Delivering Healthier Communities in London

NHS London Healthy Urban Development Unit
Land Use Consultants and CREH

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The Guidance should be referenced as:

July 2007
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### Key

- **Signposts** – these provide interactive links to documents or web pages in the text.
- **Links** – These provide links between different sections within the guidance document.
This guidance document, Delivering Healthier Communities in London, has been prepared to help integrate health and wellbeing into the planning process. In particular, the guidance provides links to the tests of soundness and how to address these when planning for health, provides evidence supporting the linkages between health and planning, and results in a series of tools to guide practitioners. This includes a policy framework for health, principles to follow to incorporate health into design and indicators to monitor health outcomes.

The guidance is aimed at planners (those involved in the writing of plans and policies; and in reviewing development applications), health practitioners (such as those working within Primary Care Trusts who are involved in the review of plans, policies and development applications and/or the provision of health advice to borough planners and developers) and to developers (involved in the design of development and regeneration schemes).

The document has been health led to emphasise the importance of public health issues and hence demonstrate the need to plan for healthier outcomes and avoid negative health impacts at the earliest possible opportunity. The final section of the document provides ‘A Spatial Plan for Health’ with health driving the selection and formulation of policy.

Five public health issues were chosen: mental health, obesity and cardiovascular disease, respiratory disease, excess summer and winter mortality and injuries. The public health issues were chosen taking account of the significance of the public health impact and the likely influence of spatial planning in modifying health risk factors. There are of course other major public health issues (e.g. cancer), however, the document is not intended to address every possible public health issue and was restricted to those most likely to be influenced by spatial planning.

A detailed evidence base is provided identifying links between spatial planning and the public health issues (for example encouraging physical activity is strongly linked to a reduction in obesity). Case studies were then selected to explore how planning can achieve more favourable healthier outcomes (for example, physical activity can be encouraged through the provision of good quality, accessible green spaces, combined with initiatives to support the ongoing use of such spaces). Case studies have also been used to illustrate the application of policy or to demonstrate changes in the physical and built environment as a means to promote healthier outcomes.

Finally, ‘A Spatial Plan for Health’ is prepared which addresses the recommendations and lessons learnt from the case studies, aiming to move towards better practice. The Spatial Plan sets out a health policy framework for those writing and reviewing health policies within Local Development Frameworks. The framework is intended to be cherry picked by practitioners and adapted as appropriate to their local circumstances.
1 - INTRODUCTION

Delivering Healthier Communities in London
## 1.1 APPROACH TO THE GUIDANCE

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1.2 NAVIGATION

HEALTH PRACTITIONERS SHOULD

Understand why it’s important to plan for mental health – see
- Part 2: Why plan for health
- Section 3.2: Mental health

Understand why it’s important to plan for obesity and cardiovascular disease – see
- Part 2: Why plan for health
- Section 3.3: Obesity and Cardiovascular disease

Understand why it’s important to plan for respiratory disease – see
- Part 2: Why plan for health
- Section 3.4: Respiratory disease

Understand why it’s important to plan for excess winter and summer mortality – see
- Part 2: Why plan for health
- Section 3.5: Excess winter and summer mortality

Understand why it’s important to plan to reduce injuries – see
- Part 2: Why plan for health
- Section 3.6: Injuries

PUBLIC HEALTH ISSUES

Mental health

Obesity and cardiovascular disease

Respiratory disease

Excess winter and summer mortality

Injuries
Delivering Healthier Communities in London

**THE PLANNING PROCESS**

- **Preparation of Development Plan & Sustainability Appraisal**

- **Design process**

- **Planning application**

- **Implementation, monitoring and review**

**PLANNERS SHOULD**

- Integrate health into **ALL** policy and plan preparation to help meet **criteria** for a **sound** plan – see
  - Part 2: Why plan for health
  - Part 4: A spatial plan for health

- Be informed of the links between health and planning during pre-application discussions – see
  - Part 2: Why plan for health
  - Part 3: Health and planning

- Consider whether appropriate use has been made of measures to promote healthy communities in consideration of the planning application – see
  - Part 3: Health and planning
  - Part 4: A spatial plan for health

- Have a mechanism in place to monitor the health outcomes of policies – see
  - Part 4: A spatial plan for health
1.3 WHAT IS THE NHS HEALTHY URBAN DEVELOPMENT UNIT?

The NHS Healthy Urban Development Unit (known as “HUDU”) was established in February 2004 to help the NHS to engage in urban planning. The primary goal of HUDU is to support all NHS organisations across London.

The aim of the HUDU is:

“To significantly improve the health of Londoners by creating healthy and sustainable communities across the capital. We do this through developing partnerships that enable health organisations to engage early, influencing the plan making process, and affecting the outcomes of planning applications. We aim to engender an effective response to London’s future population growth – both in terms of health improvement and delivery of patient centred health care.”

The Unit’s work programme is set around three objectives:

- Developing partnerships for health.
- Influencing the London urban planning agenda.
- Influencing urban development across London.
1.4 AIMS AND OBJECTIVES OF THIS GUIDANCE

The over-arching aim of this guidance is:

“To integrate health and well-being into the planning process through the development of practical, easy-to-use guidance”

This will support health and planning practitioners in preparing policy frameworks and in designing interventions at various scales that will optimise the health outcomes for new and existing populations.

In particular, outputs from the guidance will:

- Help meet challenges to planning for health.
- Help planners to meet the tests of “soundness” and prepare a “sound” plan.
- Provide evidence and case studies to support the links between planning and health.
- Provide good practice design principles for development at masterplan and project level Scales.
- Provide good practice policies in support of healthier outcomes at a variety of planning scales.
- Provide indicators to monitor health outcomes.
- Build on existing guidance.
1.4 AIMS AND OBJECTIVES OF THIS GUIDANCE

The Figure below sets out the outputs from the guidance document and the planning scales at which these can be applied.

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1.5 HEALTH AND HEALTHIER COMMUNITIES

1.5.1 What is Health?

The World Health Organisation (WHO) defines health as:

“A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity”

This definition recognises that health comprises a wide range of factors and moves away from the traditional focus on health treatment to one of prevention and cure. This ties in with one of the key principles of the Public Health White Paper which aims to create an environment which will enable people to make healthier choices.

The Diagram below sets out the main determinants of health. Many of these health determinants relate to aspects of the urban and built environment which could be influenced through urban planning.

By considering the wider determinants of health such as socio-economic, environmental and cultural conditions, one is moving away from a focus on the health of an individual towards the consideration of “healthier communities”.

1.5.2 Health in London

The health of Londoners is influenced by socio-economic factors which are unique to the city. These include London's large and ever increasing population placing great pressure on healthcare facilities, and persistent inequalities in health between the most affluent and most deprived London boroughs and between London’s diverse ethnic groups.

The need to plan for health in London is not new; indeed early public health legislation was established to address failings in London's housing infrastructure. The timeline over the page sets out the historic context for health and planning in London:
1.5 HEALTH AND HEALTHIER COMMUNITIES

1.5.3 Timeline

In recent years, health has moved increasingly higher up the London planning agenda. The London Plan\(^4\) includes an overarching objective “…to make London a **healthier** and better city for people to live in…”. Furthermore, organisations such as HUDU have been established with the explicit aim to help health practitioners engage and participate in urban planning.

**Part 2** of the Guidance, Why Plan for Health?, sets out the key drivers behind planning for health including the National, Regional and Local policy context.

- **1845** Importance of access to open spaces identified early on – Establishment of Victoria Park in East London for impoverished East Londoners.

- **1848** Passing of the Public Health Act to improve unsanitary conditions. Establishment of a General Board of Health.

- **1845** Importance of access to open spaces identified early on – Establishment of Victoria Park in East London for impoverished East Londoners.

- **1848** Passing of the Public Health Act to improve unsanitary conditions. Establishment of a General Board of Health.

- **1850**

- **1801 - 1901** Huge growth in the population of England and Wales from 8.9 – 32.5 million.

- **1875** Specifications of minimum housing standards in terms of street width, dwelling design and construction as part of the consolidating Public Health Act.

- **1840s** Epidemics of water-borne diseases such as cholera, particularly in high density cities such as London.
Early 1900s
Establishment of the Garden City Movement creating cities which aimed to combine the best elements of both urban and rural living.

1900

1919 Development of Welwyn Garden City.
1919 Ministry of Health Established.

1950

Late 20th C
Focus on land use planning.

Early 21st C
Health moves increasingly higher up the planning and policy agenda.
1.5.4 What are Healthier Communities?

It is difficult to find a widely agreed definition of a “healthy community” in existing literature and guidance. Furthermore, definitions are provided at a variety of different scales e.g. at the level of the city or the neighbourhood. It is however, possible to draw together some useful conclusions from these differing studies and concepts.

Of particular relevance is the ‘The WHO European Healthy Cities Network’ which consists of a network of cities from around Europe committed to implementation of the Healthy Cities concept. The networks are designated on a five year phase basis – Phase IV (2003 – 2008) has three core themes (healthy ageing, healthy urban planning and health impact assessment). The inclusion of healthy urban planning as a core theme in this current phase of the network is an important driver behind this guidance and the recommendations arising out of it.

The WHO defines a healthy city as:

“...one that is continually creating and improving the physical and social environments and expanding the community resources that enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential.”
The WHO expands upon this definition and sets out the key qualities of a healthy city. These are set out below:

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

1.5.5 The use of a ‘Settlement’ Model to define Healthier Communities

The diagram above illustrates the qualities of a healthy city as defined by the WHO. The diagram has been adapted from the Health Determinants diagram referred to in Section 1.5.1 above. Barton et al.\(^7\) converted this diagram into a ‘settlement’ model, which places people as the key focus of the model; the health of, well-being and quality of life experienced by people thus forms the focal point of urban planning. Ultimately, individual actions and behaviour will have a critical bearing on individual health, however, planning can help create the right environment to encourage healthier behaviour.

The diagram radiates outwards highlighting people’s reliance on local communities and social groups which in turn require a shared purpose and shared activity. Such activities are reliant on appropriate places i.e. adapted spaces and means to reach these activities.

Planners and designers exert a direct influence on ‘Places’ i.e. the Built Environment: Buildings, Spaces and Streets.

The inclusion of ‘Natural Resources’ at tier 5 indicates the role of the natural environment in sustaining life as a whole.

It is important that health considerations are taken into account at the earliest opportunity in the planning and design of the built environment to help foster healthier communities. This guidance will identify the key links between aspects of the built environment and health to focus planning policy and design. For example, healthier communities are likely to be found in ‘Places’ which are dense, comprise mixed uses, are well-connected by all modes of transport (particularly public transport) and with good access to high quality green infrastructure.

2- WHY PLAN FOR HEALTH?
2.1 INTRODUCTION

This section provides a context for the consideration of health in the planning process. First, it sets out the Health Policy Context (e.g. the European policies, plans and programmes driving the health agenda), followed by the National context including Department of Health (DH) ‘White Papers’. The second section provides an outline of the England’s Plan-Led system and the statutory and non-statutory health drivers therein.

Planning for health is important not only from a legislative perspective, but also in relation to costs. Promoting healthy lifestyles, avoiding health impacts and tackling health inequalities throughout the planning process will result in major cost savings to society. By focusing on the prevention of public health issues the need for costly treatments can be avoided. This frees up money which boroughs can re-allocate to other priority areas.

The Wanless Report examined future trends and identified factors to inform the long-term financial and resource needs of the NHS to 2022. The review considered three scenarios varying in relation to a number of factors including the extent to which people protected, promoted and managed their own health. The ‘fully engaged’ scenario assumes people are highly engaged in personal health management and focus is on health prevention. The report concluded that there is a health expenditure gap of around £30 billion (by 2022/23) between the best and worst health scenarios. This means that £30 billion could be saved by shifting from a culture of little engagement in personal health to one of individual management and control. This saving relates to half of the current NHS expenditure.

Planning can help create the right circumstances to enable people to engage more in personal health prevention and management.

Positive planning and management of health can also help reduce the burden of health inequalities (pertinent given the Mayor of London’s forthcoming Health Inequalities Strategy) and improve economic productivity. The Confederation of British Industry (CBI) estimated that workplace absence cost British business nearly £11 billion in 2000.
2.2 HEALTH POLICY

2.2.1 European Context

One of the outcomes of the Finnish Presidency of the European Union (May to December 2006) was the publication of the document Health in All Policies10 and its subsequent adoption and promotion by the EU. This considered the role of Health Impact Assessment (HIA) in policy formulation.

**What is Health Impact Assessment?**

A combination of procedures, methods and tools that systematically judges the potential and sometimes unintended, effects of a policy, plan, programme or project on the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects.

*Adapted from the Gothenburg Consensus Paper (1999) by the International Association of Impact Assessment.*

The role of HIA is becoming increasingly important as a decision-making tool in the UK at policy, plan, programme and project level although it remains non-statutory. The DH recently published Draft Guidance on SEA and Health. This will help practitioners integrate health considerations within statutory assessment processes.

For more information on how to consider health in SEA, see Draft Guidance on Health in Strategic Environmental Assessment: Consultation Document (Department of Health, 2007)11.

The Health Issues in Planning: Best Practice Guidance (June 2007)12 provides a section on HIA in London. This includes details of where HIA has been used in practice, and further sources of information for those intending to use HIA.

Part 4 of this document provides an example of how HIA may be integrated into health policy.
2.2 HEALTH POLICY

2.2.2 National Health Policy

Health Policy in England is set by the Department of Health (DH) with an aim to “...improve the health and well-being of the people of England.” This includes setting national standards, shaping the direction of the National Health Service (NHS) and social care services, and promoting healthier living.

The NHS was established in 1948 with a founding principle to “…improve health and prevent disease, not just provide treatment for those who are ill.”

This principle has formed one of the core focuses of recent DH White Papers in addition to tackling inequalities and empowering communities to make better health choices. Key DH White Papers are listed below:

- Securing good health for the whole population - Report to the Treasury (Wanless, 2004). 15
- Choosing Health: making healthier choices easier (November 2004). 16
To help meet the White Paper commitments, the Office of the Deputy Prime Minister (ODPM) established Local Area Agreements (LAA) in 2005 with a primary objective to deliver genuinely sustainable communities through better outcomes for local people. LAAs can help promote healthier communities and narrow health inequalities by providing a framework to support and maintain different initiatives and services (such as health, education and housing).

A Local Area Agreement\(^{18}\) is a three year agreement, based on local Sustainable Community Strategies, that sets out the priorities for a local area agreed between Central Government, represented by the Government Office (GO) and a local area, represented by the local authority and other key partners through Local Strategic Partnerships (LSPs).

They are structured around 4 blocks (or policy fields): Children and Young People, Safer and Stronger Communities, Healthier Communities and Older People and Economic Development and Enterprise.

The DH is also committed to a number of Public Service Agreements (PSAs)\(^{19}\) to help meet policy proposals. These cover the period 2005 – 2008 and are outlined below:

- **Objective I: Improve the health of the population.** By 2010 increase life expectancy at birth in England to 78.6 years for men and 82.5 years for women.
  
  1. Substantially reduce mortality rates by 2010 (with particular reference to deaths from heart disease and stroke and related diseases, from cancer and from suicide and undetermined injury).
  
  2. Reduce health inequalities by 10% by 2010 as measured by infant mortality and life expectancy at birth.
  
  3. Tackle the underlying determinants of ill health and health inequalities (with particular reference to adult smoking rates, childhood obesity and improving sexual health).

- **Objective II: Improve health outcomes for people with long-term conditions.**

- **Objective III: Improve access to services.**

- **Objective IV: Improve the patient and user experience.**
2.2.3 Health in London

Regional Public Health Groups are part of the Department of Health and are co-located in each of England’s nine Government Offices. They work alongside public health colleagues in NHS, local authorities and other agencies to improve and protect their local population. This involves addressing all determinants of health such as diet, housing, the economy, transport and mental health and factors that create health inequalities within their region.

The NHS in England is split into 10 Strategic Health Authorities (SHA), including NHS London. NHS London is responsible for ensuring that the capital’s health services deliver world-class care by:

- Developing and implementing a strategy for health and healthcare in London.
- Holding local organisations (see below) to account for the quality of care which they provide.
- Ensuring capacity through the development of the workforce, technology and buildings.

NHS London manages the performance of 31 primary care trusts, 25 acute trusts, 9 mental health trusts and the London Ambulance Service. The 10 Foundation Trusts in London have greater freedom to manage their own affairs and improve services.

There are 31 PCTs in London, generally aligned to each of the London Boroughs. The three main functions of a Primary Care Trust are:

- Engaging with its local population to improve health and well-being.
- Commissioning a comprehensive and equitable range of high quality, responsive and efficient services, within allocated resources, across all service sectors.
- Directly providing high quality responsive and efficient services where this gives best-value.
2.3 HEALTH CONSIDERATIONS IN NATIONAL PLANNING POLICY AND GUIDANCE

Sustainable development is the core principle underpinning planning\(^{20}\). The Government sets out five guiding principles for sustainable development in *Securing the Future: Delivering UK Sustainable Development Strategy*\(^{21}\). One of the five principles is to ensure a strong, healthy and just society, which aims to meet the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

National planning policy sets out a number of requirements for spatial plans to minimise health impacts and to promote healthy outcomes. It indicates that health is a material planning consideration in the determination of proposals for development or change of use. *PPS1: Delivering Sustainable Development* requires development plan policies to protect human health and address accessibility for all members of the community to a range of facilities including health, leisure and community services. Development plans should also deliver safe, healthy and attractive places to live, and support the promotion of health and wellbeing by making provision for physical activity.

More specific guidance on these requirements is set out in topic based planning policy statements (PPS). These are summarised in Appendix 1.

Other relevant and recent national plans and reports include the Royal Commission on Environmental Pollution (RCEP) Report on the Urban Environment\(^{22}\) and the Sustainable Development Commission’s (SDC) review of government progress on Sustainable Communities\(^{23}\).

The RCEP report sets out the key issues facing the urban environment, including the role the environment has to play in health and wellbeing. Much of the evidence and recommendations arising out of the report are reinforced in this guidance document.

The SDC report recognises the need for better co-ordination between housing, health, education and employment policy with a specific recommendation for planning guidance to integrate health issues into housing design (taking account of the differing needs of the elderly, the young etc).
In London, the Mayor has a **statutory** duty to promote the health of Londoners. In exercising its general powers, the Greater London Authority (GLA) Act 1999 requires the GLA to promote improvements to the health of people in Greater London, in addition to contributing towards the achievement of sustainable development in the UK (para. 30 (5)). In preparing or revising the Mayor’s Strategies, the GLA Act requires the Mayor to have regard to the effect which the proposed strategy would have on the health of people in Greater London (para. 41 (4b)).

Health features throughout the London Plan and its Draft Further Alterations, from reference to health considerations in the Mayor’s objectives to specific policies seeking to promote healthy outcomes and avoid negative health impacts. The London Plan seeks to protect and enhance existing healthcare and other community facilities and support the provision of additional healthcare in boroughs. It also includes specific policies to:

- **Promote public health.**
- **Ensure developments have regard to health impacts.**
- **Improve London’s open environment.**
- **Tackle health inequalities.**
- **Ensure health is taken into account in the preparation of Community Strategies.**

Health is considered more directly and comprehensively in the Draft Further Alterations to the London Plan. For example, the second Mayor’s objective has been revised to ‘make London a *healthier* and better city for people to live in’.

There are a number of Supplementary Planning Guidance (SPG) and Best Practice Guidance (BPG) documents which sit alongside the London Plan and provide additional information on how to integrate health benefits into development and regeneration projects. These include **Sustainable Design and Construction (May 2006)** and **Accessible London: Achieving an Inclusive Environment (April 2004)** SPGs and **Health Issues in Planning: Best Practice Guidance (June 2007)**.

The requirements and guidance for health considerations as set out in the London Plan, its Draft Further Alterations and accompanying documents are provided in Appendix 2. This summarises the direct and indirect links between development or regeneration and either promoting healthy outcomes or avoiding health impacts. The **HUDU Watch Out for Health Checklist** and the **Health Issues in Planning: Best Practice Guidance** also detail London Plan policies which have indirect links to health.

It is recognised that mechanisms exist for sub-regional or transboundary planning within London. For example, East London boroughs from the East London Waste Disposal Authority are working jointly to produce a Waste Development Plan Document.

This document could be equally applied to planning at this level.
Planning decisions on proposals for development or change of use are determined using a plan-led system, as illustrated in the Figure over the page. The context for this system is provided by national planning policy set out in PPSs and PPGs. National planning policy informs the statutory Development Plan, which is the starting point in the consideration of planning applications for the development or use of land. The Development Plan therefore provides the essential framework for determining planning decisions.

In London, the statutory Development Plan consists of:

- The Spatial Development Strategy prepared by the Mayor of London, which is called the London Plan; and
- Unitary Development Plans or, under the Planning and Compulsory Purchase Act 2004, Development Plan Documents (DPDs) for the local planning authority (LPA) in which the planning decision is made. DPDs are one of a number of documents that make up Local Development Frameworks (LDFs).
2.5 HEALTH PLANNING TO MEET THE TESTS OF SOUNDNESS

The Plan-led system
Note: tests to assess the soundness of a Plan are in dark blue
The Planning and Compulsory Purchase Act 2004 requires policies in Local Development Documents to be sound and sets out nine tests which should be used to assess the soundness of the Plan. These tests are summarised in the box below and their links to the plan-led system are shown above.

**TESTS OF SOUNDNESS**

**A DPD will be sound if it meets the following tests:**

**Procedural**

i. it has been prepared in accordance with the local development scheme;

ii. it has been prepared in compliance with the statement of community involvement, or with the minimum requirements set out in the Regulations where no statement of community involvement exists;

iii. the plan and its policies have been subjected to sustainability appraisal;

**Conformity**

iv. it is a spatial plan which is consistent with national planning policy and in general conformity with the London Plan and it has properly had regard to any other relevant plans, policies and strategies relating to the area or to adjoining areas;

v. it has had regard to the authority’s community strategy;

**Coherence, consistency and effectiveness**

vi. the strategies/policies/allocations in the plan are coherent and consistent within and between development plan documents prepared by the authority and by neighbouring authorities, where cross boundary issues are relevant;

vii. the strategies/policies/allocations represent the most appropriate in all the circumstances, having considered the relevant alternatives, and they are founded on a robust and credible evidence base;

viii. there are clear mechanisms for implementation and monitoring; and

ix. the plan is reasonably flexible to enable it to deal with changing circumstances.

Adapted from tests of soundness set out in PPS 12: Local Development Frameworks (ODPM, 2004).
The tests of soundness can be linked to health both in terms of the consideration of health impacts and the promotion of healthier outcomes, (evidently health is just one of the aspects which planners should take account of when aiming to prepare a sound plan).

The links between health and the tests of soundness include:

• The **third test of soundness** which requires the Plan and its policies to be subject to Strategic Environmental Assessment (SEA) and Sustainability Appraisal (SA). The SEA Directive requires authorities to assess the likely significant effects on ‘the environment, including on issues such as…human health’. Government guidance on SA suggests that maintaining and enhancing human health should be an objective against which the Plan and its policies are appraised.

For more information on how to consider health in SEA, see Draft Guidance on Health in Strategic Environmental Assessment: Consultation Document (Department of Health, 2007).️

• The **fifth test of soundness** which requires the Plan to have had regard to the Community Strategy. Boroughs should take note of the high-level vision set in the Community Strategy and the health issues identified.

• The **seventh test of soundness** which requires that the strategies, policies and allocations in Development Plan Documents are appropriate, having considered the relevant alternatives, and are based on a robust and credible evidence base. This guidance document includes good practice text for health policies and provides evidence (and sources of evidence) to support health and health-related policies. The evidence is necessarily of a general nature, but it provides strong pointers as to what evidence needs to be assembled at the local level.

• The **eighth test of soundness** which requires the plan to have clear mechanisms in place for implementation and monitoring. The need to monitor policy outcomes is critical to ensure that targets and objectives can be met. Boroughs must have this in mind during policy formulation.

• The **fourth test of soundness** which requires the Plan to be consistent with national planning policy and in general conformity with the London Plan. This policy framework requires DPDs to provide access to health facilities, deliver healthier communities and support the promotion of health through provision for physical activity. Policies at the local level are therefore expected to have a wide scope encompassing these factors, providing a statutory requirement for development and regeneration projects to reflect such requirements.
3 - HEALTH AND PLANNING
This section provides evidence linking public health issues to factors which may be influenced by spatial planning. Five public health issues have been chosen and the chapter is structured around each of these. The chosen public health issues are:

- Mental health.
- Obesity and cardio-vascular disease.
- Respiratory disease.
- Excess winter (cold) and summer (heat) mortality.
- Injuries.

These public health issues have been chosen based on the significance of the public health impact and on the basis of an initial scoping exercise to identify potential links between health and planning. There are, of course, other major public health issues (e.g. cancer), but only those where risk factors may be modified by spatial planning are addressed. The detailed evidence reviews are provided in Appendices 3.2-3.6.

Where strong links between the public health issue and spatial planning factors are identified within the evidence base, case studies are provided which aim to explore the different means by which planning can have an effect. These “interventions” may include the application of national policy or specific changes in the physical or built environment. The case studies which have been included provide examples of where health is an indirect outcome of policy or design. Finding case studies where health was planned to be a direct outcome has been difficult in practice.

**Win/Wins** and **Conflicts/Constraints** are identified for each case study.

### Win/Wins

- Win/wins are achieved where an intervention may deliver multiple benefits e.g. for more than one public health issue and/or wider benefits e.g. for economic development or sustainability.

### Conflicts/Constraints

- Conflicts/Constraints may arise when interventions have negative impacts e.g. an intervention may address one public health issue but impact directly or indirectly on another. Other impacts e.g. cost involved or time to implement are also identified.

Following on from the evidence base and case studies, a suite of recommendations are provided for each public health issue. These recommendations can be applied at a number of different spatial planning scales e.g. at the LDF level or project level (during the design of site layouts or buildings) and guide the development of the planning tools provided in **Part 4: A Spatial Plan for Health**.
3.2 MENTAL HEALTH

3.2.1 Evidence Base

Depression and anxiety are important public health problems occurring in 15-30% of the UK population and accounting for approximately 20% of GP consultations in the UK.

Taking account of individual characteristics (e.g. age, socio economic status), there is still substantial variation in rates of Common Mental Disorders (CMD) between households. This variation can be related to factors operating at a level between ward and household (a ‘neighbourhood’ effect). This ‘neighbourhood’ effect is being increasingly researched but is currently not well understood.

The factors which appear to be most strongly associated with the lowest ratings for mental health are:

- Density and escape i.e. feeling dissatisfied with available green space, and/or social facilities or feeling overcrowded.
- Design, for example;
  a) not liking the look of the estate or road etc or
  b) high rise and deck access dwellings which are a risk in particular to mothers with young children.
- Physical incivilities, for example
  a) vandalism to property
  b) low external beautification
  c) poor property maintenance
- Housing quality e.g. damp.
- Fear of crime i.e. feeling unsafe to go out.
- Neighbour noise, although an individual’s trait anxiety may itself affect noise sensitivity.

Spatial planning can markedly affect the following risk factors:
- Neighbourhood Quality
- Housing Design and Density
- Housing Quality
- Fear of crime

Residents whose homes have been flooded experience psychological distress for considerable periods of time after the flood event.

Spatial planning can minimise the risks of flooding through design and careful location of vulnerable land-uses.

See Appendix 3.2 for more information on the evidence base underpinning the links between mental health and spatial planning.
3.2.2 Case Studies

This section deals with each spatial planning factor listed in Section 3.2.1 in turn and provides case studies of possible ‘interventions’ to address the mental health issues where applicable and available.

3.2.3 Neighbourhood Quality

Neighbourhood quality can comprise a number of different elements, however, the evidence gathered as part of this study has demonstrated that ‘escape’ facilities i.e. open and green space and/or social facilities are particularly important. Studies\(^{32}\) have shown that there is less prevalence of mental ill health among people living in built areas with access to gardens than among those with no such access. Open spaces can also be important in facilitating physical exercise and longevity\(^{33}\) and recent studies have shown a causal relationship between physical activity and reduced levels of depression\(^{34}\).

Spaces which allow contact with nature e.g. parks, allotments, gardens, and green roofs need to be safeguarded and included within the design of new schemes and/or regeneration schemes. Louv\(^{36}\) discusses the importance of nature to children and how a lack of interaction may result in Nature Deficit Disorder (NDD).

Open and green spaces also provide an opportunity for communal play and social interaction. Studies have demonstrated that parents of young children in large multiple dwelling units often cope with the paucity of nearby play spaces by keeping children inside their apartments. Such restrictions heighten intrafamilial conflict, minimise play opportunities with others, and remove a primary avenue for parents to get to know their neighbours\(^{37}\), all of which may compound mental health problems.

Places and facilities to ‘escape’ to are important in urban, high density areas such as London. Where space is at a premium the need to maximise such places and facilities in new and regeneration schemes is critical.

In London such facilities include allotments. Wiltshire\(^{35}\) notes that allotments can have a positive effect on both physical and mental well-being and provide opportunities for horticultural therapy for people with physical and mental health problems. Demand outstrips supply in most London boroughs, so existing allotments should be protected and new areas provided where possible.

See Section 3.3 for more information on allotments.
The case study below provides an example of where neighbourhood and community features were included as part of scheme design.

**Case study 1: Beddington Zero Energy Development (BedZED), London**

The BedZED development in South London included a number of features aimed at enhancing the immediate neighbourhood such as first storey gardens, an on-site playing field, community centre, nursery and allotments. Walkways link up the terraced houses providing opportunities for neighbours to interact.

An initial Quality of Life Survey (conducted between January to March 2007) provided positive results of residents use of community facilities. Of the 23 households questioned (23% of households at BedZED), the majority (74%) use the community centre. Other facilities (e.g. allotments, nursery, sports field and village square) are used by approximately 25% of respondents. It is notable that 87% of respondents consider community facilities to be better than where they previously lived.

The majority of residents like their immediate neighbourhood i.e. at BedZED, but disliked the wider Hackbridge area. Reasons cited included anti-social behaviour, graffiti and vandalism.

BedZED was developed by the Peabody Trust, in partnership with Bioregional Development Group and designed by Bill Dunster Architects.

Win/Wins

- Provision of community and social facilities in new and regeneration schemes provide ‘escape facilities’ and opportunity for community interaction.
- Facilities such as allotments also provide opportunities for physical activity and access to healthy food both with positive health outcomes.

Conflicts/Constraints

- Provision of facilities will not necessary mean residents use them. Section 3.3 Obesity and Cardiovascular Disease discusses the importance of the quality of space and the development of initiatives to encourage their use.
- New developments and/or regeneration schemes need to consider the wider neighbourhood i.e. outwith the immediate regeneration area as any health benefits will depend on this wider context.
3.2 MENTAL HEALTH

3.2.4 Housing Design and Density

House type (e.g., high-rise dwellings) and floor level have been linked to poor mental health. High-rise, multiple dwelling units are harmful to the psychological well-being of mothers with young children and possibly that of young children themselves. High-rise dwellings also tend to reduce the opportunity for social interaction.

Studies have also shown that people living in deck access buildings have significantly higher risk of depression than those living in other housing types, even after adjusting for socio-economic status, floor of residence and structural problems.

High-rise, deck access housing should be avoided in new developments and regeneration schemes.

In relation to housing density the evidence generally indicates that high density living can increase mental health problems, however, there are arguments to suggest that high-density living, particularly high household density, may in fact have positive effects, leading to increased social ties and more cooperation.

PPS 3 sets out 30 dwellings per hectare (dph) as the national indicative minimum density for housing schemes but notes that “…LPAs may wish to set out a range of densities across the plan area rather than one broad density range…” Further guidance on how boroughs can determine housing mix and density for individual sites is provided in the Mayor’s Housing SPG.

The lack of space in London and demand for homes generally (both market affordable and socially affordable) is likely to push up density in both new and regeneration schemes. Thus, there will continue to be a requirement for high density housing in London.

Planning for better quality high density housing development will help reduce mental health issues.

The Commission for Architecture and the Built Environment (CABE) publication – Better Neighbourhoods: Making Higher Densities Work provides a short and useful guide to designing better high density developments. The guide sets out five key areas to focus on when designing high density developments.

These are: parking, privacy, mixed uses, mixed communities and management and are summarised in the table overleaf.
<table>
<thead>
<tr>
<th>Design Area</th>
<th>Design Suggestions</th>
<th>Health Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking</td>
<td>High density developments should be focused in areas well served by public transport to minimise parking. [25 units per ha or 100 persons/ha is the minimum density for a bus service]. Where parking is necessary this should be carefully integrated to avoid cars dominating the public realm. Underground or multi-storey parking becomes viable at densities over 100 dph. Intelligent design should be employed at lower densities.</td>
<td>Good public transport will enable people, particularly from deprived communities to access local facilities e.g. for exercise or social interaction.</td>
</tr>
<tr>
<td>Privacy</td>
<td>Acoustic and visual privacy is often a problem with higher density living. Overlooking can be designed out and inclusion of noise insulation will mitigate noise pollution.</td>
<td>Reduced noise levels will reduce anxiety.</td>
</tr>
<tr>
<td>Mixed Uses</td>
<td>The location of higher density housing should be planned in accordance with other types of uses, e.g. open/green spaces, and commercial, social and community facilities. This could be achieved by focusing development in existing town centres.</td>
<td>A mix of uses will enable people to interact more in the community improving mental health, and facilitate participation in physical activity.</td>
</tr>
<tr>
<td>Mixed Communities</td>
<td>Higher density housing should be a mix of household types and tenures. This is particularly important in regeneration schemes in deprived areas to help regenerate the area as a whole. Ensuring homes are designed as Lifetime Homes will help meet accessibility requirements (Lifetime Homes has 16 standards which apply to both the interior and exterior of the home, e.g. car parking width, approach gradients, etc).</td>
<td>A mix of household types and tenures will help to reduce health inequalities e.g. deprived communities in ‘sink’ estates. Providing homes which are accessible for all will reduce inequalities.</td>
</tr>
<tr>
<td>Management</td>
<td>Higher density housing requires ongoing management at block and neighbourhood levels if standards are to be maintained (e.g. to deal with graffiti, litter, crime). An agreement on standards and service charges should form part of the planning application.</td>
<td>Management agreements are key to ensuring the long-term success of regeneration schemes and new development and to promote long term health benefits.</td>
</tr>
</tbody>
</table>
CABE undertook an audit of higher-density housing schemes in 2004 and noted that despite the drive towards improved design, the number of exemplary higher-density housing schemes are still rare.

Local Planning Authorities will need to be proactive and forward thinking to ensure that higher-density development in new and regeneration schemes meet all possible criteria to avoid negative health issues and plan for long term healthy outcomes. The use of developer planning obligations can be used to secure ‘escape’ facilities e.g. open spaces. Schemes in new locations (i.e. without a ready supply of mixed uses) will need to be phased carefully to ensure that non-residential uses are in place prior to residents moving in. This will help deliver healthier outcomes from the outset.

High density development can be achieved in traditional building styles e.g. through conversion of Victorian terrace houses. This makes use of existing housing stock and provides a steer away from high-rise, overcrowded developments.
### 3.2.5 Housing Quality

Aspects of housing quality such as internal dampness are associated with common mental health conditions. The role of planning in dealing with such issues is limited, however, by ensuring all new homes meet required standards (e.g. Building Regulations 2, Code for Sustainable Homes) 3 then the standard of housing constructed will be improved. Ensuring maintenance and management agreements are in place in new and regenerated housing schemes will help address problems when they do arise and maintain a high standard of housing quality.

Boroughs should endeavour to identify neighbourhoods and housing estates associated with poor quality housing. This may form part of planned estate renewal and regeneration and the achievement of Decent Homes Standards. PCTs could assist in this process (e.g. identifying where GP visits are highest in relation to mental health, linked to poor quality housing). This will provide a focus for regeneration of existing neighbourhoods and housing estates.

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3.2.6 Fear of Crime

Fear of crime is strongly associated with mental health problems. This is a particular problem for existing developments and tends to disproportionately affect minority groups. Fear of crime can profoundly affect the quality of individual’s lives by causing both mental distress and social exclusion.

National planning policy e.g. PPS 1 Sustainable Development aims to:

…”promote communities which are inclusive, healthy, safe and crime free, whilst respecting the diverse needs of communities and the special needs of particular sectors of the community…”

The need to “design out crime” is emphasised in other national PPSs e.g. PPS 6: Town Centres and within the Mayor’s London Plan (e.g. Policy 4B1: Design Principles for a Compact City and Policy 4B.5i Safety, security and fire prevention and protection).

The ODPM publication Safer Places: The Planning System and Crime Prevention (April 2004) sets out 7 attributes of safer places that are particularly relevant to crime prevention which should be incorporated in design. These are:

- **Access and Movement:** places with well-defined routes, spaces and entrances that provide for convenient movement without compromising security.

- **Structure:** Places that are structured so that different uses do not cause conflict.

- **Surveillance:** Places were all publicly accessible spaces are overlooked.

- **Ownership:** Places that promote a sense of ownership, respect, territorial responsibility and community.

- **Physical Protection:** Places that include necessary, well-designed security features.

- **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.

- **Management and Maintenance:** Places that are designed with management and maintenance in mind to discourage crime in the present and the future.

Secured by Design provides a series of Design Guides on how to design out crime and provides information on construction companies and architects who are registered as Secured by Design providers.

Redesigning an urban environment to make it safer has been shown to bring financial benefits as well as positively contributing to the health of the local community. For example, improving the street environment, through better lighting in Dudley and Stoke-on-Trent showed that for every £1 spent on lighting, £27-47 was saved in tangible losses from crime.
Case study 2: Russell Square

Russell Square is a public open space in Bloomsbury, North London first opened in the 18th century. In the 1970s, park maintenance and investment was cut back resulting in the square becoming overgrown and unsafe.

In 1994 Camden Borough Council commenced restoration of the square with financial support from the Heritage Lottery Fund.

Much of the restoration work aimed to reduce anti-social behaviour within the square and to make maintenance easier. For example, path surfaces now comprise bound gravel which can easily be maintained by mechanical sweepers. Vegetation within the square is regularly mown and pruned by maintenance teams and a gardener is employed during weekdays providing on-site surveillance as well as maintenance. Lighting columns provide safely lit areas on dark days and at twilight. This is reinforced by gating and closure of the square between dawn and dusk.

Russell Square demonstrates a number of the attributes discussed above – Access and Movement (clear paths), sense of Ownership (provided by the railings and locked gate), Physical Protection (provided by the locked gates) and Management and Maintenance (employment of a full-time gardener and regular maintenance teams).

Win/Wins

- Open spaces will be used more readily if fear of crime is reduced providing space for people to unwind and relax.

Conflicts/Constraints

- Long term funding will be required for upkeep and maintenance.
Case study 3: Regeneration of Swanley’s, Northview Estate, West Kent

The original estate was constructed in the 1970s, comprising ten blocks of three storey housing. By the mid-1990s the estate had degenerated with antisocial behaviour concentrated in outside areas.

West Kent Housing Association began a programme of regeneration in the 1990s focusing on external landscaping and inclusion of security features within the residential properties. The scheme was completed in 1997 and involved close working between the architects (Fry Drew Knight Creamer), the Housing Association and a local resident steering group.

Notable features within the regeneration package included:

- Defined outside spaces e.g. parts of the communal areas given to ground floor areas and other areas given distinct uses such as children’s play area.
- Low fence along the road frontage.
- Secure storage areas for refuse and bicycles.
- Secure entrance to flats with entrance canopy.
- Good quality lighting.

The scheme addresses a number of the attributes defined earlier – Surveillance, Ownership, Physical Protection and Management and Maintenance.

Landscaping was designed in such a way to screen the estate (and clearly establish it as private). The estate is clearly visible from within, providing natural surveillance all around. The landscaping had matured by 2007.

Maintenance is undertaken by a resident who is employed as a caretaker by the Housing Association. Paid and professional help is provided when required.

Crime figures were measured pre and post scheme completion. An 80% reduction in crime (including criminal damage, theft from motor vehicles and theft offences) was recorded between September 1996 and September 2000.
Win/Wins

- Including simple design features in existing residential developments can help design out crime and reduce fear of crime.
- Involving local residents in maintenance can reinforce ownership and create a sense of empowerment, improving self-worth and overall mental health.
- Clearly setting out ownership gives responsibility to residents and provides incentives to maintain private space in good order.

Conflicts/Constraints

- Long term funding will be required for upkeep and maintenance.

Before and after photographs of Northview Estate.
Recommendations: Planning for Mental Health

Open and Green Space

- Developers and planning authorities should aim to include adequate “escape facilities” such as open and green spaces within new developments and regeneration schemes.
- Allotments are important as “escape facilities” and can provide multiple health and sustainability gains. Planning authorities should look for opportunities to include these in new developments/regeneration schemes.

Community and Social Infrastructure

- Maximise opportunities for social interaction through the inclusion of social and community facilities within new developments and regeneration schemes.

Design and Reduction of Crime

- New developments/regeneration schemes should aim to “design-out” crime.
- “Escape facilities” such as open spaces should be designed to avoid the likelihood of crime (e.g., follow Secured by Design principles).
- Estate regeneration schemes/new developments should take account of the conditions of the surrounding areas as wider problems may offset immediate health gains.

Design Quality and Type

- Boroughs should work with PCTs to identify neighbourhoods/housing estates where housing quality and/or design is having negative effects on public health.
- The design of high density development should take account of privacy, mixed uses, mixed communities and management.

Management and Maintenance

- Phasing of development in new and regeneration schemes will be important to ensure that health gains are secured from the outset e.g., provision of open spaces/community facilities before residents move in.
- Management and maintenance is critical to the long term success of new developments and regeneration schemes and to optimise health outcomes. Involvement of local residents in long term maintenance can engender empowerment and a sense of pride in surroundings.
- Developer contributions could help secure long term management funding.
3.2.7 Flooding

The health effects of flooding can be split into two areas: those associated with the immediate event (e.g. drowning) and those arising after the flood has subsided (i.e. related to exposure to flood waters, the clear up process or stress and anxiety). Mortality i.e. drowning and injuries occur during the flood event and are also possible post-event. Other health effects include respiratory symptoms arising from exposure to damp conditions and mental health problems arising from exposure to single and multiple flood events. The evidence linking flooding to the health effects described above is strong.

National Planning Policy on flooding is set out in PPS:25 Development and Flood Risk “The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing risk overall.”

PPS 25 advocates directing development away from areas at highest risk of flooding, as set out in the risk-based sequential approach.

Strategic decisions on the location of new development can be made at national (e.g. the Sustainable Communities Plan), regional (regional spatial strategies and sub-regional strategies) and local levels (local development documents including Area Action Plans). A Regional Flood Risk Assessment has been prepared for London which examines the nature and implication of flood risk in London and how the risk should be managed. This document is a consultation draft and is available on the GLA website.

New development in London should avoid areas of high flood risk as a first priority. However, where there is an overriding need for development in flood risk areas (e.g. as proposed in the Thames Gateway) good layout and design will be critical.
Case study 4: Minimising Flood Risk: Queenborough and Rushenden Regeneration, Isle of Sheppey, Swale

This 165 hectare site lies within the Thames Gateway growth area, between the settlements of Queenborough and Rushenden and is currently a mix of brownfield and industrial land and greenfield farmland. The local area has been in economic decline since the 1960s, however the construction of the River Swale crossing presents a major opportunity for economic, social and environmental regeneration. The mixed use development will comprise approximately 2,000 homes, employment land and tourism opportunities with a focus on skills and enterprise.

The masterplanning process is being led by the South East of England Development Agency (SEEDA). A development framework was adopted in 2004 by Swale Borough Council and a draft masterplan was prepared by Rumney Design Associates (2005/6). Flood risk was one of the potential impacts on site – The Isle of Sheppey has a history of flooding and much of the land area is within the Environment Agency’s Zone 2 flood risk, having a 1 in 100 or greater chance of flooding each year from the river. Climate change may exacerbate the likely flood risk.
Inclusion of sustainable Urban drainage Systems (SuDs)

Creation of watercourses throughout the site layout to help absorb floodwaters

High density apartment blocks in the areas of lower flood risk

Development set back from existing flood defences to allow maintenance and improvement

Functional parts of properties and those less easily evacuated are kept above the likely flood level

Ground floor levels raised to reduce the risk of flooding

Flood-compatible uses provided at ground floor level e.g. car parking
What are Sustainable Urban Drainage Systems (SuDs)?

SuDs provide a means to manage runoff from buildings and hardstanding. They reduce the total amount, flow and rate of surface water that runs directly to rivers through stormwater systems.

Information on types of SuDs are set out in the Mayor of London’s SPG: Sustainable Design and Construction (2006). The mayor’s SPG also provides a number of other interventions to create flood resistant development.

Win/Wins

- Designing development to minimise flood risk will help avoid direct and indirect health effects.
- SuDs create habitats of benefit to biodiversity and amenity and improve water quality – indirect health benefits.

Conflicts/Constraints

- Residents still living in a flood risk area which could increase anxiety and other mental health problems.
- High density housing can often exceed the capacity of SuDs.
- Increasing investment in flood defences and building in flood-resilience will add to the cost of development.
Case study 5: Mitigating existing flood risk problems: River Quaggy Flood Alleviation Scheme and Chinbrook Meadows

Queenborough and Rushenden provides an example of how to minimise flood risk in new developments or regeneration projects. The River Quaggy Flood Alleviation Scheme (FAS) provides possible solutions to deal with flood risk in existing development.

The FAS is a flood scheme in South East London. The River is known as Kyd Brook in its upper reaches and rises at Locksbottom, just west of Orpington. The river flows for 17 kilometres through the boroughs of Bromley, Greenwich and Lewisham before joining the River Ravensbourne in central Lewisham.

The river was channelised (engineered to flow straight) and sections of the river were put in underground channels in the 1960s to reduce flood risk to properties and businesses. This approach mirrored many early solutions to flood risk which aimed to "straighten" rivers and force the floodwater rapidly downstream. The channels created were often steep and deep and potentially dangerous to the public.

In the early 1990s proposals to extend the river channelisation were quashed – it was demonstrated that restoring the river to its natural shape i.e. reinstating the bends and the natural floodplain would be a more effective means to alleviate flood risk.

The river has been restored in phases and restoration is ongoing. This includes restoration in Chinbrook Meadows in 2002, in Sutcliffe Park and John Roan School Playing fields in 2003/04 and around Lewisham town centre in 2007.

At Chinbrook Meadows, approximately 300m of concrete channel was removed and the original function of the meadows as a floodplain restored. The Environment Agency measured usage of the meadows following restoration and found that this increased significantly (with 79% using the park more than once a week and 40% on a daily basis). Twenty percent of respondents reported fewer personal safety concerns following the restoration and respondents perceived there had been a reduction in various anti-social activities.
At Sutcliffe Park, the river previously flowed in an underground culvert. The river was brought back above ground at this section and floodwaters were able to spill out on to the Park. Surveys following restoration of Sutcliffe Park found that usage of the park had increased significantly (by over 70%).

The ongoing restoration of this river provides an award-winning example of how existing flood risk can be managed in a positive way, re-creating natural river features and creating an environment of benefit to biodiversity, whilst reducing the risk of flooding to properties and businesses. The original recreational spaces at Chinbrook Meadows, Sutcliffe Park and John Road Playing Fields were uninspiring and underused. The river restoration enabled these spaces to be enhanced increasing their attractiveness to potential users.

**Win/Wins**

- Positive planning can help reduce flood risk in existing developments and hence reduce anxiety and the likelihood of more direct health effects e.g. injuries.

- River restoration has multiple benefits – enhancing biodiversity and improving recreational spaces – this may indirectly benefit mental health and increase the likelihood of engaging in physical activity.

- Such flood management solutions are often cheaper than more conventional engineering options.

- Developer contributions can be used to fund restoration in regeneration schemes.

- River restoration could be tied to area-wide regeneration and help address environmental and social inequalities.

**Conflicts/Constraints**

- River restoration will take time to implement and will not address flood risk in the short term.

- Requires large areas of undeveloped land to recreate flood storage areas - not always available in London.

- River restoration, although often cheaper than conventional engineering options, is still expensive.
Recommendations: Planning for Mental Health

Designing for health: Location

- New development should avoid areas of high flood risk as a priority at the outset in line with national policy.

Designing to avoid flooding

- It is recognised that new development or regeneration projects may be located in flood risk areas. Layout and design should aim to address flood risk.
- Developers should take note of existing flood risk standards e.g. those proposed in the Code for Sustainable Homes and the Mayor’s Sustainable Design and Construction SPD (2006).
- Flood problems in existing development can be managed in positive ways. This can have indirect health benefits e.g. by regenerating existing open spaces/recreational areas and encouraging people to become physically active.
3.3 OBESITY AND CARDIO-VASCULAR DISEASE

3.3.1 Evidence Base

One of today's biggest public health issues is the obesity epidemic, linked to rising incidence of diabetes^49. Obesity and diabetes are risk factors for coronary heart disease. In England, 15% of children between 2 and 10 years of age are obese and the prevalence of children that are obese and overweight is increasing steadily^50. Encouraging physical activity can help to arrest this trend.

Physical activity has strong links with addressing obesity and diabetes and reducing the risk of cardiovascular disease. Cardiovascular disease refers to diseases involving the heart and/or blood vessels. Cardiovascular disease is the major cause of death and the death rate was 389/100,000 in England^51. There is evidence that physical activity such as brisk walking or cycling on most days of the week has a clear association with reduced risk of cardiovascular disease in middle aged and old people.

Physical activity does not need to be vigorous to achieve health benefits. Key factors that support physical activity include:

1) Walking and cycle ways to connect homes with schools, workplaces and shops;
2) Accessibility to playing in the park and sports facilities; and
3) Removal of environmental barriers to permit residents in poorer areas to become physically active.

There is evidence that creation or enhancement of these factors is effective in engaging people across the socio-economic and ethnic spectrum in levels of physical activity that improve their health.

Spatial planning can encourage physical activity by promoting walking and cycling through well-designed paths and cycleways, improving accessibility to open and green spaces and sports facilities, and removing environmental barriers to allow residents in poorer areas to become physically active.

Encouraging physical activity can result in substantial cost savings to the NHS. The costs of physical inactivity has been estimated at £8.2 billion per year, made up of £1.7 billion in direct health care costs for the NHS, £5.4 billion in earnings lost to sickness absence and £1 billion in earnings lost to premature mortality^52. It is suggested that a 10% increase in adult physical activity could benefit England by £500 million a year and save 6,000 lives.

Evidently, obesity is also linked to a poor diet and access to a range of food at a reasonable price. Planning can provide facilities to buy food through mixed use developments and to grow food locally (e.g. through provision of allotments or garden spaces in new developments).

Further information on the evidence underpinning the links between obesity and cardiovascular disease and spatial planning is provided in Appendices 3.3 and 3.4.
3.3.2 Case studies

As indicated in the evidence base above, measures to effectively address obesity, diabetes and cardio-vascular disease focus on the promotion of a more active lifestyle. The guidance looks at two ways of promoting physical activity; provision of and improving access to open space, and to new and existing sport and leisure facilities.

3.3.3 Access to open space in new and existing developments/ regeneration projects for physical activity

Increases in obesity are linked to ever more sedentary lifestyles and a reduction in outdoor activity. Evidence shows that adult patterns of exercise are set early on in life, so a lack of exercise when young can in turn create problems in adulthood\textsuperscript{53}. Access to good quality, well-maintained open spaces can help to improve health and tackle obesity by providing opportunities for outdoor recreation, physical exercise and play. It has been estimated that some 7 percent of urban park users in England go there for sporting activities – that represents about 7.5 million visitors a year\textsuperscript{54}.

In addition to tackling obesity, there are wider benefits associated with access to open spaces. These are summarised in the diagram over the page.
3.3 OBESITY AND CARDIO-VASCULAR DISEASE

Urban green spaces ...
... play a key role for recreation, enhance the quality of life for people living and working in an urban area and provide locations for different leisure, sport and play activities.

... help promote health lifestyles.

... contribute to social inclusion, to community development and citizenship and provide venues for cultural and social events.

... support environmental education and lifelong learning as an educational resource and help develop better understanding concerning ecological and environmental processes.

Urban green spaces ...
... serve as a factor in the location of new businesses.

... invigorate local businesses and neighbourhood economies by attracting tourists and investment.

... offer direct employment opportunities for those people who develop, manage and maintain the sites.

Urban green spaces ...
... support the protection of natural resources.

... provide wildlife habitat and positively affect species diversity.

... mitigate environmental stress associated with the urban climate, by their ecological regulatory effects, absorption of emissions, the reduction of noise, reducing air pollution, controlling water run-off and form important elements for storm water management and sustainable urban drainage systems.

Urban green spaces ...
... define the urban structure.

... give local character and identity, provide distinctive landscape and give legibility and structure to the urban fabric.

... contribute to the aesthetic, historical and cultural identity of a city, provide a natural balance to built form and can be developed as a green network to ensure contact with the natural world.

Potential Functions and Benefits of Urban Green Spaces

Social Functions

Ecological Functions and Environmental Benefits

Economic Benefits

Design and Planning


London’s green spaces include parks, allotments, commons, woodlands, natural habitats, recreation grounds, playing fields, agricultural land, burial grounds, amenity space, children’s play areas, and accessible countryside in the urban fringe. Civic squares such as squares, piazzas and market squares also form part of the open space network56.
Improving the green spaces for social housing

Of all our green and open spaces, those of social housing estates are generally some of the worst. The quality of open spaces within and around social housing estates has declined dramatically since their creation, leaving many under-used and in a state of neglect.

Neighbourhoods Green is a project which seeks to improve the green spaces for social housing. It is led by Notting Hill Housing Trust and Peabody Trust, with Groundwork London managing elements of project delivery. Neighbourhoods Green aims to highlight the importance of green spaces for the residents of social housing, and to raise the quality of their design, management and safe-use within social housing providers. It provides guidance, support and tools for housing associations, local authority housing departments, tenants associations, and their partners.

Encouraging the use of open spaces

Providing and maintaining open spaces has an important role to play in tackling obesity. However, health benefits can be further maximised by encouraging initiatives that promote the active enjoyment of these spaces. Examples of such initiatives include:

Walking the Way to Health Initiative (WHI) which aims to get more people walking in their own communities, especially those who take little exercise or live in areas of poor health. WHI is an initiative of the British Heart Foundation and Natural England. It is estimated that since 2000, the WHI have encouraged over a million people to walk more.
3.3 OBESITY AND CARDIO-VASCULAR DISEASE

The Green Gym run by the British Trust for Conservation Volunteers (BTCV) is a scheme that seeks to inspire people to improve their health and the environment at the same time. It offers opportunities to work in open spaces through local and practical environmental and gardening work.

Allotments: Allotments provide a means of promoting physical activity at the same time as providing opportunities for local food growing. They also positively contribute to stress reduction, mental health, and encouraging social interaction and inclusion.

The role of allotments in providing a resource for healthy living has been identified in Seixal, Portugal where an allotment garden project has been initiated to provide a new resource for healthy urban development. The project was developed in response to Seixal joining the WHO City Action Group on Healthy Urban Planning in 1998. The invitation to Seixal to join this group arose from problems relating health to urban planning in the city. A number of innovative policies and projects were initiated in response to this membership, of which one was the allotment garden project.

The Mayor of London’s Food Strategy (2006) provides information on the role of allotments in London.
Case study 6: Tackling obesity and cardiovascular disease through the refurbishment of an urban park – Mile End Park, Tower Hamlets

Prior to refurbishment, Mile End Park was a bleak, fragmented and under-used open space in the centre of the London Borough of Tower Hamlets. Tower Hamlets has a large population but little good quality open space.

Refurbishment of the park included a number of measures which sought to encourage healthy lifestyles for those living and working in Tower Hamlets:

- Provision of safe and attractive pedestrian and cycle routes, e.g. the Pathway, which runs the length of the park, and the Green Bridge, which links two parts of the Park previously separated by a major road. These routes are likely to encourage walking and cycling as a recreation activity within the park itself and also encourage the use of sustainable modes of transport to access work or local services and facilities where they form part of wider pedestrian and cycle networks.

- The pathways have been designed to include careful grading, ensuring that the park and its facilities are accessible to all, including young children, older people and wheelchair users. Inclusive access and ease of use encourages the use of open spaces and leisure facilities and the promotion of active lifestyles for all groups of people.

- Provision of water sport, leisure, art and play facilities, e.g. the Play Arena, encouraging active outdoor exercise. These facilities are widely used by local residents, for example, in commenting on the refurbished park, one local resident commented that ‘I usually come here with my mates to play football or cricket. It feels great to have a place like this’.

The health benefits associated with the refurbishment of Mile End Park could be further enhanced by providing people with clear information about the availability of safe and enjoyable opportunities to be active in the park. For example, ‘active-living maps’ could be designed illustrating facilities that offer physical activity facilities and setting out the location of pedestrian and cycle routes and where they link to wider walking and cycling networks.

Maintaining the long term quality of open spaces is crucial if their integrity is to be preserved and their use is to be encouraged. This was recognised by the project team redeveloping Mile End Park. To maintain the quality of this Park, rents from the shops bordering the Park go towards park maintenance and all revenue generated by park facilities is allocated to pay for park directors, rangers, events and general upkeep.
Win/wins of the Mile End Park refurbishment

In addition to incorporating measures to encourage more active and healthy lifestyles, the design of Mile End Park included other features which positively contribute to health, including:

- **Being designed to create a sense of well-being for its users with pleasant routes and large trees.** Surfaces on paths are comfortable for both pedestrians and cyclists and variations in height, planting and special features create continuous visual interest. This approach to design will help to provide a tranquil visual interlude in an otherwise heavily built up area, helping to reduce stress and anxiety for local residents and people who work in the area.

- **Provision of extensive planting, including mature trees, helps to improve local air quality, absorb emissions and reduce noise, having positive effects on mental health, cardiorespiratory diseases and stress.** In addition, trees and vegetation provide shade, helping to mitigate the urban ‘heat island’ effect, ensuring the usability of the park in a changing climate.

- **Opportunities to relax and contemplate are well catered for in the park through the positioning of well designed benches.** There are also numerous opportunities for informal seating on walls and steps. Social spaces are likely to encourage participation and social inclusion, positively contributing to health.
3.3.4 Accessibility to new and existing sport and leisure facilities

The provision of good quality accessible public services, including sport and leisure facilities, has a direct positive effect on human health\(^6^0\). Sports and leisure facilities, such as leisure centres, swimming pools and outdoor sports grounds provide important opportunities to increase activity levels through exercise. A recent study found that creating or improving access to places for physical activity can result in a 25% increase in the percentage of people who exercise at least three times a week, especially when combined with the distribution of information about the benefits and opportunities for active living\(^6^1\).

In addition to helping to tackle obesity and cardiovascular disease, increasing the number of and access to these opportunities has a number of wider benefits, such as increasing public participation and community ownership, and minimising the need to travel (see Part 3.4 which illustrates the impact of reducing travel on respiratory disease). Sport and leisure facilities should therefore be provided for by boroughs in all areas where there is currently a deficit for the local community.

Sport England has set up a database of sports facilities throughout England. This enables individuals to search for facilities within their local area. Improving individual awareness of local sports facilities is a step towards more active lifestyles.\(^1^0\)

Sport England has also recently prepared design guidelines on how to promote opportunities for sport and physical activity in the design and layout of development.\(^1^0\)
Case study 7: Encouraging physical activity through refurbishment of a recreation ground - Lammas Park, Staines

Lammas Park is situated on the north bank of the River Thames to the west of Staines. Until recently, facilities for physical activity in the park were limited; it offered a paddling pool for younger children although this no longer met safety guidelines as set out by the Royal Society for the Prevention of Accidents (RoSPA).

Following engagement with the local community, new recreation facilities were provided, including a skateboard park and a spray-ground – a water feature with a series of touch pads that when jumped or trodden on release jets of water.

These facilities have dramatically increased usage of the park, which is now a major leisure attraction for the people of Spelthorne and the surrounding area. The popularity of the skate park has been demonstrated by the fact that it has had to be repainted after six months rather than the two or three years initially recommended by the contractors.

The park now aims to offer something for all groups of people from the very young to older people. In addition to the skateboard park and spray-ground, its facilities also include tennis, crazy golf, croquet, giant chess and draughts. This provides the resources to encourage physical activity in Spelthorne and the surrounding area, promoting healthy lifestyles and helping to address obesity and cardiovascular disease.
Win/wins

- There were problems in Staines town centre with anti-social behaviour. Young people with skateboards were causing a nuisance by using town gardens and benches as they had no dedicated space. Due to the success of the skateboard park, levels of anti-social behaviour in Staines town centre have diminished.

- A ‘Skateboard forum’ had been created to develop designs for the new skateboard park. This helped to engage local people and build a closer community.

- Improving facilities at Lammas Park encourages local residents to visit the park even if they do not intend to use the facilities. This has a number of health and wider benefits.

- Lammas Park is located close to Staines town centre with its excellent transport links. Its facilities are therefore easily accessible by walking, cycling and public transport. These forms of transport have additional health benefits.

Conflicts/constraints

- Many communities report that young people playing ball-games or skateboarding in a public open space are a nuisance. However, the recreation needs of children and young people need to be met alongside the needs of all other groups.
Case study 8: Integrating leisure facilities within a healthcare centre - St. Peter’s Integrated Health and Leisure Centre, Burnley

Community health centres, hospitals and long-term care facilities have an obligation to set an example by creating and improving opportunities for participation in physical activity\(^{62}\). Health professionals who work in these centres are credible spokespeople for the value and benefits of regular physical activity and are ideally placed to suggest interventions that motivate people to increase physical activity\(^{63}\).

The St. Peter’s Centre, located in the heart of Burnley, is a combined leisure and primary care centre housed in one building. The project was initiated to raise the health and other needs of the local population. It provides health services integrated with leisure facilities, including a swimming pool, sports hall, squash courts and dance facilities. This integrated approach to healthcare sends a strong message to the residents of Burnley of the relationship between an active lifestyle and good health.

Encouraging healthy travelling to healthcare facilities

Sustrans, a charitable group promoting active transport, has produced a guide for health care organisations to promote healthy travel for staff and visitors. The guide encourages travel guidance to be set out in the healthiest order – starting with walking and cycling, then public transport (because there is usually a walk at each end of the journey) and finally car travel. Information about car driving and parking should be discussed last so that healthier ways to travel are most prominent. The guide also encourages choosing meeting rooms and venues according to healthy travel as well as access to people with disabilities\(^{64}\).
Win/wins

- Encouraging an active lifestyle will help to address obesity and cardiovascular disease in addition to a number of other health-related issues, e.g. regaining health and vigour following an illness or injury, and mental health.

- Sports and recreation facilities, along with community facilities, help to contribute to the area's social capital through interactions with other members of the community.

- Promoting healthy travel to healthcare organisations for staff and visitors has wider benefits, including reducing traffic volumes and congestion, which have positive effects on respiratory disease by reducing air pollution.

See Section 3.4 for information on the effect of healthy travel on respiratory disease.
Recommendations: Planning for Obesity and Cardiovascular Disease

Open and Green Space

• Create and develop green and open spaces in new developments.
• Integrate additional and protect existing opportunities for physical activity in parks and green spaces.
• All public spaces should offer inclusive access, ease of use and be affordable, providing opportunities for recreation for all groups of people.
• The provision/refurbishment of open spaces should contribute to a network of open spaces, by either improving linkages or contributing to areas of deficiency.
• Planning for open spaces in the future will need to consider the impacts of climate change.

Management and Maintenance

• Open spaces should be maintained to a high level of general quality. The quality of these facilities is key to how regularly they are used by those in the local community.
• Employ park attendants to make park users feel safe.

Sport and Recreation Facilities

• Plan and design for active living. Ensure that planning documents and guidelines address the impact on residents’ ability to engage in physical activity.
• Provide people with clear information about the availability of safe and enjoyable opportunities to be active. Design and promote a community-wide active living map of parks, paths, cycle and pedestrian routes and facilities that offer physical activity programmes.
• DPD policies should protect and enhance facilities and access to facilities which enable young people to play within their local neighbourhoods.
• Ensure sports facilities are integrated in new developments and regeneration projects.
• Provide recreation and sport facilities that are accessible to all and are affordable.

Healthcare Provision

• Local planning authorities should collaborate with health and long-term care facilities to increase opportunities for active living and appropriate physical activity for their employees and patients/residents.
• Local planning authorities should encourage health professionals in primary care settings to promote active living and to motivate inactive people to begin appropriate moderate exercise.
• Promote healthy travel to healthcare organisations for staff and visitors.
3.4 RESPIRATORY DISEASE

3.4.1 Evidence Base

There is strong evidence that short-term exposure to respirable particles (PM$_{10}$) in urban areas increases deaths and respiratory and cardiovascular hospital admissions. The primary source of PM$_{10}$ in urban areas is motor traffic. Nitrogen dioxide modifies the effect of PM$_{10}$ such that daily mortality increases further when high concentrations of PM$_{10}$ are in combination with high long-term concentrations of nitrogen dioxide. Nitrogen dioxide is also produced by motor vehicle exhausts.

Increases in ozone also lead to increases in deaths and respiratory hospital admissions. Ozone is created by the action of sunlight on nitrogen dioxide in the presence of volatile organic compounds (VOCs). Ozone may be transported over long distances giving rise to population exposure in both urban and rural areas.

It has been estimated that if actions are put in place to address respiratory problems associated with transport, it could save the NHS £1,400 - £2,500 per admission to hospital avoided.

Spatial planning can modify the total volume of traffic as well as congestion of traffic at certain locations. This may have a preventative effect on population cardio-respiratory disease by reducing air pollution.

There is evidence that residents are more likely to report exacerbations of asthma, coughs and respiratory infections following exposure to flooding.

Spatial planning can minimise the risks of flooding through design and careful location of vulnerable land-uses.

Further information on the evidence base underpinning the links between respiratory disease and spatial planning is provided in Appendix 3.4.
3.4.2 Case studies

As indicated in the evidence base, measures to address respiratory disease focus around the improvement of air quality, specifically on reducing emissions from transport, and minimising exposure to flooding.

3.4.3 Tackling respiratory disease by improving air quality

Management of London’s air quality is considered within the Mayor’s Air Quality Strategy (2002)\textsuperscript{66}, with an aim “…to improve London’s air quality to the point where it no longer poses a significant risk to human health.”

A key planning intervention to address air pollution is the designation of Air Quality Management Areas (AQMAs). Local authorities have been assessing and reviewing air quality in their area since December 1997. This has involved measuring air pollution and trying to predict how it will change in the next few years in order to ensure that national air quality objectives will be achieved\textsuperscript{67}. If a local authority finds any locations where objectives are not likely to be achieved, it must declare an AQMA and prepare a plan to improve the air quality of this area, called a Local Air Quality Action Plan\textsuperscript{68}. Camden’s Air Quality Action Plan is described below as an illustration of how such Action Plans can positively affect health.
Case Study 9: Camden’s Air Quality Action Plan

The pollutants of most concern in Camden are PM$_{10}$ and nitrogen dioxide. Local road traffic emissions are the dominant source of PM$_{10}$ and nitrogen dioxide in the borough. Based on emissions data, Camden declared the whole borough an AQMA in September 2002. The Camden Air Quality Action Plan sets out both current and new actions to address air pollution and to meet national air quality objectives. These are considered below in terms of area wide schemes and promoting alternative modes of transport.

Area Wide Schemes

A major Area-Wide scheme to address air pollution is the London-wide Low Emission Zone (LEZ) which aims to move London closer to achieving national and EU air quality objectives for 2010, and to improve the health and quality of life of people who live and work in London. The proposed LEZ will encourage vehicle operators to clean up their fleets. It would mean lorries, coaches and buses failing to meet a minimum pollution standard would pay a charge if they drive polluting vehicles into Greater London.

The anticipated health related benefits of the proposed LEZ in terms of PM$_{10}$ are summarised below:

<table>
<thead>
<tr>
<th>Health statistic</th>
<th>Annual benefit (relative to 2005 baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer deaths brought forward$^a$</td>
<td>11-18 deaths</td>
</tr>
<tr>
<td>Fewer respiratory hospital admissions$^a$</td>
<td>11-17 admissions</td>
</tr>
<tr>
<td>Fewer cases of bronchitis$^b$</td>
<td>29-45 cases</td>
</tr>
<tr>
<td>Fewer cases of chronic cough$^b$</td>
<td>609-964 cases</td>
</tr>
<tr>
<td>Fewer cases of congestive heart failure$^b$</td>
<td>26-36 cases</td>
</tr>
</tbody>
</table>

$^a$ Committee on the Medical Effects of Air Pollution (1998).
$^b$ ExernE (EC, 2000)

Promoting sustainable modes of transport

As set out under Case Study 8: Encouraging healthy travelling to healthcare facilities, promoting the use of walking, cycling and public transport encourages physical activity (public transport usually requires a walk at each end of the journey) which helps to address obesity and cardiovascular disease. It also reduces traffic volumes and congestion, having a positive effect on respiratory disease. The promotion of these sustainable modes of transport in Camden is primarily achieved through a number of initiatives, including the Camden Walking Plan, Cycling Plan, and Public Transport Plan.
Walking

The Camden Walking Plan sets out a series of practical actions being taken by the Council to encourage walking in the borough. In addition, the Mayor’s Transport Strategy (2001) has set out plans to create ‘Streets for People’ that seek to create or improve amenities including street lighting, seating and traffic calming.

Examples of some of the key actions already taken and still to be implemented to encourage walking in Camden include:

- Monthly inspections of footpaths especially those pavements with the highest number of trip complaints.
- Improving pavement surfaces and removing clutter.
- Tactile pavements and dropped kerbs at road crossings.
- Street lighting renewal and improvement programme.
- Seating and pedestrian signage.
- Camden and Islington Health Walks.

How can neighbourhood ‘walkability’ be improved?

The Neighbourhood Environment Walkability Scale can be used to assess residents’ perceptions of what makes a neighbourhood conducive to walking. Typically they use data from geographic information systems and residents’ responses to calculate and measure attributes such as:

- Residential density;
- Proximity to and ease of access to non-Residential facilities;
- Street connectivity;
- Walking facilities such as paths; and
- Road safety.

Studies show that residents in highly walkable neighbourhoods rate residential density, land use mix and street connectivity higher than residents in poorly walkable neighbourhoods. These attributes should be used in designing new developments or regeneration projects to encourage residents to walk rather than using the car.

A Home Zone is a residential street, or group of streets, designed for community use – i.e. for pedestrians and cyclists rather than for people in cars.
Cycling

The Camden Cycling Plan recognises the many barriers to cycling, including fear of injury, fear of theft and lack of good facilities. The Camden Cycling Plan, which stems from the National Cycling Strategy, aims to overcome such barriers. The Plan aims to go some way towards meeting one of the key targets of 10% of all journeys in London to be made by bicycle by 2012. Proposals in the Plan include new cycle routes and lanes, advanced stop lines to help cyclists through signalled junctions, signalled control cycle crossings, and more cycle parking stands.

Public transport

The Local Air Quality Action Plan recognises the role of public transport in reducing road traffic. The London Borough of Camden and Transport for London (TfL) plan to make public transport more efficient, reliable and quicker. The Mayor’s Transport Strategy also sets out plans to tackle London’s transport problems. The Mayor’s core principles are to invest in increasing safety, reliability, capacity and comfort and to improve the infrastructure of public transport.

Win/wins

In addition to reducing traffic volumes and congestion (thereby improving air quality and reducing respiratory disease), encouraging walking and cycling also helps to promote active lifestyles, positively addressing obesity and cardiovascular disease.
Minimising exposure to flooding

Minimising exposure to flooding can help to reduce the risk of respiratory infections.

**Recommendations: Planning for Respiratory Disease**

**Road Traffic Emissions**

- Ensure LDFs encourage and promote walking and cycling rather than reliance on the private car for short journeys.
- Address existing barriers to or deficiencies in provision for walking and cycling.
- Promote improvements to walking and cycling facilities within and around new developments.
- Increase walking and cycling through developing green/active workplace and school travel plans.
- Provide high-quality, segregated pedestrian and cycle paths, which are direct and provide good connections to the existing patterns of streets, and to bus stops, stations and local amenities, as part of major new developments.

**Flooding**

Refer to recommendations set out under **Recommendations: Planning for Mental Health**.
3.5 EXCESS WINTER (COLD) AND SUMMER (HEAT) MORTALITY

3.5.1 Evidence Base

Urban areas generate a ‘heat island’ effect and London can be up to 8% warmer than rural areas and night temperatures in the city can remain above 19°C. Mortality increases in hot weather and elderly people are particularly vulnerable; in the 1995 heatwave in London there was a 16% excess in deaths for all ages and those aged over 85 had a 20% excess mortality. Climate change will further exacerbate this problem.

Spatial Planning can ensure that measures are incorporated into the layout of a development to reduce the heat island effect.

In England approximately a third of excess deaths in winter (18 excess deaths per 100,000 adults) are related to low indoor temperatures and 90% of these occur in those more than 65 years of age. Three thousand pensioners died in London in winter 2006 of cold related illnesses.

Poor home insulation and fuel poverty contribute to the problem.

Spatial Planning can ensure that measures are incorporated into building design to improve insulation.

Further information on the evidence base underpinning the links between excess winter (cold) and summer (heat) mortality and spatial planning is provided in Appendix 3.5.
3.5 EXCESS WINTER (COLD) AND SUMMER (HEAT) MORTALITY

3.5.2 Case Studies

As indicated in the evidence base above, measures to effectively address excess summer (heat) mortality relate to the inclusion of measures in development layout to address overheating. Measures incorporated into building design to improve insulation can tackle excess winter (cold) mortality.

3.5.3 Excess Summer Heat Mortality

There is strong evidence linking the number of deaths and likelihood of deaths with hot weather, and elderly people are particularly vulnerable. This is a key issue in London due to the predicted impact of climate change and ‘heat island effect’.

The Consultation Draft Supplementary PPS on Climate Change recognises that the urban heat island effect may be more pronounced in those in low income households as they are more likely to live in high density social housing where ventilation cannot be easily retrofitted. This is also notable within the elderly community who have fixed incomes and are less able to pay for adaptation measures.

PPS Sustainable Development, PPS Regional Spatial Strategies and PPS Local Development Frameworks all require that development is located to take account of climate change impacts.

PPS Housing recommends that “…Local Planning Authorities should encourage applicants to bring forward sustainable and environmentally friendly new housing developments, including affordable housing developments, and in doing so should reflect the approach set out in the forthcoming PPS on climate change…”

The London Plan Further Alterations includes recommendations for strengthened climate change policies. For example, Policy 4A.2i Sustainable Design and Construction suggests that DPDs should include policies which incorporate measures to “…manage overheating…”

London Plan Policy 4A.5iv specifically relates to overheating and recommends encouraging development that “…avoids internal overheating and excessive heat generation and contributes to the prevention of further overheating especially where the urban heat island is most intense…”

It is recognised that dealing with excessive summer heat is largely a design issue, although DPD policies can be worded to include for adaptation measures. There are a number of interventions which could be included in new developments, both within site layout and at building scale. It is not the intention to illustrate all of these, as more detailed good practice examples are provided elsewhere, such as:

- Adapting to Climate Change: A good practice guide for sustainable communities.
- Adapting to Climate Change: A Checklist for Development.
Site Layout

Green spaces

The inclusion of green spaces within site layout, provides an opportunity for people to sit outside during warmer weather (particularly if trees are provided for shading – deciduous species will also allow solar gain in winter) and help reduce local heat island effects.

Building Orientation

When considering building layout and orientation the opportunity for natural ventilation should be maximised. For example the top levels of buildings may be set back from street level to encourage natural ventilation. Buildings may also be orientated to face prevailing winds and hence maximise natural ventilation.

Building Scale

Green Roofs

Green roofs, can be planted with heat-absorbing species and provide an opportunity to reduce the effect of the urban heat island effect. These are of particular value in city centre locations where space is scarce and buildings tend to be high-rise and high density (these are also the hottest parts of the city).

Thermal Mass

Thermal mass can be used to store heat temporarily e.g. in structures or spaces (such as construction materials) and prevent internal areas heating up. Effective ventilation is required to release this stored heat at night.

The type of thermal mass will depend on the expected development use and occupancy.

Source: Marcus Lyon
3.5 EXCESS WINTER (COLD) AND SUMMER (HEAT) MORTALITY

**Shading**

Shading can be used to minimise heat gains. Shading can be permanent or movable and can be retrofitted into existing buildings. Shading can be provided by planting e.g. deciduous trees.

Awnings are a temporary form of shading which may be extended when required and can be easily retrofitted.

New developments should be designed to include permanent shading e.g. louvres or balconies which can be used to shade lower stories. Case study 10 provides an example of how building design can be adapted to take account of the effects of climate change.
Case study 10: Beddington Zero Energy Development (BedZED), London

The BedZED development in South London was designed to include a number of innovative, sustainable techniques including a thermally stable environment.

Terraced houses are south facing and have triple storey conservatories to maximise heat gain from the sun. Large areas of exposed thermal mass e.g. ceilings and walls enable heat to be stored to avoid excessive heat gain in summer. Heat can escape through sunspaces (open windows provide a cool-down function) and ventilation “cowls” on the roofs.

The thermal mass and high building insulation also ensures heat gains are maximised in winter – reducing the likelihood of winter mortality. The buildings at BedZED have green roofs which provide an additional means to absorb heat.

Win/Wins

- Thermal mass and ventilation provide a means to control temperatures in summer and hence reduce health effects arising from increased temperatures.
- Heat can be stored in winter reducing the health effects of lower temperatures.
- Green roofs provide green spaces encouraging biodiversity which can have indirect health benefits e.g. on mental health.
- Increased ventilation can help reduce the causes of asthma exacerbations (e.g. dust mites allergen, mould spores etc) reducing the likelihood of asthma attacks.

Conflicts/Constraints

- It is difficult to control temperatures in prolonged hot periods – more likely under climate change scenarios.
3.5 EXCESS WINTER (COLD) AND SUMMER (HEAT) MORTALITY

The need to Retrofit.

As described earlier, the urban heat island effect may be more pronounced in low income households, particularly high density, social housing where ventilation and other adaptation measures cannot be easily retrofitted.

To tackle the health impacts and inequalities arising from high summer temperatures, spatial planners should keep abreast of evolving research into retrofitting such as that recently commissioned by the London Climate Change Partnership (LCCP).
3.5.4 Excess Winter (Cold) Mortality

There is **strong** evidence in the literature linking winter mortality and home insulation, with the elderly being particularly vulnerable.

Reductions in winter mortality can be achieved in new developments and regeneration schemes through inclusion of some of the interventions described above e.g. high thermal mass in buildings (to store heat in winter) and ensuring buildings are orientated to maximise solar gain. Buildings should be well insulated to ensure they do not lose heat in winter.

Winter deaths (caused by lower winter temperatures in existing homes) are being partly addressed through the Government’s Warm Front Initiative. This scheme aims to end Fuel Poverty by providing grants which offer a package of insulation and heating. The Mayor also supports the Winter Warmth Campaign providing advice to Londoners about how to stay warm in winter.

Local Area Agreements (LAAs) also provide a means to address fuel poverty. For example, Swindon’s LAA partnership has set a target in the Healthier Communities and Older People block to increase energy efficiency in private sector and social housing occupied by vulnerable people. The target will be delivered by the Local Affordable Warmth Partnership.

**Recommendations: Planning for Excess winter (cold) and summer (heat) mortality.**

- Planners should work with PCTs to monitor mortality and illness from excess summer (heat) and excess winter (cold) within the borough on an annual basis. This should be used to identify which neighbourhoods and housing schemes require retrofitting measures or regeneration.

**Excess summer (heat) mortality**

- DPD policies should promote new developments and regeneration schemes which include measures to adapt to overheating.
- New developments/regeneration schemes should be adapted according to their specific location e.g. green roofs can be provided in city centres where space is limited.
- Planners and designers should have regard to existing standards e.g. Building Regulations, BREEAM and Code for Sustainable Homes.
- Planners and designers should be aware of potential conflicts arising from adaptation measures e.g. excessive planting to provide summer shade may increase fear of crime and create anxiety.
- Retrofitting for the effects of climate change is essential to tackle health impacts and inequalities in existing developments. Planners should recognise this within their DPDs and keep abreast of evolving research.

3.6 INJURIES

3.6.1 Evidence Base

Injuries account for 3% of annual deaths in the UK. Injury is the greatest threat to life in children and young people and road traffic accidents (RTA) are the leading cause of death whereas falls cause 4.1% of injury deaths in older age groups. Increased vehicle speeds resulting from decreased traffic congestion (to address air pollution issues) may increase Road Traffic Accident (RTA) injuries. RTAs show substantial inequalities between groups of differing social class.

Annually, injuries lead to 720,000 admissions to hospital and 6 million emergency department visits.

Twelve month data from the Department for Transport (DFT) for the Metropolitan Police Force area reported a total of 29,775 road casualties in 2006 (of which 226 were fatalities). The cost burden of every fatality in London is £1.4 million.

There is good evidence that area-wide traffic calming reduces child pedestrian injury rates and also reduces the differential in rates based on inequalities in social groups.

There is evidence that bypasses decrease accident rates but the evidence for new major urban roads and their effect on local road networks and accidents is less strong.

Spatial planning can address road safety through the introduction of traffic calming.

Injuries in the home are common but the evidence of effects of environmental adaptation in the home is weak.

Injury rates associated with flooding are of the order of 0.4%.

Spatial planning can minimise the risks of flooding through design and careful location of vulnerable land-uses.

Further information on the evidence base underpinning the links between injuries and spatial planning is provided in Appendix 3.6.
3.6.2 Case Studies

Spatial planning can address road safety through the introduction of traffic calming (this is illustrated in Case Study 11 below). Spatial planning can prevent flood risk, and the design of flood resilient buildings can reduce the likelihood of injuries arising from flooding.

3.6.3 Road Layout and Traffic

As noted above, there is strong evidence demonstrating the use of traffic calming measures as a means to reduce road traffic deaths and injuries. Traffic calming aims to reduce traffic speed and volumes and hence road traffic related injuries.

Traffic calming measures take a variety of forms such as:

- Vertical and horizontal shifts in traffic (e.g. road humps, speed cushions, raised crosswalks, raised sections of road, chicanes, mini-roundabouts, road narrowing, channelised slip lanes etc).

- Optical measures (chevron road signs, road surface treatment, reduced horizontal visibility, audible measures such as rumble areas and alterations to road lighting).

- Redistribution of traffic or alteration to road hierarchy (e.g. permanent or temporary blocking of road, diagonal blocks, gateways, creation of one-way streets, re-introduction of two-way streets, four-way stops).

- Changes to road environment (increased vegetation along road, introduction of street furniture).
3.6 INJURIES

Case study 11: Home Zone West Ealing, London

A Home Zone is a residential street, or group of streets, designed for community use – i.e. for pedestrians and cyclists rather than for people in cars. It is based on the Dutch ‘woonerv’ concept, where pedestrians and cyclist have legal priority over motorists.

Home Zones can be achieved by the modification of existing streets, or can be designed as part of a new housing development. There is currently no specific legislation supporting UK Home Zones. However, the UK DfT provided funding for 59 Local Authorities as well as nine pilot studies to promote Home Zones.

One of the pilot studies included a scheme in West Ealing, London comprising five roads: Hastings Road, Hartingdon Road, Broughton Road, Denmark Road and Arden Road.

The area became congested and dangerous, with the roads used as short-cuts to avoid traffic lights on the A4020 Uxbridge Road and non-residents parking in the streets. RTAs were also a risk – a child resident was hit and injured by a non-resident car.

Residents from each of the roads formed a group, the Five Roads Forum, to encourage Ealing Council to pilot a Home Zone in the area. The resident group was proactive, appointing a Chairperson, attending regular meetings, publishing a newsletter and designing and maintaining a webpage. Residents regularly liaised with the project officer from Ealing Council and provided input into plans for the neighbourhood.

Proposals took time to agree and implement (up to five years from establishment of the Home Zone) and included:

- Closure of a ‘rat-run’ at Hastings Road (2002).
- Changed road layout to incorporate 30-degree parking bays (2003).
- Speed bumps in Hastings Road (2003).
- Road markings to create chicanes (2003).
- Creation of a playspace in Arden Road (2003).

There have been no follow-up studies to measure the reduction in RTA’s, or how perceptions of road safety have changed. However, discussions with the Chairperson of the Five Roads Forum indicated that generally the area is a much nicer place to live in, people considered their quality of life to have improved and the process engendered a sense of community spirit and neighbourliness.
Win/Wins

- Traffic calming measures are a proven means to reduce injury rates.
- Homezones require well-organised and cohesive community participation. This may indirectly benefit mental health (e.g. by reducing isolation).
- Reducing traffic and congestion in selected streets may help address other public health issues such as cardio-respiratory disease from vehicle pollution.
- By reducing traffic within an area, residents will be encouraged to walk and cycle, promoting healthier lifestyles.

Conflicts/Constraints

- Interventions may take a long time to agree and implement.
- A high level of independent community involvement and mobilisation required.
- There may be delayed response rates of emergency services to the streets within the Zone.
- Road closures may shift the problem elsewhere i.e. not reducing traffic overall.
3.6 INJURIES

3.6.4 Inequalities in Child Pedestrian Injuries

Pedestrian injuries from traffic are a leading cause of death and disability in children and a major cause of health inequalities. Studies have shown that children from the most deprived areas are 4-5 times at greater risk of involvement in a pedestrian road traffic accident than more affluent children.

A comparison was undertaken of two cities in Wales, one were most traffic calming was concentrated in the most deprived parts of the city and one were traffic calming was more evenly distributed between areas.

An analysis of the results demonstrated a greater narrowing of the inequalities gap (in childhood pedestrian injury rates) in the city with the traffic calming concentrated in the deprived areas.

3.6.5 Designing for People instead of Cars

The Home Zones principle and case study above focus on the use of traffic calming measures and road closures to achieve a reduction in traffic speeds.

Another means to reduce road traffic accidents is to design cities for people instead of cars. This has been successfully implemented in the City of York where a hierarchy of transport users is applied when planning land use and transport. A similar hierarchy is promoted in the recent publication ‘Manual for the Streets’. This hierarchy should be considered by developers during scheme design.

<table>
<thead>
<tr>
<th>User Hierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider First</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Consider Last</td>
</tr>
</tbody>
</table>

Reproduced from Table 3.2: User Hierarchy, Manual for the Streets.
The Manual also provides a hierarchy to address road safety problems. This is reproduced in the table below. As noted, means to reduce overall traffic volume should be considered first.

<table>
<thead>
<tr>
<th>Pedestrians</th>
<th>Cyclists</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consider First</strong></td>
<td><strong>Consider Last</strong></td>
</tr>
<tr>
<td>Traffic volume reduction</td>
<td>Traffic volume reduction</td>
</tr>
<tr>
<td>Traffic speed reduction</td>
<td>Traffic speed reduction</td>
</tr>
<tr>
<td>Reallocation of road space to pedestrians</td>
<td>Junction treatment, hazard site treatment, traffic management</td>
</tr>
<tr>
<td>Provision of at-grade crossings, improved</td>
<td>Cycle tracks away from road</td>
</tr>
<tr>
<td>pedestrian routes on existing desire lines</td>
<td></td>
</tr>
<tr>
<td>New pedestrian alignment or grade separation</td>
<td>Conversion of footways/footpaths to adjacent or shared-use routes for pedestrians and cyclists</td>
</tr>
</tbody>
</table>

Adapted from Table 4.1: The hierarchies of provision for pedestrians and cyclists, Manual for the Streets.

Traffic calming (i.e. traffic speed reduction) sits high on the road safety hierarchy and provides an effective mechanism to reduce injury rates in existing areas. New schemes should aim to reduce traffic overall i.e. by designing firstly for the pedestrian and discouraging car use.

The Mayor of London has been making ongoing improvements to the existing environment in London to encourage more journeys on foot or by bike and discourage use of the car. This has included the introduction of the congestion charging scheme into central London in February 2003.

TfL’s 4th Annual Monitoring published in 2006 noted that:

- Traffic patterns in and around the charging zone remained broadly stable during 2005.
- The changes to the scheme introduced in July 2005 were associated with small net reductions in traffic volumes.
- Reductions in congestion inside the charging zone over the whole scheme period now average 26%.
- 2004/2005 saw substantial further falls in the number of road accidents across Greater London, reflecting wider TfL and borough road safety initiatives – up to 40–70 fewer personal accidents directly due to congestion charging.
- An increase in cycling within the zone of 43%.

Other schemes include the London Cycle Network Plus (LCN+) which aims to improve London’s infrastructure for cyclists in line with the Mayor’s Cycling Action Plan by creating a well-designed cycle network that is fast, safe, convenient and easy to use. This will help promote cycling as a viable alternative to travel by car.
3.6 INJURIES

Flooding

Minimising the risks of flooding can reduce the likelihood of flood-related injuries.

Recommendations: Planning to reduce Injuries

Road Safety

- Policies which reduce dependency on the car by encouraging walking, cycling and public transport use should be promoted at LDF level and/or within Local Implementation Plans for Transport.
- New schemes should design for pedestrians as a priority.
- Traffic calming measures provide a proven means to reduce accidents in existing streets/neighbourhoods and in regeneration schemes or new developments.
- Focusing traffic calming in deprived areas will help reduce inequalities in child pedestrian injury rates.

Designing to Reduce the Impacts of Flooding

Refer to recommendations set out under Recommendations: Planning for Mental Health.
4 - A SPATIAL PLAN FOR HEALTH
4.1 INTRODUCTION

Part 3 provides evidenced-links between spatial planning and health. Case studies were then used to explore how healthier outcomes could be delivered. We identified the lessons learnt from these case studies, aiming to move towards better practice.

Part 4 aims to provide a policy framework and set of tools to help planners and health practitioners address the recommendations arising from Part 3. The Diagram below summarises the tools that have been developed and illustrates their links to the planning system and the spatial scale at which they should be implemented.
4.2 GOOD PRACTICE HEALTH POLICY WORDING

As discussed in section 4.1, a series of good practice policies have been developed which planners and health practitioners should refer to when preparing and commenting on LDF documents. The policy framework has been developed as if it were a section within a Core Strategy. However, the principles underpinning the good practice policies will be relevant to plans at all levels and spatial scales and could be applied to the wider LDF (for example if a specific Health DPD or Supplementary Planning Document is to be prepared). Thus, we recommend that the policies be cherry-picked and adapted as appropriate to local circumstances.

4.2.1 Considering options for health

Plans should demonstrate that all relevant policy options have been considered and assessed. How then does a LPA develop options for health? There are two key considerations which should be made in identifying these options, including:

- The use of a robust evidence base to identify health issues and develop health options and to provide a framework to test those options.
- The number, type and quality of healthcare facilities to be provided in the borough is likely to comprise options for health. For example, whether there should be a shift in the provision to focus resources on primary care facilities rather than acute facilities; whether there should be an increase in small local healthcare facilities or the provision of larger borough-wide facilities.

When policy options have been identified, SEA/SA provides an independent means of assessment. HIA can also be integrated into the SEA/SA process. See Section 2.2.1 for more information on SEA/SA and HIA.

Box 4.1 Testing the ‘soundness’ of the Core Strategy in relation to Options

In preparing the plan, has the LPA used the evidence base and provision of healthcare facilities to identify relevant alternatives to the policies and strategies contained therein?

Do the options address the health issues pertinent to the local population?
4.2.2 How to incorporate health within the Core Strategy

The Core Strategy sets out the long-term spatial vision for the local authority and the strategic policies and proposals required to deliver the vision. PPS1286 states that “…the policies prepared by the local planning authority should be founded on a thorough understanding of the needs of their area and the opportunities and constraints which operate within that area…” Before drafting policies therefore, planners, in conjunction with other stakeholders, should think about the local context of their area and, in particular, set out:

- An evidence-based profile of the local area;
- The issues arising from the local profile that should be addressed by the Core Strategy;
- A spatial vision of the area in the future; and
- A set of spatial objectives which fit the vision and address the identified issues.

The evidence-based profile, issues which should be addressed by the Core Strategy, spatial vision and spatial objectives will now be considered in turn to identify how health should be considered in their development.

An evidence-based profile

The profile should set out the context for the local authority including, for example, its area and population, economic base, transport links, and community and social facilities. Health should be drawn into this profile through, for example, health issues currently facing the local authority, the provision of and demand for authority-wide healthcare facilities (including the quality and type of these facilities), and links between socio-economic factors and health, specific to the local authority.
The profile must be evidence-based and locally distinctive. PPS12 states that “LPAs should prepare and maintain an up-to-date information base on key aspects of the social, economic and environmental characteristics of their area. LPAs should keep under review the following matters:

(i) the principal physical, economic, social and environmental characteristics of their area;
(ii) the principal purposes for which land is used in the area;
(iii) the size, composition and distribution of the population of the area;
(iv) the communications, transport system and traffic of the area (including accessibility by public transport); and
(v) any other considerations which may be expected to affect those matters.”

Box 4.2 Testing the ‘soundness’ of the Core Strategy in relation to the evidence-based profile

In preparing the profile, has the LPA:

- Set out health issues currently facing their area?
- Identified wider issues which may have indirect links to health and documented these links?
- Summarised the provision of and demand for authority wide healthcare facilities, specifically referring to the quality and type of these facilities?
- Provided a robust evidence base from which to draw out and monitor the health characteristics specific to their area?
Issues to be addressed

The profile should be used to identify local authority-specific issues which need to be addressed. These should include health issues currently facing the borough in addition to wider issues which may have indirect links to health.

Examples of the range of issues which could be identified are set out below:

Health issues could include:

- The number of road traffic accidents in [borough x] is higher than the average number of road traffic accidents for other London boroughs.
- Life expectancy in [ward x], a deprived ward in the borough, is significantly lower than [ward y], one of the more affluent wards in the borough.
- There are high levels of hospital admissions for respiratory disease in the borough.

Wider issues which may have indirect links to health include:

- There are high levels of unemployment in [ward x].
- There is a lack of affordable housing in the borough.
- There are poor public transport links in some areas of the borough.
- There is a low number of sports and leisure facilities and open and green spaces per 1000 population in the borough.
Spatial vision

The spatial vision should present the plan’s key areas of future focus in as concise a manner as possible, taking into account the issues arising from the profile. Where relevant, health should be integrated into the overall vision for the area, both in terms of direct health outcomes and wider outcomes which may have indirect links to health. The vision may include aspirations such as:

- A healthy place to live and work;
- A safe, prosperous and fair borough; and
- Equal access for all to homes, jobs, leisure and sports services, and community and healthcare facilities.

Although the spatial vision may consist of high-level aspirations, local authorities should consider how these relate to development and use of land on the ground. In relation to health, this would mean understanding how the health issues currently facing the borough (as identified from the local profile) can be managed through the planning process. For example, hospital admissions for respiratory disease may be particularly high in specific wards due to poor quality housing and/or road traffic pollution. Dealing with these issues may involve targeting regeneration to particular housing estates and/or introducing measures to reduce traffic levels.

The vision for the borough should be linked to the Community Strategy. PPS12 states that “…the LDF should be a key component in the delivery of the community strategy… setting out its spatial aspects where appropriate and providing a long term spatial vision…” Furthermore, the fifth test of soundness, (under the Conformity heading) requires DPDs to have regard to the authority’s community strategy.

Box 4.3 Testing the ‘soundness’ of the Core Strategy in relation to the spatial vision

In preparing the spatial vision, has the LPA:

- Integrated direct health aspirations?
- Integrated wider aspirations which may have indirect links to health and documented the links between these aspirations and health?
- Related health and wider aspirations to development and use of land on the ground?
- Had regard to the authority’s community strategy?
Strategic objectives

The objectives should illustrate, in a meaningful way, how the strategy contributes to the outcomes outlined in the spatial vision⁹. Given that health should be integrated into the vision, health should form one of the overall strategic plan objectives.

An example of how health may be incorporated as a strategic objective is outlined below. This example sets out the generic requirements which all local authorities should strive for when aiming to promote health and well-being. There will inevitably be authority-specific health issues which will need to be included. Boroughs should work in partnership with PCTs from the outset to help identify these.

To set a spatial planning framework for the improvement of [borough x’s] community health and well-being for everyone. This will be achieved through the following objectives:

1. To ensure health inequalities are addressed through equal access for all to homes, jobs, sports and leisure facilities, open and green space, social and community, and healthcare facilities.

2. To ensure that the potential health impacts of development and regeneration are identified and addressed at an early stage in the planning process.

3. To ensure that the design and management of new developments and regeneration schemes promote and maintain healthy lifestyles.

4. To encourage physical activity, e.g. through the provision of opportunities to walk and cycle in the design of new developments and regeneration schemes.

5. To provide opportunities to improve physical and mental well-being through the provision of high quality open & green spaces and sports and recreation facilities.

6. To avoid mental health effects arising from direct exposure to or fear of exposure to crime/criminal activity through appropriate design in new developments and regeneration schemes.

7. To avoid the public health impacts related to climate change, such as overheating, through adaptation and mitigation measures.
Setting objectives correctly and effectively is critical to the formulation of good policies. Objectives should:

- be different to aims/aspirations, which are high-level, over-arching visions;
- provide the means to achieve success;
- be SMART:
  - Specific – language used is appropriate and free from jargon
  - Measurable – what evidence will be used to prove that the objective has been achieved?
  - Achievable – outcomes of objective can actually be met
  - Realistic – it is clear who will deliver the objective and how it will be funded
  - Timely – A deadline for completion of objectives should be set to make it measurable

SMART Objective

Health Issue: Child injuries and fatalities from road-based transport.

Objective: To reduce the number of child pedestrian injuries and accidents from road-based transport.

Aims: The borough should aim to exceed the national level target (by 2010, a 50% reduction in child pedestrians killed or seriously injured versus 1994-1998 levels).

How to Achieve: Through the introduction of traffic calming measures, Homezones etc. Focus on wards where child pedestrian injuries and accidents are highest.

How to measure: Monitor the number of child injuries and fatalities on an annual basis. Data should be collated between wards to identify ward level differences.

Box 4.4 Testing the ‘soundness’ of the Core Strategy in relation to objectives

In preparing the strategic objectives, has the LPA:

- Integrated health as an overall strategic plan objective?
- Correctly and effectively set objectives, in line with the principles set out above?
4.2.3 How to incorporate health within the Core Strategy Policies

Within the Core Strategy, health may feature either as a cross-cutting theme or as an individual section within the plan:

- **Health as a cross-cutting theme** would enable the traditional topic-based approach of plan-writing to be followed so that health is considered under each topic heading (e.g. housing, employment, transport, etc). The health issues specific to the local area will need to be identified at the outset. The health issues should then be linked to appropriate plan topic(s) and reflected in objectives and policy. Section 4.2.5 discusses health as a cross-cutting issue further.

- **Incorporating health as an individual topic** is likely to more closely align the structure of the Core Strategy with that of the Community Strategy. Whilst there is wide diversity in the form and content of Community Strategies, a survey of 28 strategies identified health/well-being as the most popular theme to be included\(^\text{90}\). Whilst this approach may explicitly set out the links between health and spatial planning, it may result in policy overlap between topics of the Plan and confusion to readers who are used to more traditional Plan layouts.

The approach to integrating health within the Core Strategy will depend on many factors, such as local circumstances, experience, time available and the involvement of others. Whichever approach is chosen, policy development should follow the steps outlined above:

Evidence -> Issues -> Vision -> Objectives -> Policy

**Health as an individual topic section**

This guidance document follows a topic based approach to the development of health policies. This reflects the selectivity adopted in Part 3 (policies have been developed around the chosen public health issues). The policies also develop the evidence base provided in Part 3 - where strong links are identified between the public health issue and spatial planning factors these are reflected within health policy.

Following the individual health policies, good practice wording for overarching health policies is provided, which focuses around healthcare provision, designing for health and minimising the health impacts of development. The example policy, “Designing for Health aims” to draw together a series of principles to follow in the design of new developments and regeneration schemes which will help to deliver healthier outcomes. This policy could be applied to a range of public health issues.

The policy framework provided below should help planners to generate policies which are appropriate to their local circumstances.
Health and well-being are major issues on the national agenda. Health is more than access to medical treatments and services; it also extends to prevention and cure and centres on enabling people to make healthier choices.

This topic of the Core Strategy relates to the important issues connected with creating and maintaining healthier communities. The task of the LDF is to set a spatial planning framework which will facilitate positive improvements to the borough’s health and well-being and supports the borough’s spatial vision and spatial objectives.

This topic includes eight policies:

**Example policy 1:** Mental health
**Example policy 2:** Obesity and cardiovascular disease
**Example policy 3:** Respiratory disease
**Example policy 4:** Excess winter (cold) and summer (heat) mortality
**Example policy 5:** Injuries
**Example policy 6:** Healthcare provision
**Example policy 7:** Designing for health
**Example policy 8:** Health impacts

*This introduction to the topic should be grounded in evidence; it should set out the borough’s current situation with regard to health and well-being.*
MENTAL HEALTH

Depression and anxiety are important public health problems occurring in the range of 15 to 30% and they account for approximately 20% of GP consultations in the UK. Key factors associated with poor mental well-being include lack of ‘escape facilities’ (such as green space and social infrastructure), a sense of overcrowding, fear of crime and dissatisfaction with existing living conditions and the local area (e.g. high rise, deck access dwellings, poor quality housing and neighbour noise). Allotments are cited as ‘escape facilities’ that have a positive effect on both physical and mental well-being.

There is also evidence demonstrating that residents whose homes have been flooded experience psychological distress for considerable periods of time after a flood event.

New developments and regeneration schemes can help to reduce the incidence of mental health problems through provision of good quality green space and social infrastructure, designing to avoid crime and fear of crime, involving local communities in regeneration schemes and ensuring developments are of a high quality and are appropriate to their location.

Proposals should incorporate innovative means to manage and maintain open and green spaces and encourage long-term use. E.g. through the use of S106 funding to provide on-site wardens.

Avoiding development in areas at risk of flooding or designing site layout and buildings to minimise flood risk may help reduce flood-related psychological distress.

Example strategic objective 1: Mental Health

To set a spatial planning framework for addressing the borough’s mental health problems. This will be achieved by:

1. Protecting and enhancing the borough’s open and green spaces through the implementation of the Open Space Strategy.
2. Integrating open space provision within new developments and regeneration schemes.
3. Protecting and enhancing the borough’s social and community infrastructure.
4. Integrating social and community infrastructure within new developments and regeneration schemes.
5. Designing new developments to avoid crime and fear of crime.
6. Involving local communities in regeneration and development schemes to ensure design takes account of community health concerns.
7. Designing site layout and buildings to minimise flood risk.
Example policy 1: Mental health
The borough will aim to reduce the incidence of mental health problems through the provision of good quality, accessible open and green spaces and social infrastructure, involving local communities in the design of development and regeneration schemes, designing out crime in new developments and designing to minimise flood risk.

Open and green space
The borough will protect and support a diverse and multi-functional network of open and green spaces through the:
• Identification of a network of strategically and locally important green space areas in Site Allocations Development Plan Documents and Area Action Plans.
• Identification and designation of open space sites, e.g. Green Belt, Metropolitan Open Land in the Site Allocations Development Plan Documents and Area Actions Plans.
• Identification of current areas of open space deficiency through the preparation of an Open Space Strategy.

Support will be given to:
• Proposals and activities that protect, retain or enhance existing open and green spaces, lead to the provision of additional open and green spaces or improve access to existing areas, particularly by non-car modes.
• Proposals which incorporate innovative measures to manage and maintain open and green spaces and encourage long-term use.
• Major development proposals which help meet the increasing demand for open space.
• Development proposals which include provision for allotments as a means to provide multiple health and sustainability benefits.
• Development proposals which include innovative means to incorporate open space, e.g. through the provision of green roofs, wildlife gardens or play space created as a result of traffic calming.

There will be a presumption against:
• Development on existing open or green space.
• Inappropriate development of Metropolitan Open Land or Green Belt Land, i.e. development that damages the ‘open function’ of the space.
Community and social infrastructure

The borough will undertake an assessment of local infrastructure to identify areas of deficiency and to plan for projected population increase and demographic changes. This will be in conjunction with local strategic partnerships, healthcare organisations and others.

All those proposing new development and regeneration schemes will:

- Identify the social infrastructure needs of the development (Social and Economic Impact Assessments may be required for large residential sites).
- Consult the local community on their social and community requirements.
- Provide facilities within easy access by walking/cycling or public transport.
- Provide facilities which are accessible to all sectors of the community.

Support will be given to proposals which seek to promote long-term community involvement in the ownership and management of new development and regeneration schemes.

Proposals involving the loss of community and social infrastructure will only be permitted where adequate alternative provision is made to meet the needs of the community affected, resulting in high quality, accessible and locally appropriate facilities.
Design and the reduction of crime

Design of all developments and regeneration schemes should reduce the opportunity for crime. Support will be given for proposals which meet the principles below:

• Provide places with well-defined routes, spaces and entrances that provide for convenient movement without compromising security.

• Provide adequate and natural surveillance of adjacent streets and spaces e.g. by maximising active frontages in development design.

• Create a sense of ownership by providing a clear distinction between public and private spaces.

• Promote activity that is appropriate to the area, providing convenient access and movement routes.

• Avoid the creation of gated communities.

• Provide places that are designed with future management and maintenance in mind to discourage crime in the long-term. The involvement of local communities in long term management and maintenance will be particularly supported.

Designing to avoid flooding

All those proposing new development and regeneration schemes will aim to avoid areas at risk of flooding or areas likely to increase the risk of flooding elsewhere.

If new development or regeneration schemes are in areas at risk of flooding the following should be undertaken:

(i) Carry out a site survey to determine which Sustainable Urban Drainage Systems (SuDS) will be appropriate for use on the site.

(ii) Incorporate watercourses throughout the site.

(iii) Set development back from existing flood defences.

(iv) Orientate infrastructure according to flood risk vulnerability.

Boroughs will take opportunities to address social and environmental inequalities and help manage existing flood risk through river restoration and opening up culverts.

Principles set out in Example policy 7: Designing for health and Example policy 8: Health impacts should be adhered to when designing and determining planning applications.
OBESITY AND CARDIOVASCULAR DISEASE

One of today’s biggest public health problems is the obesity epidemic, linked to a rising incidence of diabetes. Obesity and diabetes are risk factors for coronary heart disease. In England, 15% of children between the ages of 2 and 10 are obese and the prevalence of children that are obese and overweight is increasingly steadily.

This trend can be addressed by encouraging physical activity. New developments and regeneration schemes can be designed to encourage more active lifestyles by providing good quality, accessible open spaces and sports and recreation facilities, and by encouraging walking and cycling. In addition to addressing obesity and diabetes, these interventions will also tackle cardiovascular disease and musculoskeletal conditions. There is evidence that leisure time physical activity is associated with reduced risk of cardiovascular disease in middle-aged and older men and women.

Example strategic objective 2: Obesity and cardiovascular disease

To set a spatial planning framework for addressing the borough’s obesity problem and cardiovascular disease. This will be achieved by encouraging physical activity through:

1. Protection and enhancement of the borough’s open and green spaces through the implementation of the Open Space Strategy.

2. Integration of open space provision within new developments.


4. Provision of appropriate facilities for sports and recreation in development proposals.
Example policy 2: Obesity and cardiovascular disease

The borough will tackle obesity and address cardiovascular disease by encouraging physical activity. This will be achieved through the provision of good quality, accessible open and green spaces and sport and recreation facilities.

Open and green space

The borough will follow the requirements set out in Example policy 1: Mental health in protecting and enhancing open and green spaces.

Sports and recreation facilities

The borough will enhance sport and recreation facilities by identifying locations for the delivery of major new facilities in Site Allocations Development Plan Documents and Area Action Plans.

Support will be given to:

• Proposals and activities that protect, retain or enhance existing sports and recreation facilities, lead to the provision of additional facilities or improve access to facilities, particularly by non-car modes.

• Development proposals which provide appropriate facilities for sport, recreation and children’s play to meet the needs of the development.

• Development proposals for new sport, recreation and children’s play facilities, or for the enhancement of existing facilities, provided that:
  - There is no demonstrable harm from noise, lighting, transport or environmental impacts.
  - The development contributes to meeting identified shortfalls in provision or enhancing the quality of provision of sport and recreation facilities.
  - The development is accessible by sustainable modes of transport, especially walking and cycling.

There will be a presumption against any development that involves the loss of a sport or recreation facility except where it can be demonstrated that there is currently an excess of provision, or where alternative facilities of equal or better quality will be provided as part of the development.
RESPIRATORY DISEASE

Short-term exposure to respirable particles (PM$_{10}$) in urban areas increases deaths and respiratory and cardiovascular hospital admissions. The primary source of PM$_{10}$ in urban areas is motor traffic. Nitrogen dioxide modifies the effect of PM$_{10}$ such that daily mortality increases further when high long-term concentrations of PM$_{10}$ are in combination with nitrogen dioxide. Nitrogen dioxide is also produced by motor vehicle exhausts.

Increases in ozone also lead to increases in deaths and respiratory hospital admissions. Ozone is created by the action of sunlight on nitrogen dioxide in the presence of volatile organic compounds (VOCs). Artificial sources of VOCs include cleaning solvents and some constituents of petroleum fuels.

Spatial planning can modify the total volume of traffic as well as congestion of traffic at certain locations, thereby reducing air pollution.

There is evidence that residents are more likely to report exacerbations of asthma, coughs and respiratory infections following exposure to flooding. Avoiding development in areas at risk of flooding or designing site layout and buildings to minimise flood risk may reduce flood-related respiratory infections.

Example strategic objective 3: Respiratory disease

To set a spatial planning framework for addressing Respiratory disease in the borough. This will be achieved by:

1. Reducing the need to and length of travel and promote a sustainable transport system.

2. Integrating sustainable modes of transport to access and move around new developments.

Example policy 3: Respiratory disease

The borough will aim to reduce the incidence of respiratory disease by tackling air pollution from road traffic emissions by encouraging the use of more sustainable modes of transport. This will also help reduce the number of cardiovascular hospital admissions related to air pollution.
Delivering Healthier Communities in London

4.2 GOOD PRACTICE HEALTH POLICY WORDING

Road traffic emissions

The borough will develop and promote a high quality and sustainable transport system and will reduce the need to and length of travel through spatial planning and design, including:

• Improving accessibility. New development which generates significant demand for travel should be provided in locations well served by a variety of modes of travel, including public transport. Higher densities of development will be required near to public transport interchanges.

• Safeguarding land for strategic public transport infrastructure. Land to be safeguarded will be identified in Area Action Plans and the Site Allocations Development Plan Documents.

• Promoting walking and cycling. Development of a network of safe walking and cycling will be promoted, connecting transport interchanges, and linking communities, services, facilities and recreation areas. Minimum cycle parking standards will be applied to ensure that new development provides adequate provision for cycling as a sustainable mode of transport.

• Promoting water transport. Development of new water transport infrastructure will be supported.

• Demand management. Development proposals will be assessed in relation to car parking standards set by the borough. These will set a maximum level of provision for different types of proposal.

Proposals for new development that generates frequent trips to and from a site must include provision for sustainable forms of transport to access the site, and within the development. Where provision is required, measures must be incorporated as an integral part of the design of all development proposals, and should include where appropriate:

• Footpaths and cycleways, linked to the wider green network;
• Safe provision for cycle parking and cycle shelters;
• Bus stops/shelters and live transport information;
• Support for sustainable forms of transport, e.g. community transport schemes;
• Preparation and implementation of Green Travel Plans for major developments, which consider and promote alternatives to car use; and
• Minimal levels of car parking, commensurate with road safety, the reduction of congestion, and the availability of alternative means of transport.

Flooding

The borough will follow the requirements set out in Example policy 1: Mental health in designing to avoid flooding.
EXCESS WINTER (COLD) AND SUMMER (HEAT) MORTALITY

In England approximately a third of excess deaths in winter (18 excess deaths per 100,000 adults) are related to low indoor temperatures and 90% of these occur in those more than 65 years of age. Three thousand pensioners in London died in winter 2006 of cold related illnesses. Poor home insulation and fuel poverty contribute to the problem.

Measures can be incorporated into building design to improve insulation and maximise the heat retained through solar gain.

Urban areas generate a ‘heat island’ effect and London can be up to 8% warmer than rural areas and night temperatures in the city can remain above 19°C. Mortality increases in hot weather and elderly people are particularly vulnerable; in the 1995 heatwave in London there was a 16% excess in deaths for all ages and those aged over 85 had a 20% excess mortality. Climate change will further exacerbate this problem.

Measures can be incorporated into the layout of development and buildings to reduce overheating and hence the likelihood of heat mortality.

Example strategic objective 4: Excess winter (cold) and summer (heat) mortality

To set a spatial planning framework to reduce the incidence of winter and summer related mortalities:

1. Ensure that site layout and the design of buildings adapts to and mitigates for the effects of climate change.

2. Ensure that improvements are made to existing housing stock to reduce winter mortality.
Example policy 4: Excess winter (cold) and summer (heat) mortality

**Excess winter (cold) mortality**

The borough will identify areas where winter mortality and/or levels of cold-related illness are highest. This will provide a means to prioritise regeneration schemes and/or housing improvements.

Boroughs will seek to ensure that regeneration schemes and/or housing improvements maximise internal insulation and opportunity for solar gain.

**Excess summer (heat) mortality**

Boroughs will identify existing areas where retrofitting climate change adaptation measures should be prioritised.

The borough will ensure that new developments and regeneration schemes adapt to and mitigate for the effects of climate change, in particular over-heating.

Support will be given to proposals which:

• Maximise opportunities for natural ventilation in buildings.
• Maximise areas of exposed thermal mass in buildings.
• Incorporate adequate shading.
• Incorporate heat-absorbing plant species e.g. through green roofs, gardens etc.
• Ensure landscaping takes account of hotter, drier summers.

Principles set out in **Example policy 7: Designing for health** should be adhered to when designing and determining planning applications.
INJURIES

Injuries account for 3% of annual deaths in the UK and were ranked the 14th leading cause of death in 2004. Injury is the greatest threat to life in children and young people (road traffic accidents cause the most deaths). Road Traffic Accidents (RTAs) show substantial inequalities between groups of differing social class.

In London, RTAs disproportionately affect pedestrians. Inequalities exist between differing socio-economic and ethnic groups.

Department for Transport statistics for the Metropolitan Police Force Area in 2006 reported a total of 29,775 road casualties, of which 226 were fatalities. The cost burden of every fatality in London is £1.4 million.

Injuries can also occur during or following flood events. Injury rates associated with flooding are in the order of 0.4%.

Annually, injuries lead to 720,000 admissions to hospital and 6 million emergency department visits.

There is good evidence that area-wide traffic calming reduces child pedestrian injury rates and also reduces the differential in rates based on inequalities in social groups.

Minimising flood risk may help reduce the incidence of injuries arising from flooding.

Example strategic objective 5: Injuries

To set a spatial planning framework to address rates of road traffic injury and avoid the risk of injury from flooding within the borough. This will be achieved by:

1. Encouraging development and regeneration schemes which minimise dependence on the car.
2. Encourage developments and regeneration schemes which promote greater road safety and reduce vehicle speeds.
3. Designing site layout and buildings to minimise flood risk.
Example policy 5: Injuries

The borough will aim to reduce RTAs (and inequalities between different social groups) by encouraging developments and regeneration schemes which minimise dependence on the car, promote greater road safety and reduce vehicle speeds.

Minimising flood risk may help reduce the incidence of injuries arising from flooding.

Road Safety

The borough will identify areas where rates of pedestrian injuries are highest. Road safety measures should be targeted in these areas.

Support will given for new developments and regeneration schemes which:

• Maximise road safety through the provision of:
  - Traffic management/calming measures.
  - HomeZones.
  - Speed limits and road signage.
  - Safe walking and cycling routes linked to the wider green network.

• Reduce dependence on the car e.g. by locating in areas accessible by walking and cycling and well served by public transport.

Designing to avoid flooding

All those proposing new development and regeneration schemes will aim to avoid areas at risk of flooding or areas likely to increase the risk of flooding elsewhere.

If new development or regeneration schemes are in areas at risk of flooding appropriate design will help to reduce the likelihood of exposure to flood events and hence injuries. This may include the design of functional parts of properties above the likely the flood level.
HEALTHCARE PROVISION

Improvements in health and wellbeing will be achieved through the safeguarding and enhancement of existing healthcare facilities and the creation of new facilities (healthcare facilities are taken to include hospitals, primary healthcare centres, GP practices and dentists).

In order to meet the demands of an increasing population and to identify areas of deficiency, an assessment will be undertaken of local healthcare infrastructure to identify locations for new facilities. This assessment will be based on a robust methodology, which takes account of local context, population and access to healthcare facilities. Access to facilities is a key factor in health status; high transport costs may prohibit certain socio-economic and ethnic groups from accessing facilities. Appropriate models to assist this process include the Social Infrastructure Framework (SIF) Toolkit [see http://www.healthyurbandevelopment.nhs.uk/pages/integrating_social_infrastructure/social_infrastructure.htm]. New healthcare provision should focus on the delivery of high quality Primary Care services which are accessible to all sectors of the community.

PCTs should provide assistance in assessing the existing healthcare infrastructure of the borough and in providing recommendations on where new facilities should be located.

Example strategic objective 6: Healthcare provision

To set a spatial planning framework to support the appropriate provision of healthcare facilities by:

1. Protecting existing healthcare facilities in accordance with an appropriate assessment of need.
2. Supporting high quality appropriate new healthcare facilities in accordance with an appropriate assessment of need.
Example policy 6: Healthcare provision

New development and regeneration schemes will only be permitted if an appropriate assessment has been undertaken of local healthcare infrastructure needs. Support will be given for new healthcare facilities which:

- Integrate health and leisure in one facility.
- Are accessible by walking and public transport and
- Are accessible to all sectors of the community.

The requirement for new healthcare facilities will be considered as part of proposals for large-scale residential sites.

Proposals involving the loss of health care facilities will only be permitted where adequate alternative provision is made to meet the needs of the community affected, resulting in high quality, accessible and locally appropriate facilities.

This policy will be implemented in the following ways:

- By working in partnership with the Health Authority, NHS and PCTs.
- Through identification of sites to support the implementation of the LIFT initiative, GP-led initiatives and others.
- Use of Planning Contributions to secure healthcare facilities as part of new development proposals and regeneration schemes.

Sites will be set out in [a relevant] Area Action Plan (AAP).
DESIGNING FOR HEALTH

Good design is a key component of promoting healthy outcomes and a firm aspiration of [your] borough.

More detailed guidance on design requirements will be contained in the Development Policies DPD. In addition, all those proposing development are advised to consult the Government guidance document ‘By Design’ (the companion to PPS 1) and the Mayor’s Sustainable Planning Guidance Documents ‘Sustainable Design and Construction’ and ‘Housing’.

The type of health impacts encountered will differ between development schemes. Therefore, the health impacts of development should be considered early on the design process (refer to Example Policy 8: Health Impacts).

Example strategic objective 7: Designing for health

To set a spatial planning framework to support the provision of well-designed developments that optimise healthy outcomes by:

1. Considering the health impacts of new developments and regeneration schemes through the design process.
2. Appropriately locating new developments.
3. Promoting high-quality development.
4. Ensuring provision for future management and maintenance of new development.
5. Monitoring the provision of well-designed developments.

Example policy 7: Designing for health

A design-led approach should be followed to optimise healthy outcomes in new development and regeneration-schemes. Support will be given for proposals that are consistent with the LDF’s detailed design policies and meet all the principles for ‘healthy design’ set out below:

**Health Impact**

The health impacts of new development and regeneration schemes will be considered throughout the design process. Refer to Example policy 8: Health impacts.

**Location**

- Development should be located in areas well served by public transport, in existing mixed use areas wherever possible and in areas with good access to social infrastructure and green/open spaces.
- Avoid developing in areas at risk of flooding or likely to increase the risk of flooding elsewhere.
4.2 GOOD PRACTICE HEALTH POLICY WORDING

**Design Quality and type**

- Safeguard, enhance and make provision for an adequate supply of social and community infrastructure which is accessible to all.
- Safeguard, enhance and make provision for an adequate supply of open and green spaces which is accessible to all.
- Provision should be made for walking and cycling, including the provision of footpath links, cycleways and cycle parking facilities.
- Provision for or enhancement of a mix of uses, including access to shops providing a range of food choices.
- Ensure high density housing in new and regeneration schemes:
  1. Is of a density appropriate to location, reflecting the Mayor’s density Matrix
  2. Minimises high-rise deck-access buildings.
  3. Minimises overlooking between properties.
  4. Is a mix of household types and tenures.
  5. Is designed to avoid ‘neighbour noise’.
  6. Includes escape facilities (e.g. green/open spaces, social & community infrastructure).
  7. Includes provision for future management and maintenance.
- Adapt to and mitigate for the effects of climate change:
  1. Maximise opportunities for natural ventilation in buildings.
  2. Maximise areas of exposed thermal mass in buildings.
  3. Incorporate adequate shading.
  4. Incorporate green roofs.
  5. Ensure landscaping takes account of hotter, drier summers.

**Management and Maintenance**

- Those proposing new developments and regeneration schemes will include provision for future management and maintenance.

**Monitoring**

- Boroughs will monitor new developments and regeneration schemes to ensure that the design principles proposed to achieve healthier outcomes have been delivered.
- Boroughs will monitor resident’s self-rated health before and after the completion of regeneration schemes.
HEALTH IMPACTS

Regeneration and development proposals can have significant impacts on public health and health inequalities. Health impacts must be considered at the outset of all development proposals to ensure positive health outcomes and avoid health impacts.

Environmental Impact Assessment (EIA) is a well-established, statutory assessment process. Most developments in London will fall under Schedule 2 of the EIA Regulations, for which EIA is only required if a particular project is judged likely to give rise to ‘significant’ environmental effects. Schedule 4 of the EIA Directive sets out the list of information which should be included within an Environmental Statement. This includes “A description of the aspects of the environment likely to be significantly affected by the development, including, population…”

EIA should be used to assess the effects (arising during both construction and operation) of development and regeneration schemes on population and human health. Planners should ensure that applicants have considered the likely public health effects of development during the ‘Screening’ and ‘Scoping’ phases of EIA.

Health Impact Assessment (HIA) is a tool to identify the likely public health impacts of developments and could be used to inform the identification of public health effects and the public health chapter of Environmental Statements. PCTs do not have a statutory role to play in EIA but can provide advice and guidance on health impacts during the Screening and Scoping phases and in the drafting health chapters in Environmental Statements. PCTs can also provide training in the use of HIA.

It is recognised that not all major developments will require EIA and HIA should be used to assess the health impacts of these.

Example strategic objective 8: Health impacts

To set a spatial planning framework to minimise the health impacts of new development by:

1. Requiring planners to work in partnership with health practitioners.
2. Considering the public health impacts of development as part of the EIA process.
3. Requiring major development proposals and regeneration schemes (which do not fall under the EIA Regulations) to be subject to an HIA.
Example policy 8: Health impacts

Planners will work in partnership with healthcare practitioners from the outset of development proposal formulation to ensure that health impacts and health opportunities are maximised in all new development and regeneration schemes.

EIA is a statutory requirement for certain types of projects. The public health effects of development will be considered as part of the EIA process. For example, planners should ensure that applicants have:

• Considered the likely public health effects during the ‘Screening’ and ‘Scoping’ of proposals.

• Incorporated a public health chapter within the Environmental Statement.

All major development proposals and regeneration schemes not subject to EIA will be accompanied by a HIA.

This policy will be implemented through the consideration of health within Screening and Scoping Opinions and Environmental Statements.

Box 4.5 Testing the ‘soundness’ of the Core Strategy in relation to policies

In preparing policies, has the LPA:

• Provided a robust and credible evidence base from which to base their policies?

• Addressed specific health issues?

• Correctly and effectively set objectives for policies in line with SMART principles?

• Formulated policies which can deliver the proposed objectives?

• Set mechanisms for implementing and monitoring the policies?
4.2.4 How to be locally distinctive

The policy framework presented above should be tailored to local circumstances. The box below provides a series of questions to help formulate locally distinctive policies for health.

**How to be locally distinctive in relation to health**

- What are the major health issues affecting the borough?
- Are there ward level differences in the extent to which health effects are experienced?
- Can these differences be teased out further e.g. between neighbourhoods?
- Do certain groups suffer from health issues more than others?
- What role can borough planning play in addressing these health issues and health inequalities?
- Is there evidence to support the links between spatial planning and health?
- Have planning interventions for health issues been reflected in objectives and policy?
- Are mechanisms in place to monitor the outcomes of objectives and policy?
4.2.5 Health as a Cross-Cutting Issue

Sections 4.2.1 - 4.2.4 have set out health as an individual topic within a Core Strategy. The matrix below provides a means to identify the links between health issues and conventional Core Strategy topics for those adopting a cross-cutting approach. For example, access to greenspace/open space (often considered under the ‘Natural Environment’ topic) would be of benefit to a number of the public health issues we have identified, Mental Health, Obesity and Cardiovascular disease.

The HUDU Watch-Out for Health Checklist provides a more comprehensive source of such linkages.

Beyond the Matrix: How to incorporate Health as a Cross-cutting Issue

Those undertaking a cross-cutting approach should be aware that merely noting the links between health and plan topics in a matrix is not enough.

Planners and others must:

• Identify locally-specific health issues.
• Quantify what health outcomes the plan is seeking to achieve.
• Demonstrate which health outcomes will be achieved by each policy where the intersection with health is identified in the matrix.
• Ensure that ALL health issues and outcomes have been addressed under appropriate plan topics and reflected in objectives and policy.

Adopting the cross-cutting approach still means that the approach outlined in section 4.2 must be followed:

Evidence –> Issues –> Vision –> Objectives –> Policy
## Matrix identifying links between health issues and Core Strategy Topics

<table>
<thead>
<tr>
<th>Health Issue</th>
<th>Employment</th>
<th>Community</th>
<th>Economy</th>
<th>Shopping</th>
<th>Public Services</th>
<th>Housing</th>
<th>Natural Environment</th>
<th>Minerals</th>
<th>Waste</th>
<th>Transport and Communication</th>
<th>Climate change</th>
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<tr>
<td><strong>Mental Health</strong></td>
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<tr>
<td></td>
<td>✓ (Sense of well-being through work)</td>
<td>✓ (Crime, social cohesion/social capital)</td>
<td>✓ (Sense of well-being through buoyant economy)</td>
<td>✓ (Access to local, good quality food)</td>
<td>✓ (Access to Education, Culture)</td>
<td>✓ (Poor quality housing)</td>
<td>✓ (Flooding)</td>
<td>✓ (Access to greenspace)</td>
<td>✓ (Improve accessibility to services)</td>
<td>✓ (Floodings)</td>
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<tr>
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<td>✓ (Access to local, good quality food)</td>
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<td>✓ (Sense of well-being through work)</td>
<td>✓ (Sense of well-being through buoyant economy)</td>
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<td>✓ (Access to healthcare)</td>
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<tr>
<td><strong>Injuries</strong></td>
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<td>✓</td>
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<td><strong>General Health Benefits</strong></td>
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</table>

### Ticks in Table Meanings:
- ✓: Present
- ✓: Absent
- ✓: Not applicable
4.3 MEETING THE TESTS OF SOUNDNESS

The flow-chart below draws together the steps required to help prepare a “Sound” plan as set out in Part 2 Why Plan for Health and Part 4 A Spatial Plan for Health. Planners should use this as a guide to follow when beginning their plan-making process to ensure that health issues are adequately identified from the outset, are based on robust evidence and clearly drive the formulation of policy objectives and policy wording.

<table>
<thead>
<tr>
<th>The steps involved to help prepare a ‘Sound’ Plan</th>
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<tbody>
<tr>
<td><strong>Local Profile</strong></td>
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<tr>
<td><strong>Spatial Issues</strong></td>
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<td><strong>Spatial Vision</strong></td>
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<td><strong>Objectives</strong></td>
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<td><strong>Policy</strong></td>
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<td><strong>Implementation</strong></td>
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<td><strong>Monitoring</strong></td>
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</table>
4.4 CHECKLIST FOR PLANNERS AND HEALTH PRACTITIONERS

A checklist has been developed to ensure that developers and others integrate health considerations into new developments and regeneration schemes.

It draws together the recommendations from Part 3 of this document and the policy framework set out earlier in this chapter.

The checklist suggests how each health outcome could be achieved by planners through planning policy, conditions applied to planning applications or through the use of planning contributions.

A tick in the relevant box  ✔️ would demonstrate that a health outcome would be achieved. Where ticks are not provided against a health outcome, justification should be provided.
### Checklist for delivering healthier communities in London

<table>
<thead>
<tr>
<th>Health Outcomes</th>
<th>Consideration by developers</th>
<th>Consideration by planners</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mental Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open/green spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retain and enhance existing open/green spaces</td>
<td>☐</td>
<td>☐ Policy Condition Agreement</td>
</tr>
<tr>
<td>Incorporate and maintain new open/green spaces in areas of deficiency</td>
<td>☐</td>
<td>☐ Policy Condition Agreement</td>
</tr>
<tr>
<td>Provide links between existing and new open/green spaces</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td>Ensure open/green spaces are accessible for all</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td>Include provision for allotments</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td><strong>Community and social infrastructure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify social infrastructure needs</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td>Retain and enhance existing social and community infrastructure</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td>Incorporate social and community infrastructure including sports and leisure facilities, community centres and healthcare facilities</td>
<td>☐</td>
<td>☐ Policy Condition Agreement</td>
</tr>
<tr>
<td>Ensure social and community infrastructure is accessible for all</td>
<td>☐</td>
<td>☐ Policy Condition</td>
</tr>
<tr>
<td>Integrate health and leisure opportunities within healthcare facilities</td>
<td>☐</td>
<td>☐ Policy</td>
</tr>
</tbody>
</table>
### Delivering Healthier Communities in London

<table>
<thead>
<tr>
<th>Health Outcomes</th>
<th>Consideration by developers</th>
<th>Consideration by planners</th>
<th>How?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crime</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide places with well-defined routes, spaces and entrances</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Maximise active frontages</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Clearly define public and private space</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Provide adequate and natural surveillance</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Promote activity that is appropriate to the area</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Avoid creation of gated communities</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Include provision for future management and maintenance</td>
<td></td>
<td></td>
<td>Policy Agreement</td>
</tr>
<tr>
<td><strong>Flooding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locate development to avoid flood risk areas</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Layout in Flood Risk Areas</td>
<td></td>
<td></td>
<td>Policy Condition</td>
</tr>
<tr>
<td>• Inclusion of Sustainable Urban Drainage Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Inclusion of watercourses throughout site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Development set back from existing flood defences?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Is infrastructure orientated according to flood risk vulnerability?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Obesity and Cardio-vascular disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open/green spaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See principles set out under mental health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sport and recreation facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect, retain or enhance existing sports and leisure facilities</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
<tr>
<td>Incorporate new facilities for sports, recreation and children's play</td>
<td></td>
<td></td>
<td>Policy Condition Agreement</td>
</tr>
<tr>
<td>Ensure sport and recreation facilities are accessible for all</td>
<td></td>
<td></td>
<td>Policy Condition</td>
</tr>
<tr>
<td>Integrate health and leisure opportunities within healthcare facilities</td>
<td></td>
<td></td>
<td>Policy</td>
</tr>
</tbody>
</table>
### 4.4 CHECKLIST FOR PLANNERS AND HEALTH PRACTITIONERS

<table>
<thead>
<tr>
<th>Health Outcomes</th>
<th>Consideration by developers</th>
<th>Consideration by planners</th>
<th>How?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road traffic emissions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locate development in areas well served by public transport</td>
<td>☐</td>
<td>☐ Policy</td>
<td></td>
</tr>
<tr>
<td>Promote walking and cycling</td>
<td>☐</td>
<td>☐ Policy</td>
<td></td>
</tr>
<tr>
<td>Promote water transport</td>
<td>☐</td>
<td>☐ Policy</td>
<td></td>
</tr>
<tr>
<td>Include provision for sustainable forms of transport</td>
<td>☐</td>
<td>☐ Policy</td>
<td></td>
</tr>
<tr>
<td><strong>Flooding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See design principles set out under mental health</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Excess winter (cold) and summer (heat) mortality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximise internal insulation and opportunity for solar gain</td>
<td>☐</td>
<td>☐ Policy</td>
<td></td>
</tr>
<tr>
<td>Ensure new and existing buildings are adapted to climate change, including:</td>
<td>☐</td>
<td>☐</td>
<td>Policy</td>
</tr>
<tr>
<td>• Maximise opportunities for natural ventilation</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Maximise areas of exposed thermal mass</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Incorporate adequate shading either from vegetation or building features</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Incorporate heat-absorbing species</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Ensure landscaping takes account of hotter, drier summers</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximise road safety through provision of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Traffic management/calming measures</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• HomeZones</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Speed limits and road signage</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Safe walking and cycling routes</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Reduce dependence on the car:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Locate development in areas accessible by walking and cycling</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>• Locate development in areas well-served by public transport</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>Flooding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See principles set out under mental health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Outcomes</td>
<td>Consideration by developers</td>
<td>Consideration by planners</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>□ ✓</td>
<td>□ ✓ How?</td>
<td></td>
</tr>
<tr>
<td>Mix of uses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision for or enhancement of a mix of uses, including access to shops providing a range of food choices.</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
<tr>
<td>High Density Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate density</td>
<td>□</td>
<td>□ Policy Condition</td>
<td></td>
</tr>
<tr>
<td>Minimise high-rise and deck access buildings</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
<tr>
<td>Ensure high density housing:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Minimises overlooking between properties</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>• Is a mix of household types and tenures</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>• Is designed to avoid ‘neighbour noise’</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>• Includes ‘escape’ facilities (e.g. green/open spaces, social, community and sports facilities)</td>
<td>□</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Include provision for future management and maintenance</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
<tr>
<td>Buildings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design residential buildings to Sustainable Code for Buildings Level 6 “Exemplar” development</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design all other buildings to BREEAM “Excellent” standards.</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design homes as Lifetime Homes</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider appropriate phasing of development (e.g. ensuring social and community infrastructure is in place prior to residents’ occupation).</td>
<td>□</td>
<td>□ Condition</td>
<td></td>
</tr>
<tr>
<td>Ensure community empowerment/involvement in regeneration schemes</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
<tr>
<td>Consider the public health impacts within EIA</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
<tr>
<td>Carry out HIA of major development and where appropriate in other schemes</td>
<td>□</td>
<td>□ Policy</td>
<td></td>
</tr>
</tbody>
</table>
4.5 MONITORING HEALTH OUTCOMES

Boroughs should demonstrate that there are clear mechanisms for monitoring the outcomes of policies (including health policies) within their Core Strategy and DPDs. This is a test of soundness and necessary to ensure that plan and policy objectives are being met.

It is not the purpose of this guidance document to propose indicators to measure all health outcomes. However the list below proposes a range of possible indicators which could be used to monitor the policies outlined above. Planners and health practitioners should pick and chose indicators as appropriate to local circumstances. It should be noted that many of these are planning outcomes which could be used a proxy to measure health outcomes.

It is recognised that there remain a number of barriers to monitoring health outcomes; data is often not available at an appropriate scale, data is not measured on a consistent basis and there is no obvious single, source of data. As such it is critical that boroughs work in partnership with PCTs and other health practitioners to identify locally-specific health issues and consider how health objectives and policies can be measured.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>How to measure?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Health</td>
<td>% of GP visits for mental health problems Recognised as difficult to measure due to compounding variables, but necessary to identify whether planning measures are having an appropriate effect on the borough's mental health issues</td>
</tr>
<tr>
<td>Number, location, type and quality of new open/green spaces provided as part of development/ regeneration schemes. Measured as part of annual development control monitoring</td>
<td></td>
</tr>
<tr>
<td>Number of new open/green spaces provided as part of development/ regeneration schemes which are accessible by public transport and/or walking and cycling Should be compared between wards to ensure access is equitable</td>
<td></td>
</tr>
<tr>
<td>Net change in open and green space provision. Measured as part of annual development control monitoring</td>
<td></td>
</tr>
<tr>
<td>Number of new allotments provided as part of development/regeneration schemes Measured as part of annual development control monitoring</td>
<td></td>
</tr>
<tr>
<td>Number and type of social infrastructure provided as part of development/ regeneration schemes addressing the need of the borough Measured as part of annual development control monitoring</td>
<td></td>
</tr>
<tr>
<td>Number of social and community facilities which are accessible by public transport and/or walking and cycling Should be compared between wards to ensure access is equitable</td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>How to measure?</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Number of developments in flood risk areas incorporating flood resilient design measures</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Number of homes judged unfit to live in</td>
<td>Available at borough level from PCTs/London Health Observatory. This data would need to be monitored annually</td>
</tr>
<tr>
<td>Number of people with self-assessed good health</td>
<td>This would need to be measured at number of levels – e.g. for the borough as a whole, and individual regeneration schemes. Boroughs should endeavour to assess self-rated health before and after regeneration schemes to ensure desired health outcomes are achieved</td>
</tr>
<tr>
<td>Obesity and cardiovascular disease</td>
<td></td>
</tr>
<tr>
<td>Number of children in the borough who are considered obese</td>
<td>Should be monitored annually</td>
</tr>
<tr>
<td>Number of deaths and hospital admissions as a result of cardiovascular disease</td>
<td>Should be monitored annually</td>
</tr>
<tr>
<td>Number of children in the borough with Type 2 diabetes</td>
<td>Should be monitored annually</td>
</tr>
<tr>
<td>Number of children engaging in 60 minutes of moderate physical activity daily</td>
<td>Recognised that this will be difficult to measure in practice</td>
</tr>
<tr>
<td>Indicators proposed for open/green space above can be used as a proxy for encouraging physical activity and hence reducing obesity and cardiovascular disease.</td>
<td></td>
</tr>
<tr>
<td>Number of new sports and leisure facilities provided as part of developments and regeneration schemes addressing the need of the borough.</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Number of new sports and leisure facilities provided as part of development/regeneration schemes which are accessible by public transport and/or walking and cycling.</td>
<td>Should be compared between wards to ensure access is equitable</td>
</tr>
</tbody>
</table>
## 4.5 Monitoring Health Outcomes

<table>
<thead>
<tr>
<th>Indicator</th>
<th>How to measure?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory disease</strong></td>
<td></td>
</tr>
<tr>
<td>Number of deaths and hospital admissions as a result of respiratory disease</td>
<td>Should be monitored annually</td>
</tr>
<tr>
<td>Number of times per year levels of PM$_{10}$ (measured as 24 hour mean) exceeds National Air Quality objectives</td>
<td>Already monitored through Air Quality Plans</td>
</tr>
<tr>
<td>Number of times per year levels of nitrogen dioxide (measured as 1 hour mean) exceeds National Air Quality objectives</td>
<td>Already monitored through Air Quality Plans</td>
</tr>
<tr>
<td>Number of times per year levels of ozone (measured as running 8 hour mean) exceeds National Air Quality objectives</td>
<td>Already monitored through Air Quality Plans</td>
</tr>
<tr>
<td>Number of times per year levels of nitrogen dioxide (measured as 1 hour mean) exceeds National Air Quality objectives</td>
<td>Already monitored through Air Quality Plans</td>
</tr>
<tr>
<td>Number of times per year levels of ozone (measured as running 8 hour mean) exceeds National Air Quality objectives</td>
<td>Already monitored through Air Quality Plans</td>
</tr>
<tr>
<td>Number of trips made by walking, cycling and public transport</td>
<td>Already monitored through transport strategies</td>
</tr>
<tr>
<td><strong>Excess winter (cold) and summer (heat) mortality</strong></td>
<td></td>
</tr>
<tr>
<td>Number of elderly people dying as a result of cold-related illness</td>
<td>Should be monitored on an annual basis</td>
</tr>
<tr>
<td>Number of elderly people dying of heat-related illness</td>
<td>Should be monitored on an annual basis</td>
</tr>
<tr>
<td>Number of new developments/regeneration schemes incorporating measures to adapt to/mitigate for climate change</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
</tr>
<tr>
<td>Number of admissions to accident and emergency departments due to road traffic accidents</td>
<td>Should be measured on an annual basis to monitor the effectiveness of traffic management measures</td>
</tr>
<tr>
<td>Road traffic casualty rate per 1,000 population</td>
<td>Should be measured on an annual basis to monitor the effectiveness of traffic management measures</td>
</tr>
<tr>
<td>Number of child injuries arising from road traffic accidents</td>
<td>Should be measured at smaller scales i.e. between wards to ascertain whether traffic management measures are reducing inequalities in road traffic accidents.</td>
</tr>
<tr>
<td>Number of child fatalities arising from road traffic accidents</td>
<td>Should be measured at smaller scales i.e. between wards to ascertain whether traffic management measures are reducing inequalities in road traffic accidents.</td>
</tr>
<tr>
<td>Number of developments located in areas well served by public transport</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Indicator</td>
<td>How to measure?</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Healthcare provision</td>
<td></td>
</tr>
<tr>
<td>Number and type of healthcare facilities addressing the social infrastructure needs of the borough.</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Number of healthcare facilities accessible by walking or cycling</td>
<td>Should be compared between wards to ensure access is equitable</td>
</tr>
<tr>
<td>Number of large-scale residential sites incorporating healthcare facilities</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Number of integrated health and leisure facilities</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
<tr>
<td>Health impacts</td>
<td></td>
</tr>
<tr>
<td>Number of EIA Screening Opinions considering the likely public health impacts of development proposals.</td>
<td>Split according to Screening, Scoping and Environmental Statement; monitored annually</td>
</tr>
<tr>
<td>Number of EIA Scoping Opinions considering the likely public health impacts of development proposals.</td>
<td></td>
</tr>
<tr>
<td>Number of “significant” public health impacts for which mitigation is provided within Environmental Statements.</td>
<td></td>
</tr>
<tr>
<td>Number of ‘major’ developments subject to HIA (where EIA is not required)</td>
<td>Measured as part of annual development control monitoring</td>
</tr>
</tbody>
</table>


5. The WHO European Healthy Cities Network: http://www.euro.who.int/healthy-cities


18. Local Area Agreements: www.communities.gov.uk/index.asp?id=1163655

19. Public Service Agreements: http://www.hm-treasury.gov.uk/spending_review/spend_sr04/psa/spend_sr04_psaindex.cfm
20. (ODPM, 2005): Planning Policy Statement 1: Delivering Sustainable Development


22. Royal Commission on Environmental Pollution (March 2007): 26th Report: The Urban environment


24. The Mayor’s Strategies include the transport strategy, the London Development Agency strategy, the spatial development strategy, the London Biodiversity Action Plan, the municipal waste management strategy, the London air quality strategy, the London ambient noise strategy and the culture strategy.


29. Under the reforms of the planning system, PPGs are gradually being reviewed and replaced by PPSs.


36. Richard Louv (2005). Last Child in the Woods: Saving our Children from Nature Deficit Disorder,
REFERENCES


45. (ODPM, 2005): Planning Policy Statement 1: Delivering Sustainable Development


47. Living Streets, Streets are for Living. The importance of streets and public spaces for community life, August 2001: 7-8.


49. Town and County Planning February 2007 (Volume 76 Number 2).


58. Mile End Park Project Summary.

59. Town and County Planning February 2007 (Volume 76 Number 2).


67. Air quality objectives and the deadlines against which these objectives should be met are set out in the UK’s Air Quality Strategy (January, 2000).

68. The UK Air Quality Archive (available at http://www.airquality.co.uk/archive/laqm/laqm.php)

REFERENCES


71. Research shows that of those 20 mph zones introduced in 2002, average speeds had reduced and accident rates had dropped.


74. Help the Aged.


81a. UNICEF (February 2001): A league table of child deaths by injury in rich nations, Innocenti Report Card No.2


84. Test of soundness vii states that ‘the strategies/policies/allocations represent the most appropriate in all the circumstances, having considered the relevant alternatives, and they are founded on a robust and credible evidence base’

85. The Core Strategy needs to conform to all nine tests of soundness. The questions set out in Box 4.1 relate specifically to the seventh test of soundness (which includes the consideration of relevant alternatives to strategies/policies/allocations in the plan).


87. The Core Strategy needs to conform to all nine tests of soundness. The questions set out in Box 4.2 relate specifically to the seventh and eighth tests of soundness (including the provision of a robust and credible evidence base and provision of mechanisms for implementation and monitoring).

88. The Core Strategy needs to conform to all nine tests of soundness. The questions set out in Box 4.3 relate to the fifth test of soundness (having regard to the authority’s community strategy).


90. ODPM (2003): Survey carried out as part of the relationships between Community Strategies and Local Development Frameworks.

91. The Core Strategy needs to conform to all nine tests of soundness. The questions set out in Box 4.5 relate specifically to the seventh and eighth tests of soundness (including the provision of a robust and credible evidence base and provision of mechanisms for implementation and monitoring respectively).
APPENDIX 1: Consideration of Health in National Planning Policy Statements/Guidance Notes

### Accessibility to health facilities

PPS1: *Delivering Sustainable Development* sets out the overarching planning policies on the delivery of sustainable development through the planning system and so is the key policy that seeks to facilitate and promote sustainable and inclusive patterns of urban development. In preparing development plans, PPS1 requires planning authorities to provide improved access for all to health and community facilities and to services which promote healthy outcomes, such as open space, sport and recreation facilities.

PPS12: *Local Development Frameworks* reinforces this approach, suggesting that adopted proposals maps show where policies will be seeking to deliver community facilities, including health, education and social facilities, to assist regeneration and the achievement of sustainable communities.

### Promoting healthy communities

PPS1 requires planning authorities to promote communities which are inclusive, healthy, safe and crime free, whilst respecting the diverse needs of particular sectors of the community.

PPG17 *Planning for open space, sport and recreation* recognises the role that open space, sports and recreational facilities have to play in promoting healthy living and preventing illness, and in the social development of children of all ages through play, sporting activities and interaction with others. The PPG includes principles for planning for new open space and sports and recreation facilities. Integrating open spaces is promoted at the regional, local and individual building level.

### Influence of design on health

PPS1 states that high quality and inclusive design should be the aim of all those involved in the development process. This design should create well-mixed and integrated developments which have well-planned public spaces that bring people together and provide opportunities for physical activity and recreation. In terms of individual buildings, PPS3: *Housing* sets out a number of factors to consider when assessing design quality. These factors include the extent to which the proposed development provides, or enables good access to, community, green, open amenity and recreational space (including play space) in addition to private outdoor space such as residential gardens, patios and balconies.

PPS6: *Planning for Town Centres* recognises that well-designed public spaces and buildings, which are fit for purpose, comfortable, safe, attractive, accessible and durable, are key elements which can improve the health, vitality and economic potential of a town centre (para. 2.19).

### Avoiding health impacts

PPS23: *Planning and Pollution Control* clearly states that potential impacts arising from development, which could have impacts on health, is capable of being a material consideration, in so far as it may arise from or may affect any land use. This provides a clear policy steer that seeks to avoid impacts on human health arising from development projects.
Similarly, PPS1 advises that development plans should take account of environmental issues such as the management of waste in ways that protect the environment and human health. Whilst PPS10: Planning for Sustainable Waste Management expects modern and well-regulated waste management facilities operated in line with current pollution control techniques to pose little threat to human health, para. 30 reiterates policy set out in PPS23 acknowledging that planning operates in the public interest and seeks to ensure that the location of proposed development is acceptable and that health can be material to such decisions.

**Taking into account relevant health strategies and plans**

PPS12 requires local planning authorities to take account of the principles and characteristics of other relevant plans and programmes when preparing local development documents and in particular the core strategy. These should include the community strategy and strategies for, among other things, education, health, social inclusion, waste and environmental protection. This will ensure that the overarching objectives of the London Health Strategy and Local Delivery Plans are taken into consideration in the preparation of development plans.
APPENDIX 2: Consideration of Direct and Indirect Links to Health in the London Plan

Consideration of health in the London Plan, its Draft Further Alterations and accompanying documents

Objectives of regional planning policy

The London Plan sets out the Mayor's objectives, which Development Plan policies should take fully into account (Policy 1.1 The Mayor's Objectives). Health considerations are integrated within these objectives. The second objective, as revised by the Draft Further Alterations to the London Plan, seeks to make London a healthier and better city for people to live in. Key policy directions for achieving this objective include:

• Promoting policies to address health inequalities and the determinants of health in London and to improve the health of Londoners;
• Creating a cleaner, healthier and more attractive environment in all parts of London;
• Improving the provision of play space; and
• Improving the availability and quality of local services particularly education and health.

The fourth objective, also revised by the Draft Further Alterations to the London Plan, seeks to promote social inclusion and tackle deprivation and discrimination. A key policy direction for achieving this is to improve the provision of social infrastructure and related services including provision for health, playspace and childcare facilities and to address health inequalities.

Sustainable development

Health is recognised as a key element of sustainable development in the Draft Further Alterations to the London Plan. Policy 2A.1 Sustainability criteria states that the Mayor will, and boroughs and other stakeholders should, use a series of criteria in implementing the London Plan, and when considering Development Plan policies and planning proposals. These criteria include:

• Taking account of the impact that development will have on the health of local people;
• Preventing major accidents and limiting their consequences;
• Using a design-led approach to improve the quality of life; and
• Ensuring that development incorporates green networks that are planned, located, designed and managed as an integral part of the wider network of open space.

Addressing health is described as a core element of sustainable development in the Health Issues in Planning: Best Practice Guidance.

Providing for community facilities

The London Plan also requires Development Plan policies to protect and enhance existing health facilities and support the provision of additional healthcare in boroughs:

• Policy 3A.15 Protection and enhancement of social infrastructure and community facilities requires Development Plan policies to assess the need for social infrastructure and community facilities, including children's play and recreation facilities. It notes that adequate provision of these facilities is particularly important in major areas of new development and regeneration.
• Policy 3A.18 Locations for health care states that Development Plan policies should support the provision of additional healthcare within the borough as identified by the strategic health authorities and primary care trusts. The preferred locations for healthcare centres should be identified in appropriate locations accessible by public transport.
## Consideration of health in the London Plan, its Draft Further Alterations and accompanying documents

The Draft Further Alterations to the London Plan seek to ensure that future residential development is located so as to be within reach of healthcare and other facilities. For example, the supporting text to policy 3A.5 *Large residential developments* states that ‘in considering development proposals for large residential sites, boroughs should assess the need for community and ancillary services such as local health facilities, schools, leisure facilities, public open space and children’s playspace’ (para. 3.23).

*Accessible London: Achieving an Inclusive Environment* sets out a number of SPG Implementation Points which should assist boroughs when reviewing Development Plans and development control practices and procedures and when assessing planning applications. Implementation Point 15: *Health* states that the Mayor will and boroughs should endeavour to work with the Health Authority, National Health Service trusts and primary health care trusts to secure the provision of good quality health facilities that are well located and accessible to all users.

### Promoting public health/avoiding health impacts

The Further Alterations to the London Plan recognise that health is far more than the absence of illness, but is made up of a person’s physical, mental and social wellbeing (para. 3.87). It seeks to promote this definition of health in London. Policy 3A.20 *Health impacts* states that boroughs should require Health Impact Assessments for major new development proposals and have regard to the health impacts of development proposals as a mechanism for ensuring that major new developments promote public health within the borough.

As set out in the NHS London Healthy Urban Development Unit’s *Watch Out for Health*, a number of London Plan policies indirectly seek to promote health. For example, policies 3C.20 *Improving conditions for walking*, 3C.21 *Improving conditions for cycling*, and policy 3D.5 *Sports facilities* are likely to result in healthy outcomes from development and regeneration projects.

### Improving London’s open environment

The London Plan and its Draft Further Alterations recognise the health benefits of open spaces. Policy 3D.7 *Realising the value of open spaces* encourages the protection and promotion of London’s network of open spaces and seeks to protect the many benefits of open space to communities, including those associated with health, sport and recreation, children’s play, regeneration, biodiversity and the environment. Additional policies in the London Plan seek to identify broad areas of public open space deficiency and set priorities for addressing them and produce open space strategies to protect, create and enhance all types of open space.

The importance of open spaces on health is reinforced by the *Sustainable Design and Construction* SPG to the London Plan. It suggests that appropriate and imaginative measures to providing open spaces should be taken and encourages the consideration of multifunctional uses of open spaces where amenity spaces will be at a premium (page 23). *Accessible London: Achieving an Inclusive Environment* recommends that audits of parks and open spaces should identify improvements that are needed to make them accessible and inclusive to all potential users, regardless of disability, age and gender (Implementation Point 21).
APPENDIX 2: Consideration of Direct and Indirect Links to Health in the London Plan

Consideration of health in the London Plan, its Draft Further Alterations and accompanying documents

Influence of design on health

London Plan Policy 4B.1 Design Principles for a Compact City promotes high quality and inclusive design, which contributes to healthy communities. The Further Alterations to the London Plan recognise how sustainable design and construction can contribute to the good health of Londoners (para. 4.52). This is reinforced by the SPG to the London Plan on Sustainable Design and Construction which recommends a number of building specific measures to benefit the health of building occupiers (e.g. managing internal air quality, introducing natural light into buildings, etc).

Recognising health inequalities

The Draft Further Alterations to the London Plan recognise the health inequalities that exist in London and how providing facilities and addressing barriers to work (e.g. good public transport, skills development opportunities, etc) can help to tackle them (para. 3.62). Policy 3A.14 Addressing the needs of London’s diverse population states that policies in Development Plans should identify the needs of the diverse groups in their area, including the provision of healthcare facilities.

Health inequalities in London are dealt with in more detail in the Health Issues in Planning: Best Practice Guidance (2007). This guidance document sets out how planning decisions can directly and indirectly improve health and reduce health inequalities through the following topics:

• Good quality and affordable housing;
• Transport;
• Employment and skills training;
• Education and early life;
• Access to services;
• Community safety;
• Liveability, public space and urban realm;
• Air, water and noise quality;
• Access to fresh food; and
• Climate change.

Sustainable Design and Construction recognises that overheating in London associated with the urban heat island effect can result in increased morbidity in vulnerable groups such as the very young and the elderly, people with long term limiting illness, the disabled and people with health problems (Section 2.2.3 of Sustainable Design and Construction).

Taking into account relevant health strategies and plans

Consistent with PPS12, which requires local planning authorities to take account of relevant plans and programmes, the Draft Further Alterations to the London Plan require Development Plan policies to promote the objectives of the NHS Plan, the ‘Choosing Health’ White Paper, Local Delivery Plans and Modernisation Programmes and the delivery of health care in the borough (Policy 3A.17 Health objectives). The NHS and Local Delivery Plans, for example, set out how the NHS will improve the health of the local population and narrow inequalities in health (para. 3.82 of the Draft Further Alterations to the London Plan).
Delivering Healthier Communities in London

Consideration of health in the London Plan, its Draft Further Alterations and accompanying documents

Preparing borough-wide strategies

The London Plan encourages community strategies to take account of health considerations. In preparing community strategies, Policy 3A.23 Community strategies requires boroughs to support London’s health services, improve health and reduce health inequalities, and maintain and enhance London’s environmental quality and open spaces.

Consideration of the indirect links to health in the London Plan and its accompanying documents

The Health Issues in Planning: Best Practice Guidance sets out indirect links to health in the London Plan. These include:

- Large residential developments (Policy 3A.5).
- Affordable housing targets (Policy 3A.7).
- Negotiating affordable housing in individual private residential and mixed-use schemes (Policy 3A.8).
- Addressing the needs of London’s diverse population (Policy 3A.14).
- Protection and enhancement of social infrastructure and community facilities (Policy 3A.15).
- Developing London’s Economy (Policy 3B.1).
- Improving the skills and employment opportunities for Londoners (Policy 3B.12).
- Climate Change (Policy 4A.15).
- Priorities in planning obligations (Policy 6A.4).
APPENDIX 3.2: Detailed Mental Health Evidence Base

MENTAL HEALTH AND RISK FACTORS WHICH MAY BE MODIFIED THROUGH SPATIAL PLANNING

Synopsis of the Evidence

Depression and anxiety are important public health problems occurring in 15-30% of the UK population and accounting for approximately 20% of GP consultations in the UK.

Taking account of individual characteristics (e.g. age, socio economic status), there is still substantial variation in rates of Common Mental Disorders (CMD) between households. This variation can be related to factors operating at a level between ward and household (a ‘neighbourhood’ effect). This ‘neighbourhood’ effect is being increasingly researched but is currently not well understood.

The factors which appear to be most strongly associated with the lowest ratings for mental health are:

- Density and escape i.e. feeling dissatisfied with available green space, and/or social facilities or feeling overcrowded.
- Design, for example:
  a) not liking the look of the estate or road etc or
  b) high rise and deck access dwellings which are a risk in particular to mothers with young children.
- Physical incivilites, for example
  a) vandalism to property
  b) low external beautification
  c) poor property maintenance
- Housing quality e.g. damp.
- Fear of crime i.e. feeling unsafe to go out.
- Neighbour noise, although an individual’s trait anxiety may itself affect noise sensitivity.

Spatial planning can markedly affect the following risk factors:

- Neighbourhood Quality
- Housing Design and Density
- Housing Quality
- Fear of crime

Residents whose homes have been flooded experience psychological distress for considerable periods of time after the flood event.

Spatial planning can minimise the risks of flooding through design and careful location of vulnerable land-uses.
MENTAL HEALTH and the BUILT ENVIRONMENT – effects of neighbourhood and housing

Common Mental Diseases

Anxiety and depression are the most common form of psychiatric morbidity in the British general population (Meltzer H et al, 1995) and are a major public health problem (Paykel ES, 1978, Goldberg D & Huxley P, 1980, Goldberg D & Huxley P, 1992). The distribution of the common mental disorders (CMDs) is measured in population surveys, using validated questionnaire instruments, such as the General Health Questionnaire (Goldberg D & Williams P, 1988), and the Short Form-36 (SF-36) (Ware JE et al, 2000). Surveys show that the population prevalence of CMDs is between 15% and 30% and they account for approximately 20% of GP consultations without diagnosed psychiatric disorder but a poor level of mental health (Weich S & Lewis G, 1998), (Weich S, 1997). The case to reduce the public health burden of CMDs was recognised by the UK government during the 1990s in a succession of UK strategy documents, including The Health of the Nation in 1992 (Secretary of State for Health, 1992) and more recently in the National Service Framework for Mental Health (http://www.dh.gov.uk/assetRoot/04/01/45/02/04014502.pdf).

People and Places

Understanding the contribution of risk factors at the individual and area (contextual) level, that is the contribution of people and places, to determining mental health status is clearly necessary as a first step towards planning evidence-based interventions to improve population mental health.

A research focus has been developed on investigating the inter-relationships between ‘People and Places’: i.e. what are relations between CMDs and either characteristics of individuals, ‘compositional’ factors, such as age, gender, social class, educational level, economic status or the contextual factors of the neighbourhoods, or communities, in which they live (Macintyre S et al, 1993). “Contextual” measures reflect characteristics of places rather than residents (Weich S et al, 2002), (for example, educational attainment, employment) may be influenced by area characteristics (for example, quality of local schools, job opportunities, public transport). MacIntyre and her colleagues, who are developing measures of place based on needs, represent a major empirical advance (MacIntyre S et al, 2003). Another approach has been to classify small areas according to a particular characteristic. These contextual factors relate to the wider social, economic and built environment and may be area-based measures of social and/or material deprivation, economic conditions relating to local employment opportunities, type and quality of local housing and local environmental quality. (Kawachi I & Berkman L, 2000).

There is a need to study directly those features of the local social and physical environments which might promote or inhibit health. Improvements in public health might be achieved by a greater focus on places (Macintyre S et al, 1993).
A number of studies have attempted to investigate whether area differences in a variety of health outcomes were due to the composition of the resident population, or to features of place not captured by individual, compositional, properties. In the late 1990s, however, most studies which tried to partition area effects into compositional or contextual explanations tended to find that there was some residual effect of area having taken into account a number of compositional features. Thus, although cautioning that the finding of contextual effects may be due to unmeasured individual effects, most investigators have tended to conclude that where you live matters for health, although probably not as much as who you are (Pickett K & Pearl M, 2001).

UK studies have found variations in the associations between social class and health depending on the type of area, particularly steep health gradients, between more deprived and affluent small areas, being observed in more affluent districts or regions (Shouls S et al, 1996). Gender and age differences have also been observed in patterning by area (Ellaway A & Macintyre S, 2001), as have differences in the likelihood of observing ‘area effects’ according to the health measure of choice.

Investigators have tended to seek to establish both whether there is any explanatory role for context after taking population composition into account, and how much of the observed geographical variation this context might explain. There are problems with this common approach. Firstly, the distinction between composition and context may not be as conceptually clear or as useful as may appear at first glance. The properties of individuals or households which are used in many multilevel models are themselves shaped by the properties of the locality used in the same models. For example, social class as based on occupation is likely to be constrained and shaped by the local labour market economy, educational achievement may be based on local school standards, and housing tenure on the local housing market (Macintyre S & Ellaway A, 2002). However, more recently there has been some interest in the possibility of ‘pull up’ or ‘pull down’ effects on health of adjacency to different types of people or places (Graham E et al, 2000).

Macintyre states that: ‘people create places and places create people’ (Macintyre S & Ellaway A, 2003). The presence of spatial variation in mental health status and ecological associations with measures of social deprivation does not imply that the places where people live necessarily have any independent effects on mental health, since variation at area level may simply arise from variation in the characteristics of individuals living in these areas (Duncan C et al, 1996; Duncan C et al, 1998). Dissatisfaction with housing and the urban neighbourhood may also be a consequence of emotional distress, rather than a cause, thus further compounding the difficulties in isolating housing factors that may contribute to mental ill health. Since psychological well-being can affect one’s judgment about environmental quality, some of the apparent correlation between housing quality and well-being may be spurious. For example, people who are depressed might rate their housing quality lower than others not suffering psychological distress. People living in poor-quality housing experience stigma and may attribute some of their predicament to themselves (Halpern D, 1995; Kearns A et al, 2000).

For research into contextual explanations of variations in mental health, firstly, the geographical area for the measurement of context must be defined. ‘Neighbourhood’ is a commonly used term to try and capture the essence of a local social and community structure, but common agreement on geographical definitions of neighbourhood remains elusive, with a range of definitions for neighbourhoods, (Lee BA & Campbell KE, 1997; Kearns A & Parkinson M, 2001; Meegan R & Mitchell A, 2001; Glaster G, 2001). In the absence of any agreed definition, neighbourhoods must be pragmatically defined for the UK. (Mitchell R, 2001, Lynch J & Kaplan G, 2000, Diex-Roux AV, 2003).
A method of statistical analysis (multilevel modelling) is necessary that can disentangle compositional (individual characteristic) from contextual (neighbourhood) effects on mental health, and to model how contextual effects might vary between different groups of people. (Goldstein H, 1995).

Personal control, socially supportive relationships, and restoration from stress and fatigue are all affected by properties of the built environment and so characteristics of the built environment can directly influence mental health. Environmental characteristics with direct effects on mental health include housing, crowding, noise and indoor air quality. In addition to direct effects, the built environment can indirectly impact mental health by altering psychosocial processes with known mental health consequences. For example, higher residential density interferes with the development of socially supportive relationships with the household.

**Housing**

House type (e.g. high-rise), floor level, and housing quality (e.g. structural problems) have all been linked to mental health. High-rise, multiple dwelling units are inimical to the psychological well-being of mothers with young children and possibly that of young children themselves (Evans GW et al, 2003; Freeman HL, 1984; Gifford R, 2003). High-rise housing and poor quality housing have also been associated with more uncontrollable social interaction (Churchman A et al, 1984; Evans GW et al, 2001). Evans GW et al (2000) suggest that high-rise dwelling can be associated with negative mental health impact on children and mothers, because of lack of play space and social isolation. Young mothers are particularly at risk: a study in Glasgow has shown that women in their early 20s are three times more likely to consult their GP for a mental health problem if they (the women) live in flats (Lowry S, 1991). McCarthy P et al (1985) demonstrated that levels of psychopathology are high among the inhabitants of high-rise flats on inner city problem estates but not among those in the suburbs. Weich S (2002) has shown that people living in deck access building have a significantly higher risk of depression (odds ratio of 1.28, 95% CI 1.03-1.58) than those living in other housing types, even after adjusting for socio-economic status, floor of residence and structural problems. Parents of young children in large multiple-dwelling units often cope with the paucity of nearby play spaces by keeping children inside their apartments. Such restrictions heighten intrafamilial conflict, minimize play opportunities with others, and remove a primary avenue for parents to get to know their neighbours (Bartlett S, 1998; Stewart W, 1970).

The availability and arrangement of communal social space is an element covered in the literature on a range of spatial scales. The development of a neighbourhood community social life can be fragmented by lack of communal space. In a study of a school, for example, architect Sebastian Quin found that the social life was interrupted and fragmented by a lack of a central meeting place and the separation of spaces for different activities (Thompson-Fullilove M, 2001).

Maintenance of housing may also be an important issue in understanding mental well-being. A systematic review by Thomson H et al (2001) considers the evidence of the effects on health of interventions to improve housing. Two studies that examined the effects of housing improvement in the context of area regeneration reported that residents’ concerns about local crime were reduced (Thomson H et al, 2001). Kahlmeier S (2001) examined the influence of changes in environmental housing quality on people’s well-being when they moved house. They found a gain in self-rated health score was most strongly predicted by an improvement in satisfaction with location of building and perceived air quality.
The suitability of the apartment itself, quality of relationship with neighbours and noise from neighbours were found to be important indicators. Evans GW et al (2000) examined the potential link between housing quality and mental health. Their study demonstrates that, after controlling for income, physical housing quality is a significant predictor of psychological distress and that as housing quality rises symptoms of psychological distress diminish.

Although not all recent housing stock is of poor quality design and construction the view that people living in more recently constructed buildings have lower levels of mental well-being has been confirmed by Weich S (2002). This study found that people living in houses built after 1969 have a 43% higher risk of depression than those living in houses built earlier. These odds for poor mental health were found after adjusting for socio-economic deprivation, floor of residence and structural housing problems.

Temperature and humidity

A study by Hopton JL and Hunt SM (1996) used household interviews of people living in a local authority housing estate on the outskirts of Glasgow to demonstrate that dampness and cold could be significantly associated with mental health problems. In particular they found that a problem with dampness was significantly and independently associated with scoring more than five on the GHQ scale after controlling for possible confounding variables. Raw GJ et al (2001) also refer to the psychological effects arising from the constant sight of fungal growth, the sometimes unpleasant smell and the difficulty of getting rid of mould, although these have not been quantified.

Neighbourhood Quality

What constitutes a healthy neighbourhood?

1. Physical features of the environment shared by all residents in a locality
2. Availability of healthy environments at home, work and play
3. Services provided, publicly or privately to support people in their daily lives
4. Socio-cultural features of a neighbourhood
5. The reputation of an area.

When people change houses, they often move to new neighbourhoods as well. Relocating from low-income neighbourhoods to middle-income areas is associated with enhanced mental health for both adults and children (Johnson MP et al, 2002; Dalgard OS et al, 1997). When public housing residents relocate to middle-class suburban neighbourhoods, feelings of mastery increase relative to other public housing residents who relocate to low-income neighbourhoods (Rosenbaum JE et al, 2002). Poor-quality housing is more likely to be located in neighbourhoods with multiple indicators of urban decay (Evans GW et al, 2002; Wandersman A et al, 1998). There is growing literature demonstrating that neighbourhood quality has mental health impacts on children and their families, independent of household SES (Wandersman A et al, 1998; Leventhal T et al, 2000). Unfortunately, none of these studies specifies physical qualities of neighbourhoods; instead defining neighbourhood quality as a bundled index of multiple social (e.g. percentage unemployed) and physical attributes (e.g. number of abandoned buildings).
Children with attentional disorders (e.g. attention-deficit/hyperactivity disorder) have fewer behavioural problems when they spend more time in natural settings (Kuo FE, 2002). Wells NM (2000) found similar results for residential access to nature in a longitudinal study comparing children who relocated. Low-income housing areas in London with less access to private gardens have higher prevalence of depression, independent of SES (Weich S et al, 2002) and public housing residents living adjacent to natural outdoor areas report better adjustment to their living environment, feel safer, and have more positive affect than others from the same housing development living near outdoor spaces devoid of nature (Kuo FE et al, 1998).

**Crowding/Density**

Indices of crowding measured in the aggregate such as people per census tract bear little relationship to mental health outcomes (Baum A et al, 1987; Evans GW, 2001). It is important to exclude people living alone, since single residence is a well-documented correlate of mental illness.

With particular reference to inner-city boroughs, Kennedy HG et al (1999) found strong correlations between violence, homicide and suicide rates and population density and indices of deprivation. Rates were highest in boroughs with high population density and deprivation scores. A study of women in West London showed a ‘J’ shaped relationship between internal density and psychological symptoms (i.e. symptoms initially fell then rose as density increased). This relationship persisted when variables such as social class, unemployment and the presence of children were controlled for (Gabe J et al, 1993). The main factor contributing to stress appears to be the loss or lack of personal control associated with crowding (Lowry S, 1991). High-density living, particularly high household density, may in fact have positive effects, leading to increased social ties and more co-operation (Halpern D, 1995). Dalgaard OS et al (1997) investigated the reasons for variations in rates of mental disorder in five urban neighbourhoods. Of the five neighbourhoods surveyed, one had previously been a poorly functioning neighbourhood with high levels of mental ill health among its residents. Following a major development programme that included improvements to schools, kindergartens and playgrounds, and to ‘escape facilities’ such as transport, shops and youth activities, levels of residents’ mental well-being rose. These findings support the environment stress hypothesis, implying that the quality of a neighbourhood has an impact on mental health and that improving the urban environment can be a key factor in improving mental well-being, although it is extremely difficult to identify the specific impact of the different improvements: whether it is reduction in graffiti or increased access to green, open spaces, and so forth.

**‘Escape facilities’**

A national survey on public attitudes undertaken in 1995 that nine out of ten people value the countryside and that there is a very strong desire for greater opportunities to access rural areas and for green, open spaces in urban areas (Countryside Commission, 1997). A study by Lewis G et al (1994) indicates less prevalence of mental ill health among people living in built areas with access to gardens than among people with no such access. Open spaces can also be important in facilitating physical exercise and longevity (Takano T, 2002) and recent studies have shown a causal relationship between physical activity and reduced levels of depression (Mutrie N, 2000). Allotment gardening is another example of an ‘escape facility’ that has a positive effect on both physical and mental well-being and also provides opportunities for horticultural therapy for people with physical and mental health problems (Wiltshire R, 2000).
Crime and fear of crime

In the urban neighbourhood both crime rates (Norris F et al, 1994) and fear of crime have a significant impact on health, including individuals’ sense of physical and emotional vulnerability. Keithley J et al (1999) make the case for a major impact of crime on mental health. Fear of crime can profoundly affect the quality of individuals’ lives by causing both mental distress and social exclusion (Evans D et al, 2000). Wandersman’s neighbourhood disorder model (1998) demonstrates that anti-social behaviour and neighbourhood decline can impact on feelings of safety and on mental health. He cites physical signs including dilapidated houses, abandoned buildings, vandalism, litter and garbage. Practical interventions to improve the look of the urban neighbourhood – for example, work on improving deteriorated housing and open land, repairing vandalised facilities, removing graffiti and regular rubbish clearance – can help increase residents’ sense of safety and reduce actual crime levels (Blackman T, 2001). This study of the effects of regeneration on an area of Newcastle upon Tyne (2001) found that residents who perceive where they live to be unsafe are more likely also to report mental health problems. Greenberg SW et al (1984) suggest that high risk areas are generally characterised by more major thoroughfares, a larger percentage of commercial and mixed land use, more permeable boundaries, the close proximity of poorer areas, more multi-family units, higher levels of public parking and vacant land and lower levels of social cohesion. Dwellings that are located in areas of relatively low usage but with many thoroughfares tend to be an easy target for burglars, according to Halpern D (1995). Major MD and colleagues (1997) contend that busy streets and areas make people feel safer by providing a ‘virtual community’ through ‘natural surveillance’.

Social participation and Support

Measures which help promote mental health through environmental interventions can help strengthen an individual’s connection to the informal and ‘associational’ life of neighbourhoods and local communities. A healthy environment, provides safety, opportunities for social integration, and the ability to predict and/or control aspects of that environment (Taylor SE et al, 1997).

Spatial variation in rates of the common mental disorders at different spatial scales

The spatial scale at which contextual factors might have an impact on mental health remains unknown. Most studies have used data collected within administrative boundaries (MacIntyre S et al, 2002; Mitchell R, 2001). The independent associations between the prevalence of depression and (a) area level indices of socio-economic deprivation, and (b) urbanicity and population density, after adjusting for individual socio-economic status have been examined at the geographical scale of ward and wider area. (Reijneveld SA et al, 2000) The results based on the analysis of the full dataset showed no evidence for a significant association between individual mental health and ward deprivation, rurality or population density. Studies of large areas, such as UK regions (with hundreds of thousands of residents), are difficult to interpret (Lewis G et al, 1992; Duncan C et al, 1995; Skapinakis P et al, 2007). Wards may be too large and heterogeneous to detect contextual effect, and variance in CMD may be greater over smaller areas (Reijneveld SA et al, 2000). Recent studies have examined effects over smaller UK electoral wards (average population 5500) (McCulloch A, 2001; Weich S et al, 2003; Wainwright NWJ et al, 2004). Effect sizes at these levels are small and rarely statistically significant – percentage of variance in symptoms of anxiety and depression ranges from 0.5% to 4% before adjusting for residents’ characteristics, to less than 1% after doing so.

A number of studies have examined ways of measuring neighbourhood characteristics using a variety of neighbourhood sizes, principally in large American cities. Chicago (Sampson & Raudenbush, 1999), and Salt Lake City (Brown et al., 2003). However this approach needs to be extended to more detailed assessments in different types of urban settings, where the cultural and environmental contexts are different, and with different criteria for defining neighbourhoods. Survey tools have been developed (Dunstan F. et al) to assist with the definition and assessment of urban residential environments at smaller scales than ward level and closer to the level directly experienced by householders.

A postal survey based on a theoretical model of domains that might link the physical and urban environment with mental well-being was sent to 2696 adults aged 18 years or over, in four areas of Greenwich, London. (Guite H.F. 2006) Mental health was measured using the SF36 subscales for mental health (MH) and vitality (V).

Within domain analysis, adjusting for each of the confounding factors, resulted in the following factors being significantly associated with being in the lowest quartile for MH score: (i) control over the internal environment (damp), (ii) design and maintenance (not liking the look of the estate/road, (iii) noise (neighbour noise), (iv) density and escape (feeling over-crowded in the home, being dissatisfied with green spaces, dissatisfied with social and entertainment facilities) being dissatisfied with community facilities (such as libraries and community centres) was only significant for vitality, (v) fear of crime and harassment (feeling unsafe to go out in the day, feeling unsafe to go out at night, agreeing that needles and syringes left lying around are a problem) (vi) social participation (not enough events to get people together, not enough places to stop and chat).
One notable finding is substantial between household variation in rates of CMD in Britain, although most studies overlook this as a discrete level (McCulloch A, 2001; Wainwright NWJ et al, 2003; Silver E et al, 2002). In a national study, over 10% of variance in score on the 12 item general health questionnaire occurred at household level. This finding was not changed, even by adjusting for characteristics of individuals (including marital status, ethnicity, education, employment status, financial strain, and the number of current physical health problems), households (income, car access, housing tenure, social class, composition), or wards (Weich S et al, 2003). This finding remains unexplained, but could be attributable to exposures operating at a spatial level between ward and household.

Conclusions

There is little cross sectional variance in the prevalence of the CMD between areas with populations of 5000-8000 in the UK. Such areas may be too large to observe effects at a very localised level. However, substantial variance at the household level and at spatial scales below ward level indicate that place may still matter – but not in ways that have been studied to date. Anxiety and depression are important public health problems in their own right, and their prevalence is not declining. These conditions are also associated with mortality and physical morbidity, particularly cardiovascular disease. As acute and chronic environment stressors are potent drivers of onset and outcome, living in places with fewer amenities, or where personal safety is less secure, might lead to higher rates of psychiatric morbidity. Alternatively, risk may be confined to those with specific vulnerabilities. Modifying the physical or social environments could lead to substantial reductions in rates of the most common mental disorders.

Key domains through which the urban and built environment might impact on mental well-being:

• control over the internal housing environment
• quality of housing design and maintenance
• presence of valued ‘escape facilities; especially where there is high residential density
• crime and fear of crime
• social participation.

Noise and Psychological Morbidity in the Community

In Survey of Psychiatric Morbidity in West London, 5885 adults were randomly selected from within four aircraft noise zones and no overall relationship was found between aircraft noise and the prevalence of psychiatric morbidity. However there was an association between noise and psychiatric morbidity in two subgroups: those who finished full time education at more than 19 years of age and professionals (Tarnopolsky A. & Morton-Williams J. 1980)

In a follow-up of a cohort of male residents in Caerphilly, South Wales no association was found between the initial level of road traffic noise and minor psychiatric disorder but there was a small association of noise with increased anxiety scores (Stansfield S et al 1996).
Noise sensitivity, based on attitudes to noise in general, in an intervening variable that explains much of the variance between exposure and individual annoyance responses (Fields J.M. 1992). Noise-sensitive people tended to have higher levels of defence/startle responses and noise sensitivity may be an indicator of vulnerability to minor psychiatric disorder (Stansfield S 1992). In the Caerphilly cohort study, noise sensitivity did predict psychiatric disorder at follow-up, but did not interact with noise level, suggesting that noise sensitivity does not specifically moderate the effect of noise on psychiatric disorder. After adjusting for trait anxiety at baseline, the effect of noise sensitivity was no longer statistically significant, which suggests that the association between noise sensitivity and psychological morbidity may be accounted for by the confounding association with trait anxiety (Stansfield S 1996).

Noise

A study of children exposed to traffic noise from roads and trains in small towns in Austria generated a dose-response function between noise and psychological distress (Lercher P et al, 2002). On the other hand, studies around Heathrow Airport have found more equivocal data on noise and children’s mental health (Haines MM et al, 2001; Haines MM et al, 2001; Haines MM et al, 2001). Ouis D (2001) concluded that exposure to noise has been shown to lead to various kinds of discomfort, and can engender physiological reactions typical of stress. Stansfeld SA et al (2000) argue that the question of whether environmental noise exposure causes mental ill-health is still largely unanswered. Haines MM et al (2001) found that, although chronic aircraft noise is associated with higher levels of annoyance and also impairs reading comprehension, it is not associated with mental health problems in children. However, the relationship between noise and mental health is influenced by individual attitudes and perceived sense of control (Ludlow B et al, 1997).

If there are few overall effects of environmental noise on the psychological health of the population, it may be that there are certain groups who are more vulnerable to noise, particularly children, the elderly and people with existing illness (Stansfield S 1997).

MENTAL HEALTH EFFECTS FROM FLOODING

There has been increasing interest in the possible mental health effects of flooding events. Mental health impacts vary in severity and include a wide range of symptoms, including possible suicide attempts, post-traumatic stress disorder (PTSD - characterised by intrusive memories, avoidance behaviour, sleep disturbances, irritability, anger and excessive vigilance), depression and substance abuse. The studies identified from the literature have been divided according to whether they examined a single flooding event, or multiple events.
APPENDIX 3.2: Detailed Mental Health Evidence Base

SINGLE EVENT STUDIES

A number of retrospective studies examining single events have been identified from the literature. The earlier studies typically examined a flooded population and sought information on symptoms or GP visits in the 12 months prior to and 12 months after the flood, either through self-reported symptoms or GP records (Bennet, 1970; Abrahams et al., 1976). However, in the most recent UK-based quantitative study, (Reacher et al, 2004) simply compared a flooded group and a control group on the basis of their experiences after the flood. In France, Duclos et al. (1991) examined the immediate health impact of the flash flood in Nîmes, without using a control group. Studies often included a variety of physical illnesses (which have been outlined in earlier sections) as well as mental health effects.

Post-traumatic stress disorder

Verger et al. (1999; 2000) examined the risk factors for post-traumatic stress disorder symptoms five years after a large flood in the Vaucluse area of France. The flood, which affected over 60 municipalities, resulted in 38 deaths. In a pilot study, the researchers conducted face-to-face interviews with residents from two different areas affected by the flooding and found that the PTSD scale (based on a standardized questionnaire) was an effective tool (Verger et al., 1999). In the main study, a single area (Bedarrides) was targeted and 500 people interviewed. Significantly higher PTSD scores were observed for females, people over the age of 35, with a low monthly income and those who had a history of psychological disorders or life-threatening traumatic events. They also found a significant exposure-response relationship with the level of exposure to the flood and PTSD score (Verger et al., 2000).

In Canada, Auger et al. (2000) conducted a telephone survey of flooded and non flooded areas in Saguenay four months after a flood event. A total of 141 adults were interviewed; 62 from the flood area and 79 from an adjacent non-flooded area. PTSD was found to be significantly elevated in the flooded group (OR 6.08; 95% CI 1.63 – 22.64), with prevalence in the flooded group being almost 20% compared to 3.8% in the control group. Emotional distress was also significantly higher in the flooded group (OR 2.42; 95% CI 1.04 – 5.61).

McMillen at al. (2002) studied people who had been affected by the Midwest floods in 1993, which resulted in 50 deaths, damage to 50,000 homes and the evacuation of 54,000 people. Interviews were conducted with 160 people (from those thought to be worst affected by the flooding), 40 of whom reported flood-related injuries. 16 of the respondents saw others injured or killed in the flood, 25 had a family member injured or killed in the flood and 118 people reported doing or seeing something disgusting during the flood. McMillan et al. (2002) found that 60 people (38%) met criteria for a post-flood psychiatric disorder and that 35 people (22%) met criteria for PTSD related to the flood, although it should be noted that the response rate to the invitation to participate in the study was only 30%.

In Poland, Bokszczanin (2002) found that exposure to the 1997 flood disaster was a strong predictor of symptoms of PTSD, depression and feelings of loneliness in children and adolescents. The study, which took place 20 months after the flood, collected questionnaire response data from children and adolescents between the ages of 11 and 20. The occurrence of more intense symptoms was seen in those who had suffered greater threats during the flood event (fear of death, evacuation, being trapped by the flood and so on).
General symptoms

In the USA, Ginexi et al. (2000) studied Iowa residents before and after the 1993 Midwest floods. An Iowa Health Poll (IHP) conducted in 1992 (with 2379 respondents), a year before the flooding event, was used to provide pre-disaster data. Attempts were made to contact those who had participated in IHP, two – three months after the flooding, to provide post-disaster data (Iowa Flood Study – IFS). The researchers were successful in contacting and re-interviewing over 70% of the original respondents. Although the whole of Iowa had been declared a Federal disaster area as a result of the flood, the actual level of flooding experienced by people varied markedly. Over 50% of the respondents to the IFS reported some flood impact but only 2% of the respondents had vacated their homes. Despite this the study was able to demonstrate a small but true rise in depressive symptoms in those affected by the flood.

Reacher and colleagues performed a historical cohort study using telephone interviews to establish physical illness and psychological distress in residents from 103 flooded and 104 non flooded properties in the same postcode area in Lewes, Southern England (Reacher et al., 2004). Previous studies (Bennet, 1970; Abrahams et al., 1976) had suggested that psychological distress may be associated with flooding, so this was specifically examined in adults using the GHQ-12 (a 12-item General Health Questionnaire, which is a standardised tool used to assess psychological symptoms). At the peak of the flooding some areas of the town were under 3.6 m of water. No deaths or trauma were reported as a result of the flood and routine surveillance of infectious disease did not detect an increase in the aftermath of the flood. The telephone interviews were conducted nine months after the flooding; information was recorded for injuries, other physical symptoms (see earlier sections) and, for adults, psychological health. Psychological distress in adults (pre-defined as a score of ≥4 in response to the GHQ-12) was significantly raised in the flooded group (RR 4.1; 95% CI 2.6-6.4). Psychological distress also exhibited a significant trend by flood depth. There were marked decreases in the risk estimates for physical illnesses in adults after adjustment for psychological distress. The authors note that their results suggest that the risk of psychological distress from being flooded was independent of reported physical illness and sanitary disruption within flooded households: “Our findings support the view that psychological distress is a leading adverse health outcome associated with flooding and may explain a proportion of physical illness.”

MULTIPLE EVENT STUDIES

In 2003, Defra and the EA published a study on the appraisal of human-related intangible impacts of flooding, much of which was aimed at producing a methodology to account for the impacts of flooding on human health in order to assess the benefits of flood alleviation measures (Defra/EA, 2003; Tunstall et al., 2006). Questionnaires were developed based on other questionnaires and a number of previously used scales designed to assess health effects. The scales considered the most appropriate to flooding and a UK population after pilot trials were the GHQ-12 and PTSS (Post-Traumatic Stress Scale). The SF-12 (Short Form) could not be used as the group were unable to obtain formal approval for its use.
In the main study over 1,500 face-to-face interviews were conducted with people who had been flooded (983) or those at risk of flooding (527) in 30 locations across England and Wales. The questionnaires were used to assess both health status at the time of the interview (considered to be an indicator of the long-term effects of flooding) and health at the time when the flooding was most severe for them (an indicator of the short-term effects of flooding). The number of people who had been flooded scoring 4 (the threshold indicative of some degree of mental health problems) or greater on the GHQ-12 was high, with 64% of all respondents recording this level at the worst time of flooding (generally within three months of the event), and 25% when current health was being assessed. In comparison, only 10% of those ‘at risk’ of flooding scored 4 or more. Interestingly, the figure of 10% is less than that reported by the general population, for whom the proportions scoring four or more on this scale were reported to be 13% for men and 18% for women (DoH, 1999). Most of the respondents (72%) reported experiencing some psychological effects as a result of the flooding, with most people reporting an increase in anxiety when it rains. In subjective terms stress rated highly in terms of the severity of the effects of flooding, while health effects (presumably, other than stress) were rated among the lesser effects of flooding.

Three factors were considered in relation to the effects on health:

- Socio-demographic factors;
- Flood characteristics; and
- Post-flood factors.

The socio-demographic factors found to be important were gender, prior health, age, rented housing, flood risk awareness and long-term illness, although the ranking of these depended upon the health measure used (PTSS, current GHQ-12 or worst time GHQ-12). The flood characteristics found to be important were contamination, depth of flooding, years since flooding and warning time. Problems with insurers and evacuation were found to be significant post-flood factors.

In a series of studies conducted by the FHRC on behalf of the EA in response to the Easter floods of 1998 and the summer floods of 2000, the following self-reported psychological health effects were reported by those who had been flooded (Tapsell and Tunstall, 2003):

- Anxiety (e.g. during heavy rainfall)
- Increased stress levels
- Sleeping problems
- Depression
- Panic attacks
- Flashbacks to flood
- Difficulty concentrating on everyday tasks
- Lethargy/lack of energy
- Feelings of isolation
- Increased use of alcohol or prescription (other) drugs
- Nightmares
- Anger/tantrums
- Mood swings/bad moods
- Increased tensions in relationships (e.g. more arguing)
- Thoughts of suicide
VULNERABILITY AND HASTENED MORTALITY

Although many studies note that certain groups may be more or less vulnerable to health impacts (e.g. Huerta and Horton, 1978 – who actually noted that the elderly in their study coped well in terms of emotional effects), few studies have enough participants to be able to quantify the interaction between age and these effects. In addition to vulnerable groups that can, to some degree, be predicted, Few et al. (2004) note that “vulnerability is shaped by a combination of physical, social, economic and environmental factors – the attributes of the person/system that condition the impacts resulting from flooding.”

It has also been noted that, in some instances, flooding seems to hasten mortality in the elderly or chronically sick (Bennet, 1970). Anecdotal evidence from flooding in Banbury and Kidlington (Tapsell, 2000) supports this with a number of people being upset about elderly neighbours who had died shortly after the flooding and feeling that the experience had accelerated their demise. There are, however, very little data with which to quantify this effect and it is not accounted for within the quantification (as this only reflects deaths up to a week after the event). Deaths other than drowning are included as a heart attack during an evacuation while not caused by the water, is nevertheless directly related to the flood event (Kelman, 2004).

The FHRC have developed a social flood vulnerability index, which is based upon the number of people aged 75 and over, people suffering from long term illness, lone parent households and financially deprived households. This could be employed to determine areas that may have more susceptible populations but it can not be translated into differential health impacts.

While the immediate effects of flooding, both in terms of health impact and damage to the property, are the most obvious, Tapsell and Tunstall (2001) note that “the aftermath of the flooding and coping with the recovery process was for the majority of participants the most stressful and difficult time.”
APPENDIX 3.2: Detailed Mental Health Evidence Base

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APPENDIX 3.2: Detailed Mental Health Evidence Base


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OBESITY

Synopsis of the Evidence

In England, 15% of children between 2 and 10 year of age are obese and the prevalence of obesity and overweight children is increasing steadily. Further to this, since 1990 there has been a dramatic increase in the incidence of type 2 diabetes which has occurred in tandem with the prevalence of sedentary lifestyles and obesity.

There are ways to address this trend by encouraging physical activity. In adults physical activity reduces the risk for all-cause mortality as well as for cardiovascular disease, obesity and diabetes and musculoskeletal conditions. Physical activity does not need to be vigorous and sustained to achieve health benefits.

Factors key to supporting physical activity are:

a) Walking and cycle ways to connect homes with schools, workplaces and shops.
b) Accessibility to playing in the park and sports facilities.
c) Removal of environmental barriers to permit residents in poorer areas to become physically active.

There is evidence that creation or enhancement of the above factors is effective in engaging people across the socio-economic and ethnic spectrum in levels of physical activity that improve their health.

Spatial planning can encourage physical activity by promoting walking and cycle ways, improving accessibility to open and green spaces and sports facilities, and removing environmental barriers to allow residents in poorer areas to become physically active.
The prevalence of obesity and overweight in children is rising steadily and if this trend continues, obesity may constitute the single most serious health threat to the current generation of children. According to the latest figures from the Health Survey for England (HSE) (2002-04 data combined), 15% of children aged 2-10 are obese (http://www.dh.gov.uk/en/Publicationsandstatistics/PublishedSurvey/HealthSurveyforEngland).

The incidence of Type 2 diabetes has increased dramatically since 1990 and this rise has occurred in tandem with the prevalence of sedentary lifestyles and obesity. There are ways to address this trend by encouraging physical activity (McGinnis JM 2002) and in the U.S.A a large clinical trial (Diabetes Prevention Program DPP) demonstrated that through diet and engaging in walking or other moderate intensity exercise for thirty minutes each day, participants reduced their body weight by 5% to 7% with a consequent reduction in risk for diabetes of 60% (National Institute of Diabetes and Digestive and Kidney Disease 2001). 45% of the participants in the DPP trial were from minority groups that suffer disproportionately from Type 2 diabetes, including African-American and Hispanic-Americans, demonstrating that exercise intervention is effective in dealing with inequalities in health (Kriska A 2002). The physical activity prescription used in the DPP was similar to public health recommendations (Centres for Disease Control 1996, Pate RR 1995) which call for an increase in moderate levels of physical activity, such a brisk walking for about thirty minutes on most days. Such activities are more likely to be maintained over the years by people of different ethnic/racial and economic groups than are high-intensity sports (Task Force on Community Preventive Services 2002). Planning changes are needed to build environments that are more favourable to physical activity and which will maximise the likelihood that walking will be maintained.

Physical activity is essential to the aim of addressing the problems of sedentary living and obesity amongst children and adults. Accessibility (determined by land-use patterns and the transport system) to playing in the park, sport and other facilities is key to supporting physical activity. Proximity to routine destinations is an important correlate of physical activity (D.A. Cohen 2006) and residents living in poorer areas have more environmental barriers to overcome to become physically active (W.C. Taylor 2006) which highlights the need for environmental justice. Active living requires that development plans incorporate walking and cycle ways to connect homes with schools, workplaces and shops whilst implementing appropriate control of motor traffic. The World Health Organisation (WHO 2006) has produced guidance for local governments and examples of case-studies whereby physical activity and active living may be promoted in urban environments. For example, the Sandness Municipal Council in Norway has made a systematic effort to identify and promote the interests of children in planning. Schools and children have registered hundreds of play areas and short cuts on digital maps and these areas are required to be safeguarded in planning activities.

Physical activity does not need to be vigorous and sustained to achieve health benefits. Improved health can be attained through the accumulation of shorter bouts of moderate-intensity activity (US Department of Health and Human Services 1996); however, greater levels of activity do produce greater health benefits.
In the U.S.A the Task Force on Community Preventive Services conducted a systematic review of community interventions to increase physical activity. It found sufficient evidence to recommend creation of or enhanced access to places for physical activity combined with informational outreach activities. This was effective as measured, for example, by percentage of persons exercising on three or more days of the week (Task Force on Community Preventive Services 2002a, 2002b). Lack of data is one of the main barriers to progress in examining the causal links between the built environment and physical activity levels (Transportation Research Board of the Institute of Medicine, 2005) There is a need for geographic and environmental data which will permit the linking of information on physical activity with details about the respondents' location and physical environment (Boarnet MG 2004, Handy 2004, Handy et al 2002).

There is a growing awareness that cities can be designed to fight obesity (Larkin M 2003) and there is increasingly a marriage of city planning and public health. Planners have the imperative of solving problems of congestion and lack of open-space and public health professionals are realizing that these problems contribute to the prevalence of obesity in the population. There are initiatives in the U.S.A with projects looking at ways communities can be designed to encourage more physical activity (e.g. Active Living by Design: http://www.activelivingbydesign.org and American Planning Association: http://www.planning.org/physicallyactive). The U.K also has several well developed programmes for promoting fitness-friendly environments such as the UK’s Walking the Way to Health Initiative (http://www.whi.org.uk) which is a project of the British Health Foundation and the Countryside Agency.

The rising prevalence of obesity and Type 2 diabetes as well as the recognised preventive measure of increasing physical activity resulted in guidance from the National Institute for Health and Clinical Excellence (www.nice.org.uk). NICE has published a quick reference guide for local authorities and the public in the prevention of obesity in adults and children (NICE 2006). This encourages planners to facilitate links between health professionals and others to ensure that local policies improve access to opportunities for physical activity and healthy food.

Evidence such as that cited above as well as others (Kahn E 2002, Spence JC 2001, ACES 2006) have made the case for how land use planning can impact on the public health and healthy living. Researchers are now addressing how perceptions of the local environment affect people’s preparedness to exercise (Rutten et al 2001) as well as the issues relating to access to facilities by socioeconomic status (Gordon-Larsen P 2006). Also, attention is being focused on vulnerable groups such as children (Active Living Research 2005), people with disabilities (Active Living Research 2006) and older adults (Cunningham GO 2004, King AC 1998).

Regular physical activity is associated with enhanced health and reduced risk for all-cause mortality (Lee et al 1995, Paffenbarger et al 1993, Paffenbarger et al 1994, Blair et al 1995). Beyond the effects on mortality, physical activity has multiple health benefits, including reducing the risk for cardiovascular disease, diabetes, obesity, selected cancers and musculoskeletal conditions (Bouchard et al 1994).
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APPENDIX 3.4: Detailed Cardiovascular and Respiratory Disease Evidence Base

CARDIOVASCULAR AND RESPIRATORY DISEASE AND RISK FACTORS WHICH MAY BE MODIFIED THROUGH SPATIAL PLANNING

Synopsis of the Evidence

• There is strong quantitative evidence that respirable particles (PM10) in urban areas have a short term effect on deaths from all causes (0.75% per 10 µgm⁻³ PM₁₀ as 24 hour mean) and respiratory hospital admissions (0.8% per 10 µgm⁻³ PM₁₀ as 24 hour mean). The primary source of PM₁₀ in urban areas is motor traffic.

• Nitrogen dioxide is produced by motor vehicle exhausts and is an effect modifier. Increase in daily mortality associated with a 10 µgm⁻³ increase in PM₁₀ was 0.8% for a city with high long term average NO₂ concentrations compared to 0.19% for a city with low long term average.

• Ozone gives rise to population exposure in both rural and urban areas. Deaths (all causes) and respiratory hospital admissions are +3% and +3.5% respectively for 50 µgm⁻³ eight hour mean O₃ concentration.

◆ Spatial planning can modify the total volume of traffic as well as congestion of traffic at certain locations. This may have a preventive effect on population CVD and respiratory disease by reducing air pollution.

• There is evidence that vigorous physical activities such as brisk walking or cycling on most days of the week has a clear association with reduced risk of CHD in middle aged and older people.

◆ Spatial planning has the potential to provide opportunities for walking to work, cycling and access to leisure facilities.

• The epidemiological evidence for association between noise exposure and CVD is not strong.

• There is evidence that following flooding residents are more likely to report exacerbations of asthma, coughs and respiratory infections.

◆ Spatial planning can prevent flood risk to residential properties.
CARDIOVASCULAR AND RESPIRATORY DISEASE

Health Risks Associated with Respirable Particles in ambient air

There is a body of epidemiologic evidence which demonstrates that there are small health risks associated with population short-term (acute) and long-term (chronic) exposure to ambient levels of PM$_{10}$ particles. The evidence base is sufficiently robust to permit quantitative risk estimates. The DOH’s Committee on the Medical Effects of Air Pollutants have reviewed the available epidemiological evidence and published exposure-response coefficients (COMEAP 1998) for short term effects of air pollution on health. These are:

- Deaths, all causes: +0.75% per 10µg/m$^3$PM$_{10}$ (24 hour mean)
- Respiratory hospital admissions: +0.8% per 10µg/m$^3$PM$_{10}$ (24 hour mean)

The estimates of the exposure-response relationships are based on the results of time-series studies. These studies examine the relationship between daily levels of pollution and the risk of adverse health effects, on the same day or subsequent days, adjusting for climate and other factors.

The APHEA-2 mortality study (Air Pollution and Health: a European Approach) covered a population of more than forty three million people living in European cities studied for more than five years in the 1990’s. The all-cause daily mortality increased by 0.6% (95% CI 0.4-0.8) for each 10µgm$^{-3}$ increase in PM$_{10}$ (Katsouyanni K et al, 2001). The National Mortality, Morbidity and Air Pollution Studies (NMMAPS) in the USA investigated 50 million inhabitants of metropolitan areas during 1987-94 and all-cause mortality increased by 0.5% (95% CI 0.1-0.9) for each 10µgm$^{-3}$ increase in PM$_{10}$. (Samet JM et al, 2000).

In Europe, a World Health Organisation (WHO) task group conducted a meta-analysis of time series studies. (Anderson HR et al, 2005). Estimates of PM$_{10}$ effects on all cause mortality were taken from 33 separate European cities or regions and all cause mortality increased by 0.6% (95% CI 0.4-0.8) for each 10µgm$^{-3}$ increase in PM$_{10}$. The summary estimates for cardiovascular and respiratory mortality separately were 0.9% (95% CI 0.5-1.3) and 1.3% (95% CI 0.5-2.0) respectively for each 10µgm$^{-3}$ increase in PM$_{10}$.

The APHEA-2 hospital admission study covered a population of thirty eight million living in eight European cities during the 1990s. Hospital admissions for chronic obstructive lung disease (COPD) and asthma for people of more than sixty five years of age were increased by 1% (95% CI 0.4-1.5) per 10µgm$^{-3}$ increase in PM$_{10}$ and admissions for cardiovascular disease (CVD) were increased by 0.5% (95% CI 0.2-0.8) per 10µgm$^{-3}$ increase in PM$_{10}$. (Le Tertre A et al, 2003). In the USA effects on people of more than sixty five years of age who were studied in ten cities were an increase of 1.5% (95% CI 1.0-1.9) on COPD admissions and 1.1% (95% CI 0.9-1.3) on CVD admissions per 10µgm$^{-3}$ increase in PM$_{10}$. (Zanobetti A, 2000).

It is important to realise that these outcomes are likely to only apply to patients who already have severe, pre-existing disease (e.g. Chronic Obstructive Pulmonary Disease and ischaemic heart disease). In these circumstances the increment in level of an air pollutant acts as the precipitating factor.
Two epidemiological studies in the United States have shown long term effects and that those living in less polluted cities live longer than those living in more polluted cities. The measure of particulates employed was PM\textsubscript{2.5} defined analogously to PM\textsubscript{10} (i.e. smaller particles). COMEAP considers that this evidence demonstrates that it is more likely than not that a causal association exists between long term exposure to particles and although the results of the US studies may be transferable to the UK, the size of the impact could differ.

COMEAP reviewed these two studies (COMEAP, 2001) and also a reanalysis of their data by the Health Effects Institute. The COMEAP review reported that:

The ‘Six Cities; study (Dockery DW et al, 1993) examined the mortality experience of over 8000 adults living in six cities in relation to measurements of air pollution in the cities in which they lived. They were followed up for 14 to 16 years between 1974 and 1991. All cause mortality rates, adjusted for sex, age, smoking, education, occupational exposure and body mass index, were shown to be associated with levels of fine particles (measured from 1979 to 1985) and sulphate (1979 to 1984). The ratio of the adjusted mortality rate in the most polluted city to that in the least polluted city (using fine particles as a measure) was 1.26 (95% confidence intervals 1.08-1.47). Air pollution was positively associated with death from lung cancer and cardiopulmonary disease but not other causes.

The ACS study (Pope CA et al, 1995) made use of a cohort of 552,138 adults living in 151 cities across the United States. The cohort was followed for 7 years from 1982 to 1989. Again, there was an association between all cause mortality (adjusted for age, sex, race, smoking, occupational exposure, education, body mass index and alcohol use) and sulphates (measured in 1980 in all 151 cities) or fine particles (measured from 1979 to 1983 in 50 of the cities). The adjusted relative risk for the most polluted areas compared with the least polluted areas (as indicated by fine particles) was 1.17 (95% confidence intervals 1.09-1.26). Positive associations were found with cardiopulmonary mortality and, for sulphates only, with lung cancer.

The HEI reanalysis (Krewski D, 2000) also looked at whether the associations between fine particles and mortality varied in different subgroups. Those with pre-existing heart or lung disease are one plausible susceptible subgroup but the relative risk was not increased in this group in the ACS study and the increase seen in the six cities study was not statistically significant. Similarly, the increased relative risk in those with reduced FEV1 in the six cities study was not significant. There was also no difference in relative risk between smokers and non-smokers. It seemed that only cardiovascular mortality was affected in both studies. It might be suggested that the apparent lack of an effect on respiratory mortality might be due to misclassification between cardiovascular and respiratory deaths. Schwartz (1994) has shown that cardiac deaths associated with short-term exposure to air pollution more often have respiratory disease as a contributing cause of death. It is unknown whether this is the case for the long-term effects.

The cohort studies (Dockery DW et al, 1993; Pope CA et al, 1995) were unable to take account of different durations of exposure or of the differences in historical levels of air pollution in the cities. Particle levels measured over relatively brief periods (6 years at most (Dockery DW et al, 1993)) were used to represent the pollution experience of cities.
Stratification of age in the ACS study indicated that risks were not reduced in those under 50 as would be expected if more than 40 to 50 years of exposure were needed before the onset of an effect. The studies examine mortality in relation to spatial rather than temporal differences in pollution so there are additional uncertainties when applying them to assess the impact of changing pollution over time. The mix of pollutants in the air may vary between countries and this may be important for transferability of the results.

The ACS study (Pope CA et al, 1995) represented the PM$_{2.5}$ levels in terms of a single value of long-term average concentration in each of the cities studied. It used a median concentration, based on measurements from 1979-1983, as its index of long-term annual average PM$_{2.5}$. The relative risk for fine particles and mortality in the ACS study (Pope CA et al, 1995) was 1.17.

A multi-disciplinary team co-ordinated by the Institute of Occupational Medicine (IOM) (Hurley JF et al, 2000) has analysed the possible implications of the effects of long-term exposure to particles on the UK population. The IOM report used life-table methods to link the results of the US cohort studies with the age and mortality experience of the UK population. This allowed an estimate of the possible loss of life expectancy due to long-term exposure to fine particles subject to certain assumptions. The calculations are for changes in all-cause mortality in those over 30 (as in the cohort studies).

The results apply to the population of England and Wales alive in 2000 followed to the end of their lives assuming a 1µg/m$^3$ drop in annual mean PM$_{2.5}$ is maintained for the rest of their lifetime. The baseline assumes current mortality rates remain unchanged (sensitivity analyses have shown that changing this assumption has little effect on the results). In a statement on the long-term effects of particles on mortality (COMEAP 2001) COMEAP also provided a separate rough estimate of the life years gained, if the effect of short-term exposure on mortality is calculated for a 1ugm$^{-3}$ drop in annual mean PM$_{10}$ rather than PM$_{2.5}$. This includes the under 30s and assumes an effect on all ages.

The answers range from 0.2 to 4.1 million life years gained over the rest of the lifetime of the population alive today. This could be expressed as 1 day to 1 month per person per µg/m$^3$ PM$_{2.5}$ on average but it should be noted that the gains if life expectancy are unlikely to be evenly distributed across the population.

To put this reduction into context, a series of measurements of PM$_{2.5}$ made at 3 urban background sites in London during 2000-2001 gave an average of 18µ gm$^{-3}$. A reduction of 1ugm$^{-3}$ PM$_{2.5}$ represents around a 5% reduction from this level (COMEAP 2001).

In addition to studies on hospital admissions and mortality the effects of air pollution on respiratory morbidity have also been investigated. Lung function and symptoms of bronchitis in adults was negatively associated with PM$_{10}$ in different communities in Switzerland (Zemp E 1999). Associations were also reported between lung function and symptoms of bronchitis in children and fine particles in children in US and Canadian communities. (Raizenne M. 1996, Dockety D.W. 1996). Also lung function growth has been shown to be affected by exposure to air particulates. (Gauderman W.J. 2000). The evidence base of air pollution and health is very extensive and a review of the major studies is given by Brunekreef and Holgate (Brunekreef B 2002).
Health Effects Associated with Nitrogen Dioxide in Ambient Air

Nitrogen dioxide is produced with nitric oxide by motor traffic. Epidemiological studies have tended not to show that nitrogen dioxide contributes much to health effects associated with ambient air pollution (Department of Health, 1999). COMEAP reported on acute and chronic effects of nitrogen dioxide in 1998 (Department of Health, 1998) and commented that:

The effects of NO₂ appear to be dependent on a wide range of modifying influences and are difficult to assess. All cause mortality is increased by approximately 3.5% per 100µgm⁻³ on days with elevated NO₂. There is little evidence that admissions to hospital are increased by increased levels of NO₂ for all respiratory causes but there are apparent increases in admissions for COPD and asthma. A large proportion of all studies on the acute effects of NO₂ emphasize the heterogeneity of response between groups defined either by personal characteristics or by coexistent exposures. COMEAP quotes a risk coefficient for respiratory hospital admissions of +2.5% per 50µgm⁻³ NO₂ increase in 24 hour average NO₂. There is a lack of consistency in the results of studies examining the chronic effects of NO₂ on respiratory symptoms and lung function in children and therefore COMEAP has not yet estimated risk coefficients for these effects.

Since 1998 the APHEA study which relates time-series of routinely collected mortality and hospital admissions to daily air pollution data (Katsoyanni K, 2001) has found that NO₂ is an effect modifier and that the estimated increase in daily mortality associated with a 10µgm⁻³ increase in PM₁₀ was 0.8% for a city with high long term average NO₂ concentrations compared to 0.19% for a city with low long term average.

Health Effects Associated with Ozone in Ambient Air

Ozone is created by the action of sunlight on nitrogen dioxide in the presence of volatile organic compounds and ambient concentrations show yearly, seasonal and diurnal variation. Ozone and its precursors may be transported over long distances giving rise to population exposure in both rural and urban areas.

COMEAP concluded that for the purposes of health impact assessment only data for respiratory admissions and all cause mortality should be used and published exposure response coefficients (Department of Health 1998):

Deaths (all causes) and respiratory hospital admissions +3% and +3.5% respectively per 50µgm⁻³ 8 hour mean 03 concentrations.
Physical activity in the prevention of Cardiovascular Disease

The amount and type of physical activity required for the primary prevention of coronary heart disease is not known precisely. There is evidence from a number of studies (Wannamethee SG, 2001) that leisure time physical activity is associated with reduced risk of CHD in middle-aged and older people of both sexes. Perhaps the strongest evidence comes from an ongoing cohort of men in the USA (Sesso HD, 2000) which demonstrates that vigorous activities are associated with a reduced risk of CHD but that moderate or light activities have no clear association with the risk of CHD. Vigorous activities equate to activities such as brisk walking and recreational cycling on most days of the week. Such activity may favourably affect CHD risk even in the presence of other CHD risk factors.

Noise and Cardiovascular Disease in the Community

Concerns have been expressed that long term exposure to community noise may have adverse health affects. There is some evidence that noise is a non-specific stressor that arouses the autonomous nervous system and the endocrine system. (Spreng 2000a, Spreng 200b) and that the arousal of the endocrine and autonomic nervous system in turn affects classical biological risk factors for cardiovascular disease (e.g. blood pressure) (Babisch 2002).

In a community cardiovascular survey in the early 1970s, into cardiovascular health and aircraft noise around Schiphol airport in Amsterdam, over 5,800 people were screened for cardiovascular symptoms using a questionnaire and medical examination (Knipschild, 1977, Knipschild & Oudshoorn 1977). It was found that in areas with “more” aircraft noise a significantly greater number of people were receiving medical treatment for heart trouble (p<0.05), were receiving medical treatment for hypertension (high blood pressure – p<0.001) or were taking cardiovascular drugs (p<0.01). These changes could not be explained by potential confounding factors such as age, sex, smoking habits and so on. This work has been criticised, however, because of the poor response rate (of the people contacted only 42% took part in the survey) (Green et al , 1982). It was also not possible to control for socio-economic factors, and socio-economic status was lower in the group exposed to the greatest aircraft noise (Knipschild, 1977).

In a study on GP contacts (Knipschild, 1977a), total contact rate was found to be significantly higher (p<0.001) in the group exposed to the greatest aircraft noise. As with the cardiovascular screening survey socio-economic variables were not accounted for, nor were other confounding factors, such as the prevalence of smoking, considered.

In a study on school children, (Cohen et al, 1980) found that children attending a school near the Los Angeles International airport (mean peak classroom noise: 74 dB) were more likely to have higher systolic and diastolic blood pressure than children from “quiet” schools (mean peak noise: 56 dB). Socio-economic factors, race, mobility etc. were taken into account. Living in a quiet home but attending a noisy school was not found to affect the results. A longitudinal study (where participants are followed through time), conducted 1 year after the original study failed to confirm these findings (Cohen et al, 1981). The authors attribute this to the high drop out rate, with a large proportion of the children from the noisy school not being re-tested. Although the original study did demonstrate a statistically significant difference in blood pressure readings between the two groups of children, the readings from the high-noise exposed children were still within the normal range (Voors et al, 1976).
In Slovak Republic, children between the ages of 3 – 7, attending kindergartens subject to high traffic noise (>60 dBA) have been shown to have higher mean systolic and diastolic blood pressure and lower mean heart rate than children attending quiet kindergartens (<60 dBA). The location of the kindergarten in relation to noise exposure was found to be more important than home noise exposure estimates (Regecova, Kellerova, 1995). In this study account was taken of confounding factors and statistical analysis showed that noise was the most important variable (p<0.001).

In case-control studies undertaken in Berlin relative risks greater that 1 for the incidence of myocardial infarction were found only in men who lived adjacent to streets where daytime noise levels exceeded 70 dB(A) outdoors (Babisch W et al 1994). However assessment of cardiovascular risk associated with prolonged exposure to traffic noise at home through a 10 year follow-up cohort study of middle-aged men in Caerphilly and Bristol found no statistically significant noise effects (Babisch W. et al 1999). More recently, meta analyses of case-control and cohort data from the epidemiological studies in Caerphilly and Speedwell in the United Kingdom (Babisch 2003) and from Berlin (Babisch 2005) have been undertaken on the relationship between road traffic noise level and the incidence of myocardial infarction (Babisch 2006). A dose response relationship was observed when the incidence of myocardial infarction was compared by exposure category i.e. <60 dBA, 61-65 dBA, 66-70 dBA, 71-75 dBA and 76-80 dBA but none of the exposure category estimates achieved statistical significance.

The epidemiological evidence for association between noise exposure and cardiovascular disease is not strong as indicated by reviews (Babisch 2000, Kempen 2002, Passchier-Vermeer et al 2000).

**RESPIRATORY DISEASE ASSOCIATED WITH FLOODING**

Dales et al. (1991a and b) examined the effects on health in adults and children (between the ages of 5 and 8) exposed to home dampness and moulds (defined as damp spots, visible mould or mildew, water damage and flooding). In adults, lower respiratory symptoms (any cough, phlegm, wheeze or wheeze with dyspnoea – laboured or difficult breathing) were reported more frequently in those living in homes with dampness or mould (Dales et al., 1991a). The relationship remained after adjusting for a number of socio-demographic and exposure variables (adjusted odds ratio [OR] 1.62; 95% confidence interval [CI] 1.48 – 1.78). In children, the prevalence of all respiratory symptoms was higher in homes with reported dampness or moulds. The adjusted odds ratios ranged from 1.32 (95% CI 1.06 – 1.39) for bronchitis to 1.89 (95% CI 1.58 – 2.26) for cough (Dales et al., 1991b). Although these studies were conducted as questionnaire surveys and no fungal spore measurements were taken, previous studies have suggested that respondents’ perceptions of home dampness correlate with measured spore concentrations (von Wageningen et al., 1987) and that where a ‘water problem’ existing for more than three days this was associated with an increase in measured spore levels (Gallup et al., 1987).

Research conducted in the UK by the Flood Hazard Research Centre (FHRC), has suggested that respondents at focus group meetings following flooding in the northeast of England (June 2000) were likely to report asthma, chest infections, coughs, colds and flu believed to be due to the flooding (Tapsell et al., 2002), although the specific symptoms reported vary by the area studied. In a Defra/EA study (Defra/EA, 2003) respondents were asked to report on physical health effects following flooding. Respiratory symptoms (namely colds, cough, sore throats and flu) were reported by 20% of the respondents. Reacher et al. (2004), in a study of the health impacts experienced as a result of flooding in Lewes found a significant association between flooding and self-reported worsening of asthma in adults (relative risk [RR] 3.1; 95% CI 1.2 – 4.4) but not for respiratory illness in children or adults.
REFERENCES


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APPENDIX 3.4: Detailed Cardiovascular and Respiratory Disease Evidence Base


Zemp E, Elsasser S, Schindler C et al Long-term ambient air pollution and respiratory symptoms in adults (SAPALDIA study) Am. J. Respir Crit Care Med (2999) 159;1257-66.
Heat and Cold Related Mortality and Morbidity

Synopsis of the Evidence

Urban areas generate a ‘heat island’ effect and London can be up to 8% warmer than rural areas and night temperatures in the city can remain above 19°C. Mortality increases in hot weather and elderly people are particularly vulnerable; in the 1995 heatwave in London there was a 16% excess in deaths for all ages and those aged over 85 had a 20% excess mortality. Climate change will further exacerbate this problem.

Measures can be incorporated into the layout of a development to reduce the heat island effect.

In England approximately a third of excess deaths in winter (18 excess deaths per 100,000 adults) are related to low indoor temperatures and 90% of these occur in those more than 65 years of age. Poor home insulation and fuel poverty contribute to the problem.

Measures can be incorporated into building design to improve insulation.
Mortality and morbidity rise in hot weather and elderly people are particularly vulnerable (Kunst AE 1993). Increases in death rates during heat waves are associated with underlying cardiovascular, cerebrovascular and respiratory disease. A proportion of those dying may have experienced a death hastened by only days or weeks due to severe illness and there may also be an interaction between temperature and concurrent episodes of air pollution (Sartor F 1995). Heat-related deaths begin to occur when mean daily temperatures rise above the minimum mortality band of 15.6 – 18.6 C. Currently, approximately 800 heat-related deaths occur in the U.K each year with 80 thousand extra hospital admissions (Department of Health 2001). A comparison of excess mortality during the 1995 and 1976 heat waves (Rooney C 1998, McMichael AJ & Kovats RS 1998) showed that excess deaths for all ages for England and Wales was 9.7% in 1976 and 8.9% in 1995. The impact of heat waves is higher in Greater London with excess deaths for all ages of 15.4% in 1976 and 16.1% in 1995. In the 1995 heat wave, those aged over 85 in Greater London had an excess mortality of 20.1%. There is also some indication that excess mortality was proportionately higher in more deprived populations (McMichael AJ & Megens T 1998). A study of heat-related deaths during a 1995 heat wave in Chicago showed that risk was increased for people with known medical problems who were confined to bed, those who did not leave home each day or who lived on the top floor of a building (Semenza JC 1996). All urban areas generate an urban heat island effect where night-time temperatures are higher compared to rural areas. London can be up to 8% warmer than rural areas and night temperatures in the city can remain above 19 C (Greater London Authority 2007). Measures can be incorporated into the layout of a development to reduce the heat island effect (Land Use Consultants 2006). A set of widely accepted climate change scenarios for the U.K have been developed under the U.K Climate Impacts Programme (UKCIP). The impact of climate change on temperature related mortality under a medium-high climate change scenario would result in an estimated 2800 heat-related deaths per year in the U.K in the 2050’s compared to 800 currently (DOH 2001).

The Eurowinter study found that mortality increased for outdoor temperatures below 18oC but that variations in mortality were independently associated with both outdoor and indoor temperature. (Eurowinter Group 1997; Healy J.D. 2003). In England approximately 90% of excess winter deaths are in those over 65 years of age and approximately a third of excess deaths are related to indoor temperatures yielding 18 excess deaths per 100,000 adults (Kingman S 2001; Wilkinson P 2001). This seasonal excess, although it has declined (Donaldson GC 1997), is still high compared to other European countries (Keatinge WR 1997). In the U.K, fuel poverty and poor home insulation contribute and are being addressed through the Government’s Warm Front Programme. Climate change will result in less excess winter deaths in the future.
APPENDIX 3.5: Detailed Winter (cold) and Summer (heat) mortality Evidence Base

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INJURIES AND RISK FACTORS WHICH MAY BE MODIFIED THROUGH SPATIAL PLANNING

Synopsis of the Evidence

- Injuries account for 3% of annual deaths in the UK. Injury is the greatest threat to life in children and young people and road traffic accidents are the leading cause of death whereas falls cause 4.1% of injury deaths in older age groups. Increased vehicle speeds resulting from decreased traffic congestion (to address air pollution issues) may increase RTA injuries.

- RTAs show substantial inequalities between groups of differing social class.

- Annually, injuries lead to 720,000 admissions to hospital and 6 million emergency department visits.

- There is good evidence that area wide traffic calming reduces child pedestrian injury rates and also reduces the differential in rates based on inequalities in social groups.

- There is evidence that bypasses decrease accident rates but the evidence for new major urban roads and their effect on local road networks and accidents is less strong.

- **Spatial planning can address area traffic calming.**

- Injuries in the home are common but the evidence of effects of environmental adaptation in the home is weak.

- Injury rates associated with flooding are of the order of 0.4%.

- **Spatial planning can prevent flood risk.**
INJURIES

Public Health Burden of Injuries

The Centre for Health and Environment Research has reported on the burden of injuries in the UK. (Jones S and Parry S 2005 www.hpa.org.uk/publications/2005/burden_disease/10_supporting_doc.pdf)

Injuries account for 3% of annual deaths in the UK and are ranked 14th leading cause of death in 2004. In the UK, injury is the greatest threat to life in children and young people. Between the ages of 15 and 24 years, 57% of all deaths are the result of injuries. The risks to older people are also substantial as around 20,000 deaths each year are due to injury, 4600 of which are over 75 year olds. In the UK, road traffic accidents and falls are the leading causes of unintentional injury death. RTA deaths are highest amongst young adult males, with falls predominantly affecting older females. Injury deaths in the UK have fallen by around 8% during the last decade, as a result of factors such as better medical treatment, improved safety practices and changing lifestyles (BMA, 2001).

Most injury deaths result from unintentional incidents, particularly amongst children and young adults; 76% of fatal injuries to 1-4 year olds, 83% to 5-14 year olds and 59% to 15-24 year olds are classified as ‘unintentional’. Unintentional injury deaths can be divided into a number of groups, but it is road traffic accidents (RTAs) and falls, both accounting for 27% of all deaths, that are of greatest concern. However, while the overall burden of these groups of incidents is similar, age related patterns are very different. RTAs tend to affect children and younger adults, peaking in the 15-24 year age group at 76% of all unintentional injury deaths, while falls affect older age groups, causing up to 41% of unintentional injury deaths.

Child pedestrian death rates have decreased during recent years but this is thought by many to be due to decreases in exposures of children as pedestrians, rather than as a result of roads being safer. As government targets for increasing physical activity and decreasing obesity are addressed, it is likely that pedestrian exposure will increase, with the possible effect of increasing pedestrian injury and death rates again. Furthermore, increased vehicle speeds resulting from decreased traffic congestion (to address congestion and pollution issues) is likely to compound this problem still further, increasing the severity of injuries and the likelihood of death.

ONS (2004) data presented here do not allow for deprivation based analysis. Previous analysis of trends in injury deaths, in England and Wales, by social class, has shown that the risk to the poorest is considerably greater than that to richer members of society (BMA, 2001).
Motor vehicle accidents are a leading cause of death amongst children and adolescents and also show substantial inequalities between different social class groups. However, while the actual rates and inequalities are of concern, it is also of note that the inequalities gap widened throughout the 1980s. This was due to a drop in rates amongst the most affluent, while rates for the most deprived showed no change. It is possible that the changes in driving habits and vehicle use that have occurred during the 1990s have lead to a further increase in inequalities. Pedestrian deaths account for a substantial proportion of all RTA related deaths in this age group and given the inequalities that exist for all RTAs, it is of little surprise that pedestrian incidents also show variation between the most affluent and most deprived. The more recent data indicate that the most deprived are more than 5 times more likely to be killed in pedestrian incidents than their more affluent counterparts. Again, changes in exposure that have occurred in recent years are unlikely to be equitable – affluent families have greater access to cars, meaning that there is greater potential for these children to walk less. Therefore, it is possible that inequalities in child pedestrian death rates have increased further during recent years.

Inequalities in injury related deaths are substantial and the gap between the most deprived and most affluent may be increasing. Prioritising the reduction of inequalities would have a substantial effect on the overall burden of injuries.

Only a very small proportion of injury episodes result in death. It is estimated that for every injury death there are 45 hospital episodes (HEs), 630 doctor consultations and 5000-6000 minor injuries (BMA, 2001). Annually, injuries lead to 720,000 admissions to hospital and 6 million emergency department visits (DTI, 2000). Twice are many pre-retirement life years are lost to injury as to coronary heart disease and 5% of health service expenditure is on the treatment of injuries (NHS Executive, 1996).

Any analysis of hospital admissions data and the burden of injuries on inpatient resources must be mindful of the fact that the likelihood of admission following an injury is not only affected by the severity, diagnosis and anatomical site of injury, but also by factors such as bed availability, seasonal variations, admission polices and procedure and treatment factors.

Almost two thirds of injury HEs are the result of unintentional incidents (61%). Falls and RTAs are the main causes of injuries, in terms of hospital episode data and deaths data.

Pedal cyclists account for the greatest proportion of HEs and emergency admissions for RTA incidents, but pedestrian injuries are associated with longer stays and a greater proportion of bed days.

Deprivation is an important risk factor for injury. However, when studying the relationship between hospital admission based injuries and deprivation, it needs to be remembered that deprivation influences the likelihood of admission. It has been shown, particularly for children, that admission is often dependent upon the perceived deprivation status, with judgements being made about the quality of care available at home and the likelihood of return for outpatient treatment. This leads to the most deprived being more readily admitted (Beattie et al, 1998; Kendrick, 1993).
Amongst 0-15 year olds, unintentional injury rates are considerably higher for the most deprived compared with the most affluent. Amongst males aged 20-64, unintentional injury rates were lower in all social classes than for the equivalent 0-15 year olds, and while rate ratios were similar in 1979-83, the inequalities gap was wider for 0-15 year olds by 1989-92. Analysis of emergency admissions data for Welsh residents treated at Welsh or English hospitals between 1997 and 1999 shows how deprivation based inequalities vary between age groups and cause of injury (Lyons et al, 2003).

There are substantial differences in the deprivation gradient for 0-14 year olds injured in pedestrian and non-pedestrian RTAs. For pedestrian RTAs, the SHR for the deprived is 2.5 times higher than that for the affluent. However, for non-pedestrian RTAs in the same age group, the gradient is minimal, with rates amongst the deprived just 1.3 times the affluent.

Amongst 15-75 year olds the pattern is very similar. For pedestrian RTAs the deprived are at 2.1 times greater risk than the affluent, while for non-pedestrian incidents, the difference is just 1.1 times.

Child pedestrian deaths and injuries are a particular concern for a number of reasons. In the UK, children pedestrian death rates are higher than those of many other western nations, particularly Scandinavian countries (Belin et al, 1997).

Substantial inequalities in child pedestrian injury risk also exist, with the most deprived at up to 5 times greater risk of death or injury than the most affluent.

Falls are a particular problem amongst older people. Although people of any age may fall, the outcomes for older people are poorer, often including substantial disability or death. Osteoporosis significantly affects fall outcomes, in some cases causing the fall, but in most cases influencing the likelihood of suffering a fracture. Hip and wrist fractures are common fall outcomes amongst older people and hip fractures, in particular, have poor recovery and survival rates.

As the older population is healthier and more mobile, the numbers of falls is likely to increase, increasing the burden of fall related injuries. Identifying strategies by which to tackle the problem of falls before the burden increases substantially is an important task for health promotion and protection professionals.

The burden of injuries on hospital admissions is in the long lengths of stay required following injury. Compared with all other disease and condition diagnoses, injury diagnoses, particularly fractures and specifically femur fractures, are ranked in the leading causes of burden of finished consultant episodes, emergency admissions and bed days.

Falls account for more finished consultant episodes than any other injury causation group, with RTAs accounting for a relatively small proportion. Falls place a substantial burden on hospital in-patient resources, accounting for a substantial proportion of emergency admissions and injury related bed days. Those who have fallen are often older people who suffer a substantial impact upon their quality of life as a result. Although the in-patient burden of RTAs is considerably lower than that of falls, the concern with these cases is the potential for long term effects on health and quality of life amongst younger people.

Child pedestrian RTAs show significant deprivation related inequalities, with the most deprived around 3 times more likely to be injured and admitted to hospital than the most affluent. Falls amongst older people, however, show little variations according to deprivation.
APPENDIX 3.6: Detailed Evidence Base for Injuries

Tackling road traffic injuries, particularly child pedestrian injuries, the deprivation based inequalities in these injuries, and fall related injuries is essential to reducing the numbers of deaths and the burden upon the NHS in the UK.

Injuries and the Built Environment

The Safe Communities concept was introduced to the world during the First World Conference on Accident and Injury Prevention held in Stockholm, Sweden in September 1989. It arose as the celebrated response to a successful community approach to the problem of injury which had been implemented as a pilot project in the Swedish municipality of Falkoping in 1974 (WHO 1999).

Since then, the Safe Communities approach has been embraced around the world as a model for co-ordinating community-oriented effort to enhance safety and reduce injury. The official WHO Safe Communities Web site is available at http://www.phs.ki.se/csp/default.htm and describes the Safe Communities model in detail.

Most of the road deaths in developing countries involve vulnerable road users such as pedestrians and cyclists. Pedestrian injuries account for 84% of all road traffic fatalities compared with 32%. Pedestrians account for a large proportion of road deaths involving children.

Falun a Swedish municipality with 55,000 residents introduced an injury prevention programme in 1989 with interventions which included a focus on cycling and pedestrian injuries. The Safe Community intervention may have prevented an increase in injuries which was observed to have occurred in a control area. (Bjerre B et al 2000). In Harstad, a Norwegian municipality of 22,000 residents a traffic injury prevention campaign and a cyclist and prevention injury campaign resulted in a 26% decrease in traffic injury rates following intervention. (Ytterstad B 1995) In Motala, Sweden interventions including a “Safe way to school” programme implemented at every primary school did not lead to a reduction in traffic injuries. (Lindquist K et al 2001).

Reported studies make it difficult to assess the effectiveness of interventions as the information is limited concerning differences in outcome compared to control communities.

The identification of effective strategies for the prevention of traffic related injuries is of global health importance. Area-wide traffic calming schemes that discourage through traffic on residential roads is one such strategy. Area-wide traffic calming measures are designed to discourage the use of residential streets for through travel and to create an environment where residential streets are safe. Eligible schemes included those that involved a number of specific named changes to the road layout, road hierarchy, or road environment, such as:

- Vertical and horizontal shifts in traffic (e.g. road humps, speed cushions, raised crosswalks, raised sections of road, chicanes, mini-roundabouts, road narrowing, channelized slip lanes, etc.)

- Optical measures (chevron road sings, road surface treatment (colour, texture), reduced horizontal visibility (shortened sightlines); audible measures (rumble areas, jiggle bars), alterations to road lighting
- Redistribution of traffic or alteration to road hierarchy, (e.g. permanent or temporary blocking of road, diagonal blocks, gateways, creation of one-way streets, re-introduction of two-way streets, four-way stops)

- Changes to road environment (increased vegetation (trees, shrubs) along road, introduction of street furniture).

A meta-analysis found that area-wide traffic calming schemes on average reduce the number of injury accidents by about 15% (Elvik 2001). However, this study included uncontrolled before-after studies in which the effect of traffic calming could be confounded by the effect of other concurrent changes in road traffic injury rates. For example, in many high income countries pedestrian injury rates have fallen because nowadays fewer people walk. In this case, the inclusion of uncontrolled studies could exaggerate the apparent effect of traffic calming.

Sixteen non-randomized before and after studies (i.e. contemporaneous data collection before and after the intervention and an appropriate control site) of area wide traffic calming schemes have been reviewed (Bunn F. et al Cochrane Review).

The results of each study are expressed as rate ratios. The rate ratio is the ratio of event rates post and pre intervention in the intervention area divided by the corresponding post to pre intervention event ratio in the control area. Provided that any changes in the population at risk are the same in both control and intervention areas, the rate ratio gives the reduction in the accident rate in the intervention area compared to that in the control area. For example, a rate ratio of 0.8 corresponds to a 20% reduction in events compared to that predicted from the rates in the control area.

Eight trials reported the number of road traffic crashes resulting in deaths. The pooled rate ratio was 0.63 (0.14, 2.59 95% CI). Sixteen studies reported the number of road traffic crashes resulting in injuries (fatal and non fatal). The pooled rate ratio was 0.89 (0.80, 1.00 95% CI). Nine studies reported the total number of road traffic crashes. The pooled rate ratio was 0.95 (0.81, 1.11 95% CI). Thirteen trials reported the number of pedestrian-motor vehicle collisions . The pooled rate ratio was 1.00 (0.84, 1.18). There was significant heterogeneity for the total number of crashes and deaths and injuries.

The results from this review suggest that area-wide traffic calming in towns and cities may be a promising intervention for reducing the number of road traffic injuries, and deaths. English studies identified included Swindon (Dalby E 1981), Bristol, Reading and Sheffield (Mackie AM 1988). In the Stockton cycle route after study (Dean D 1986) the number of accidents to cyclists increased in both a national catchment area for the cycle route and in a control area elsewhere in the town.

In a report which examined Urban street activity in 20 mph zones in London (Babtie Group 2001) the mean annual number of accidents decreased in all zones by between 32% and 100%.
APPENDIX 3.6: Detailed Evidence Base for Injuries

The effects of area wide traffic in calming on reductions in child pedestrian injury rates and reduction in relative inequalities in these rates in two UK cities, 45 miles apart with similar 4-16 year old populations were examined (S.J.Jones et al 2005). The most deprived fourth of city a had 4.8 times (95% Cl 3.72 to 6.22) the number of traffic calming features per 1000 population compared with the most affluent fourth. Injury rates among the most deprived dropped from 9.42 to 5.07 from 1992-94 to 1998-2000 (95% CI for change 2.82 to 5.91) in city B, the traffic calming ratio of the most to least deprived fourth was 1.88 (95% CI 1.46 to 2.42); injury rates in the deprived areas dropped from 8.92 to 7.46 (95% CI for change 0.84 to 3.77). Similar proportions of 9-12 year olds walked to school in both cities. Area wide traffic calming is associated with absolute reduction in child pedestrian injury rates and reductions in relative inequalities in child pedestrian injury rates. The importance of local political support to ensure the most appropriate spatial distribution of area traffic calming with respect to inequalities has also been highlighted. (Lyons RA et al 2006).

A systematic review has been undertaken (Egan M et al 2003) of studies assessing effects of new roads on injury prevalence rates. Four studies considered major urban roads which take traffic through urban areas and considered the effects of new roads on the wider local network. (Judaan KS. Et al 1988; Levine DW, Golob TF. 1988). Two of these showed small decreases 4% and 1% in the incidence of accidents including injuries and two showed larger increases 8% and 19% respectively. 5 by pass studies showed a general decline in the incidence of injury accidents after the opening of new by-passes. (Elvik R et al 2001) Three studies of major connecting roads joining two urban areas showed a 25% reduction in injury accidents in one study. Overall there was little evidence that new major urban roads significantly reduce the incidence of injury accidents.

In a study of the effects of Bypasses around English towns (Social Research Associates 1999, Barrell J 1995) the mean annual number of accidents decreased in all six towns. The annual number of accidents to pedestrians and cyclists decreased in five towns and increased in one town.

Injuries in the home are very common. Most of the injuries of older people and children under five occur at home. Many people are encouraged to alter their home to try to reduce such injuries. Common alterations include improvement of lighting in halls and stairways and the removal of falls hazards. A review has been conducted of 5 randomised trails involving children and 14 involving older people. (Lyons RA, Cochrane ref ). None of the studies demonstrated a reduction in injuries that might have been due to environmental adaptation in the home.

FLOODING

Much of the literature is based on opportunist retrospective studies of flooding (sometimes conducted a considerable time after the event), cases studies or anecdotal information.

Research into the health effects associated with flooding and the number of health reviews conducted (e.g. Hajat et al., 2003; Tapsell and Tunstall, 2001; Ohl and Tapsell, 2000) seems to have increased relatively recently, perhaps driven by the increase in flooding. The health effects of flooding are generally split into those associated with the immediate event (with drowning being the most obvious) and those arising after the flood has resolved (i.e. post-onset, which may be related to exposure to flood waters, the clear up process or stress and anxiety).
1. **MORTALITY**

Examination of the EM-DAT database (on the occurrence and immediate effects of all reported mass disasters), which was established in 1988, reveals that the UK has suffered from 17 flooding events since 1900 that warrant an entry\(^1\). A total of 51 people were reported killed and eight injured in these events, with over 4000 people affected by the events (EM-DAT, 2005). This, however, does not seem to be comprehensive as it does not include the 1953 storm surge affecting coastal areas of several North Sea countries, including the UK. Although reported death tolls vary according to which source is examined, it would seem that over 300 were killed on land, during the event, with a further 200+ killed at sea (Kelman, 2003a). In addition, 20 people were killed in eastern England in floods on January 11th, 1978, and five people were killed during the April flooding in 1998 (Kelman 2003b). Analysis of events surrounding the autumn 2000 floods suggests that four drownings may have been related to the flood and the fact that there weren’t many directly attributable to the event seems to be more the result of luck than judgement (Kelman 2003b), as many people are, perhaps not surprisingly, ignorant of appropriate behaviour during flooding.

Duclos and Isaccson (1987) report on 24 deaths related to flooding events in the USA, only nine of which had drowning as the primary cause. Another nine were due to heart attacks while people were involved with unusual flood-related stress or activities (including moving furniture and clean up processes). The other two deaths relevant to the flood event were asphyxiation while using a gas generator to pump water out of a basement and electrocution while connecting a pump in a flooded basement. In flash floods affecting Georgia, 28 deaths were classified as flood-related (CDC, 1994a), 27 of these deaths were due to drowning (cause of death was unknown in one case), with 20 being motor-vehicle related (i.e. victims drove into low-lying areas, across washed out bridges or off the road into deep water).

In France, Duclos et al. (1991) reported details of a flash flood that occurred in the region of Nîmes. Despite extensive flooding and a great deal of damage only nine deaths were reported (all due to drowning) and three severe injuries. The low impact in terms of mortality and serious injuries was attributed to the time of flooding (most people were still at home).

2. **INJURIES**

Injuries may occur during the flooding (e.g. from impact with flood-related debris or being knocked over by the floodwater) and also from the subsequent clean up process. During surveillance of emergency departments and enhanced surveillance (including contact with emergency shelters) following the Midwest flood in Missouri, USA, in 1993, 524 flood-related conditions were reported, 250 (47.7%) of which were injuries, with the most common being sprains, strains and lacerations (CDC, 1993). It is estimated that 60,000 people were displaced during these floods – giving a reported injury rate of 0.4%.

In France, Duclos et al. (1991) reported three serious injuries as a result of flooding (arm and face burns, a broken leg, broken arms) and found that 6% of occupants in households surveyed following the flooding in Nîmes reported mild injuries (such as bruises, cuts and sprains).

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\(^1\) For entry at least one of the following criteria must be satisfied: 10 or more people reported killed, 100 people reported affected, a call for international assistance or declaration of a state of emergency. It should be noted, however, that not all of the UK flood examples in this database seem to fall into one of these categories.
Daley et al. (2001) reported an ‘outbreak’ of carbon monoxide poisoning that resulted from the use of petrol-powered pressure washers for the cleaning of flooded basements. There were 18 separate incidents, involving 33 cases. Thirty of the cases reported that the basement was ventilated while the pressure washer was in use. The most common symptoms were dizziness, headache, nausea, and fatigue. With the exception of a patient who lost consciousness, all the cases were released from hospital after receiving oxygen.

APPENDIX 3.6: Detailed Evidence Base for Injuries
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APPENDIX 3.6: Detailed Evidence Base for Injuries


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