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Land use planning and health and well-being[☆]

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ABSTRACT

This paper is concerned with the relationship between the planning of settlements and health. It gives a brief introduction to the issues before summarising the evidence in relation to a range of topics, concluding with some more speculative thoughts on likely future findings.

Modern planning was invented in response to inhumane living conditions in 19th century cities. But in the last century the connection was lost. Only now, with concerns over climate change and obesity, is there beginning to be the realisation that the physical environment is an important determinant of health.

The paper uses a particular model of this relationship based on eco-system and health determinants theories to structure the review of evidence. The review covers: lifestyle choices in relation to physical activity and diet, mental well-being and community, the local economy and income, health inequalities and strategic land use transport planning, pollution and urban form, and finally impacts on global ecology.

There is now a growing consensus that while personal factors are critical in determining health, the urban environment exacerbates or mitigates health and well-being outcomes.

The level of active travel (walking and cycling) and outdoor recreational activity is strongly affected by accessibility to local facilities. Access to green, natural environments, and to local social networks, are factors in mental well-being. The wider sub-regional pattern of housing, economic development, land use and transport is a determinant of social exclusion and therefore health inequalities. It also affects health-damaging pollution, adaptability in the face of climate change and the level of carbon dioxide emissions.

We have literally been building unhealthy conditions into many of our towns and cities. But comparisons with the best cities in Europe indicate that it is possible to reverse the less desirable trends. Success depends, however, on more radical policies of local authority control over land and finance than any political party has yet advocated. It also requires collaboration between the full range of powerful public and private organizations that influence the built environment.

Future research is likely to further strengthen these conclusions. It will become much more obvious that planning for health and well-being is not only the NHS, but about creating a health-promoting physical, social and economic environment.

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Introduction

Purpose and definitions

The focus of this paper is on land use planning for healthy human settlements. It is widely recognised that the spatial planning of human urban activity is affecting quality of life, health and well-being (EEA, 2009; WHO, 2009; RTPI, 2009; NICE, 2008). The paper

gives a brief introduction to the issue and provides a framework for analysis, before summarising the evidence in relation to a wide range of topics. It concentrates in particular on the crucial relationship between spatial variables and physical activity, mental well-being and inequality.

First to give some definitions: settlements in this context include cities, towns and villages. The tentacles of large settlements spread out far beyond urban areas, into hinterlands and networks, linking places together through commuter residence and work, retail, educational and leisure activities. So there is no clear functional distinction between urban and rural settlements within a town or city region.

Land use planning is conventionally called 'town and country planning' in Britain, following the 1947 Act, but since 2004

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is officially termed 'spatial planning', implying a more integrated, inter-agency process. In literature the term 'built environment' is often used to mean the human-made environment that may be subject to planning. It does not refer only to buildings and hard infrastructure but to all the physical elements that go to make up settlements, including greenspace.

Health is defined broadly, in line with the World Health Organization (WHO), as 'not only the absence of disease but a state of complete physical, mental and social well-being. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being, without distinction of race, religion, political belief or economic or social condition' (WHO, 1946). Health in this sense is linked to every aspect of life – the social, the economic and the environmental – and can be seen as consonant with the anthropogenic version of sustainable development evident in the UN Brundtland definition. Just as equity (intra-generational as well as inter-generational) is a key aspect of sustainable development, so concern for health inequalities is central to public health policy.

Health and land use planning

Health and land use planning are historically linked. Modern planning originated in the nineteenth century expressly in order to combat unhealthy conditions—the unsanitary, over-crowded and inhumane conditions of the burgeoning industrial cities. It was recognised then, and still is, that there is an umbilical link between environmental conditions and human health. This link has been articulated in the modern era as permeating the human condition. The environment is seen as one of the key determinants of health, alongside inherited characteristics, lifestyles, and social and economic variables (Lalonde, 1974; Whitehead and Dahlgren, 1991). It is not only a matter of the direct physical impacts on health – for example of foul air or contaminated water – but also of indirect social and behavioural effects, on the exercise we take, the people we meet, and the degree of inequality in access to housing, employment opportunities, health services and other facilities.

According to VicHealth (the Victorian Health Promotion Foundation in Australia) there are four key reasons why planning health into the environment is positive for population health. Good planning can:

- reduce the inequalities that exist in access to housing, facilities and transport for different socioeconomic groups and vulnerable groups in the population, such as the elderly or children;
- increase the amount of incidental physical activity necessary to reduce the burden of disease, disability and mortality due to sedentary life styles, by improving access and providing walkable, mixed use communities;
- contribute to the improved health of the population by the reduction of air and water pollution and greenhouse emissions, combating the threat of climate change;
- contribute to a changed social environment by improving the liveability of streets, making them safer, improving communication between people and therefore improving community cohesion (Butterworth, 2000).

All this reflects the broad WHO view of health as a positive experience of well-being and not merely the absence of disease. Yet despite the symbiotic relationship between land use planning and health, these connections have in practice been forgotten until recently. This is in part because of departmental silos. Health authorities have been charged with providing services for those who are ill. Public health programmes have concentrated on infec-

tious diseases and addiction (to tobacco, alcohol and drugs) rather than on healthy environments. Health and safety and environmental protection agencies have been given narrow, functional remits. Planning authorities have often been equally blinkered (see a survey reported in Barton and Tsourou, 2000). Local councils, guided by national governments and local politics, have taken the view that the purposes of town planning are economic development and environmental protection rather than health promotion. Each sphere of public policy has been pursued independently, with agencies adopting specific targets in order to deliver on their mission, failing to grasp, or at least failing to deal with, the interdependence of the issues.

Partly as a result we have been quite literally building unhealthy conditions into the fabric of our cities, towns and villages. All levels and types of planning are implicated. The report *Building Health* (National Heart Foundation et al., 2007) provides an accessible overview, showing how broad strategy, urban and transport policies, urban design and greenspace management are all important, and sometimes at present counterproductive.

We are discovering that the diseases of advanced civilisations – such as cardio-vascular disease, diabetes, asthma and chronic depression – are associated with particular social and environmental conditions. The overriding impression from recent research is that we ignore environmental factors at our peril. Attitudes are changing fast in response, and the WHO has played a role in this. The WHO Healthy cities programme has been acting as a catalyst for 'healthy urban planning' in municipalities across Europe since 1998 (Barton, forthcoming). There is now growing recognition amongst professional planners that the health-environment link is important, and that some current development trends compromise health (see RTPi, 2009). But while many planners recognise that urban planning influences health, they do not normally perceive it as their job to worry about it or study it. Their priorities are elsewhere.

At the same time the public health professionals are suddenly taking a real interest in spatial planning. They have become conscious that advocacy and specific population programmes are not enough to change behaviour (e.g. to persuade people to take more exercise) when structural limits, the very forms of towns and cities, are working against them. In 2008, and even more in 2009, there has been an explosion of demands from public health authorities for knowledge exchange and for effective contact between the health and planning sectors. The National Institute for Health and Clinical Excellence has issued guidelines on physical activity and the environment (NICE, 2008).

Framing the debate

The diagram below (Fig. 1) offers a way of conceptualising both the way settlements work and the way they affect health. It is based on two interlocking sets of theories: about urban eco-systems and about the determinants of health (Barton, 2005; Whitehead and Dahlgren, 1991).

Each of the layers of the model impacts on health and well-being. Equivalently each layer is influenced by land use change. The built environment layer is the sphere where land use planning has a direct impact. A change in the structure of the built environment alters the natural environment and the social and economic environment.

The overview in this paper draws on a wide range of evidence, including a number of broad ranging literature reviews (NICE, 2008; Croucher et al., 2007; Jones et al., 2007; Davis et al., 2007; National Heart Foundation et al., 2007; Institute of Public Health in Ireland, 2006; Transportation Research Board, 2005; Cave et al., 2004). Taking each sphere in turn, the summary first highlights its

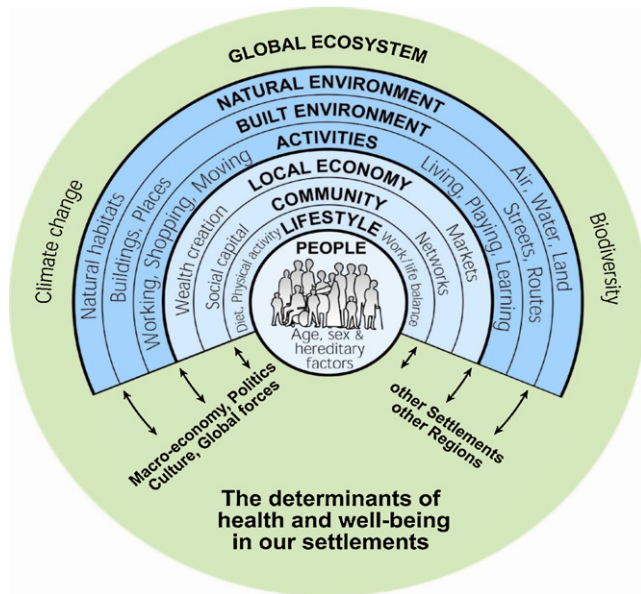


Fig. 1. The settlement health map.

Source: Barton and Grant (2006).

health significance and then identifies the main ways in which land use planning influences the relevant factors. The sequence works from the inmost ring (lifestyle) to the outer ring (the earth):

- Lifestyle: physical activity – active travel and recreation, with an emphasis on the neighbourhood planning level.
- Lifestyle: diet – retailing and local food production.
- Community: mental well-being – local social networks and neighbourhood planning.
- Local economy and income – the general influence of planning.
- Activities, space and networks (linking two spheres of the health map) – social inclusion and health inequalities, with a strategic planning emphasis.
- The natural environment: air pollution – transport and urban form.
- Global eco-system: climate change – mitigation and adaptation.

Lifestyle: physical activity

The critical issue of physical activity is given most space. The level of physical activity, particularly 'active travel', in the population is important not only in relation to the obesity epidemic, as highlighted by the *Foresight Obesity Report (2007)*, but also to social capital, mental well-being, equity, pollution and climate change. It is central to the UK Government programme promoting 'sustainable communities' that are socially inclusive, low carbon and safe.

Physical activity is defined as 'any bodily movement produced by the contraction of skeletal muscles that increases energy expenditure above a basal level' (CDC, 2008). This definition includes:

- everyday home or work activity: walking, carrying, cleaning, climbing stairs;
- children's active play, running, gambolling, skipping, skateboarding;
- activities in specific places: gardening, dancing, gym exercise, swimming;
- sports such as football, rugby, tennis, hockey – also in specific places;
- 'active travel' to get to places: walking and cycling.

The significance of physical activity for health and well-being is profound and need not be rehearsed in detail here. It is related to the so-called 'epidemic of obesity' (Jones et al., 2007). If present trends continue half the UK's adult population will be clinically obese by 2050. Excess weight and lack of exercise are associated with increased risk of diabetes, stroke, heart disease, osteoarthritis, and some forms of cancer. Physical activity can also reduce feelings of depression, anxiety and promote physiological and psychological well-being. The evidence of inadequate exercise gets more alarming by the day: UK cases of type 2 diabetes – the form linked to obesity – rose by 69% between 1996 and 2005 – the fastest rate of increase in the world (Newsflash 24/02/09). The positive physiological and psychological benefits of regular exercise encouraged the Chief Medical Officer to give a target of 30 min of moderate intensity activity at least 5 days a week. For many people this is only practicable if they engage in daily active travel.

The degree to which physical activity is affected by the built environment rather than being determined by social, economic and cultural factors is contested. Levels of physical activity vary between different types of people, places and culture. Public health professionals use the phrase 'obesogenic environments' to highlight the links between land use and obesity. On the basis of its review of the evidence, NICE public health guidance 8 encompasses almost every aspect of the built environment, from strategic plans and major developments through to the detailed design and management of streets, schools, buildings and public open spaces (NICE, 2008). The main focus is on walking and cycling as active travel, and on play. Active travel to get to work, school, friends, shops, etc. is highlighted as the most critical issue because it is about daily physical activity and is the main way in which groups at risk of poorer health gain their exercise. The existence of good pedestrian networks and accessible local facilities is a good predictor of physical activity amongst older people (Patterson and Chapman, 2004).

Active travel

However, the significance of active travel (walking and cycling to get somewhere) for a healthy lifestyle and for combating obesity, is still much debated. We are not dealing here with simple cause and effect. People may get their exercise by sport, cycling or walking for pleasure, gardening, swimming or workouts at the gym. The ownership and use of cars is for many people associated with status and self-respect, and that in itself has health benefits. Conversely, walking and cycling also confer physiological benefits and create opportunities for informal meetings which build social networks and help give a sense of a supportive environment, which is good for mental well-being.

There is consensus in the literature that urban environments influence levels of active travel and thereby levels of physical activity (Handy et al., 2005; Anand, 2006; Lee and Moudon, 2008; Brown et al., 2008). The degree of influence, though, has been the subject of much debate, with some studies suggesting that land use patterns have only a slight impact on travel choice by comparison with social variables (e.g. Boarnet and Sarmiento, 1998). Establishing a clear relationship between particular land use variables – such as density or 'mixed use' – has been particularly problematic (Handy, 2005). However, many studies show an unequivocal relationship between accessibility (in terms of time and distance) to local facilities and the propensity to walk (Hanson and Schwab, 1987; ECOTEC, 1993; Farthing et al., 1996; Lee and Moudon, 2008; Horswell et al., 2009). The significance of local non-motorised trips for health was supported by Brown et al. (2008), who found that neighbourhood, utilitarian walking and cycling trips were associated with lower body mass index.

The importance of local or neighbourhood trips is evident. Neighbourhoods in this context may be defined simply as local service catchments areas, based on walking distance (Barton and Hills, 2005). Yet neighbourhoods have often been perceived as dying or even dead, as mobility and virtual communication increase (Webber, 1964; Dennis, 1968; Giddens, 1990). And indeed, the characteristics that go to make a viable neighbourhood – such as a certain level of density, local shops, services and schools, the presence of pavements and footpaths, an attractive and safe environment – are not present in many modern suburban estates.

Where facilities are not conveniently located, the propensity for active travel reduces markedly (Lee and Moudon, 2008). One US study which systematically compared the 'walkability' of localities found that only 18% of those living in the lowest quartile of walkability recorded 30 min or more of physical activity on at least 1 day, compared with 37.5% of those in the highest quartile (Frank et al., 2005). In England a recent survey of 12 suburban and exurban neighbourhoods found that the proportion of 'local' trips by foot and pedal varied between 18% and 62%. Some of the difference was accounted for by car ownership levels and local culture, but the biggest factor was distance: there was some consistency across neighbourhoods in terms of how far people would walk, but some places had far fewer facilities accessible (Horswell et al., 2009). The implication is that the structure of localities – specifically the location and accessibility of facilities and the quality of the route network – is a critical determinant of the amount of active travel.

There is more to accessibility than simple distance. The quality and safety of the pedestrian and cycling environment is important – particularly the perception of these things (Pikora et al., 2003). Parental consent for children to walk or cycle to school, friends or playground is notoriously low in the UK by comparison with much of Europe, due to real or perceived traffic and stranger danger. Children's freedom to roam has been curtailed. Physical improvement to route continuity, directness, safety, informal surveillance and aesthetic quality is a part of any strategy to change perceptions and culture. Once there are some more people on the streets, perceptions begin to change and we have a virtuous circle (Hume et al., 2005).

There remain questions about particular built environment and behavioural variables. Density, for example, may not be as key a factor as it is often portrayed, while households' choice of dwelling location to suit their lifestyle could be significant. The huge variation in behaviour between people in different countries (e.g. the US, Britain and the Netherlands – the latter with 70% of all trips by active travel modes in some towns) has not been adequately addressed. The degree to which people change behaviour, or more precisely the conditions which foster change when accessibility is improved, also needs more investigation.

Despite the research uncertainties, official policy for sustainable development has for some while laid great stress on the need to revive neighbourhoods and enhance the availability of facilities within walking distance of people's homes (DETR, 1998; Urban Task Force, 1999; Social Exclusion Unit, 2000). The benefits would (it is hoped) be better accessibility for the transport-disadvantaged, improved social capital and health, and reduced transport emissions. Particular models of neighbourhood design have been advocated as likely to promote the use of local facilities as well as walking and cycling (Urban Villages Group, 1992; Calthorpe, 1993; Urban Task Force, 1999; Barton et al., 2003).

Local authorities are employing specific accessibility criteria in policy. Some such standards are very widely used across Western Europe, such as the criterion that dwellings should be within 400 m

of a bus stop. Others have rapidly gained currency in recent years, such as the principle of an 800 m 'ped-shed' around local shopping centres (Llewelyn Davies, 1998). The research underpinning these standards from the physical activity viewpoint is weak, but current research at UWE is beginning to provide evidence (Horswell et al., 2009).

Recreational activity

Recreational physical activity comes in many forms, from children's play to gardening, from organized sports, swimming or gym activity to walking or cycling for pleasure. It therefore relies on many different kinds of spatial provision. Some aspects of provision – notably the availability of greenspace – have been studied in greater depth than others, but before turning to them it is important to note the spatial planning significance of

- private gardens for both gardening and young children's play;
- allotments and community gardens (more on this under 'food');
- tennis courts, squash courts, swimming pools, leisure centres and gyms;
- hard surface provision for team sports or youth games.

All these require land, careful planning and appropriate mechanisms for implementation and management, and have importance for levels of physical activity. For some activities people may be willing to travel a considerable distance to reach the club or activity of their choice, but the participation of the less mobile is important in order to combat health inequalities. Accessibility from home is therefore critical.

Apart from provision for specific activities, the natural environment itself plays a significant part in facilitating physical activity: 'evidence consistently shows that accessible and safe urban greenspaces have a positive influence on levels of physical activity' (Croucher et al., 2007). Evaluation of programmes for encouraging exercise indicates that attractive, green environments close to the home or work provide the best opportunities to encourage daily exercise, walking or cycling. People also keep exercising longer in natural surroundings (Bird, 2004). The effect on children seems particularly marked. Children who have easy access to safe greenspaces (parks, playgrounds, kick-about areas) are more likely to be physically active than those who are not so close, and this has a positive effect on health, particularly for those from low income families (Mitchell and Popham, 2008). One analysis of a European cross-sectional survey suggests that the likelihood of being physically active is three times greater, and the prevalence of obesity 40% less, in neighbourhoods with high levels of greenspace as opposed to those with low levels (Ellaway et al., 2005).

Greenspace Scotland has undertaken a comprehensive literature review (Croucher et al., 2008), selecting 87 studies from 550 identified across the world (a third from the UK), and advises that physical activity (which can sometimes be an incidental benefit from other priorities, such as relief from stress) is influenced by these attributes:

- distance of residence from greenspace;
- ease of access in terms of routes and entry points;
- size of greenspace in relation to levels of population use;
- connectivity to residential and commercial areas (allowing through routes);
- the range of amenities for formal and informal activities;
- perceived safety of the greenspace;
- the quality of maintenance.

Lifestyle: diet

The relationship of spatial planning to diet is less clear. There has been much speculation in the past about food deserts (places, normally outlying estates, with relatively low car ownership and lacking local access to fresh food). But empirical evidence so far does not lend credence to this theory. One longitudinal study of the effect of a supermarket opening in a poor outer estate found that the impact on fresh food purchase was negligible – the local residents changed their diet at the same rate as the city as a whole. However, the study did find a marked affect on active travel. Many more people walked to the superstore because it was now close (Cummins et al., 2005). Studies of the location of fast food outlets affecting diet are also inconclusive. It seems that eating habits are largely a cultural, habitual matter, and are not heavily influenced by spatial planning.

However, household choice on whether to grow fruit and vegetables is itself affected by the options presented by the built environment. Many places, including most modern housing estates, have been built at relatively high densities with small gardens or none at all for flats. This militates against home food production. Allotments are often at an inconvenient distance from home, and many cities now have waiting lists for them. Few recent housing developments have provided accessible allotments, and over the past few decades some allotments have been sold off for housing. There is clearly a need for new research and policy which will enhance local food production.

Community and mental well-being

Community is defined here in terms of social networks of mutual support. Social networks are critical to mental and emotional well-being (Halpern, 1995). Many people have social networks which are numerous, varied and geographically widespread, with a basis in a range of shared interests. Some are virtual. But the networks of vulnerable groups are often very local. These groups include elderly people, infirm or disabled people, young parents (especially single parents) and their children, some teenagers, and unemployed and unskilled people. For them the local social networks in their own neighbourhood are particularly critical.

The quality of social networks is affected by people's perception of the safety of their locality and their sense of belonging. One study of an inner London suburb found that residents experienced 'time-space inequality' as a consequence of crime and fear of crime, resulting in feelings of isolation and low self esteem (Whitley and Prince, 2005).

Research is unequivocal in relating people's perception of their neighbourhood both to objective indicators of its physical and social quality and to health and well-being (Truong and Ma, 2006; Croucher et al., 2007). It is less clear exactly what physical features or characteristics have particular significance. Causality is also difficult to establish. But one study pursued a rare quasi-experimental approach by placing difficult families randomly into affluent localities. It found that their mental well-being improved by comparison to those placed in poor communities (Levanthal and Brooks-Gunn, 2003).

Supportive social networks are also affected by traffic levels and by access to local facilities. Addenbrooke's classic research in the US has been reproduced in this country with similar findings: that levels of social interaction and the extent of the perceived home territory vary inversely to traffic levels (Hart, 2008). Lack of availability of local schools, health facilities and libraries can also have negative social impacts and affect both physical and mental well-being (Lavin et al., 2006). A current study is finding a strong positive relationship between the local availability of shops and services,

the density of social networks, the perceptions of social capital and mental well-being. The fact of being able to walk easily to facilities, meeting people either by accident or arrangement, appears to be key to these relationships (Calve-Blanco, 2009).

Greenspaces facilitate physical activity, and can also promote social interaction and social cohesion (Croucher et al., 2008). Close access to greenspace promotes the sense of well-being, stress relief and speed of recovery from illness. Residents of urban social housing who can see trees or open space from their homes demonstrate greater ability to deal with stress than those who have no such views (Kuo, 2001). People who are more locally based – older residents, the unemployed and single parents – benefit especially from such access (Orsega-Smith et al., 2004; De Vries et al., 2003). However, the quality and safety of open space is important. If the community perceives the risk of assault or intimidation to be high, the benefits of greenspace largely evaporate (Croucher et al., 2007). Social problems are compounded if park maintenance is poor. In 2000 only 44% of local greenspace managers considered the quality of their parks to be stable or improving. However, the positive news is that by 2005 this had risen to 84% (National Audit Office, 2006).

Overall, then, and contrary to earlier social science assumptions (Giddens, 1990; Dennis, 1968; Webber, 1964) it seems that spatial planning is important for social networks and for mental well-being. This is particularly so for poorer and less mobile groups, who are more likely to be locally based. The structure of the housing market and the allocation of affordable housing mean that vulnerable households tend to be clustered in less desirable locations, reinforcing patterns of deprivation. The significance for health inequalities and social exclusion is clear.

Local economy and income issues

Employment and income are clearly related. Both are determinants of health and both impact on social status, which is also a key determinant of wellness (Marmot, 2004). It is generally accepted that mortality and mental illness increase when unemployment rises (Cave et al., 2004). Individuals who are long-term unemployed are much more likely to suffer depression and physical illness than those in satisfying work, because of both relative poverty and lack of purpose in life. Poverty itself (whether due to unemployment or not) is associated with poor housing, limited mobility, reduced life chances and increased stress, all of which are likely to impact on health and well-being.

Spatial planning effects the local economy broadly, through its effects on the dynamics and growth patterns of regions and settlements, and more specifically through land availability, planning permission for commercial and retail land and buildings, retraining programmes, regeneration strategies and infrastructure provision (improved roads, new stations) that can encourage enterprise. Planning may also affect the economy indirectly through the housing market and the general quality of the environment. For example Welsh valley towns, suffering from terminal decline of traditional industries and poor population health, find it difficult to attract entrepreneurs because of the limitations of the housing stock and facilities available.

Governments attach high value to a successful economy, while health professionals recognise the importance of income and the status that work gives. But research linking health and economic development policy is not evident in the broad reviews of evidence.

Activities, space and networks

Spatial planning influences activities through decisions on infrastructure, land and buildings (the 'built environment'), while

the activities themselves are pursued by individuals, households, firms and institutions. The focus here is on equity and social inclusion.

Spatial planning is deeply implicated in social exclusion and health inequalities. Land use decisions, particularly in relation to housing, transport and economic development, are key determinants of where people live, and therefore of the population profile in any particular area. For example, the distribution of social housing determines where low income groups in housing need tend to live. The most important variables apart from income are probably household status and culture or ethnicity. The social segregation that can occur as a result of the housing market can lead to geographical health inequalities to a sometimes alarming degree. Glasgow provides an extreme example, with life expectancy in one deprived suburb being 54 years, while in an affluent suburb not far away it is 82 years. These figures can be compared with the all-India life expectancy of 61 (Hanlon et al., 2006). The concentration of poverty and unemployment in ghettos causes individual misfortune to be magnified and reinforced.

The strategic planning of housing numbers and land requirements – a cause of continuing political conflict – have profound implications for health. If supply is unduly constrained and prices are high in relation to incomes, social exclusion in the housing market increases (Barker, 2004; Bramley, 2009). Health inequalities are exacerbated as poorer households have difficulty in finding adequate accommodation at a price they can afford in a convenient location. The recent report by Knight Frank (2009) cites evidence from Oxford to show how green belt and housing policies are compromising the options for poorer households, and notes the increasing backlog of affordable units.

The situation of poorer households is also worsened by the prevailing fashion for low density, edge-of-city commercial development, in the form of business parks, retail and leisure parks (National Heart Foundation et al., 2007). This pattern of development increases dependency on the car, and disenfranchises households which do not have access to a car (or two). Conversely, it can force them to buy and run a vehicle they can ill afford.

These edge city locational patterns relate to overall land use and transport strategies. Despite many brave words from local planning authorities, the reality is that new suburban development is proceeding in a way which does not support viable public transport services and which discourages walking and cycling. The public and private sectors are both implicated in this trend, including hospital trusts which close inner city facilities in favour of edge-of-town facilities.

We now appreciate that if households find themselves having to live in over-crowded conditions far from their main social connections, they will be more prone to stress and ill-health. A particular problem, currently becoming more common in both urban and rural areas as energy costs rise, is fuel poverty. Houses which are poorly insulated, draughty, and with inadequate or expensive heating systems, are frequently occupied by those least able to cope with these conditions. The result is 'spatial shrink' (when old people live in their one heated room), vulnerability to illness, and hypothermia. Rehabilitation and renewal programmes, aimed at bringing all houses up to standard, are therefore important from the health perspective (DETR, 2001).

The local bioregion

The relationship between environmental pollution and health was, as noted earlier, one original reason for developing a land use planning system. Basic life support depends on the quality of the air, the availability and quality of water, and lack of contamination of soils when they are used to grow food. This section focuses on

air pollution as the most significant environmental health risk in the UK.

The risks associated with poor air quality come mainly from transport and to a lesser extent industry and energy use. Environmental pollutants including particulate matter, ozone, carbon monoxide, nitrogen oxides, sulphur dioxide and benzene cause lung and heart disease, while fresh air contributes to a sense of well-being. In the UK these concerns are institutionalised and are generally effectively managed through the Environment Agency and Environmental Health departments. The Royal Commission on Environmental Pollution has spelt out all the aspects of pollution, including its relationship to health and to the natural and built environments (RCEP, 2007).

In terms of land use, the health impacts of air pollution are greater in urban areas with high traffic levels and high built densities, more people and lower air dispersal characteristics (RCEP, 2007). Here there is a complicated balance of conflicting parameters: more compact urban centres reduce the amount of per capita travel but at the same time, greater density results in increased vehicle trips in any given area, with higher congestion which itself increases pollution (Frank et al., 2005). With regard to health inequality, a study reporting on England found that the most deprived wards were those with highest pollutant concentrations. "The number of people in wards above pollution thresholds increases progressively with increasing deprivation" (Walker et al., 2003). However, this pattern is not universal, and in Wales for instance, both the least and the most deprived areas on average experience similar levels because of their particular spatial distribution (Pye et al., 2006). The key point is that there are large clusters of wards experiencing pollution above health thresholds in larger cities.

Pollution can be tackled at source (through better vehicles, changed power sources, improved industrial processes and heating systems, more efficient buildings, etc.), but can also be managed by good urban form and the management of the urban environment. In terms of urban form, concentrations of pollution can be moderated and pollutants absorbed by linear parkways and green lungs that break up the urban area and almost literally let it breathe (Hough, 1995). Urban heat domes (associated with excess summer deaths as the climate warms) can be effectively managed by greening the city – not just by open spaces but also by tree planting and having living green surfaces as widespread as possible.

All this points to the critical importance of seeing settlements not simply as human artifacts but also as part of the natural world, affecting it and dependent on it. The phrase 'green infrastructure' hints at this relationship. It is vital to see the planning of green infrastructure in the broadest sense, embracing the management of key environmental assets (air quality, water, energy, biodiversity) as well as providing for physical activity, community activities and psychological well-being.

Global ecology

The interdependence of humans and nature becomes obvious when we consider climate change. Global warming and sea level rise are the biggest risks to health in the world – and possibly to the UK specifically, as the Inter-Governmental Panel on Climate Change (2007), the World Health Assembly (WHA, 2008) and Costelloe et al. (2009) have shown. The main threats to health come from regional weather changes, which affect heat stress, flooding, water security and food production, and from sea level rise, with huge implications for coastal settlements, economic dislocation, forced migration and disease.

Settlements, both rural and urban, are profoundly implicated in the causes of climate change. Land transport accounts for 28% of end

user carbon dioxide emissions, and is tending to rise (DEFRA, 2008). Spatial policy to combat climate change touches every element: of the energy efficiency of new and existing buildings, carbon-neutral energy generation, a progressive and massive reduction of reliance on carbon-fuelled transport, and the planning of town and country for easy accessibility and active travel. While certain aspects of this agenda are being actively pursued in the UK, the current plans for future of cities and regions involve growing transport energy consumption (and carbon emissions) over the next 20 years at least (Echenique et al., 2009). Much more radical measures are needed if the UK is to achieve its targets.

Urban and rural areas will have to adapt to some level of climate change, whether mitigation is effective or not. This includes the proper planning of the water cycle, including flood risk management and sustainable urban drainage, reducing the urban heat island effect by greening the city, constructing buildings that maintain a comfortable temperature without energy use, and coping with the broad social and economic changes caused by climate change. It is salutary to note that many of the measures needed to combat global warming are similar to those needed to cope with it.

Overview: a wicked problem

This brief review points up a vital realisation: the relationship between health and land use, especially urban land use, is hugely complex. The various aspects of human social and economic activity, development patterns, planning and environmental policy and health and well-being interact in a myriad ways. Inevitably, many different agencies need to be involved in cooperating to create a healthy environment. This highlights the desperate need for a coherent, shared philosophy. Health (which we all believe in) draws together all the main policy themes: it is closely tied to economic health because of the importance of jobs and income; it relies on the reduction of inequality, building inclusive and supportive communities, and it helps drive the need for environmental sustainability.

While the UK is spending more on the National Health Service, it should also aim to reduce illness through investing in healthy environments. In many towns and cities in Western Europe, priority has been given to the quality of the environment and to inclusive accessibility, and the culture allows children to play in and roam their public realm.

The UK community of planning practitioners is beginning to be influenced by continental European experience. Comparative studies of UK experience with specific cities and neighbourhoods in Germany, France, the Netherlands and Scandinavia are startling. In terms of equity, active travel, accessibility, environmental quality and robustness in the face of the climate change threat, the best UK cities are far behind their continental equivalents (Falk and Hall, 2009). Our UK research, and other English language research, mainly from the US, seem sometimes to miss the point. In some places in Europe we see experimental evidence of behaviour which is very different from that which prevails in the UK, amongst populations that are in other ways quite similar. There is also general evidence that this different behaviour is affecting health and well-being. The comparative study of child health and well-being in OECD countries puts British children as amongst the least healthy and least happy (UNICEF, 2007). Spatial planning in its broad sense, and the character of settlements, are part of the UK problem, and need to become part of the solution.

Future directions and expected findings of future research

Below are some of the expected insights which research will be able to afford us in the future, chosen from instances where already

one can see clear trends in findings and the conviction with which researchers are able and willing to put them across. It is interesting to note the relative speed with which the research community acts once a new agenda – such as climate change or the obesity epidemic – takes hold. In the field of physical activity and urban form, for example, the main research effort (following the work of some early pioneers) has occurred this decade. For a while much of the research used methods which searched for aggregate average patterns and which were often not very revealing. It used spatial variables, such as density, which proved not to be so critical as many had believed. But just in the last few years, we have found more crucial variables and the weight of evidence is becoming impressive, allowing more discriminating judgements to be made.

My belief is that the inter-linkage of health and spatial planning research literature will continue apace, and progressively leave little excuse for inaction. A major shift in political priorities, however, will be necessary if action is to be effective. Part of that shift will be increased autonomy and financial muscle for local authorities, so that they can innovate and shape the future of their communities to a much greater degree, as we see in continental European examples. Also necessary is a shift in the control of land for development, so that vested interests do not dominate over the common good. At present, the main political parties show little sign of shifts in such a direction. We await a crisis (possibly due to climate change) to galvanise the political classes and public opinion.

The research areas in which we might expect interesting results in this area include:

- *Integrated settlement theory*: current research is hampered by the inadequacy of human settlement theory. Each discipline provides its own perspective but they are not integrated. Various attempts have been made to integrate them, none yet fully convincing. The next 40 years will see the development of an integrated theory of settlement function, form and evolution. It will be based in eco-system theory, linking human activity and well-being with development processes, the structure of the built environment and the natural bioregion.
- *Normative planning strategies*: partly as result of the integrated theory, and partly as a result of gathering comparative evidence from around the globe, clear normative principles will be identified in relation to the processes of urban governance and decision-making and the spatial structures that are successful at delivering healthy, sustainable human settlements. These principles are already being articulated but not are widely accepted.
- *Health well-being and spatial planning*: much more research will be undertaken to help us understand the links between health and urban land use, including strategic policies for housing, commerce and transport. This is still a new research arena. The areas of uncertainty will be progressively reduced, and the more significant determinants of health will be separated from less critical factors. The relative significance of, and dynamic relationship between, social, cultural, environmental and economic drivers of personal behaviour will be much better understood.
- *Population, social mix and health inequalities*: the evidence will become compelling that if long-term productivity, health and quality of life for all (avoiding the crippling societal costs of poor health) are priorities, then the social structure of population within a neighbourhood or town is a matter of central policy concern. The socially polarised geographies in the UK which result from current housing mechanisms and urban forms will be condemned as exacerbating social and health inequalities and for their high cost to society.
- *Lifestyle: physical activity and the built environment*: the growing but still contended evidence that urban form, settlement patterns and local environments have a major impact on behaviour,

especially the levels of physical activity and therefore obesity, will be full and clear. The significance and dangers of obesogenic environments – again with a cost tag which will influence the Treasury – will be accepted. Local greenspace, retail, social and educational facilities, and the cycling routes and walkways which give access to them, will become recognised as important for public health and well-being.

- *Community networks, mental well-being*: The still uncertain relationship between community networks, the physical environment and mental well-being will have been sorted. There will be a recognition that it is impossible to generalise about this topic, because of the increasingly diverse patterns of social connection which people have. Nevertheless, for those who are obliged, or choose, to live locally, the importance of local facilities and casual pedestrian meetings will be established. In an aging population, with more retired people, this will be especially important.
- *Children, education and locality*: the crisis brought on by a generation of obese children becoming adults, with consequent health problems, will focus the minds of politicians and academics. There will be research showing that it is vital for children to experience their environment, engage in active play and free socialising, and learn about the world, in the context of a more holistic educational approach, if they are to be happy and healthy. The dangers of exaggerated fear of strangers, fortress schools and car-dependence will be accepted – though the aftermath of the current situation will still impede progress.

Given the strong direction of research, and the urgent necessity of planning the human habitat so that it promotes health and sustainability, a maxim of Goethe's is apposite:

Whatever you can do, or dream you can, begin it. Boldness has genius, power and magic in it.

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