *Nature*. 438(7066):310-7.

181 Intergovernmental Panel on Climate Change Secretariat, World Meteorological Organization, United Nations Environment Programme (2007). *Climate Change 2007: impacts, adaptation and vulnerability*. Contribution of Working Group II to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Summary for policy makers. Cambridge, UK and New York, NY, USA: Cambridge University Press.

182 Stern N. (2006). *The Economics of Climate Change; The Stern review*. London: HM Treasury.

183 Woodcock, J., Banister, D., Edwards, P., Prentice, A. & Roberts, I. (2007). Energy and Transport. *Lancet* 370:1078-88.

184 Kjellstrom, T., Ferguson, R. & Taylor, A. (2009). *The total public health impact of road transport in Sweden*. Technical report. Borlange: Swedish National Road Authority. http://tiny.cc/Via2A.

185 Woodcock, J., Banister, D., Edwards, P., Prentice, A., Roberts, I. (2007). Energy and Transport. *Lancet*, 370:1078-88.

186 Department for Transport (2007). 2006 National travel survey. Transport Statistics.

187 Graham, D.J. & Stephens, D.A. (2008). Decomposing the impact of deprivation on child pedestrian casualties in England. *Accident Analysis and Prevention, 40*(4):1351-64.

188 Graham, D., Glaister, S. & Anderson, R. (2005). The effects of area deprivation on the incidence of child and adult pedestrian casualties in England. *Accident Analysis and Prevention, 37*(1):125-35.

189 Jones, A.P., Haynes, R., Kennedy, V., Harvey, I.M., Jewell, T. & Lea, D. (2008). Geographical variations in mortality and morbidity from road traffic accidents in England and Wales. *Health Place, 14*(3):519-35.

190 Department for Transport. (2008). *Road Casualties Great Britain 2007.* http://tiny.cc/mGRlw.

191 Department for Transport. (2009). *A Safer Way – Making Britain's Roads the Safest in the World.* http://tiny.cc/KXv5O

192 Office for National Statistics (2002). *National Statistics Socio-economic Classification: User Manual.* London: Office for National Statistics.

193 Edwards, P., Roberts, I., Green, J. & Lutchmun, S. (2006). Deaths from injury in children and employment status in family: analysis of trends in class specific death rates. *British Medical Journal, 333*(7559):119.

194 Frank, L.D., Saelens, B.E., Powell, K.E. & Chapman, J.E. (2007). Stepping towards causation: do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? *Social Science and Medicine, 65*(9):1898-914.

195 Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., et al. (2007). Foresight. Tackling Obesities: Future Choices – Project Report. 2nd Edition. London: Government Office for Science.

196 National Institute for Health and Clinical Excellence (2008). *Promoting and creating built or natural environments that encourage and support physical activity.* NICE public health guidance 8. London: National Institute for Health and Clinical Excellence.

197 Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J., et al. (2007). Foresight. Tackling Obesities: Future Choices – Project Report. 2nd Edition. London: Government Office for Science.

198 Sustrans (2009). *Active travel and health inequalities. How walking and cycling can benefit the health of the most disadvantaged people.* Information sheet FH12. Bristol: Sustrans.

199 Hillsdon, M., Lawlor, D.A., Ebrahim, S. & Morris, J.N. (2008). Physical activity in older women: associations with area deprivation and with socioeconomic position over the life course: observations in the British Women's Heart and Health Study. *Journal of Epidemiology and Community Health, 62*(4):344-50.

200 Department of Health Public Health Research Consortium, Law, C., Power, C., Graham, H. & Merrick, D. (2007). Obesity and Health Inequalities. Obesity reviews 8 (Suppl. 1), 19–22.

201 Mitchell, R. & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet,* 372:1655-1660.

202 Popham & Mitchell (2007). Relation of employment status to socioeconomic position and physical activity types. *Preventive Medicine 45*:2-3.

203 Stafford, M., Cummins, S., Ellaway, A., Sacker, A., Wiggins, R.D. & Macintyre, S. (2007). Pathways to obesity: identifying local, modifiable determinants of physical activity and diet. *Social Science and Medicine, 65*(9):1882-97.

204 Mohebati, L., Lobstein, T., Millstone, E. & Jacobs, M. (2007). Policy options for responding to the growing challenge from obesity in the United Kingdom. *Obesity Review, 8* Suppl 2:109-15.

205 Frank, L.D., Saelens, B.E., Powell, K.E. & Chapman, J.E. (2007). Stepping towards causation: do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? *Social Science and Medicine, 65*(9):1898-914.

206 Warburton, D.E., Nico, C.W. & Bredin, S.S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 14;174*(6):801-9.

207 Mohebati, L., Lobstein, T., Millstone, E. & Jacobs, M. (2007). Policy options for responding to the growing challenge from obesity in the United Kingdom. *Obesity Review, 8* Suppl 2:109-15.

208 Frank, L.D., Saelens, B.E., Powell, K.E. & Chapman, J.E. (2007). Stepping towards causation: do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? *Social Science and Medicine, 65*(9):1898-914.

209 National Institute for Health and Clinical Excellence (2008). *Promoting and creating built or natural environments that encourage and support physical activity*. NICE public health guidance 8. London: National Institute for Health and Clinical Excellence.

210 Sonkin, B. et al. (2006). Walking, cycling and transport safety: an analysis of child road deaths. *Journal of the Royal Society of Medicine; 99*(8): 402–405.

211 Department for Environment, Food and Rural Affairs (2007). *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Volume 1*. London: TSO.

212 Heinrich, J., Schwarze, P.E., Stilianakis, N. et al. (2005). Studies on health effects of transport-related air pollution. In: Krzyzanowski M, Kuna-Dibbert B, Schneider J eds. *Health effects of transport related air pollution.* Geneva: World Health Organisation.

213 Committee on the Medical Apsects of Air Pollutants (COMEAP) (2009). Long-Term Exposure to Air Pollution: Effect on Mortality. A report by the Committee on the Medical Effects of Air Pollutants (COMEAP). London: Department of Health.

214 Pope, C.A. 3rd. (2007). Mortality effects of longer term exposures to fine particulate air pollution: review of recent epidemiological evidence. *Inhalation Toxicology, 19* Suppl 1:33-8.

215 Boldo, E., Medina, S., LeTertre, A., Hurley, F., Mucke, H.G., Ballester, F., et al. (2006). Apheis: Health impact assessment of long-term exposure to PM(2.5) in 23 European cities. *European Journal of Epidemiology, 21*(6):449-58.

216 Sustrans (2009). *Active travel and health inequalities. How walking and cycling can benefit the health of the most disadvantaged people.* Information sheet FH12. Bristol: Sustrans.

217 Environment Agency (n.d.). *Addressing Environmental Inequalities.* http://tiny.cc/ikLci.

218 Royal Commission on Environmental Pollution (2007a). *Study on Urban Environments Wellbeing and Health*. London: The Stationary Office.

219 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

220 Forastiere, F., Stafoggia, M., Tasco, C., Picciotto, S., Agabiti, N., Cesaroni, G., et al. (2007). Socioeconomic status, particulate air pollution, and daily mortality: differential exposure or differential susceptibility. *American Journal of Industrial Medicine, 50*(3):208-16.

221 HM Government (2005). *Securing the Future: delivering the UK sustainable development strategy.* London: The Stationary Office.

222 AE Technology for Department of Environment, Food and Rural Affairs (2006). *Air Quality and Social Deprivation in the UK: an environmental inequalities analysis.* http://tiny.cc/ysVGb.

223 O'Neill, M.S., Jerrett, M., Kawachi, I., Levy, J.I., Cohen, A.J., Gouveia, N., et al. (2003). Health, wealth, and air pollution: advancing theory and methods. *Environmental Health Perspectives, 111*(16):1861-70.

224 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health.*

225 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

226 Environmental Protection UK (2010). *Noise Pollution.* http://tiny.cc/BchM3.

227 Woodcock, J., Banister, D., Edwards, P., Prentice, A., Roberts, I. (2007). Energy and Transport. *Lancet,* 370:1078-88.

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

229 Greater London Authority (2004). *Sounder City: The Mayor's Ambient Noise Strategy.* London: Greater London Authority.

230 Stansfeld, S.A., Haines, M. et al (2000). Noise and health in the urban environment. *Reviews of environmental health, 15*(1-2),43-82.

231 Stansfeld ,S.A., 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.

232 Matsui, T., Stansfeld, S., Haines, M. & Head, J. (2004). West London schools study: the effects of chronic aircraft noise exposure at Home. *Noise and Health 7*(25), 49-57.

233 Cohen, S. (1973). Apartment Noise, Auditory Discrimination, and Reading Ability in Children. *Journal of Experimental Social Psychology, 9*(5), 407-422.

234 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health.* London: The Stationary Office.

235 Royal Commission on Environmental Pollution. (2007b). *The Urban Environment.* London: The Stationary Office.

236 Evans, G. W., Bullinger, M., & Hygge, S. (1998). Chronic noise exposure and physiological response: a prospective study of children living under environmental stress. *Psychological Science, 9*(1): 75-77.

237 Putnam, R.D. (2000). *Bowling Alone: The Collapse and Revival of American Community.* New York, NY: Simon & Schuster.

238 Hart, J. (2008). *Driven To Excess: Impacts of Motor Vehicle Traffic On Residential Quality Of Life.* UWE MSc Dissertation 2008. http://tiny.cc/eqx8c

239 Crawford, J. H. (2000). *Carfree Cities*. The Netherlands: International Books.

240 Selander, J., Nilsson, M.E., Bluhm, G., Rosenlund, M., Lindqvist, M., Nise, G., et al. (2009). Long-term exposure to road traffic noise and myocardial infarction. *Epidemiology, 20*(2):272-9.

241 Babisch, W. (2006). Transportation noise and cardiovascular risk: updated review and synthesis of epidemiological studies indicate that the evidence has increased. *Noise Health, 8*(30):1-29.

242 Stansfeld, S.A., Matheson, M.P. (2003). Noise pollution: non-auditory effects on health. *British Medical Bulletin,* 68:243-57.

243 Franssen, E.A., van Wiechen, C.M., Nagelkerke, N.J., Lebret, E. (2004). Aircraft noise around a large international airport and its impact on general health and medication use. *Occupational and Environmental Medicine, 61*(5):405-13.

244 Jarup, L., Babisch, W., Houthuijs, D., Pershagen, G., Katsouyanni, K., Cadum, E., et al. (2008). Hypertension and exposure to noise near airports: the HYENA study. *Environmental Health Perspectives, 116*(3):329-33.

245 McMillan, A.S., Barlow, J. (2008). *Promoting the mental health of young children through urban renewal: a review of the evidence.* Warwick: Health Sciences Research Institute Medical School, Warwick University & West Midlands Health Teaching Network.

246 Sustrans (2009). *Take Action on Active Travel.* http://tiny.cc/BF6wg

247 Health Committee (2009). *Health Inequalities Third Report of Session 2008–09.* London: The Stationary Office Limited.

248 Hillsdon, S., Thorogood, M., Anstiss, T. & 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.

249 Van Lenthe, F.J., Brug, J., Mackenbach, J.P. (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.

250 Berke, E.M., Koepsell, T.D., Vernez Moudon, A., Hoskins, R.E., Larson, E.B. (2007). Association of the Built Environment with Physical Activity and Obesity in Older Persons. *American Journal of Public Health, 97*(3), 486-492.

251 National Institute for Health and Clinical Excellence (2008). *Promoting and creating built or natural environments that encourage and support physical activity.* NICE public health guidance 8. London: NICE.

252 Danish Architecture Centre (n.d.). *Copenhagen: The world's best city for cyclists.* Sustainable Cities. http://tiny.cc/3HbdW.

253 National Institute for Health and Clinical Excellence (2008). *Promoting and creating built or natural environments that encourage and support physical activity.* NICE public health guidance 8. London: NICE.

254 Pikora, T., Giles-Corti, B., Knuiman, M. (2005). Neighbourhood environmental factors correlated with walking near home: using SPACES. . *Medicine and Science in Sports and Exercise 38*(4), 708-714.

255 Saelens, B., Sallis, J., & Frank, L. (2003). Environmental correlates of walking and cycling: findings from the transportation, urban design and planning literature. *Annals of Behavioural Medicine 25*(2):80-91.

256 Frank, L., Schmid, T., & Sallis, J. (2005). Linking objectively measured physical activity with objectively measured urban form: findings from SMARTRAQ. *American Journal of Preventative Medicine, 28* (2S2):117-125.

257 McCormack, G., Giles-Corti, B., Lange, A. (2004). An update of recent evidence of the relationship between objective and self-measures of the physical environment and physical activity behaviours. *Journal of Science, Sport and Medicine, 7*(1 Supplement):81-92.

258 Gorman, D. et al. (2003). Transport policy and health inequalities: a health impact assessment of Edinburgh's transport policy. *Public Health,* 117:15-24.

259 Jones, S., Lyons, R., John, A., Palmer, S. (2005). Traffic calming policy can reduce inequalities in child pedestrian injuries: database study. *Injury Prevention, 11*:152-156.

260 Grundy, C. et al. (2009). Effect of 20 mph traffic speed zones on road injuries in London, 1986-2006: controlled interrupted time series analysis. *British Medical Journal,* 339:b4469.

261 Tonne, C., Beevers, S., Armstrong, B., Kelly, F., Wilkinson, P. (2008). Air pollution and mortality benefits of the London Congestion Charge: spatial and socioeconomic inequalities. *Occupational and Environmental Medicine, 65*(9):620-7.

262 Noland, R.B., Quddus, M.A., Ochieng, W.Y. (2007). The effect of the London congestion charge on road casualties: an intervention analysis. *Transportation, 35*:73-91.

263 Steinbach, R., Wilkinson, P., Edwards, P., Grundy, C. The Congestion Charge Scheme and road casualties in London. submitted

264 Department for Transport (2009) *Interim Evaluation of the Implementation of 20 mph Speed Limits in Portsmouth* http://tiny.cc/oqaLf

265 Biddulph, M. (2001). *Home Zones: A Planning and Design Handbook.* Bristol: Policy Press.

266 Cycling England. (2008). *Planning for Cycling.* http://tiny.cc/XuiHU

267 European Parliament. (2007). *Compensation of victims of cross-border road traffic accidents in the EU: Assessment of selected options.* http://tiny.cc/mXWpn

268 Sloman, L. (2006). Car Sick – *Solutions for our car addicted culture.* Devon, England: Green Books Ltd.

269 Sustainable Development Commission (2004). *Progress in Practice: Addenbrooke's Hospital Travel Plan.* http://tiny.cc/o1qxo

270 Sustrans(2009). *Take Action on Active Travel.* http://tiny.cc/BF6wg

271 Department for Transport (2009). *Call for comments on revision of DfT's speed limit cicular.*

272 Play England (2008) Playday Survey

273 Mitchell, R. & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet,* 372:1655-1660.

274 Centers for Disease Control and Prevention (2008). *Healthy Places Terminology.* http://tiny.cc/8qhj5

275 HM Government (2005). *Securing the Future: delivering the UK sustainable development strategy.* London: The Stationary Office.

276 Sustainable Development Commission (2008). *Health Place and Nature: How outdoor environments influence health and wellbeing: a knowledge base.*

277 Bird, W. (2004). *Natural Fit: Can green space and biodiversity increase levels of physical activity?* http://tiny.cc/GBYCr

278 Bird, W. (2007). *Natural thinking.* RSPB. http://tiny.cc/8X27v

279 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

280 Newton, J. (2007). *Wellbeing and the natural environment: A brief overview of the evidence.* http://tiny.cc/9HMnh

281 Croucher, K., Myers, L. & Bretherton, J. (2007). *The links between greenspace and health: a critical literature review*, University of York.

282 Greenspace Scotland (2008). Green space and quality of life: a critical literature review. Stirling: Greenspace Scotland.

283 Pretty, R. (2007). *The Earth Only Endures.* London: Earthscan.

284 De Vries, S., Verheij, R., Grenewegen, P. & Spreeuwenberg, P. (2003). Natural environments – healthy relationships? An exploratory analysis of the relationship between greenspace and health. *Environment and planning A 35*, 1717-1731.

285 Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N. & Griffin, M. (2007). Green exercise in the UK Countryside: Effects on Health and Physiological Wellbeing, and Implications for Policy and Planning. *Journal of Environmental Planning and Management, 50*(2), 211-231.

286 Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. Nature and Health (2004). *The influence of nature on social, psychological and physical wellbeing.* The Hague: Health Council of the Netherlands and RMNO, publication no. 2004/09E; RMNO publication nr A02ae.

287 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

288 De Vries, S., Verheij, R., Grenewegen, P. & Spreeuwenberg, P. (2003). Natural environments – healthy relationships? An exploratory analysis of the relationship between greenspace and health. *Environment and planning A 35*, 1717-1731.

289 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.

290 Grahn, P. & Stigsdotter, U.A. (1991). Landscape planning and stress. *Urban Forestry & Urban Greening, 2*(1):1-18.

291 Hartig, T, Mang, M & Evans, G. (1991). Restorative Effects of Natural Environmental Experiences. *Environment and Behaviour 23*, 3-26.

292 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.

293 Maas J et al. (2006). Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health, 60*, 587-592.

294 Kuo, F. (2001). Coping with poverty – impacts of environment and attention in the inner city. *Environment and Behaviour, 33*: 5-33.

295 Ulrich, R.S. (1984). View through a window may influence recovery from surgery. *Science,* 224, 420-421.

296 Heerwagen, J.H., Heubach, J.G., Montgomery, J. & Weimer, W.C. (1995). Environmental design, work, and wellbeing: managing occupational stress through changes in the workplace environment. *American Association of Occupational Health Nurses Journal, 43*(9): 458-468.

297 Mooney, P. & Nicell, P.L. (1992). The importance of exterior environment for the Alzheimer's residents. Effective care and risk management. *Health Care Management Forum, 5*(2): 23-29.

298 Moore, E.O. (1981). A prison environment's effect on health care service demands. *Journal of Environmental Systems,* 11: 17-34.

299 Bird, W. (2004). *Natural Fit: Can green space and biodiversity increase levels of physical activity?* http://tiny.cc/GBYCr

300 Cohen, D.A., McKenzie, T.L., Sehgal, A., Williamson, S., Golinelli, D. & Lurie, N. (2007). Contribution of public parks to physical activity. *American Journal of Public Health, 97*:509-14.

301 Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment. Nature and Health (2004). *The influence of nature on social, psychological and physical wellbeing.* The Hague: Health Council of the Netherlands and RMNO, publication no. 2004/09E; RMNO publication nr A02ae.

302 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.

303 National Heart Forum (2007). *Building health: Creating and enhancing places for healthy, active lives.* London: National Heart Forum.

304 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.

305 Bell, J., Wilson, J. & Liu, G. (2008). Neighborhood greenness and 2-year changes in body mass index of children and youth. *American Journal of Preventative Medicine, 35*(6): 547-553.

306 Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N. & Griffin, M. (2007). Green exercise in the UK Countryside: Effects on Health and Physiological Wellbeing, and Implications for Policy and Planning. *Journal of Environmental Planning and Management, 50*(2), 211-231.

307 Mind (2007). *Ecotherapy: The green agenda for mental health.* http://tiny.cc/KryDO

308 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.

309 The Mental Health Foundation (2000). *Strategies for Living: A Report Of User-Led Research Into People's Strategies For Living With Mental Distress.* London: The Mental Health Foundation.

310 Abbott et al. (2004). Walking and dementia in physically capable elderly men. *Journal of the American Medical Association, 292*: 1447-1453.

311 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.

312 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.

313 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.

314 Ibid.

315 Bodin, M. & Hartig, T. (2003). Does the outdoor environment matter for psychological restoration gained through running? *Psychology of Sport and Exercise, 4*:141-153.

316 BTCV(2008). *BTCV Green Gym national evaluation report: Summary of findings 2008.* http://tiny.cc/X89Vh

317 Mind. (2007). *Ecotherapy: the green agenda for mental health.* http://tiny.cc/KryDO

318 Ibid.

319 Gimeno, D., Brunner, E.J., Lowe, G.D., Rumley, A., Marmot, M.G. & Ferrie, J.E. (2007). Adult Socioeconomic position, C-reactive protein and interlukin 6 in the Whitehall II prospective study. *European Journal of Epidemiology, 22*:675-683.

320 Wright, C.E., Strike, P.C., Brydon, L. & Steptoe, A. (2005). Acute inflammation and negative mood: Mediation by cytokine activation. *Brain, Behaviour and Immunity, 19*:345-350.

321 Freeman, D.J., Norrie, J., Caslake, M.J., Gaw, A., Ford, I., Lowe, G.D., O'Reilly, D.S., Packard, C.J. & Sattar, N. (2002). West of Scotland Coronary Prevention Study. C-reactive protein is an independent predictor of risk for the development of diabetes in the West of Scotland Coronary Prevention Study. *Diabetes, 51*(5):1596-600.

322 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.

323 Cohen, D.A., McKenzie, T.L., Sehgal, A., Williamson, S., Golinelli, D. & Lurie, N. (2007). Contribution of public parks to physical activity. *American Journal of Public Health, 97*:509-14.

324 Kuo, F.E., Sullivan, W.C., Coley, R.L. & Brunson, L. (1998). Fertile ground for community: Inner-city neighbourhood common spaces. *American Journal of Community Psychology, 26*:825-851.

325 Lewis, C.A. (1996). *Green Nature/Human Nature: The Meaning of Plants in our Lives.* Chicago: University of Illinois Press.

326 Department for Children, Schools and Families (2007). *The Children's Plan: Building brighter futures.* Norwich, UK: The Stationary Office.

327 Play England (2007). *Play day 2007: Our Streets Too! Street Play Opinion Poll Summary.* ICM.

328 Mental Health Foundation (1999). *Brighter Futures: Promoting Children and Young Peoples Mental Health.*

329 Audit Commission, The Healthcare Commission & The National Audit Office (2006). *Tackling Child Obesity – First Steps.* London: The Stationary Office.

330 Wells, N., & Evans, G. (2003). Nearby Nature; A buffer of life stress among Rural Children. *Environment and Behaviour, 35*(3), 311-330.

331 Faber, T. A., Kuo, F., & Sullivan, W. (2001). Coping with ADD: The surprising connection to green play settings. *Environment and Behaviour, 33*:54-77.

332 Faber, T. A., Kuo, F., & Sullivan, W. (2002). Views of nature and self-discipline: evidence from inner-city children. *Journal of Environmental Psychology, 22*:49-64.

333 Kellert, S. (2002). Experiencing nature: affective, cognitive, and evaluative development in children. In *Children and Nature: Psychological, socio-cultural and Evolutionary Investigations.* Boston, United States: MIT Press.

334 Lester, S. & Maudsley, M. (2006). *Play Naturally: A Review of Children's Natural Play.* Commissioned by the Children's Play Council. London: National Children's Bureau.

335 Bird, W. (2007). *Natural thinking.* RSPB. http://tiny.cc/8X27v

336 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.

337 Ibid.

338 Maan, N. (2005). *The delivery of environmental play projects by the Better Play Funded Organisations.* Barnardos, Briefing 4, 2005. http://tiny.cc/jQQoq

339 Sustainable Development Commission (2007). *Every Child's Future Matters.* http://tiny.cc/i6Fxz

340 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

341 Coley, R.L., Kuo, F.E. & Sullivan, W.C. (1997). Where does community grow? The social context created by nature in Urban Public Housing. *Environment and Behavior, 29*(4):468-494.

342 Sullivan, W.C., Kuo, F.E. & Depooter, S.F. (2004). The Fruit of Urban Nature: Vital Neighborhood Space. *Environment and Behaviour, 36*(5):678-700.

343 Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N. & Griffin, M. (2007). Green exercise in the UK Countryside: Effects on Health and Physiological Wellbeing, and Implications for Policy and Planning. *Journal of Environmental Planning and Management, 50*(2):211-231.

344 Sullivan, W.C., Kuo, F.E. & Depooter, S.F. (2004). The Fruit of Urban Nature: Vital Neighborhood Space. *Environment and Behaviour, 36*(5):678-700.

345 Bird, W. (2007). *Natural thinking.* RSPB. http://tiny.cc/8X27v

346 Kuo, F.E. & Sullivan, W.C. (2001). Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behaviour; 33*(3):343-367.

347 Kuo, F.E., Sullivan, W.C., Coley, R.L. & Brunsn, L. (1998). Fertile ground for community: Inner-city neighbourhood common spaces. *American Journal of Community Psychology, 26*:825-851.

348 Lewis, C.A. (1996). *Green Nature/Human Nature: The Meaning of Plants in our Lives.* Chicago: University of Illinois Press.

349 Maller, C., Townsend, M., Pryor, A., Brown, P. & St Leger L. (2006). Healthy nature people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International, 21*: 45-54.

350 Austin, M. (2002). Partnership opportunities in neighbourhood tree planting initiatives: building from local knowledge. *Journal of Arboriculture, 28*:178-186.

351 Inerfield, R., & Blom, B. (2002). A new tool for strengthening urban neighbourhoods. *Journal of Affordable Housing, 11*:128-134.

352 Nowak, D., Crane, D. & Stevens, J. (2006). Air pollution removal by urban trees and shrubs in the United States. *Urban Forestry Urban Greening, 4*:115-23.

353 Lovasi, G., Quinn, J., Neckerman, K., Perzanowski, M. & Rundle, A. (2008). Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology & Community Health, 62*(7):647-649.

354 Townshend, J., Hails, S. & McKean, M. (2007). Diagnosis of asthma in children. *British Medical Journal, 28*; 335(7612):198-202.

355 London Climate Change Partnership (2002). *London's Warming: The impacts of climate change on London.* London: Greater London Authority.

356 Gill et al. (2007). Adapting Cities for Climate Change: The Role of the Green Infrastructure. *Built Environment, 33*:1 115-133.

357 Mitchell, R. & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet, 372*:1655-1660.

358 Maas J et al. (2006). Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health, 60,* 587-592.

359 Cohen, D.A., McKenzie, T.L., Sehgal, A., Williamson, S., Golinelli, D. & Lurie, N. (2007). Contribution of public parks to physical activity. *American Journal of Public Health, 97*:509-14.

360 BTCV(2008). *BTCV Green Gym national evaluation report: Summary of findings 2008.* http://tiny.cc/X89Vh

361 Mental Health Foundation (2009). *Mental health, resilience and inequalities.* http://tiny.cc/Bxp5x

362 Sustainable Development Commission (2007). *Healthy Futures #6: The natural environment, health and wellbeing.*

363 Sustainable Development Commission (2009). *Breakthroughs for the 21st century.*

364 Sustainable Development Commission (2008). *Health Place and Nature: How outdoor environments influence health and wellbeing: a knowledge base.*

365 Department for Children, Schools and Families & Department of Health (2009). *Healthy Lives: Brighter Futures: The Strategy for Children and Young People's Health.* London: COI. http://tiny.cc/Knv0l

366 Sustainable Development Commission (2008). *Health Place and Nature: How outdoor environments influence health and wellbeing: a knowledge base.*

367 H M Treasury (2006). *Stern Review on the Economics of Climate Change.* London: H M Treasury.

368 Sustainable Development Commission. (2006). *"Stock take": delivering improvements in existing housing - UK.* London: Sustainable Development Commission.

369 German Energy Agency (Deutsche Energie-Agentur) (n.d.). www.dena.de

370 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health.* London: The Stationary Office.

371 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

372 Boardman, B. (1991), *Fuel poverty: from cold homes to affordable warmth.* Belhaven Press, London.

373 Sustainable Development Commission (2009). *Breakthroughs for the 21st century,* page 7.

374 Royal Commission on Environmental Pollution. (2007a). *Study on Urban Environments Wellbeing and Health.* London: The Stationary Office.

375 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

376 Gilbertson, J., Green, G., & Ormandy, D. (2006). *Decent Homes Better Health - Sheffield Decent Homes Health Impact Assessment.* Sheffield: Sheffield Hallam University.

377 Royal Commission on Environmental Pollution (2007b). *The Urban Environment.* London: The Stationary Office.

378 The Institute of Public Health in Ireland (2006). *Health Impacts of the Built Environment: A review.*

379 WHO Commission on Social Determinants of Health (2007). *Achieving health equity: from root causes to fair outcomes.* http://tiny.cc/GFr4X

380 Social Exclusion Unit (2003). *Making the connections: Final report on transport and social exclusion.* London: Social Exclusion Unit.

381 new economics foundation (2002). *Ghost Town Britain: The treat from economic globalisation to livelihoods, liberty and local economic freedom.* London: New Economics Foundation.

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

383 new economics foundation (2002). *Ghost Town Britain: The treat from economic globalisation to livelihoods, liberty and local economic freedom.* London: new economics foundation.

384 National Institute for Health and Clinical Excellence (2008). *Promoting and creating built or natural environments that encourage and support physical activity.* London: NICE.

385 Poortinga, W. (2006). Perceptions of the environment, physical activity and obesity. *Social Science and Medicine, 63*:2835-2846.

386 Harrison, R.A., Gemmell, I. & Heller, R.F. (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.

387 Duncan, M., Spence, J., & Mummery, W. (2005). Perceived environment and physical activity: a meta-analysis of selected environmental characteristics. *International Journal of Behavioural Nutrition and Physical Activity*, 2(11), DOI: 1186/1479-5868-1182-1111.

388 Humpel, N., Owen, N., & Leslie, E. (2002). Environmental factors associated with adults' participation in physical activity: a review. *American Journal of Preventative Medicine* 22(3):188-199.

389 Gordon-Larsen, P., Nelson, M., Page, P., & Popkin, B. (2006). Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics 112*(2):417-424.

390 McManus, J. (2001). *Better health, lower crime: A briefing for the NHS and partner agencies.* London: Nacro Crime and Social Policy Section.

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

392 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.

393 World Health Organisation Europe (2007). *A European framework to promote physical activity for health.* Denmark: WHO.

394 Progressive Scottish Opinion (2007). *Scotland – Omnibus Survey.* Edinburgh: Progressive Partnership.

395 Harrison, R.A., Gemmell, .I & Heller, R.F. (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.

396 Shenassa, E.D., Liebhaber, A. & Ezeamama, A. (2006). Perceived safety of area of residence and exercise: A pan-European study. *American Journal of Epidemiology, 163* (11):1012-1017.

397 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.

398 Poortinga, W. (2006). Perceptions of the environment, physical activity and obesity. *Social Science and Medicine, 63*:2835-2846.

399 Kuo, F.E. & Sullivan, W.C. (2001). Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behaviour; 33*(3):343-367.

400 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.

401 The Institute of Public Health in Ireland (2006). Health Impacts of the Built Environment: A review.

402 Dannenberg, A.L., Jackson, R.J., Frumlin, H., Schieber, R.A., Pratt, M., Kochtizky, C. et al. (2003). The impact of community design and land-use choices on public health: a scientific agenda. *American Journal of Public Health, 93*(9): 1500–1508.

403 Armitage, R. (2000). An Evaluation of Secured by Design Housing within West Yorkshire: Home Office Briefing Note, 7/00.

404 HUDU. (2007). *Delivering healthier communities in London.*

405 Starfield, B. (2001). Basic concepts in population health and health care. *Journal of Epidemiology and Community Health, 55*:452-4.

406 Shi, L., Macinko, J., Starfield, B., Wulu, J., Regan, J. & Politzer, R. (2003). The relationship between primary care, income inequality, and mortality in US States, 1980-1995. *Journal of the American Board of Family Medicine, 16*(5):412-422.

407 Brooks, R. (Ed). (2007). *Public Services At The Crossroads.* London: Institute for Public Policy Research.

408 Hart, J.T. (1971). The inverse care law. *Lancet, 1*(7696):405-12.

409 Wilson, A. (1991). Consultation length in general practice: a review. *British Journal of General Practice, 41*(344):119–122.

410 Stirling, A.M., Wilson, P. & McConnachie, A. (2001). Deprivation, psychological distress, and consultation length in general practice. *British Journal of General Practice, 51*(467):456-460(5).

411 Brooks, R. (Ed). (2007). *Public Services At The Crossroads.* London: Institute for Public Policy Research.

412 Department of Health and Department of Children, Schools and Families (2008). *The Child Health Promotion Programme.*

413 Johnson, Z., Howell, F. & Molloy, B. (1993). Community mothers' programme: randomised controlled trial of non-professional intervention in parenting. *British Medical Journal, 306*:1449-1452.

414 National Literacy Trust. (2009). *Thurrock Community Mothers Programme.* http://tiny.cc/RtrLG

415 Schorr, L.B. (1988). *Within our Needs.* New York, N.Y.: Anchor Press, Doubleday.

416 Charlton et al. (1990). Evaluation of peak flow and symptoms only self care plans for control of asthma in general practice. *British Medical Journal, 301:*1355-9.

417 Choy et al. (1999). Evaluation of the efficacy of a hospital-based asthma education programme in patients of low socio-economic status in Hong Kong. *Clinical Experimental Allergy, 29*:84-90.

418 Gillies et al. (1996). A community trial of a written self management plan for children with asthma. Asthma Foundation of NZ Children's Action. *New Zealand Medical Journal, 109*:30-3.

419 Grossel, E. & Cronan, T. (2000). Cost analysis of self management program for people with chronic illness. *American Journal of Community Psychology, 28*(4):455-480.

420 Levine, P.H. (1973). Supervised Patient-Management of Hemophilia. *Annals of Internal Medicine, 78*:195-201.

421 Lorig, K.R. et al. (2002). Can a back pain e-mail discussion group improve health status and lower health care costs? *Archives of Internal Medicine, 162*:792-796.

422 Mannix, et al. (1999). Impact of headache education program in the workplace. *Neurology, 53*:868-71.

423 Oosterhuis & Klip (1997). The treatment of insomnia through mass media, the results of a televised behavioral training programme. *Social Science Medicine, 45*:1223-9.

424 Vickery et al. (1988). The effect of self care interventions on the use of a medical services. *Medical Care, 26*(6):580-588.

425 Fries, J. et al. (1998). Reducing need and demand for medical services in high risk groups. *Western Journal of Medicine, 169*:201-207.

426 Montgomery et al. (1994). Patient education and health promotion can be effective in Parkinson's disease: a randomised control trial. *The American Journal of Medicine, 97*:429.

427 Ryan, P., Kobb, R. & Hilsen, P. (2003). Making the right connection: Matching patients to technology. *Telemedicine Journal and e-Health, 9*(1):81-88.

428 Coote, A. (ed). (2002). *Claiming the Health Dividend: Unlocking the benefits of NHS Spending*. London: Kings Fund.

429 NHS Sustainable Development Unit (2009). *Saving Carbon, Improving Health: NHS Carbon Reduction Strategy for England.*

430 Coote, A. (ed.) (2002). *Claiming the health dividend: Unlocking the benefits of NHS Spending.* London: Kings Fund.

431 Sustainable Development Commission (2007). *Progress in Practice: University Hospital Birmingham NHS Foundation Trust.* http://tiny.cc/RFZHh

432 The Agency for Health Enterprise & Development (2003). *A fair share of health care: Time banks and health.* http://tiny.cc/6x2E2

433 Royal Cornwalls Hospitals Trust (2008). *Food unit leads the way for NHS.* http://tiny.cc/suFZi

434 The Carbon Trust (2008). *Introducing NHS Carbon Management.* UK: Carbon Trust. http://tiny.cc/armNQ Stated figures result from enquiry to the Carbon Trust.

435 Sustainable Development Commission (2008). *Healthy Futures #7: The NHS and Climate Change.*

436 Sustainable Development Commission (2009). *Breakthroughs for the 21st century.*

437 National Institute for Clinical Excellence (n.d.). *Spatial planning for health – in development.* http://tiny.cc/0yjco

438 Improvement and Development Agency (2009). *The role of infrastructure and town planning in health improvement case study.* http://tiny.cc/8eoLl

Sustainable
Development Commission

The Sustainable Development Commission is the Government's independent watchdog on sustainable development, reporting to the Prime Minister, the First Ministers of Scotland and Wales and the First Minister and Deputy First Minister of Northern Ireland.

Through advocacy, advice and appraisal, we help put sustainable development at the heart of Government policy.

www.sd-commission.org.uk

England

(Main office)
55 Whitehall
London SW1A 2HH
0300 068 6305
enquiries@sd-commission.org.uk

Scotland

Osborne House
1 Osborne Terrace
Edinburgh EH12 5HG
0131 625 1880
Scotland@sd-commission.org.uk
www.sd-commission.org.uk/scotland

Wales

Room 1, University of Wales
University Registry
King Edward VII Avenue
Cardiff CF10 3NS
029 2037 6956
Wales@sd-commission.org.uk
www.sd-commission.org.uk/wales

Northern Ireland

Room E5.11, Castle Buildings
Stormont Estate,
Belfast BT4 3SR
028 9052 0196
N.Ireland@sd-commission.org.uk
www.sd-commission.org.uk/northern_ireland