

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 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.

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).

APPENDIX 3.2: Detailed Mental Health Evidence Base

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.

APPENDIX 3.2: Detailed Mental Health Evidence Base

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). Dalgard 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).

APPENDIX 3.2: Detailed Mental Health Evidence Base

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).

A multitude of empirical studies reflect positive relationships between social support and mental health (Cohen S et al, 2000; Cohen S et al, 1985; Kawachi I et al, 2001; Vaux A, 1988).

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).

APPENDIX 3.2: Detailed Mental Health Evidence Base

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, is 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 et 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.

APPENDIX 3.2: Detailed Mental Health Evidence Base

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

REFERENCES

- Abrahams MJ, Price J, Whitlock FA, Williams G (1976) The Brisbane floods, January 1974: their impact on health. *Medical Journal of Australia* 2:936-939.
- Auger C, Latour S, Trudel M, Fortin M (2000) [Post-traumatic stress disorder. After the flood in Saguenay]. *Canadian Family Physician* 46(12): 2420-2427. [Article in French].
- Bartlett S. Does inadequate housing perpetuate children's poverty? *Childhood*, 1998;5:403-420.
- Baum A, Paulus PB. Crowding. In: Stokols D, Altman I, eds. *Handbook of Environmental Psychology*. New York, NY: Wiley; 1987:533-570.
- Bennet G (1970) Bristol floods 1968. Controlled survey of effects on health of local community disaster. *British Medical Journal* 3:454-458.
- Blackman T, Harvey J. Housing renewal and mental health: a case study. *Journal of Mental Health* 2001;10(5):571-583.
- Bokszczanin (2002) Long-term negative psychological effects of a flood on adolescents. *Polish Psychological Bulletin* 33(1): 55-61.
- Brown B, Perkins DD, Brown G. Place attachment in a revitalizing neighbourhood: Individual and block levels of analysis. *Journal of Environmental Psychology*, 2003;23:273-281.
- Churchman A, Ginsberg Y. The image and experience of high rise housing in Israel. *J Environ Psychol* 1984;4:27-41.
- Cohen S, Gottlieb BH, Underwood LG. Social relationships and health. In: Cohen S, Underwood LG, Gottlieb BH eds. *Social Support Measurement and Intervention*. New York, NY: Oxford University Press; 2000:3-28.
- Cohen S, Syme SL, eds. *Social Support and Health*. New York, NY: Academic; 1985.
- Countryside Commission. *Public attitudes to the countryside*. Northampton: Countryside Commission, 1997.
- Dalgard OS, Tambs K. Urban environment and mental health: a longitudinal study. *Br J Psychiatry* 1997;171:530-536.
- Davey-Smith G, Hart C, Watt G, Hole D, Hawthorne V. Individual social class, area-based deprivation, cardiovascular disease risk factors, and mortality: the Renfrew and Paisley study. *Journal of Epidemiology and Community Health* 1998;52:399-405.
- Defra/EA (2003) *The appraisal of human-related intangible impacts of flooding*. R&D Project FD2005. Defra/Environment Agency Flood and Coastal Defence R&D Programme. Policy Development Theme, London.

Diez-Roux AV, Nieto FJ, Muntaner C, Tyroler HA, Comstock GW, Shahar E, Cooper LS, Watson RL, Szklo M. Neighbourhood environments and coronary heart disease: a multilevel analysis. *American Journal of Epidemiology* 1997;146(1):48-63.

Diez-Roux AV. Methodological and conceptual approaches to studying neighbourhood effects on health. In: *Neighbourhoods and Health*. Kawachi I, Berkman LF (eds). New York, Oxford University Press, 2003, pp47.

DoH (1999) Health Survey for England 1998. Cardiovascular Diseases. Erens B, Primatesta P (Eds.) The Stationery Office, London.

Duclos P, Vidonne O, Beuf P, Perray P, Stoebner A (1991) Flash flood disaster – Nîmes, France, 1988. *European Journal of Epidemiology* 7(4): 365-371.

Duncan C, Jones K, Moon G. Psychiatric morbidity: a multilevel approach to regional variation in the UK. *J Epidemiol Community Health* 1995;49:290-5.

Duncan C, Jones K, Moon G. Health-Related Behaviour in Context: A Multilevel Modelling Approach. *Social Science and Medicine* 1996;42(6):817-830.

Duncan C, Jones K, Moon G. Context, composition and heterogeneity: using multilevel models in health research. *Soc Sci Med* 1998;46:97-117.

Dunstan F, Weaver N, Aray R, Bell T, Lannon S, Lewis G, Patterson J, Thomas H, Jones P, Palmer S. An observation tool to assist with the assessment of urban environments. *J Environmental Psychology*. 25 (2005) 293-305.

Ellaway A, Macintyre S. Women in their place: gender and perceptions of neighbourhoods and health in the West of Scotland. In: I. Dyck, N Lewis, S McLafferty (eds). *Geographies of Women's Health* (pp264-281) London: Routledge.

Evans GW, Chan E, Wells H et al. Housing quality and mental health. *Journal of Consulting and Clinical Psychology* 2000;68(3):526-530.

Evans D, Fletcher M. Fear of crime: testing alternative hypotheses. *Applied Geography* 2000;20:395-411.

Evans GW. Environmental stress and health. In: Baum A, Revenson T, Singer JE, eds. *Handbook of Health Psychology*. Mahwah, NJ: Erlbaum; 2001:571-610.

Evans GW, Kantrowitz E. Socioeconomic status and health: the potential role of environmental risk exposure. *Annu Rev Public Health*, 2002;23:303-331.

Evans GW, Saltzman H, Cooperman J. Housing quality and children's socioemotional health. *Env Behav* 2001;33:389-399.

Evans GW, Wells NM, Moch A. Housing and mental health: a review of the evidence and a methodological and conceptual critique. *J Soc Issues* 2003;59:475-500.

APPENDIX 3.2: Detailed Mental Health Evidence Base

Few R, Ahern M, Matthies F, Kovats S (2004) Floods, health and climate change: a strategic review. Tyndall Centre for Climate Change. Working Paper 63.

Fields JM (1993). Effects of personal and situational variables on noise annoyance in residential areas. *Journal of the Acoustical Society of America* 93(5):2753-2763.

Freeman H. Housing. In: Freeman HL, ed. *Mental Health and the Environment*. London, England: Churchill Livingstone; 1984:197-225.

Gabe J, Williams P. Women, overcrowding and mental health. In: Burridge R, Ormandy D (eds). *Unhealthy housing: research, remedies and reform*. London: E&FN Spon, 1993.

Gifford R. Satisfaction, health, security, and social relationships in high-rise buildings. In: Seidel A, Health T, eds. *Social Effects of the Built Environment*. London, England: E&FN Spon. In press.

Ginexi EM, Weihs K, Simmens SJ, Hoyt DR (2000) Natural disaster and depression: a prospective investigation of reactions to the 1993 Midwest floods. *American Journal of Community Psychology* 28: 495-518.

Glaster G. On the nature of neighbourhood. *Urban Studies* 2001;38(12):2111-24.

Goldberg D, Huxley P. *Mental illness in the community: the pathway to psychiatric care*. London: Tavistock, 1980.

Goldberg D, Huxley P. *Common mental disorders: a bio-social model*. London: Routledge, 1992.

Goldberg D, Williams P. *A User's Guide to the General Health Questionnaire*. Windsor: NFER-Nelson, 1988.

Goldstein H. *Multilevel Statistical Models (2nd Edition)*. Edward Arnold: London, 1995.

Graham E, MacLeod M, Johnston M, Dibben C, Briscoe S. Individual deprivation, neighbourhood and recovery from illness. In: H Graham (ed). *Understanding Health Inequalities* (pp156-169). Buckingham: Open University Press, 2000.

Greenberg SW, Rohe WM. Neighbourhood design and crime: a test of two perspectives. *Journal of American Planning* 1984;50(1):48-61.

Guite H.F., Clark C, Ackrill G. The impact of the physical and urban environment on mental well-being. *Public Health* 2006;120:1117-1126.

Haines MM, Stansfeld SA, Brenthall S et al. The West London schools study: the effects of chronic noise exposure on child health. *Psychol Med* 2001;31:1385-1396.

Haines MM, Stansfeld SA, Job RFS, Berglund B, Head J. A follow-up study of effects of chronic aircraft noise exposure on child stress responses and cognition. *Int J Epidemiol* 2001;30:839-845.

- Haines MM, Stansfeld SA, Job RFS, Berglund B, Head J. Chronic aircraft noise exposure, stress responses, mental health and cognitive performance in school children. *Psychol Med* 2001;31:265-277.
- Halpern D. *Mental health and the Built Environment*. London, England: Taylor and Francis; 1995.
- Halpern D. *Mental health and the environment: more bricks than mortar?* London: Taylor and Francis Ltd, 1995.
- Hopton JL, Hunt SM. Housing conditions and mental health in a disadvantaged area in Scotland. *Journal of Epidemiology and Community Health* 1996;50(1):56-61.
- Huerta F, Horton R (1978) Coping behaviour of elderly flood victims. *The Gerontologist* 18(6): 541-546.
- Johnson MP, Ladd HF, Ludwig J. The benefits and costs of residential mobility programs for the poor. *Housing Stud* 2002;17:125-138.
- Kahlmeier S, Schindler C, Grize L et al. Perceived environmental housing quality and well-being of movers. *Journal of Epidemiological Community Health* 2001;55(11):708-718.
- Kawachi I, Berkman L. *Social Cohesion, Social Capital, and Health*. In: *Social Epidemiology*, Kawachi I, Berkman L (eds). New York, Oxford University Press, 2000, pp174-190.
- Kawachi I, Bergman LF. Social ties and mental health. *J Urban Health*. 2001;78:458-467.
- Kearns A, Hiscock R, Ellaway A, Macintyre S. Beyond four walls. The psychosocial benefits of home: evidence from West Central Scotland. *Housing Stud* 2000;15:387-410.
- Kearns A, Parkinson M. The Significance of Neighbourhood. *Urban Studies* 2001;38(12):2103-10.
- Keithley J, Robinson F. *Exploring the impacts of crime on health and health services: a feasibility study*. Durham: Durham University, 1999.
- Kelman I (2004) Philosophy of flood fatalities. <http://www.floodrisknet.org.uk/newsletters/2004-01/flood-fatalities>.
- Kennedy HG, Iveson RYC, Hill O. Violence, homicide and suicide: strong correlation and wide variation across districts. *British Journal of Psychiatry* 1999;175:462-469.
- Kuo FE. Bridging the gap: how scientists can make a difference. In: Bechtel RB, Churchman A, eds. *Handbook of Environmental Psychology*. 2nd ed. New York, NY: Wiley; 2002.
- Kuo FE, Sullivan WC, Coley R, Brunson L. Fertile ground for community: inner-city neighbourhood common spaces. *Am J Community Psychol*, 1998;26:823-851.
- Lee BA, Campbell KE. Common Ground? Urban neighbourhoods as survey respondents see them. *Social Science Quarterly* 1997;78(4):922-930.

APPENDIX 3.2: Detailed Mental Health Evidence Base

Lercher P, Evans GW, Meis M, Kofler W. Ambient neighbourhood noise and children's mental health. *Occup Environ Med*, 2002;59:380-386.

Leventhal T, Brooks-Gunn J. Neighbourhoods they live in: the effects of neighbourhood residence on child and adolescent outcomes. *Psychol Bull* 2000;126:309-337.

Lewis G, Booth M. Regional differences in mental health in Great Britain. *J Epidemiol Community Health* 1992;46:608-11.

Lewis G, Booth M. Are cities bad for your mental health? *Psychological Medicine* 1994;24:913-915.

Lowry S. *Health and housing*. London: BMJ Publishing, 1991.

Ludlow B, Flindell IH. An overview of noise and health effects – one way forward. *Proceedings of Internoise 1997*;97(3):1199-1202.

Lynch J, Kaplan G. Socioeconomic position. In: *Social Epidemiology*. Kawachi I, Berkman L (eds). New York, Oxford University Press, 2000, pp20.

McCarthy P, Byrne D, Harrison S. Housing type, housing location and mental health. *Social Psychiatry* 1985;20:125-130.

McCulloch A. Ward-level deprivation and individual social and economic outcomes in the British household panel study. *Environment and Planning A* 2001;33:667-84.

McMillen C, North C, Mosley M, Smith E (2002) Untangling the psychiatric comorbidity of posttraumatic stress disorder in a sample of flood survivors. *Comprehensive Psychiatry* 43(6): 478-485.

Macintyre S. Inequalities in health – geographical inequalities in mortality, morbidity and health-related behaviour in England. In: D Gordon, M Shaw, D Dorling, G Davey-Smith (eds). *Inequalities in health: The evidence presented to the Independent Inquiry into Inequalities in Health* (pp 148-154). Bristol: The Policy Press, 1999.

MacIntyre S, Ellaway A, Cummins S. Place effects on health: how can we conceptualise, operationalise and measure them? *Soc Sci Med* 2002;55:125-39.

Macintyre S, Ellaway A. Neighbourhoods and Health: An Overview. In: *Neighbourhoods and Health*. Kawachi I, Berkman LF (eds). New York: Oxford University Press, 2003, pp26.

Macintyre S, Maciver S, Sooman A. Area, class and health: should we be focusing on places or people? *Jnl Soc Pol* 1993;22:213-34.

MacIntyre S, Ellaway A, Hiscock R et al. What features of the home and the area might help to explain the observed relationships between housing tenure and health? Evidence from the west of Scotland. *Health and Place* 2003;9:207-18.