The Marmot Review: implications for Spatial Planning.

The Marmot Review Team
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People with higher socioeconomic position in society have a greater array of life chances and more opportunities to lead a flourishing life. They also have better health. The two are linked: the more favoured people are, socially and economically, the better their health. This link between social conditions and health is not a footnote to the 'real' concerns with health – health care and unhealthy behaviours – it should become the main focus.

Summary

1. This report is intended to inform the NICE work on evidence relating to spatial planning and health It aims to provide evidence on the relationship between aspects of spatial planning, the built environment, health and health inequalities.

2. The elements identified as having a significant impact on health, as well as relating to socio-economic status are:

- Pollution
- Green and Open Space
- Transport
- Food
- Housing
- Community Participation and Social Isolation

3. There is a social gradient in health: those living in the most deprived neighbourhoods die earlier and spend more time in ill health than those living in the least deprived neighbourhoods. Such health inequalities are determined by social inequalities, including environmental inequalities; there is a gradient in the distribution of environmental disadvantages: those living in the most deprived neighbourhood are more exposed to environmental conditions, which negatively affect health.

4. In order to reduce health inequalities, universal action is needed, but with a scale and intensity that is proportionate to the level of disadvantage – this is called *proportionate universalism*. The same principle should be applied to reduce environmental inequalities.

5. The Marmot Review recommends 3 main policy actions to tackle the problem areas highlighted above and to try to ensure that the built environment promotes health and reduces inequalities for all local populations. All actions should be applied across the social gradient.

- Prioritise policies and interventions that both reduce health inequalities and mitigate climate change by:
  - Improving active travel
  - Improving good quality open and green spaces
  - Improving the quality of food in local areas
  - Improving the energy efficiency of housing

- Fully integrate the planning, transport, housing, environmental and health systems to address the social determinants of health in each locality

- Support locally developed and evidence-based community regeneration programmes that:
  - Remove barriers to community participation and action
  - Reduce social isolation

6. There are a number of tools to assess areas' needs and to assess the potential impact of development and regeneration programmes, which are describe in this paper.

Introduction

The aim of this paper is to present further analysis of evidence on health and the built environment, sustainable development and spatial planning which was outlined in the Marmot Review and associated evidence papers. The analysis is intended to inform the NICE work on the evidence relating to spatial planning and health.
The objective of this paper is to provide information and material that helps identify the opportunities for further integrating health considerations within the spatial planning process and to highlight resources for practitioners (architects, urban designers, planners, public health practitioners, NHS bodies and local authorities) working to implement the guidance. The Marmot Review Team (MRT) has identified and collated the evidence relating to aspects of spatial planning, the built environment and sustainable development (such as transport, accessibility of services, urban infrastructure) and their interrelationships with health. The paper:

- Provides evidence about the relationships between health and spatial design, and the socio-economic gradient in environmental disadvantage.
- Outlines the Marmot Review policy recommendations for the built environment and the evidence and analysis behind these proposals. .
- Proposes 'good design principles' for promoting both physical and mental health and well-being within communities.
- Gives examples of best practice in addressing health inequalities through spatial planning and matrices to develop best practice interventions.
- Includes a review of available resources and tools to assess the health and equity needs of an area, and the impact of developments and regeneration projects on health equity (both pre- and post- implementation.)

The basis for this paper is the overwhelming evidence that health and environmental inequalities are inexorably linked and that poor environments contribute significantly to poor health and health inequalities.

Health and planning

Health and health inequalities have not featured substantively as yet in national planning policy, despite evidence which describes the clear interrelationship between planning policy and health and health inequalities. .The new national strategy for public health (Healthy Lives, Healthy People 2010) issued by the Coalition Government, gives a commitment to strengthening how health is considered within the planning system. Previous planning policy as expressed through 25 planning policy statements or guidance (PPS or PPG) covered a range of issues and in addition local planning authorities are expected to take account of two supplementary statements covering eco towns and climate change. None of the national planning statements are specific to health, health inequalities or social inequalities. However, despite the lack of explicit focus there are some statements which relate to health indirectly. *PPS1: Sustainable Development* sets the overall planning policy framework, the role, purpose, and aims of the planning system and states that the planning agenda should be focused on sustainable development and communities and addressing social inequalities. . These social inequalities produce health inequalities and tackling community and environmental inequalities will also address health inequalities:

> "planning policies should: ensure that the impact of development on the social fabric of communities is considered and taken into account; seek to reduce social inequalities; address accessibility (both in terms of location and physical access) for all members of the community to jobs, health, housing, education, shops, leisure and community facilities… deliver safe, healthy and attractive places to live, and… support the promotion of health and well being by making provision for physical activity"[2]

PPS1 advocates working in partnership with other sectors and the community – "regeneration of the built environment alone cannot deal with poverty, inequality and social exclusion. These issues can only be addressed through the better integration of all strategies and programmes, partnership working and effective community involvement."[2] It also recognises the needs of communities beyond involvement in planning decisions, and advocates that planning decisions should reflect the Government's commitment "to developing strong, vibrant and sustainable communities and to promoting community cohesion in both urban and rural areas. This means meeting the diverse needs of all people in existing and future communities, promoting personal well-being, social cohesion and inclusion and creating equal opportunity for all citizens."[2]

PPS1 is a positive statement in delivering the agenda set out in the Marmot Review of tackling inequalities in built environment and communities. However, the principles set out in PPS1 are not often included in other, more focussed policy statements. Most noticeably, the statements on housing[3], planning for sustainable economic growth[4], enforcing planning control[5], and renewable energy[6] which do not mention of health, well-being or inequalities despite conclusive evidence showing the interrelationships, as set out in the next section.

Other statements, where one would expect the guidance in PPS1 to be articulated more fully, also take little account of health or health equity. For example, the only mention in the Local Spatial Planning Statement is that regeneration should promote "economic, environmental and social well being for the area"[7]. This is not elaborated upon and therefore guidance on *how* to promote wellbeing remains unclear. Similarly, the planning and noise guidance mentions health when it states that local authorities must serve noise abatement orders where noise is "prejudicial to health or a nuisance."[8] This is not in relation to spatial planning, and therefore is unlikely to promote an equal distribution of noise burden between more and less disadvantaged communities. Similarly, the statement on planning and pollution control recognises that decisions on planning applications for polluting processes "can have an immediate impact on the local environment, human health and well-being,"[9] but focuses on preventing the health risks of contamination rather than providing guidance to address the unequal burden of pollution. In a workshop on Health Outcomes in Local Spatial Planning Decisions run for NICE, attendees felt that because health issues are not enshrined in government guidance on planning policy, they tend not to be picked up as a matter of course by planning inspectors when spatial plans are being examined.[10]

Health has been addressed implicitly in the planning system and issues of equity of distribution of impact on health have been more neglected.

However, two other policy statements (PPG 13 on transport and PPG 17 on planning for open space, sport and recreation) do give consideration to health in developing and implementing planning strategy. PPG 13 recognises the need for integration of planning policy with policies for education, health and wealth creation. There seems to be an implicit (although partial) understanding of how transport policy can affect local health in the recommendation that local authorities should "locate day to day facilities which need to be near their clients in local and rural service centres, and adopt measures to ensure safe and easy access, particularly by walking and cycling."[11] PPG 17 clearly articulates the importance of open space for health and well-being:

> "open spaces, sports and recreational facilities have a vital role to play in promoting healthy living and preventing illness, and in the social development of children of all ages… Well planned and maintained open spaces and good quality sports and recreational facilities can play a major part in improving people's sense of well being in the place they live. As a focal point for community activities, they can bring together members of deprived communities and provide opportunities for people for social interaction."[12]

Regional spatial strategies have recently been revoked by the Government, and therefore the regional planning policy statement has been cancelled as the current Government consider regional development agencies to be ineffective, impractical and too bureaucratic in implementing plans, while not reflecting either local or national interests. These strategies contained a direct requirement that "education and health authorities and health trusts will also need to be consulted to ensure that the education and health implications of the draft strategy are properly examined."[13] Workshop participants on the topic felt that a key opportunity for engagement has been missed in health authorities not being statutory consultees for planning authorities in the preparation of local development frameworks.[10] Although the future of such requirement is currently unclear, the involvement of health services and health practitioners in the planning consultation process is an obvious requirement if the planning system is to effectively address health and health inequalities.

The Marmot Review findings

The Marmot Review was commissioned by the Secretary of State for Health in November 2008. The Review was to include policies and interventions that address the social determinants of health and reduce health inequalities, including identifying the evidence most relevant to underpinning future policy and action and show how this evidence could be translated into practice.

The review showed that socio-economic inequalities, including the built environment, have a clear effect on the health outcomes of the population. It confirmed that there is a social gradient in health, and related to that showed that there is a social gradient in environmental disadvantage.

The Review was published in February 2010 and proposed 6 policy objectives and related interventions aimed at reducing the gap in life expectancy between people of lower and higher socio-economic backgrounds. The 6 key policy objectives are:

- Give every child the best start in life
- Enable all children, young people and adults to maximise their capabilities and have control over their lives
- Create fair employment and good work for all
- Ensure a healthy standard of living for all
- Create and develop healthy and sustainable places and communities
- Strengthen the role and impact of ill health prevention.

Although spatial planning has an impact on many aspects of all the above, the fifth objective, which focuses on places and communities, is the one directly relevant to spatial planning. The Review identified a number of factors for which the evidence of the relationship with health was particularly strong. The evidence was reviewed by two task groups of independent experts, one task group on sustainable development and one task group on the built environment. Each task group included a former member of the global Commission on Social Determinants of Health, who provided international expertise.
The task groups presented their evidence to the Review, including the strengths and shortcomings of the evidence, and made recommendations for policy and practice interventions. With respect to 'sustainable places and health, the elements identified as having a significant impact on health are listed below and the evidence also showed that these and their disadvantages or benefits were also relation to social and economic distribution.
They are:

- **Pollution**
  There is clear evidence of the adverse effects of outdoor air pollution, especially for cardio-respiratory mortality and morbidity[14-16]. Poorer communities tend to experience higher concentrations of pollution and have a higher prevalence of cardio-respiratory and other diseases. Sixty-six per cent of carcinogenic chemicals emitted into the air are released in the 10 per cent most deprived wards[17]. There is strong evidence that reductions in traffic to reduce air pollution are successful in improving health[18].

- **Green/open Space**
  Numerous studies point to the direct benefits of green space to both physical and mental health and well-being[19-22]. Green spaces have been associated with a decrease in health complaints[23] blood pressure and cholesterol, improved mental health and reduced stress levels[24;25], perceived better general health[26] and the ability to face problems[27].
  There is strong evidence that provision of green space effectively improves mental health and less strong/inconclusive evidence that it improves levels of physical activity[18].

- **Transport**
  Transport accounts for around 29 per cent of the UK's CO2 emissions[28]. The relationships between transport and health are multiple and complex, and transport also provides access to work, education, social networks and services, which can improve people's opportunities[29].

There is strong evidence that traffic interventions reduce road accidents, while there is some inconclusive evidence that they improve physical activity[18]. The impact of transport on health inequalities is greatest when looking at deaths from road traffic injuries, especially for children, as they are four times more likely to be hit by a car in the 10 per cent most deprived wards than in the least deprived wards[30]. Fatal accidents on the road are also particularly high among children of parents classified as never having worked or as long-term unemployed[31;32].

- **Food**
  Low income and area deprivation are both barriers to purchasing fresh or unfamiliar foods[33], while lower income households are the harder hit by food price fluctuations. However, there is only anectodal evidence that local access to healthy foods improves diets[18], although there are indications that residents in deprived areas could benefit from interventions aimed at low-mobility groups, increasing their access to better shopping facilities[34]. Studies of proximity to healthy food do not show causality between inadequate access and health outcomes[35], and studies on greater access to unhealthy food in the UK has shown that this may disproportionately affect those in more deprived areas[34;36;37].

- **Housing**
  Over the past 20 years, the poorest groups have become concentrated in social housing[38], and the association between social housing and negative outcomes applies across several domains, including health, education, self-efficacy and income[39]. A study suggested that children in bad housing are more likely to have mental health problems, such as anxiety and depression, to contract meningitis, have respiratory problems, experience long-term ill health and disability, slow physical growth and delayed cognitive development[40].
  Cold housing is also a risk to health, affecting the levels of winter deaths and respiratory diseases. Evaluation of home insulation programmes concluded that targeting home improvements at low-income households significantly improved social functioning, as well as physical and emotional well-being[41-43]. Adequate heating systems improve asthma and reduce the number of days off at school[44].

- **Community Participation and Social Isolation**
  Community capital differs in areas of deprivation, with less volunteering and unpaid work, less socialising and less trust in others, in the neighbourhoods that are perceived to be less safe[45]. Evidence of the association between social capital and health is significant and improving: in many communities facing multiple deprivation, stress, isolation and depression are all very common[46], and low levels of social integration, and loneliness, significantly increase mortality[47].Social participation acts as a protective factor against dementia and cognitive decline over the age of 65[48;49] and also have an impact on the risk of mortality by aiding recovery when becoming ill[50]. Furthermore, there is some evidence that increasing community empowerment may result in communities acting to change their social, material and political environments[46].

During the Review, expert task groups analysed all these factors and proposed strategies and interventions aimed at reducing the social-economic inequalities in exposure to such factors. The MRT drew on the task groups' work to develop policy recommendations aimed at addressing the problem of environmental inequalities – three recommendations were put forward:

1. Prioritise policies and interventions that both reduce health inequalities and mitigate climate change by:
   a. Improving active travel across the social gradient
   b. Improving good quality open and green spaces available across the social gradient
   c. Improving energy efficiency of housing across the social gradient
2. Fully integrate the planning, transport, housing, environmental and health systems to address the social determinants of health in each locality.
3. Support locally developed and evidence-based community regeneration programmes that:
   a. Remove barriers to community participation and action
   b. Reduce social isolation

The social gradient in health

The starting point of the Marmot Review was the fact that health inequalities that are preventable are fundamentally unfair. Analysis of data on mortality and morbidity confirmed not just that life expectancy is socially graded, but that the length of time that someone can expect to live healthily is also socially graded. In fact the gradient is even steeper for disability free life expectancy (fig. 1). Both the expected length of life and the physical quality of that life are influenced by the conditions in which one is born, lives, works, ages, and dies: people at the bottom of the socio-economic scale not only die, on average, seven years earlier than those at the top, but also spend many more years with a disability. The top curve in the graph below shows the relationship between neighbourhood income and life expectancy.

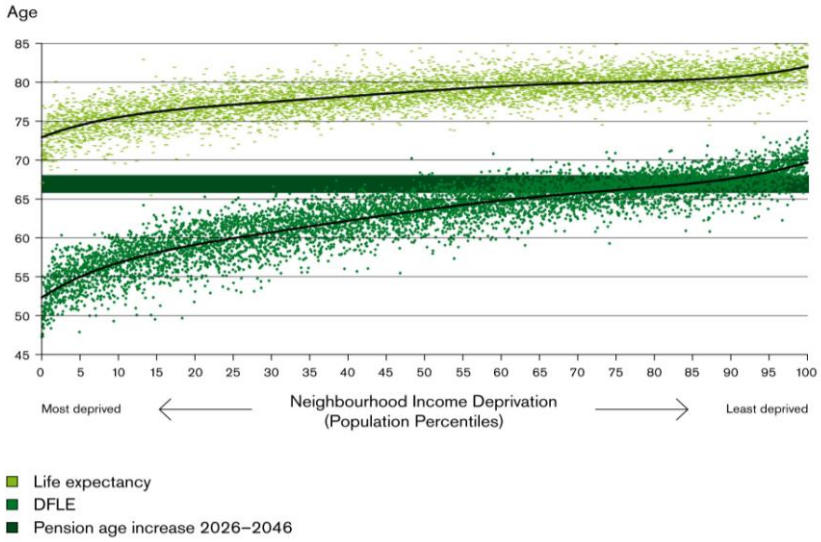

Fig. 1 Life expectancy and disability-free life expectancy (DFLE) at birth, persons by neighbourhood income level, England, 2009. Source: Office for National Statistics[51].

The association is clear – those living in the poorest neighbourhoods in England will die earlier than people living in the richest. The gradient of the lower curve is even steeper: this represents the difference in disability free life expectancy – the number of years the average resident of an area will live in good health. The average difference between the richest and poorest neighbourhoods on this measure is seventeen years. For both lines, the gradient applies across levels of deprivation. The relationship between deprivation and health is not only relevant for the most and least deprived areas – every small increase in the conditions of someone's life is likely to result in an improvement to their health. This is the social gradient in health and means that everyone below the very top is suffering some degree of health inequality.

To reduce the steepness of the social gradient in health, actions must be universal, but with a scale and intensity that is proportionate to the level of disadvantage. This is called *proportionate universalism*. Greater intensity of action is likely to be needed for those with greater social and economic disadvantage, but focusing solely on the most disadvantaged will not reduce the health gradient, and will only tackle a small part of the problem. Action is needed to improve health for all, but must be focussed proportionately more for those lower down the gradient, with the aim that all have the health outcomes of the most advantaged - this is called 'levelling-up.'

The social gradient in environmental disadvantage

In terms of environmental inequalities, lower socio-economic groups, those living in the more deprived areas will find themselves exposed to a greater range and intensity of environmental burdens (fig. 2). This gradient raises many questions about equity and the built environment – can we identify groups that are likely to live near environmental burdens? Such gradient suggests that socio-economic characteristics dominate the location of population groups regarding environmental burdens and benefits.

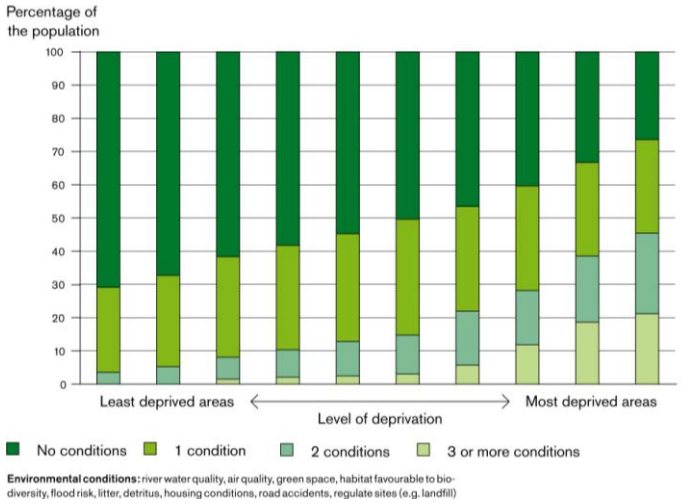

Fig. 2 Populations living in areas with, in relative terms, the least favourable environmental conditions. Source: Department for Environment, Food and Rural Affairs[52].

Environmental inequalities impact on health and wellbeing, and 'conspire' with other factors to reinforce health inequalities. People who live next to 'environmental benefits', such as good quality green spaces, enjoy better air, less noise and access to natural spaces. People who, for example, live in the vicinity of polluting factories, major roads or railway lines inevitably suffer from the related noise and air pollution.

The evidence of the distribution of environmental burdens across the social scale analysed by the Review highlighted the disproportionate impact of environmental burdens on disadvantaged groups, in particular poor housing, higher rates of crime, poorer air quality, lack of green spaces and places for children to play, and more risks to safety from traffic as well as the negative effects of climate change. The graph above shows the presence of unfavourable environmental conditions according to levels of deprivation. In the least deprived areas, over 70% of the population experience no unfavourable environmental conditions, compared to less than 30% in the most deprived areas. In fact, in the most deprived areas, approximately 45% of the population experience 2 or more unfavourable conditions, compared to less than 5% in the least deprived areas. The relationship between deprivation and unfavourable environmental conditions holds true across the social gradient.

There are a number of key areas where socio-economic status correlated with environmental disadvantage:

Transport:
The proportion of people cycling (and therefore likely to be benefiting from the associated health improvements) follows a clear social gradient, as can be seen in the graph below.

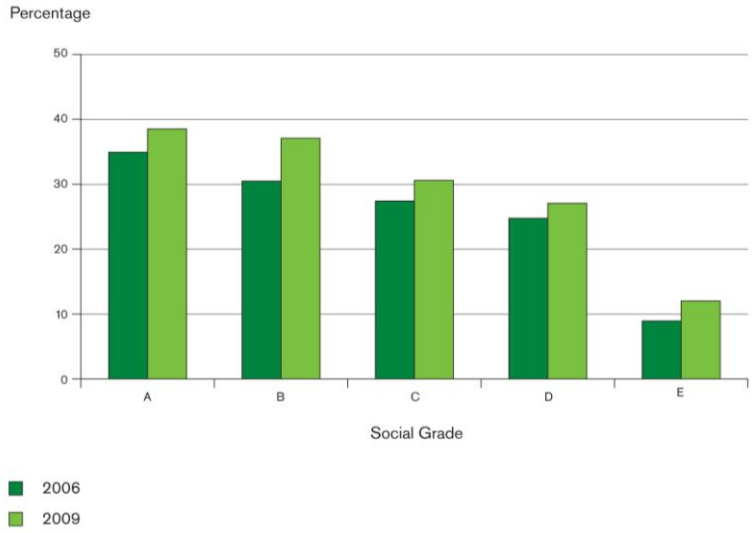

Fig. 3 Proportion reporting any cycling in a typical week in the previous year in 6 Cycling Demonstration Towns, by social grade, 2006 and 2009. Source: Department for Transport[53].

The lower the social grade of a person, the less likely they are to cycle. Where interventions have taken place to improve cycling rates, they have tended to focused on the whole population of selected areas rather than looking at the distribution of cycling across the social gradient. The interventions in Cycling Demonstration Towns aimed to provide a coordinated programme of initiatives, which included travel information, bicycle purchase schemes, cycle training, free cycle loan schemes, marketing campaigns, etc. While cycling has increased in 6 areas where interventions have been implemented from 2006 to 2009, this has happened equally across social grades and has therefore not changed the steepness of the gradient. However, the equal increased take-up of cycling across the classes also indicates that there is no reason to believe that any one or other class would be more or less prone to take up cycling.

The table below shows bicycle travel by income quintile in 2009 and the percentage change from the National Travel Survey in 2006. Increases in distance per person per year are greatest at the lowest real income level. While the data for trips per person per year does not show a clear gradient according to income quintile, the distance per person does with those in the lowest two quintiles covering significantly less distance per year. The percentage change in distance per person per year shows the highest value in the lowest real income level, suggesting there is no reason to believe changes can not be made across the gradient. Interestingly despite this value the rest of the quintiles revert to the gradient an argument in favour of proportionate universalism in interventions.

	Real household income quintile					
	Lowest real income level	**Second level**	**Third level**	**Fourth level**	**Highest real income level**	**All income levels**
2009						
Trips per person per year by main mode:						
Bicycle	15	16	13	16	17	15
Percentage Change since 2006	7.14%	-5.88%	-27.78%	-6.67%	0.00%	-6.25%
Distance per person per year by mode:						
Bicycle	32	32	39	49	77	46
Percentage Change since 2006	23.08%	0.00%	5.41%	19.51%	22.22%	17.95%

Table 1. – Travel by household income quintile and main mode, Great Britain. Source: National Travel Survey[54].

The social inequalities in the impact of transport is perhaps most notable when examining the rates of death from road traffic injuries as the graph below shows.

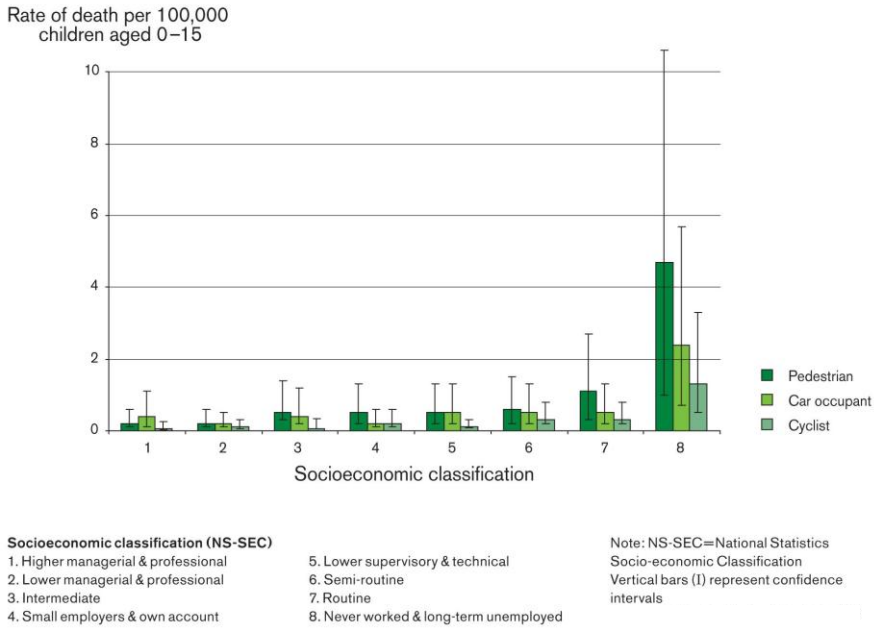

Fig. 4 Child deaths by socio-economic class (NS-SEC), 2001-2003. Source: Office for National Statistics[55].

The single major avoidable cause of death for children over five is unintentional injury on the roads. The social class gradient in injury across all ages is steeper than for any other cause of death or long-term disability. Furthermore, in the last 20 years, rates of child death from unintentional injury have not declined in families in which no adult is in paid employment, despite overall reductions. The inequalities are indisputable - children in the 10% most deprived wards in England are 4 times more likely to be involved in a road accident than children in the 10 % least deprived wards[30;56].

Green Space:
Access to good quality (quality is very important as access to poor quality 'green' space doesn't show the same benefits) green space has a clear effect on physical and mental health and well-being. Many studies show the positive effect of good quality green space – it helps to decrease blood pressure and cholesterol, improve mental health and the ability to face problems, and reduce stress levels[57-59].

Green space also encourages social contact and integration, provides space for physical activity and play, improves air quality and reduces urban heat island effects[i]. Considering the strong evidence around the relationship between green space, health and well-being, it is perhaps worrying that there is a significant difference in the frequency of different classes visiting a green space.

[i] The urban heat island is a metropolitan area, which is significantly and consistently warmer than its surroundings areas. This is usually caused by a combination of urban development, which uses materials that retain heat, and waste heat generated by energy usage of the local population.

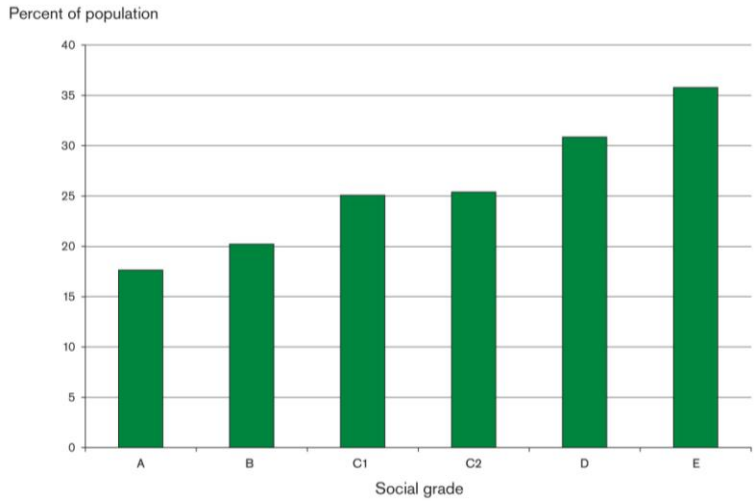

Fig. 5 Percentage of the population by social grade who visit a green space infrequently in a year 2009. Source: Department for Environment, Food and Rural Affairs; Energy Saving Trust[60].

The graph above shows that over 35% of those in the lowest social grade visit green spaces infrequently (less than once a month). This is likely to be due to both the low availability and bad quality of green space in deprived areas.[61]

Pollution:
Pollution also follows a social gradient, with poorer communities on average experiencing higher concentrations of pollution and therefore higher prevalence of cardio-respiratory and other diseases; 66% of carcinogenic chemicals emitted into the air are released in the 10% most deprived wards. Air pollution correlates well with noise pollution, especially in areas where air pollution is caused by car or air traffic. Noise pollution therefore often adds to the environmental burden shouldered by poorer sections of society - studies have shown that noise pollution is worse in areas of high density housing, rented accommodation, areas of deprivation and areas which are highly urbanised. It has also been demonstrated that noise pollution has adverse effects on mental health - it can result in increased stress levels and reduced educational outcomes in children, and increased stress and hypertension in adults.

Food:
The mix of shops in deprived areas tends to be weighted towards fast food chains and other unhealthy food options, making it harder to access healthy food, particularly fresh produce. One study showed that per capita provision of McDonald's outlets was four times higher in the most deprived areas compared to the least[35]. Perhaps partly as a consequence of this, and food deserts (the unavailability of local food shops), low income groups are more likely to consume fat spreads, non-diet drinks, meat dishes, pizzas, processed meats, whole milk and table sugar than higher income groups[62]. This affects levels of obesity in the population and is reflected in the gradient in obesity levels as shown in Fig. 6 for females (the gradient is similar for males).

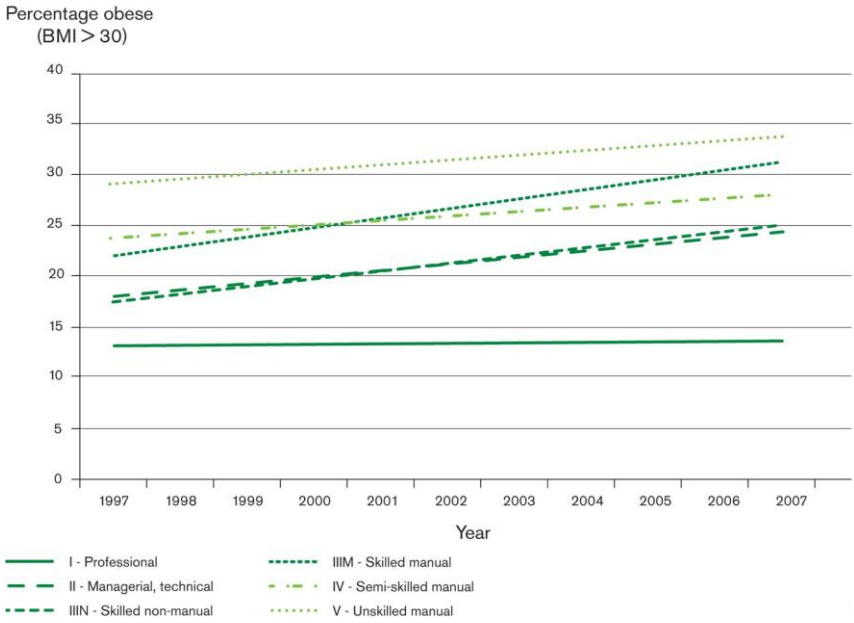

Fig. 6 Obesity prevalence at ages 16 and over by social class for females, 1997-2007. Source: National Obesity Observatory, based on the Health Survey for England[ii].

The purpose of many local journeys is shopping for food supplies as well as other basic items such as household cleaning supplies and clothing: a lack of local food shops can decrease rates of active travel, as people are forced to drive to buy their food and other supplies. The presence of retail uses within an area and sustainable local economies is vital to provide for an environment that allows for active travel opportunities.

Housing:

There are a number of issues that connect housing and health. Firstly, the 'clustering' of housing into relatively poor or relatively rich areas has increased, and often correlates with multiple environmental advantages or disadvantages. This is partly because those features of a local area that encourage health (good local schools, health services, employment opportunities, good housing and sense of community) also increase house prices to a point where the poor are effectively priced out. Thus, those who need these benefits most are least likely to experience them, and inequality increases.[63]

Social housing is related to disadvantage: since the 1970s there have been clear negative outcomes associated with living in social housing for both men and women. Such association applies to health as well as education, self-efficacy and income[39]: these disadvantages have increased with the growth of owner occupation and did not exist in earlier decades, which suggests that the negative effect is not caused by social housing itself, but by its relative status in the housing market and by residualisation.[iii]

For many people, the shortage of affordable housing poses the greatest threat to health. Many are either homeless or forced to wait for new homes in unsuitable conditions, due to a lack of housing. Almost two million people are on council waiting lists, with 500,000 in overcrowded conditions and 70,000 in temporary accommodation[64]. Because of such shortage, the bottom end of the private rental sector is subject to little competition and is often offers poor housing conditions at high rents, where disadvantaged people often find impossible to ensure basic maintenance of the property.[65] Overcrowding is also detrimental to health, in particular mental health – this is also caused by the shortage of affordable housing, with a lack of large properties for families in the social rental sector and unaffordable private rents for those with large families.[66]

[ii] Data supplied by the National Obesity Observatory.
http://www.noo.org.uk/data_sources/adult/health_survey_for_england

iii Because of a reduction in the supply of social housing over the past 25 years, there has been what is termed a 'residualisation' effect in the make-up of social housing tenants, so that as a group they have higher rates of unemployment, ill health and disability than the average for the rest of the population.

The Marmot Review also assessed the evidence on fuel poverty[iv]. Cold housing is a clear health risk – it is believed to be the main explanation for the excess winter deaths that occur each year. From December 2008 to March 2009, there were 36,700 additional winter deaths in England and Wales[67]. As can be seen in the graph below, approximately 33% of the poorest fifth of households are in fuel poverty, compared to less than 1% of the richest fifth of houses.

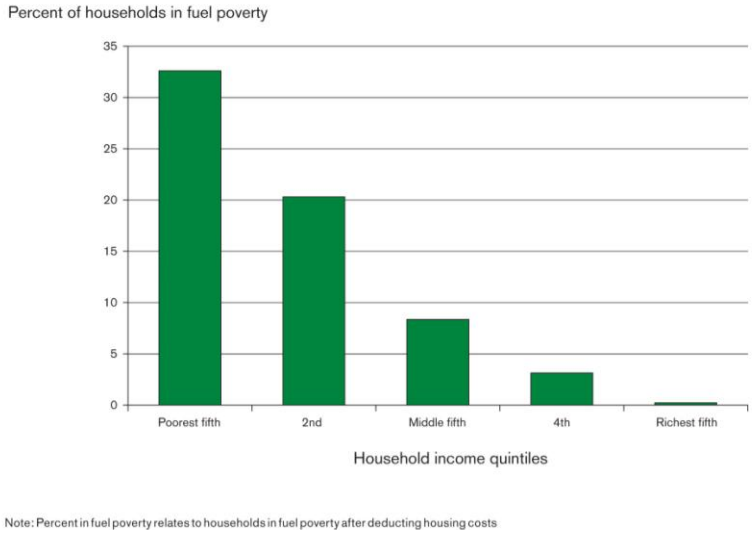

Fig. 7 The risk of fuel poverty according to household income. Source: English House Condition Survey; Department for Communities and Local Government[68].

Extreme weather conditions, both hot and cold, are a particular risk to health and have an impact on inequality, because of the spatial distribution of people on low incomes, who are more likely to live in areas which are warmer during the summer months[69], more exposed to weather extremes and to flooding[28].

Community Participation and Social Isolation:
These issues are inter-related. On the one hand, social networks and participation act as protective factors against cognitive decline and dementia for those over 65.[48] They also aid recovery of those who fall ill and therefore reduce the risk of death.[50] These patterns are reinforced by the negative effects of social isolation – those who are socially isolated are between two and five times more likely to die prematurely when compared to those with strong social ties. Social isolation can cause stress and depression, particularly for those with young children and older people.[70]
The graph below shows the gradient in social support. This is most pronounced in the upper, light green parts of the bars – those with a severe lack of social support. 19% of people in the most deprived areas of England have a severe lack of social support compared to 12% in the least deprived quintile.

[iv] This is defined as when a household needs to spend 10% or more of its income to adequately warm their home or when the household is not adequately warming their home in order to meet other basic needs.

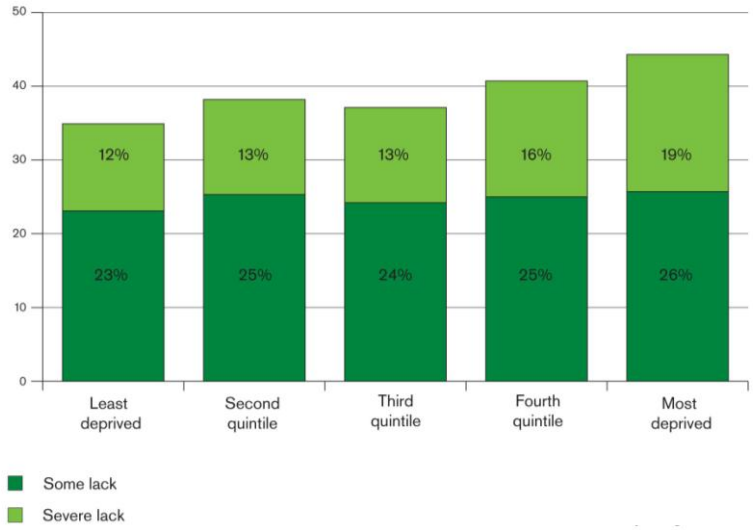

Fig. 8 Percentage of those lacking social support, by deprivation of residential area, 2005. Source: Health Survey for England[71].

In some cases social isolation is heightened by the physical environment, especially for elderly and disabled people: the design of neighbourhoods, in particular street crossings and the quality of spaces can stop many vulnerable people from leaving the home. Fear of crime in public spaces and fear of traffic often stops elderly people from reaching services and community groups, and taking advantage of interaction with neighbours and local retailer in public spaces and shops. [70]

Implementing the Review's recommendations

This paper suggests that the Review's findings on the relationship between the built environment and health inequalities can provide a basis to assess how different groups are distributed proximally to environmental burdens and whether interventions, developments and regeneration projects are addressing the gradient in environmental disadvantage. This would highlight how different environmental burdens and benefits are experienced by migrant groups and provide a framework to evaluate interventions on the environment aimed at reducing health inequalities experienced by specific population groups.

Many interventions are planned specifically to have an impact on the gradient and are not assessed for their impact on health equity. Area-based interventions, such as the New Deal for Communities, target specific highly-deprived areas, and have shown little measureable success in terms of health outcomes, perhaps due to the timescale needed to affect such outcomes. However, such targeted interventions, even if successful, are unlikely to affect the gradient as a whole, while some universal interventions have shown impact on the gradient by reducing environmental inequalities proportionately (the effect is proportionate because the distribution of pollution is proportionately greater down the gradient) across the socio-economic gradient; such an example is the London Congestion Charge.

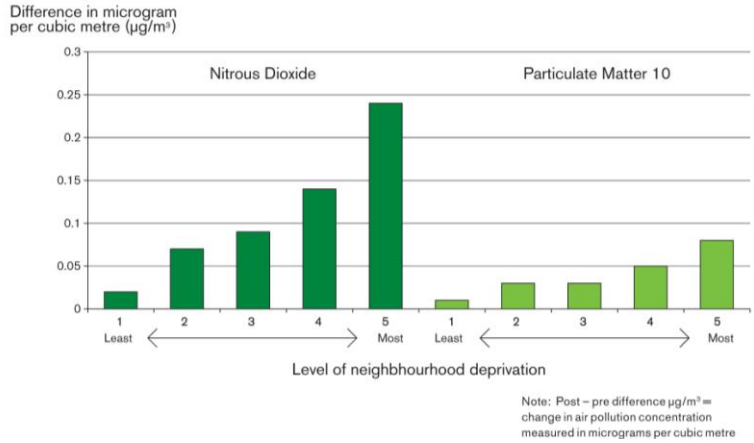

Fig. 9 Modelled changes in air pollution concentration due to London Congestion Charge, by area of London and level of socio-economic deprivation, 2003-2007. Source: Tonne et al.[72]

This graph shows that after the congestion charge was introduced, levels of pollution decreased across the social gradient: pollution levels decreased progressively more in the more deprived neighbourhoods. Considering the inequalities in pollution distribution – (disadvantaged communities suffer disproportionately higher levels of pollution compared to more advantaged communities) - the effect of these comparative decreases in pollution are likely to decrease the steepness of the social gradient in pollution distribution.

The importance of green space to good health has already been mentioned and one study has shown that in areas in England with more green spaces the gradient in deaths from circulatory disease by income deprivation is reduced – this suggests that the amount and the distribution of green space has great potential to reduce health inequalities, as shown in figure 10.

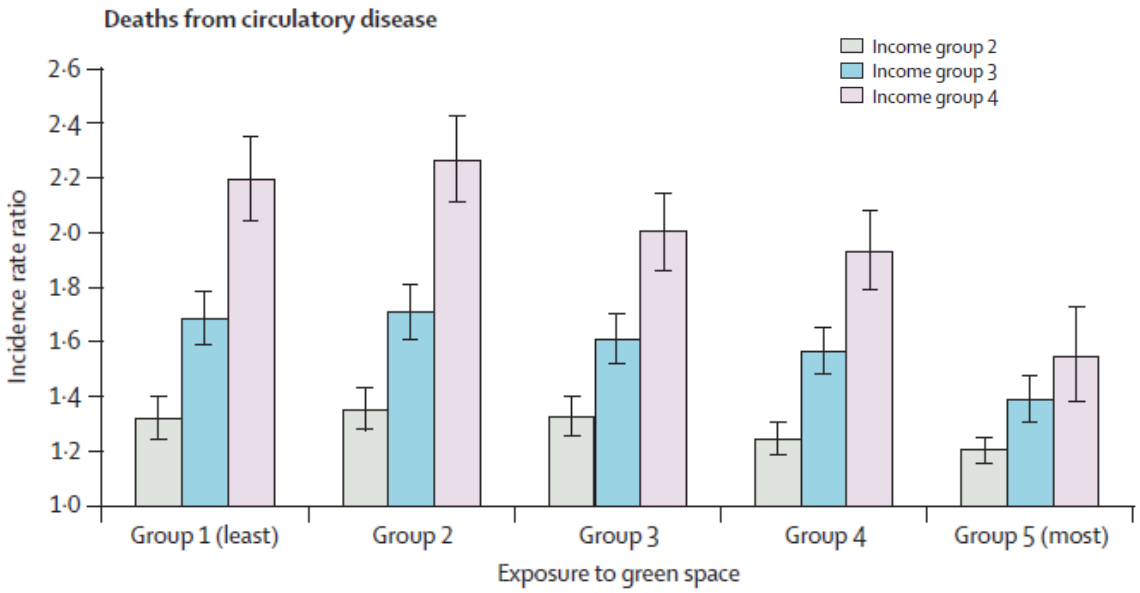

Fig. 10 Deaths from circulatory disease by income group and exposure to green space, where income group 4 is the most deprived. Source: Mitchell and Popham, 2008[73].

The Marmot Review recommends 3 main policy actions to tackle the problem areas highlighted above and to try to ensure that the built environment promotes health and reduces inequalities for all local populations.

1. **Prioritise policies and interventions that both reduce health inequalities and mitigate climate change, by:**

a. Improving active travel across the social gradient.

Interventions to encourage active travel include investing in better walking and cycling routes, reducing car speed to improve road safety, and improving public transport. For example, better cycling infrastructure often leads to long-term increases in cycling, and much lower numbers of cyclists killed or seriously injured. Lower speed limits also decrease the risk of death and serious injuries. Designing local areas so that they are easy and safe to walk around, and providing many destinations within walking distance, increases their 'walkability' and consequently, activity levels. All interventions should be targeted progressively across the social gradient.

b. Improving good quality open and green spaces across the social gradient

This includes providing more green space, of better quality, that is well designed, and close to people's homes. Providing more green space is affordable – CABE estimates that the budget for new road building until 2014 could instead provide 1,000 new parks (2 for each local authority in England). This would also reduce CO2 output by approximately 74,000 tonnes. Design is also important: school playgrounds that stimulate active games are associated with a 20% long term increase in physical activity. Natural play environments at school also help reduce bullying, improve concentration and promote feelings of self-worth. In underprivileged neighbourhoods, good quality green space can increase levels of social contact and integration. Finally, the proximity of green space is essential to good health. Having green space that residents can walk to will provide clear health benefits for the local community – prevalence rates for diabetes, cancer, migraine/severe headaches and depression are lower in areas with more green space within a one kilometre radius.

c. Improving the quality of food in local areas across the social gradient

Residents of deprived areas could particularly benefit from policies which aim to improve availability of healthier food options and better access to shopping facilities. Having local shops within walking distance and generally high accessibility to shops which stock healthy food is likely to improve health within these areas, especially when coupled with planning restrictions on the density of fast food outlets within deprived areas.

d. Improving the energy efficiency of housing across the social gradient.

This would go some way to decreasing the fuel poverty of households in deprived areas, although increases in income are also necessary. It also decreases energy related emissions which helps to tackle climate change and has positive health impacts.

2. Fully integrate the planning, transport, housing, environmental and health systems to address the social determinants of health in each locality:

Addressing health inequalities requires action across all the social determinants of health and this will require different stakeholders to work in partnership to effectively deliver health equity. Cross-government working at national and local level within planning and between different departments can be encouraged and achieved in a number of ways:

- A planning policy statement on health.

This would incorporate health equity into planning processes and locate it more centrally in the work of spatial planners. Good planning can have a positive impact on public health and designers can create neighbourhoods that fulfil this possibility.

- Better use of existing tools.

Existing tools such as Joint Strategic Needs Assessments could be used to encourage and facilitate integrated local planning procedures, as well as informing development and regeneration plans.

- Training:

There should be more information and training provided on health equity issues for local authority managers and officers in planning, housing, environment and transport. Additionally, related professional bodies could make health equity mandatory in professional development. This would improve commitments to local development frameworks and aid integrated working between health authorities and local planers.

- Local Planning:

Local planning has a huge potential to positively affect health through the design of neighbourhoods. Planners can ensure that services are joined up and easier to access. They can also encourage community participation and cohesion by providing accessible transport and well located services, and make it easier for people to pursue healthy lifestyles by promoting active travel and use of green space

3. Support locally developed and evidence-based community regeneration programmes that:

a. Remove barriers to community participation and action

Regeneration programmes should involve local communities in the development and delivery of local plans. This should happen in a way that reflects the capacity of local communities - often interventions work best where national guidance is provided and used by local communities who are free to develop their own, locally suitable programmes. Local areas should be designed in a way that facilitates and encourages community participation.

b. Reduce social isolation

There are four recommended pathways to reducing social isolation:

1. Collecting better information from communities to identify population needs.
2. Providing the support and space for communities to direct and control local interventions and services.
3. Enhance community empowerment
4. Which can, in turn, result in communities acting to positively affect their social, material and political environments.

These have relevance to spatial planning in terms of designing for the local population needs and for service accessibility, but in terms of the local physical environment the point that was made above - that the spatial design of local areas can act to prevent or promote social contact, cohesion and participation, especially for vulnerable people – is particularly relevant. It is recommended that specific groups such as the elderly and the disabled should be consulted on the design of the physical environment in order to

ensure that this does not impede opportunities for these groups to take advantage of opportunities for social contact within their neighbourhoods.

Area assessment tools

In order to improve the health of an area, it is first necessary to evaluate the area's needs. Not all deprived areas are lacking the same things, and solutions need to recognise the individual problems in individual areas. Many deprived areas also have unrecognised assets that can be drawn on and developed to significantly contribute to the quality of an area. Similarly, areas that are not the most deprived may still require development in some key areas.

It is recommended that all parties involved in design and regeneration should be very familiar with the area's needs and strengths. It is particularly important that architects and designers, as well as planners, are aware of an area's health profile and social determinants, such as education, including outcomes and school facilities, the local economy and labour market, wider learning and leisure services, as well as environmental health factors, such as air and noise pollution.

Evaluating a local area's needs can be undertaken using a range of assessment tools. Some tools are purely descriptive, and though they may provide data and some analysis of the location of different needs, they are not necessarily spatial, in the sense that they do not necessarily give an assessment of how different needs, services provision and the physical environment relate to each other and interact in space.

Many assessment tools also fail to analyse the economic circumstances and the social make-up of the populations living in specific areas, as well as the effort, energy and contributions of people to improving their area in a non-official capacity. Such an analysis is needed to fully understand how to implement interventions and improvements in the environment more intensively along the social gradient.

Some assessment tools have become mandatory for local authorities to carry out and these are accessible to the public. Other tools to analyse the spatial nature of health and environmental inequalities, such as GIS, are commonly available to developers and planners, but are often under-exploited due to a lack of resources or to a poor understanding of the variables that need to be analysed.

It is suggested that a benchmark of variables to be analysed should be developed to provide a framework for a thorough understanding of how health inequalities and their social determinants are spatially distributed within any one area. Such a dataset would include information and analysis of elements detailed in table 2.

Category	Measure	Spatial Unit	Source
General Mapping	Age	output area	census
	Ethnicity	output area	census
	Tenure	output area	census
	IMD	output area	census
	environmental indicators	-	census
	relevant OS maps	-	OS
Employment	land use	-	LA/survey
	frontage	-	LA/survey
	small business density	Postcode	EDINA
	strategic employment areas		LA
	employment	output area	census
Education	Schools- location	-	LA/DfES
	Schools- outcomes	-	LA/DfES
	school travel patterns	Ward	school census 2009
	no. of students	output area	census
	qualifications	output area	census
	play areas	-	LA
Social Interaction and Physical Activity	Crime	-	Met
	Libraries	-	LA
	Leisure Centres	-	LA
	Youth Centres	-	LA
	Green Space	-	OS/LA
Transport	Bus routes and stops	-	TfL
	road network	-	ITN
	rail/underground/tram network	-	TfL
	cycle-friendly routes	-	ITN
	pedestrian links	-	LA
	airports	-	ITN
	PTAL bands	Raster	TfL
	distance and mode of travel to work	ward/output area	census
	noise pollution	-	DEFRA
	main transport mode	-	CID
Sustainability	Pollution data	-	DEFRA?
	flood risk	-	LA
	green space quality	-	survey
Health	Slope index	-	PHO
	self-reported	-	census
	healthcare facilities	-	LA/PCT
	GP performance	-	QOF
	exercise rate	-	PCT
	prevalence of illness	-	PHO/PCT
	dental health satisfaction	-	PCT

Table 2. Suggested dataset for analysis of spatial distribution of health inequalities and their social determinants.

Some of the main tools that are currently available and can be drawn upon to assess areas and develop a spatial analysis of health inequalities are described below.

Joint Strategic Needs Assessments:
PCTs and local authorities are, at present, required to carry out a Joint Strategic Needs Assessment (JSNA) in their local area. JSNA "describes a process that identifies current and future health and wellbeing needs in light of existing services, and informs future service planning taking into account

evidence of effectiveness. JSNAs identify the 'bigger picture' in terms of the health and wellbeing needs and inequalities of a local population"[74].

The JSNA used to inform local area agreements in the short term (3-5 years) and strategic planning in the long term (5-10 years), and is focussed on "commissioning services and interventions that will achieve better health and wellbeing outcomes and reduce inequalities"[74]. It is an ongoing process underpinned by partnership working, community engagement, and evidence of effectiveness.

The JSNA ideally examines "all the factors that impact on health and wellbeing of local communities, including employment, education, housing, and environmental factors". This is facilitated through contact with a wide range of partners, drawing on a range of expertise. The core dataset is also essential, which signposts users to existing data sources that they can use for the JSNA. The core dataset is regularly being updated and refined, and users are encouraged to supplement it with locally relevant information.

At the moment, in practice they primarily focus on health and social care services, but the intention is that in time they should tackle broader determinants through the inclusion of demographic, social and environmental information.[75] In discussion groups, it was felt that one way of better using JSNAs in spatial planning guidance could be to make more linkages to strategic housing market assessments (SHMAs). This would be an opportunity to build a common evidence base to be shared by health and planning. It was also felt that because initial guidance on JSNAs did not link them to planning, opportunities for using them within this agenda may have been missed.[10]

However there are examples of JSNAs being used to address wider determinants beyond purely service provision. The 2009 JSNA for Cumbria includes a chapter on 'living conditions and health inequalities' which evaluates the distribution of deprivation of health outcomes across the area, and assesses what is being done to improve health in the areas of early childhood, education, employment, and good quality housing.[75] This could be extended to take into account more spatial design features such as the provision of outside space and the promotion of active travel.

Under the new plans outlined the the white paper 'equity and excellence: liberating the NHS'[76], JSNAs will be undertaken by the new health and wellbeing boards. However, they will remain within the local authority, and probably maintain their basic structure, serving a similar purpose as they currently do.

Health inequalities intervention tool:
The health inequalities intervention tool was developed by the London Health Observatory. "The tool allows users to look at the gap in life expectancy between the most deprived quintile in the local authority selected and a range of comparators. It also allows them to model the impact of four interventions on life expectancy in the local authority and the most deprive quintile of the local authority selected. The interventions considered are smoking cessation, measures to reduce infant mortality, high blood pressure and the use of statins to reduce cholesterol which causes heart disease"[75]

Health poverty index:
The health poverty index is a "web based tool covering all local authority districts in England. It allows geographical areas and different ethnic groups to be compared in terms of their 'health poverty'. It provides a single, high level, visual summary of an area's status in terms of health poverty, drawing on over 60 indicators of health and its wider determinants."

It is "an essential summary at the start of the decision-making process as part of assessing needs and facilitating discussion within local partnerships on local priorities." [75]

Local health profiles:
Local health profiles are designed to describe the health of people in local areas across England. They can be used for historical comparison and to evaluate progress. They cover a very wide range of indicators, including deprivation indicators and many elements covering the wider determinants of health.[75]

PTALS:
As has been shown above, access to good public transport links can help to improve health. Public transport can provide access to services, employment opportunities and can facilitate social cohesion. In addition, it can help to reduce carbon emissions, road accidents and pollution by reducing car use. In London, access to transport is measured using PTALs – public transport accessibility levels. This is a detailed measure that combines the time taken to walk to and wait for public transport from where people live. Once measured, a small area can be graded from 1-6 according to the level of access (1 being bad and 6 being good); and contour maps can be created that show areas that lack public transport services. There is also a measure of acceptability set – a maximum walk time for any London resident of 8 minutes to the nearest bus service and 12 minutes to the nearest rail or underground stop.[77] This information can be overlaid with data on economic as well as environmental deprivation in order to plan for interventions improving accessibility for the most disadvantaged areas.

ATOS:
However PTALs don't measure where transport goes[77] – a bus that runs very close and very regularly to someone's house would yield a high score even if it did not allow that person to access jobs, services, or improve social contact. Since this is possibly the primary value of transport in people's lives, the measure seems insufficient if used alone. A possible supplementary tool is ATOS – Access to Opportunities and Services – which is currently being piloted in some London Boroughs. The ATOS model measures the ease of transport from an origin point (one of 5,231 zones in London) to a service or destination point. It incorporates all forms of public transport, (except for the measure for green space which only uses walking,) and recognises the fact that users may require choice between services. The service or destination points are:

- Work, measured as average journey time to the nearest 10,000 low qualified or high qualified jobs (which is considered the minimum number necessary for someone to gain employment)
- Education, measured as average journey time to the nearest three primary schools, secondary schools and further education colleges; health services, measured as average journey time to the nearest three doctors surgeries
- Quality food shopping, measured as the nearest supermarket or town centre
- Open space, measured as the average walking time to the nearest publicly accessible open space.[77]

Travel times on public transport are then calculated using CAPITAL, which can check the effects of future networks, use only individual modes of transport (e.g. buses), vary walking speeds, and use census output areas to link travel times to demographic data.[77] This data is combined with walking times to create a list of average or minimum travel times from each zone, by each service type. ATOS scores are then allocated from A (best accessibility) to E (worst accessibility). The scores are relative to the standard deviation for each particular service. If it is useful, ATOS scores for particular services can be combined to give a composite ATOS score for each zone's accessibility as a whole.[77]

The value of this measure is that it allows planners, designers and local councils to see whether the residents of particular areas are able to access the services they need to live healthy lives. Plans for future development can incorporate ATOS results to improve either service provision or transport links for areas that need them. ATOS can also be combined with PTALs to give a fuller picture – those areas that have a low PTAL score (bad access to public transport) may have a high ATOS score, suggesting services are available locally within walking distance. It can also be combined with data on deprivation and employment by local area. Areas with a low ATOS score, high deprivation and low employment should be a priority for investment. Finally, it can inform decisions on where new housing should be built by modelling the likely ATOS score of proposed developments.[77]

Space Syntax:
Space syntax is a method for quantitatively describing patterns of spatial layout and relating these patterns to social activities such as movement, behaviour, and even social meaning and interpretation.

Space is an essential element of human activity, and the urban form creates spatial layouts that are relevant to human behaviours and can be analysed independently of the characteristics of individual public spaces or buildings.

Considering that space syntax emphasises the way that people create, live within and interact with their surroundings; it is an efficient analytical tool of how various social variable are spatially distributed. By analysing areas using space syntax, it is possible to better evaluate the impact of spatial configuration on a local community, their living conditions and their health.[78]

In space syntax elements of the urban form are overlaid on maps and then mathematically analysed to reveal levels of integration and segregation, and therefore likely levels of accessibility. This has particular relevance when analysing how people use their local areas, and can therefore inform explanations of levels of active transport and social contact.

Food:
This is an area where there are no systematic assessment tools and researchers have called for the development of indices that show spatial variations in the price and availability of healthy food and health outcomes. These could then be used to develop remedial strategies based on providing sustainable, healthy food to ensure equitable access across the social gradient.[79]

Healthy Cities tools:
The WHO Collaborating Centre for Healthy Cities and Urban Policy advocates 9 assessment tools. These do not cover all social determinants of health, but are strictly related to planning and the built environment:[80]

- settlement or urban ward job ration (census)
- settlement or ward job mix (census)
- public transport to main centres (GIS analysis)
- access to local/district centres (GIS)
- access to green space (GIS)
- Children play opportunities (survey)
- Pedestrian/cycle route quality (survey)
- Activity and health outcomes (survey)
- Grade places by key thresholds which themselves are action oriented – e.g. Spectrum

The WHO has developed a set of survey templates for the above tools, which include a community assessment of opportunities for physical activity, a sample walkability audit, and a cycling questionnaire.[81]

Reducing health inequalities through spatial planning

From the evidence presented above, it is clear that environmental disadvantages are unfairly burdened on the poorer members of society, and in the poorer areas within society. This is true across the social gradient – the more disadvantaged a community, the more likely they are to lack good quality open space, easy walking and cycling routes, well located services and good housing mix and design. They are also more likely to experience environmental burdens such as pollution and crime. Social isolation is progressively more likely and community participation less likely. All of these factors conspire to create a clear social gradient in health. However, these factors are shaped and at least partially created by the development and implementation of design decisions. There are, therefore, clear strategies and principles of healthy design and interventions which can improve the health and well-being of populations and tackle health inequalities.

In order for spatial planning to have an impact on health inequalities, it has to impact on the social determinants of health – below is a matrix showing how spatial planning can aid the development of different characteristics of the environment that would have a positive impact on the social determinants of health.

Social Determinants approach	Spatial Planning		
Areas of action	**'Good communities'**	**Health Behaviours**	**Environmental Health**
1. Early Years	Develop continuous and accessible walking routes to good quality green/play areas.	School playgrounds should stimulate active games. Play areas should be safe and within 4 mins walk of every family home[66] Should be outdoor playing fields within ¾ mile.[82]	
2. Skill Development	Local provision of educational facilities.	Increase in skill levels in the care of green space – incl. design of health promotion initiatives[83]	
3. Employment & work	Local provision of places to work[18]. Safe environment for those working outdoors and travelling to and from work at night time.	Environment fostering active travel to work (provision of cycling routes, facilities to park bicycles at work and shower).	
4. Communities & places	Places must have distinctive character, be adaptable and diverse[84] Involve the local community in developing and delivering local plans. Promote Spatial planning that encourages community participation Basic amenities within 5 minutes (also for HB)[85] Streets that are social places: -Hugh Barton's 7 principles[80] -less audio and visual confusion[86] Avoid single use buildings and categorized zoning.[85] Avoid locating new neighborhoods far from local shops, services and jobs.[87] Should be village halls in every community[66] Must allow possibility of anarchic activity[80]	Provide many destinations within walking distance. Large, open public space = walking[18] Space for inner city farms and allotments[80],[66] Mixed land use promotes physical activity[79] – include mixed use enters embedded in settlements.[87] Streets that promote physical activity: -many street intersections[66] -safe road crossings that don't remove people from their 'desire line'[88] -reduce no. of cul de sacs and dead ends.[85] -long, wide roadways[81] Provide many cycle parking spaces[66], including in parks[82] Rectify loss of features in parks[83]	Reduce Car Speeds: -20mph speed limit - traffic calming measures[66] - decrease controls – make streets feel riskier = natural control.[86] Less car use: -less bypasses and ring roads[87] -limit no. of parking spaces[89] -less park and ride[87], only in low density areas, close to traveler and should promote walking/cycling.[81]

	Ensure presence of human activity in spaces between buildings[86]		
5. Standard of living			Improve energy efficiency of housing.
6. Prevention	Tackle crime: - improve street lighting[66] - broken windows theory[66] - should structure local through movement[66] - housing should be less detached, close to other houses and less exposed.[90] - pps1 7 principles[2]	Provide continuous and safe cycling and walking routes linking the more deprived areas with services and opportunities. Provide Green space that people can walk to. Improve access to healthy food options Provide readily available area maps to promote active travel[66], maps should also provide details of open space, cycling/walking routes and sporting facilities[81] Effective public transport can increase walking[87] – provide access to high-quality transport within 1km walk.[85] Government staff (police/ park employees) should cycle.[81]	
7. Equality/health equity	Busy roads and steep hills pose accessibility problems[66] Play areas and playing fields should be accessible to all[82]	Improve the quality of green spaces on housing estates.[91]	Interventions such as the London Congestion Charge tackle inequalities in pollution

In order to effectively implement the actions above the focus should remain on universal healthy design principles. These are grouped below according to theme, however there are some cross-cutting principles that apply to all areas. Partnership working and community engagement is mentioned in the last section, but this applies across all the areas – not only to local communities but between departments in government[86] and planning bodies, There has also been increasing recognition that places must have their own distinctive character[84] – this is more likely when local communities are engaged in planning processes, but it must also be recognised at national and regional levels. In addition, places must be adaptable[84] – a place that can change easily is more likely to be able to meet its populations needs as they change over time. Finally, places must be diverse. This is relevant to housing and building mix (covered below), but it also applies to other areas of design. A dynamic area with variety and choice allows people to live more healthy lives.[84]

Strategic planning – layout, service provision, movement and street design:

The way that neighbourhoods are laid out can positively affect health. Mixed land use promotes physical activity, as people are more likely to walk or cycle to go to work, go shopping, or spend their free time if destinations are in their local area [79], [66]. In contrast, business parks are particularly inhospitable for those who are walking or cycling. Mixed use centres embedded in settlements are far more likely to promote active travel. [87] Ideally, all basic amenities should be located no further than 5 minutes walk away from where people live.[85] Furthermore, the local provision of places of work is likely to reduce unemployment[18]. there does need to be employment opportunities available too.

It is important that people find it easy to move about their local environments,[84] (which is addressed further below). This extends to accessibility problems for those who are disabled or the elderly population. Busy roads, crossing times at traffic lights and steep hills may pose particular barriers to movement locally and this should be taken into account in planning procedure.[66] However, CABE also advocate that 'continuity and enclosure' should be key principles in planning – public and private space should be clearly distinguished and delineated.[84]

The particular design features of streets can have an effect on movement and health. Having many street intersections increases physical activity[66], while long, wide roadways are likely to reduce active travel.[81] Traffic calming measures (one-way streets, roundabouts, road narrowings, chicanes, road humps, reduction speed limits) reduce accidents and injuries,[18] and benches and trees on streets encourage people to spend time outside. [66]
There are also opportunities for planners to promote health and well-being by creating streets that are social places where people can meet. This can foster community cohesion and tackle social isolation. In order to achieve this, Hugh Barton advocates seven design principles[80]:

- Density sufficient
- Street connectivity
- Facilities at pedestrian nodes
- A sense of enclosure
- Active frontages
- Traffic tamed
- Open to all

Hamilton-Baillie argues that streets would be more welcoming if there were less features that cause visual and audio confusion. These include extensive road markings, traffic signals, road signs and steel pedestrian guards, and concrete kerbs, barriers and traffic islands, which fragment the space.[86]

Transport – walking, cycling, driving, public transport:

Transport, including walking, cycling, driving and public transport, is essential to the health and well-being of a community. Two of CABE's seven principles for healthy design are that a place should have ease of movement – (it should be easy to get to and move through), and legibility – (it should be easy to navigate.)[84] These are determined partly by the layout of streets and services within an area, as well as street design (all discussed above). However transport is also important. Places that promote active

transport (walking and cycling) and provide effective public transport are likely to improve health, cut carbon emissions, and improve community cohesion.

Walking is encouraged by the presence of safe, traffic free, and well maintained walking routes[66], and large, public open spaces[18]. As well as the road design principles discussed above, road crossings should be modelled around pedestrians – designers should assess not only if a pedestrian is able to cross the road safely but if the route creates delays or takes them away from their 'desire line' – their natural walking route. [88] Dales advocates that the 'walkability' of an area should be determined using the '5 Cs' – walk routes should be Connected, Comfortable, Convenient, Convivial and Conspicuous[88].

As with walking, cycling is also promoted by safe, traffic free and well maintained cycle paths, as well as the presence of sufficient cycle parking spaces[66]. Insall suggests that all new developments should provide a minimum number of cycle parking places[89]. Readily available area maps will encourage active travel,.[66], particularly if they include details of parks, trails, cycling and walking routes and facilities that offer sport and activity programmes[81] . Edwards and Tsouros have suggested that it is often a good idea for the public sector to lead by example – providing more bikes for government staff (such as police and park employees) may encourage wider use of cycling, as well as improving the health and wellbeing of the employees involved[81].

Walking and cycling will both be encouraged by less traffic, moving at a slower speed. This would also cut traffic accidents on the roads. Many studies have suggested a 20mph speed limit in residential areas[66], [89]. It is also important that 20mph zones should be area-wide as effects are much greater this way, (compared to when only some roads are included) [79]. Dorling points out that this can also have an equalising effect on the value of areas within towns - "poor areas in that town will increase slightly in amenity, while living in a twee village out of town will reduce in value just a little".[63] However Hamilton-Baillie argues that lowering speeds requires decreasing legal and state-defined controls rather than increasing them. If a shared space is created, where traffic movement and social exchange are integrated rather than segregated, then cars will naturally slow down. This involves making places feel riskier (by removing safety barriers, for example), which in fact decreases the risk of injury as car drivers become more aware of pedestrians.[86]

Car use can be discouraged by building less bypasses and ring roads[87], placing facilities in local areas (see above), and ensuring that new developments have a limit on the number of possible car parking spaces[89]. Park-and-ride services should also be discouraged when they increase car use and take resources away from local transport [87]. Instead, they should only be used in low-density areas where existing levels of public transport are inadequate. They should be located as close as possible to the traveller and should promote use by cyclists and walkers.[81]

Effective public transport can allow people to access services and improve community cohesion. It can also increase active travel – people are often willing to walk to get to good public transport links, such as light rail stations.[87] However it is essential that land use planning and transport planning are pursued as linked agendas. Communication, co-operation and joint working between the relevant departments will aid the development of healthy communities.[81]

Implementing these changes may be hard – at a workshop run for NICE it was suggested that transport planners conventionally base their plans on traffic forecast from the status quo and can therefore be unwilling to consider a radical change of direction towards a very different future with a much greater use of walking, cycling and public transport than at present.[10] However there are a number of places that have bucked this trend and put some of the above principles into practice. Vauban (in Germany) has focussed on policies promoting walking and cycling and discouraging car use. It now has 70% active travel, 10% car dependence, high accessibility, social diversity, car-free streets and great community spirit[80],[61]. Copenhagen has also made some streets car free, or 'pedestrian-priority', as well as decreasing the number of parking spaces by 3% a year. To encourage people to use their streets more, outdoor cafes, public squares and street performers were promoted in summer and skating rinks, heated benches and gas heaters on street corners in winter.[89]

Green/open space – incl. playgrounds and allotments:

One of CABE's seven principles of healthy design is 'quality of the public realm' – that a place should have attractive and well-used outdoor spaces[84]. The benefits for health have been outlined above, along with the Marmot Review recommendation that there be enough good quality and easily accessible green space within each locality.

There are, however, other design principles for open and/ or green space. They should be accessible for those walking, cycling and using public transport, and have adequate cycle parking[82]. Reinvestment is recommended, not only to improve quality, but to rectify the recent loss of features such as paddling pools, toilets, shelters and tennis courts[83]. There should be an increase in the skill levels in the care of parks and green spaces, particularly in the design of health promotion initiatives in those spaces[83]. It is important to recognise that 'one-size-fits-all' green space doesn't work – spaces need to be flexible to meet the needs of a diverse community[91]. This fits with the general principles outlined at the start of this chapter. It is also advocated that in areas with a shortage of green space, the creative use of temporarily vacant spaces, such as development sites, should be supported. [91] Providing space for inner city farms and allotments is also likely to increase community interaction, access to food and active recreation[80],[66].

The open space on social housing estates is often insufficient and unsatisfactory - currently less than 1% of people living in social housing report using the green space on their estate.[91] This is an obvious opportunity for improvement – interventions to improve green space on housing estates would help to improve the health and mental well-being of residents. Safety, cleanliness, not mixed age group use etc.

One of the clear benefits of outside space is the opportunity it provides for children to engage in active play. For this reason, it should be ensured that play areas are safe, and that there is a park or small supervised (overlooked) play area within 4 minutes walk of every family home[66]. Early advocates that playing fields (or other local outdoor facilities) should be within ¾ of a mile of where people live and of high quality.[82] Accessibility is also important – design should take account of the '3 A's' – accessibility, attitudes and adaptation. These are particularly relevant for those who may not otherwise access the space – families on low earnings, those with disabilities, etc. [82]

Buildings/housing – mix, density, location and design:

There are various healthy design principles for the interior of buildings (such as cold-proofing, ventilation, and overcrowding[66]) which are not of great relevance to spatial planning. However, there are other, more relevant, concerns such as residential density, mix (of use) and location. Higher residential density is associated with higher levels of physical activity[18], however within an area there should also be green space and a mix of buildings in order to enable the easy use of services as outlined in the first part of this section[85]. For this reason, Hulme advocates medium density, mixed used development that avoids single use buildings and categorised zoning. This will foster community cohesion and active transport[85]. Additionally, buildings should not be planned around car use, and instead it should be ensured that there is access to high-quality public transport within a 1km walk[85].

The location of neighbourhoods is also relevant. Barton argues that the high demand for new housing coupled with the strategy of protecting any Greenfield sites and green belts means that housing placement sometimes exacerbates health problems. Housing can too easily end up in unsuitable and isolated areas where there are no local shops, services or jobs, and little potential for social cohesion[87].

Community participation, crime and the prevention of social isolation:

Places should be formed through community participation[80], and should act as a force for social cohesion rather than isolation. Making outside places more pleasant to be in and neighbourhoods easier to get around encourages this, and has been discussed above. Tackling crime will also encourage people and communities to integrate and cooperate, as well as promoting active travel. Parkes and Kearns have showed that in areas where residents felt unsafe, there were poorer health outcomes.[92] In addition, crime follows a social gradient. As Chiaradia et al. state, "the British Crime Survey shows there is considerable class/income bias in most forms of security behaviour. Access to the means of security depends upon access to economic and related forms of social capital."[90]

Power et al, in their task group submission to the Marmot Review, recommended that there should be village halls in every community[66], and Barton argues that in order to ensure that all groups of people are encouraged to participate in and use their areas, sometimes we must allowing the possibility of anarchic activity. This involves not making somewhere too tidy, and leaving 'grey' spaces for minority interests[80]. Designers should also grasp every opportunity to ensure human presence and activity in the spaces between buildings.[86]

Crime can be tackled by interventions such as improving street lighting[66], and making places more pleasant (broken windows theory) [66]. This can also have a more direct effect on health - a European cross sectional survey of 12 cities found that, compared to respondents from areas with low levels of litter and graffiti, those from areas with higher levels, were 50% less likely to be physically active and 50% more likely to be overweight.[61] There is evidence that local through movement reduces risk of crime, however larger scale movement increases it, therefore designs should structure local through movement[66]. 'Secured by Design' housing has produced documented reductions in crime, for example in Northview Estate in Kent. Here there was an 80% reduction in crime after a number of interventions, including external landscaping to define public and private space, maximising natural surveillance, and providing secure areas for bikes/refuse. [66]

PPS1 includes 7 design principles for same places and crime reduction:[2]

1. access and movement: places with well-defined routes, spaces and entrances that provide for convenient movement without compromising security
2. structure: places that are structured so that different uses do not cause conflict
3. surveillance: places where all publicly accessible spaces are overlooked
4. ownership: places that promote a sense of ownership. Respect, territorial responsibility and community
5. physical protection: places that include necessary, well-designed security features
6. activity: places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times
7. management and maintenance: places that are designed with management and maintenance in mind, to discourage crime in the present and the future.

However, it has been argued that "the guidance is qualitative and too often unclear on how to make decisions on how best to design out crime"[90]. Research has focused on the occurrence of robbery and burglary, and have created a model that tries to more closely define the risk impact of spatial design features. In relation to burglary, they have found an increase in risk associated with houses that are more detached, on a street segment with less other houses, in an area of less housing density, or more exposed (more faces of the plot exposed to the public realm.) The risk of personal robbery increases as socio-economic condition and/ or housing density decreases. [90] The spatial design of streets is of particular relevance as 50% of all personal robberies occur on streets. [90]

> "the establishment of national health equity measuring and monitoring systems, with routine collection of data on social determinants and health inequity, is fundamental to the process of developing national and local strategies to reduce health inequalities."[61]

The study on the spatial economics of crime that was detailed above[90] used the identified risk factors to evaluate the total socio-economic cost of spatial attributes, and work out a cost-benefit analysis of spatial design features. They used the Home Office 'costs of crime', which are:

- anticipation of crime (security expenditure, insurance administration costs, etc.)
- consequence of criminal events (property stolen, emotional and physical impacts, health services)
- responding to crime and tackling criminals (costs to the criminal justice system).

This doesn't include fear of crime, which is also important as it can have a clear impact on active transport and social cohesion,[92] however the model is still useful as it provides an economic calculation of the impact of particular spatial design decisions.

AUNT-SUE is a five year research study which attempts to combine community perceptions with quantitative data on accessibility, urban design and social inclusion. This study paid particular attention to perceptual safety issues, seeing these as major barriers to transport access for vulnerable groups. They point out that CCTV accounts for over 75% of spending on crime prevention in the UK, despite the fact that it does little to *prevent* crime, operating more as a tool to help find and charge criminals. The argue that "investment in improved environmental design and community safety would more directly address fear of crime and situational crime prevention" [93]. They also see a deficiency in design guidance that sees accessibility provision as purely being a function of building design and layout. A more complete assessment would recognise that often the reasons that people have trouble accessing local services, transport or participating in the community are complex and multiple – "current guidelines don't fully take into account excluded groups, perceptual fear of crime and local knowledge factors." [93]

AUNT-SUE created a transferable index for accessibility that included an audit of macro elements of urban design (including land use, windows, walls/boundaries, public space, and street furniture); and detailed micro-elements. Some of the most relevant of these were elements that signified identity and character, public art and features, and design and arrangement of boundary walls, railings and plantings. [93]

Through surveys and local consultation, they found that fear of crime was the highest barrier to walking, followed by road safety, pavements and distance to amenities. They created detailed maps that included the triangulation of comprehensive mapped digital data, with observational – human and environmental – and systematic street design analysis, combined with user consultation on needs, aspirations and perceptions. They also created an index of permeability which includes visibility and sight-lines, as this problem was often raised in consultation. [93] mention inequalities in fear of crime and experience of crime etc.

The Royal Commission for Environmental Pollution has twice recommended that health impact assessments become a regulatory requirement**[94].** WHO defines a HIA as " a combination of procedures, methods and tools by which a policy, programme or project may be judged as to its potential effects on the health of a population and the distribution of those effects within the population."[95] This could provide a good opportunity for spatial planning decisions and strategies to be evaluated with health equity specifically in mind, in order to flag up any negative consequences. There is also "an explicit focus on health inequalities by giving specific consideration to whether impacts of a proposal fall disproportionately on vulnerable or minority groups." [95]

Davis argues that "prospective HIAs undertaken alongside policy development afford the greatest opportunity to influence and to change draft policies, so that any potential negative health impacts can be avoided or reduced, and any positive impacts enhanced." [95] However the fact remains that they are not mandatory, and vary in style, scope and application; and this limits their value in the field of spatial planning as a whole.

Along with Health Impact Assessments, there are also Strategic Environmental Assessments, Appraisal of Sustainability, Sustainability appraisals and Environmental Impact Assessments. A problem that has arisen since the implementation of such assessments is that they are largely carried out within the terms of the policy framework rather than as a distinct, independent and objective assessment of impacts. In order for any appraisal to be successful it should be integrated in the strategic planning process, rather than applied ad-hoc following development.

Post-development indicators

Below is a framework for assessing the health equity impact of developments and regeneration programmes.

Policy Recommendations	Process Indicators	Output Indicators	Outcome Indicators
Prioritise policies and interventions that both reduce health inequalities and mitigate climate change, by;	Greater accessibility to active models of travel in all areas. Improved road Layouts/separation of modes of travel. Street safety initiatives.	Increase in active miles travelled/people using active modes of travel. Reduction in traffic accident rates involving active travel and in street crime and disorder.	Improved fitness levels across the social gradient. Reduction in car travel.
(i) Improving active travel across the social gradient		Increased sustainable travel.	Improved fitness levels across the social gradient. Reduced levels of pollution.
(ii) Improving quality open and green spaces available across the social gradient	Reduction in walking distance to quality green space. Street and park safety initiatives.	Reduced social gradient in stress, greater levels of exercise. Reduction in crime and disorder in streets and parks.	Health benefits associated with healthy eating across the social gradient.
(iii) Improving the food environment in local areas across the social gradient	Reduction in local concentration of fast food outlets. Improved food options in local shops.	Reduction in consumption of unhealthy food across the social gradient and increases in healthy eating.	Health benefits associated with healthy eating across the social gradient.
(iv) Improving energy efficiency of housing across the social gradient	Affordability of fuel for those in poverty. Reduction of numbers in poorly insulated housing. Reduction in use of high energy alternatives (e.g transport, heating, lighting)	Reduced energy usage across the social gradient.	Fuel poverty outcomes. Carbon footprints.
Fully integrate the planning, transport, housing, environmental and health systems to address the social determinants of health in each locality	Greater travel options. Reduction in car use. Increase in walking and cycling.	Reduction in stress associated with living in isolated and deprived neighbourhoods.	Reduced ill health gradients in ill health associated with social isolation and adverse impacts of travel e.g pollution and accidents.
Support locally developed and evidence-based community regeneration programmes that:			
(i) remove barriers to community participation and action	Increased opportunities for participation and community activity among local residents.	Greater participation and community activity among local residents.	Improved well-being of local residents affected by regeneration.
(ii) Reduce social isolation	Increased opportunities for participation and community activity among local residents. Integrated transport links and street safety initiatives.	Reduction in social isolation of elderly/deprived communities.	Reduced gradients in ill health associated with social isolation and area deprivation. Reduce mental health problems and improve self reported health and well being.

Conclusions

The lack of an integrated strategy across policy areas serves to perpetuate and possibly increase the disadvantages documented in the areas above. While separate working in silos continues, it will be harder to address these issues and tackle inequalities in environmental disadvantage. In order to address the exposure to multiple negative environmental conditions that deprived communities face, planning will need to consistently take into account the spatial distribution of environmental disadvantages and assess how they impact on the communities that are exposed to them.

Aligned strategies that are formed through informed, co-operative, communicative work will be more likely to effectively tackle the range of disadvantages that poorer communities face. Data, tools for analysis and design guidance are available to professionals for assessing areas' needs in relation to deprivations and plan the intensity of interventions needed to effectively reduce the gradient in environmental disadvantage.

The planning policy statements summarised earlier on in the paper show this – they are not systematically concerned with the impact of planning decisions on health and health equity. The dissolution of regional spatial strategies may serve to increase this disconnection, and policies that have unintended and/or negative consequences for health may be continue to be approved.

In this context it is vital that planners, developers and design professionals are aware of the health equity impact of their work and proactively address environmental disadvantage through their practice. The main components for implementing the Marmot Review's recommendations and addressing health inequalities through spatial planning are:

- addressing the gradient in environmental disadvantage.
- establishing a benchmark for area assessment analysis which includes an equity component.
- addressing the elements of the built environment which affect health across the social gradient according to the area's needs.

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