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# **Obesogenic environments: exploring the built and food environments**

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# **Obesogenic environments**

## ***Abstract***

Obesity is a significant health and social problem which has reached pandemic levels. The obesogenicity of an environment has been defined as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations' (1). Prevention and treatment of obesity has focused on pharmacological, educational and behavioural interventions, with limited overall success. A novel and a longer term approach would be to investigate the environments which promote high energy intake and sedentary behaviour; this has not yet been fully understood. The obesity epidemic has attracted attention at all levels, from general media interest to policy and practice from health and other professions including urban designers and planners. Shaping the environment to better support healthful decisions has the potential to be a key aspect of a successful obesity prevention intervention. Thus in order to develop effective environmental interventions, in relation to obesity, we need to understand how individuals, and different groups of individuals, interact with their environments in terms of physical activity and food intake.

## ***5 key words***

Obesity, young people, environment, planning

## ***Introduction***

### **Obesity**

Obesity is a significant health and social problem which has reached pandemic levels. While reported energy intakes from food, in England, have been decreasing over 30 years, the prevalence of obesity has tripled over 20 years and continues to increase at an alarming rate (2). The health and social costs of obesity are high; obesity accounts for approximately 30,000 premature deaths and the total estimated cost of obesity is £3.3 - 3.7 billion per year (3). Whilst obesity is influenced by genetic and behavioural factors, the environmental influences have yet to be fully explored and understood (4). Obesity prevention and treatment has focused on pharmacological, educational and behavioural interventions, with limited overall success (3). A novel and a longer term approach would be to investigate the environments which promote high energy intake and sedentary behaviour: this has not yet been fully understood. If the influences of these environments were understood, approaches which modify the environment have the potential to assist in the prevention of this multi-factorial disease. It is well established that dietary intake and physical activity can influence the advancement and prognosis of chronic disease (5). In relation to the current obesity epidemic, diet and physical activity cannot be examined in isolation. To understand 'why we eat what we eat' requires an understanding of time, space, social relationships, culture and nature (6). The obesogenicity of an environment has been defined by Swinburn et al. (1) as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations.' Obesogenic environments (obesity-promoting) are

perceived to be a driving force behind the escalating obesity epidemic (7). Human environments are enormously complex (8) and therefore warrant a multidisciplinary approach to investigate this concept of obesogenic environments. Overweight and obesity are not caused by a single factor, and evidence indicates that the environment has a significant impact on diet, physical activity and obesity (9).

This paper will specifically explore the built environment and the food environment and their relationship with obesity.

### **Environments**

The health impacts of the environment can take a number of forms, from physiological and emotional to social, spiritual and intellectual wellbeing. The environment can be related to health through; i) its physical design (the built environment); ii) the socio-cultural rules which govern these environments and; iii) the socio-economic status of these environments. For example, high levels of environmental stresses and lack of social cohesion in lower socio-economic neighbourhoods have been found to contribute towards poorer health outcomes (10). Food environments and the ability of the environment to encourage physical activity, or active living, can be closely related to health. How an individual uses an environment may also be largely dependent on their perceptions of the environment for example, how safe they feel.

Due to the complex nature of environments and numerous environments which people occupy it is simplistic to categorise environments as either supportive of health or unsupportive of health (8) although modern society

could broadly be described to support unhealthful eating patterns and physical activity (11). Further research is required to establish how different environments affect different individuals (11) as individuals interact with the environment on a number of levels. Swinburn et al. (7) described the environment in terms of 'microenvironments' (e.g. schools, workplace, home, neighbourhood) which are influenced by the broader 'macroenvironments' (education and health systems, government policy, society's attitudes and beliefs). These different types and levels of environments interact together and behaviour is determined by a combination of direct and indirect mechanisms (12).

### **The built environment**

One aspect of the obesogenic environment is the built environment. The built environment consists of three elements (13):

- 1) Physical design.
- 2) Land use patterns (residential, commercial, office, industrial, and other activities).
- 3) Transportation systems.

Tackling the way the built environment influences public health and obesity requires professionals to cross disciplinary boundaries (14). Historically, both in the UK and US, modern town planning grew from a concern regarding the unsanitary conditions of industrialising cities in the 19th Century. In an attempt to solve the problems of unhealthy, overcrowded slums it was the UK Public Health Acts that dictated issues such as, street widths and most aspects of domestic dwellings, transforming large tracts of cities into by-law terraces, still

familiar today (15). However, as the health community became increasingly focussed on treating diseases, so the planning profession became fixated on the aesthetic and economic aspects of planning and collaboration between the two professions dropped away (16). Since the 1980s and the growth of the 'Healthy Cities' movement (see below) there has been a growing recognition that in order to plan effectively there is a need to reinvigorate the historic collaborative link between public health and urban planning and together conduct informed science (17-19).

Since the 1930's (UK) planning theory has criticised suburban development as an inefficient and wasteful way of developing (18). In the 1960s, however, some US theorists began linking sprawling suburban development to health issues and in particular mental health problems of isolation, alienation and dysfunctional family life (20, 21). Around the same time studies were conducted investigating possible stress and related health impacts caused by driving (22, 23).

In 1987 the World Health Organisation Regional Office for Europe launched its 'Healthy Cities' Project. This takes a holistic approach to healthy urban environments stating that healthy cities are ones where physical and social environments are continually improved and community resources strengthened to help people achieve their full potential (24). In the USA corresponding programmes have also been initiated such as the Healthy Communities Movement and the Coalition of Healthier Cities and Communities (25). The 'New Urbanism' movement emerged in the late 1980s

with the key aims of developing pedestrian friendly neighbourhoods which, while accommodating the car, encourage people to walk to local shops, services and use public transport for longer journeys (26-29). A vital element to make this system work is that residential densities need to be sufficiently high to support the transport network, shops and services. In the UK the need to develop more compact forms of development, reducing the need for travel and improving the pedestrian environment have also been promoted through government policy (30-32). The links between health and built environment have, therefore, been back on the research and policy agenda for some time. However, what has emerged over this time, though large in volume, is a disparate and often seemingly contradictory body of evidence, the majority of which has been conducted in the US.

Looking at the rapid rise in obesity over the past three decades may suggest that any link between, urban form, exercise and obesity is not strong, given that suburbanisation has been a much longer process. A body of evidence does, however, suggest that there is a link between the built environment, physical activity, obesity and chronic disease (33). Much in the literature points to a consistent link between urban design, walking and cycling. Research has suggested a number of factors within the built environment which appear to correlate with people's propensity to undertake physical activity and thereby improved health outcomes; increased residential densities; neighbourhood design features, such as historic structures; land use mix, in particular local shops, services and schools within primarily residential neighbourhoods; the presence and quality of pavements and



footpaths; enjoyable scenery; perceptions of safety; and the presence of others, have all been cited as encouraging walking and cycling (34).

Often groups of neighbourhood characteristics will be found together. In the US there tends to be a marked difference between, older traditional neighbourhoods and more modern auto-dependant ones. Traditional neighbourhoods display higher residential densities; high levels of connectivity between streets (e.g. in the US the gridiron pattern); high levels of land-use mix (residences, local shops and services mixed together); good levels of pavement provision and; are perceived to be aesthetically pleasing and safe. Modern sprawling suburban neighbours often lack nearly all of these qualities, i.e. large tracts of single use land patterns; few or no local shops, or services combined with housing; largely disconnected development i.e. 'cul-de-sac' layouts; poor levels of pavement provision and monotonous, uninteresting views. There is much research into why people live in such areas and whether this is due to choice, or lack of alternatives. Debates focus on the inherent conservatism of both developers and lenders; relative affordability of such housing stock; and people's desire to be within reach of what they consider to be good schooling (35). These sprawling suburbs have been labelled 'less walkable' neighbourhoods and have been related to obesity in a number of studies in the US and Australia (36-38). In San Diego, Saelens et al. (39) reported that people in the high walkable neighbourhoods on average walked over an hour more than those in the low walkable neighbourhoods. While 35% of people were overweight in the high walkable neighbourhood this rose to 60% of those in the low walkable neighbourhood.

Another US study, the SMARTRAQ programme (Atlanta), found a correlation between body mass index (BMI) and built environmental factors. A significant correlation was noted between the obesity of white males and the density of residential neighbourhood, decreasing from 23 percent to 13 percent from the least dense to the most dense<sup>1</sup> neighbourhoods. Further investigation adjusted for other factors known to affect obesity, including age, income and educational attainment, confirmed that higher levels of residential density are associated with a reduced likelihood of obesity for white men (40).

In a large study (13,637) of the health status of residents of the New York City, four specific built form characteristics of neighbourhoods (density, land-use mix, access to sub-way stations and bus stops, and street connectivity (based on intersection density)) are being correlated against resident's BMI. Preliminary analysis suggests that, at neighbourhood level, increased land-use mix, access to subway stops, though not necessarily bus stops and increased population density correlate to lower BMI. Only inter-connectedness appears to have no correlation to BMI. The study provides new evidence that urban form and travel behaviour are associated with patterns of obesity (41). One issue which has not emerged in the existing research is whether the mere inconvenience of owning a car in higher density neighbourhoods, for example, difficulties in parking, or perceptions about the safety of on-street parking encourages more walking and cycling. This work is

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<sup>1</sup> Atlanta has very low residential densities compared with UK residential densities. In Atlanta low density areas have 0-2 dwelling per acre, while the most dense have 8 and upwards. In the UK 8 dwelling per acre would be considered medium density.

potentially significant for the UK since the densities of the neighbourhood studied in New York are more comparable than some earlier studies in the South and West U.S.

### **Food and nutrition environments**

The food environment can include availability and accessibility to food as well as food advertising and marketing. Cummins and McIntyre (42) described two food access pathways in relation to the food environment; food for home consumption from supermarkets and grocery shops and ready-made food for home and out-of-home consumption from restaurants and take-aways.

Evidence in North America indicates that the food environment may help explain the racial and socio-economic inequalities in health and nutritional outcomes (43). In the UK the picture is less clear. Work which has explored access to affordable food, found that retail factors were not important predictors of diet for the majority of the population (44). White et al. (44) did not find an independent relationship between most indicators of healthier eating and factors relating to the local retail environment. While Pearson et al. (45) reported that age, gender and cultural influences rather than poverty and distance to the supermarket were found to influence fruit and vegetable intake. The links between the retail environment and diet have been suggested to be observational (42) and therefore merit further investigation.

Eating-out accounts for an average of 7.6 percent of energy intake (46). A popular form of eating out is the fast-food outlet. Due to its high energy

density, fast food has been implicated in the obesity epidemic (47). A recent spatial analysis in Chicago found a clustering of fast food restaurants around schools (48). Cummins et al. (49) reported that the greater the level of neighbourhood deprivation in Scotland and England, the more likely the neighbourhoods was exposed to McDonalds restaurants. Conversely, work in Glasgow found no association between area of deprivation and access to take-away outlets (50). While restaurants have been implicated as an aspect of the obesogenic environment, they have also been identified as an important venue for initiatives to improve dietary intake, for example to increase fruit and vegetables (51).

The workplace and particularly school food environments have received a lot of interest. Schools have been recognised as important environments that can shape and influence the health related habits of young people (52, 53). In New Zealand, Carter and Swinburn (54), found that 'less healthy' choices dominated food sales and concluded that the school food environment was not conducive to healthy food choices. Similarly, in secondary schools in the UK, a large variety of unhealthy options made it difficult for young people to choose a healthy diet (52). The television chef Jamie Oliver's campaign on school dinners resulted in dramatic government intervention and the banning of specific foods from school menus (55). September 2006 will see the launch of new nutritional standards for schools (56) covering lunch food initially but also all other food served in all local authority primary, secondary and special schools in the UK.

We are subjected to messages about food numerous times in a day in a variety of forms; from educational materials to information about food products and from food retailers (57). Food companies use sophisticated advertising and marketing campaigns to promote products. For every \$1 spent by the WHO to improve nutrition, \$500 is spent by the food industry on promoting processed foods (58). In the UK which has a government led 5-a-day programme, advertising of fruit and vegetables is considerably less than other foods. Recent figures from the 2003 Advertising Statistics Yearbook (59) report £15.2 million being spent on total confectionery advertising in 2002, compared with £2.8 million on fresh fruit and £1.2 million on fresh vegetables.

Currently there is a high level of concern regarding the influence of industry, advertising, marketing and the media on children's food consumption (60). A recent systematic review produced evidence that advertising to children does have an effect on their food knowledge, preferences and behaviour (61). This is supported by a study which showed a significant association between the proportion of children who were overweight and the number of adverts per hour on children's TV, especially those that encouraged the consumption of energy dense micronutrient-poor foods (62). Marketing strategies which are aimed at children include the use of 'pester power'(63), target schools through sponsored educational materials, contests, samples and vending machines (64). Cadbury's scheme to offer free sports gear is paradoxical, the scheme required 160,000,000 bars of chocolate to be consumed in exchange for sports equipment (65). This heavy marketing of energy dense foods, particularly to children, has been described as a 'probable' risk factor for

obesity (66) and needs to be addressed in efforts to control the obesity epidemic. While this effect is well documented the issue is not resolved, The National Heart Forum is currently preparing a judicial review against the TV regulator Ofcom over their refusal to consult on a 9pm watershed on television advertising to children (67).

While good evidence for environmental influences on diet and obesity exist in the US,(42) further work is required to explore this relationship particularly in the UK.

### **Measuring the obesogenic environment**

The complexity of the environment and the 'fusion' of different forms of research (14) presents methodological challenges for researchers. While evidence does exist to link the built environment with obesity, the methods which have been used are inconsistent, and vary across studies (68).

Methods for assessing the built environment varied from indirect measures (e.g. combination of survey data to estimate socio-economic status), intermediate measures (e.g. use of telephone book yellow pages or marketing databases), and direct measures (e.g. face to face interviews by trained investigators) (68). A combination of objective measurements (e.g. actual counts of traffic) and subjective measurements (e.g. an individual's self-reported perception of crime in their neighbourhood) are important in explaining the relationship between weight gain, obesity and the environment (12). More consistent methods still need to be developed and applied in the field (68).

## **Future work**

Reducing obesity, improving nutrition and increasing physical activity are high on the public health agenda, as set out by the recent white paper (69). Most research in the area of environmental influences on obesity and physical activity has focused on adults (70). Obesity in young people is of particular concern. Obesity, once developed, is difficult to treat, and prevention programmes aimed at children and adolescents are considered a high priority as there is a high risk of obesity persisting into adulthood (71). Adolescent health has implications for the health of future populations. Obese adolescents are likely to remain obese throughout their adult lives, have poor health and reduced life expectancy through increased risk of associated diseases (72). The WHO Diet, Nutrition and the Prevention of Chronic Disease report (5) commented that the obesogenic environment, in terms of advertising and marketing, appears to be largely directed at the adolescents, making healthy choices for this age group more difficult. It is acknowledged that the current evidence base of health outcomes in relation to the environment must be expanded to include diverse populations, such as young people (9).

Work being planned at Newcastle University will focus on 16-18 year olds. This cohort will provide information about an important life stage, captured at a time of emerging independence. Respondents will be selected from two geographically and demographically different areas. This planned study will

investigate the relationship between location, diet and activity. The work will meet the following objectives:

1. To record the dietary intake and physical activity levels of a cross-sectional sample of 16-18 year olds from two geographically different areas in Newcastle.
2. To explore qualitatively specific factors related to their environment and urban space which enhance and limit their healthy food choices and physical activity.

Pilot work with a group in the target age range is currently in progress. This will develop and refine methods to be used in the main study. Preliminary work suggests that the relationship between food, physical activity and the environment, in this age group, is complex and requires multidisciplinary methodological decisions.

## **Discussion**

This paper has presented evidence which supports the existence of an obesogenic environment. While evidence has been described from studies conducted in Australia, New Zealand and the UK, the majority of the evidence has been collected in the US and is often based on large national survey databases, equivalents of which do not exist in the UK. The cultural and physical differences between the US and UK environments also mean that this research is not directly comparable. The UK-based body of evidence on the obesogenic environment needs to be expanded and related to varied groups of individuals and a range of environmental settings.



The food environment and built environment are closely related. While in the past these environments have been considered separately, by different groups of professionals, there is a need to consider these important obesity related factors together. For work to progress in this area links need to be established and developed between health professionals and those involved in planning, transport and housing. As mentioned, this presents methodological challenges, but has the potential to drive innovative obesity prevention interventions.

The environment consists of both perceived and objective factors, untangling the effects of the environment on health and obesity is a complex process. Tackling the current obesity epidemic requires individual behaviour change but it is important that there are broader ecological approaches to obesity prevention which support these changes (73).

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