

SUPPORTING HUMAN HEALTH: FOCUSING EFFECTIVE BUILT ENVIRONMENT INTERVENTIONS

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ABSTRACT

The built environment has an important role to play in supporting human health as part of everyday living. While this is increasingly recognised in a burgeoning inter-disciplinary body of literature, there is ongoing difficulty in defining the most effective built environment interventions that support human health. This paper proposes a way forward. We suggest three domains where planning can focus its support for human health by addressing the principle risk factors for contemporary chronic disease – physical inactivity, obesity and social isolation. First, the built environment can increase opportunities for, and reduce barriers to physical activity. The varying needs of different population groups, the purpose of the activity (transportation or leisure), and the characteristics of the built environment (such as residential and commercial densities, land use mix, connectivity and accessibility) must be considered in understanding how the environment can best support physical activity. Second, communities can be strengthened and connected by facilitating interaction in public spaces including gardens, town squares, parks and lively streetscapes. Such spaces have to be safe, inviting and meaningful for the communities that they serve. And third, through zoning and land use regulation, the built environment can support healthy eating. Interventions include community gardens and fresh food markets, as well as protecting food production systems and controlling marketing and advertising infrastructure, and food retail outlets. Our paper, based on a systematic literature review, establishes an evidence base that supports the development, prioritisation and implementation of healthy built environment policies and practices through the three identified domains.

INTRODUCTION

The built environment plays a critical role in supporting human health and well-being as part of everyday living. This is increasingly recognised in a burgeoning inter-disciplinary body of research literature. Nevertheless, for planning and other built environment professionals, there is an ongoing need to clarify the most effective interventions from the discipline's perspective. In this paper we propose a way for this to occur.

We suggest three domains where the built environment can focus its support for human health. These are:

1. The built environment and getting people active
2. The built environment and connecting and strengthening communities
3. The built environment and providing healthy food options.

These domains address the major risk factors for contemporary chronic disease – physical inactivity, social isolation and obesity.

The paper presents the mounting research evidence for different built environment interventions in the three identified domains. We assert that a more targeted understanding of *how* the built environment can support human health and well-being in areas of most influence will enhance effective and evidenced-based policy making to underpin specifically targeted interventions.

The material presented in this paper is part of a larger body of research examining the relationship between the built environment and health (Kent et al. 2011). Here we synthesise that research, focusing on literature of particular relevance to the Australian context. In the next section we outline the research methodology as a prelude to presenting the findings under each domain.

METHODOLOGY

The methodology employed for this project was rigorous and systematic. We initially interrogated built environment and health databases using tailored key word searches. The grey literature was also systematically investigated. Experts working in healthy built environments were also questioned about relevant unpublished literature. As a result of this process, a burgeoning literature on healthy built environments was identified across the three domains. A total of 1,615 references was located, critically reviewed and synthesised (Kent et al. 2011). The knowledge search was conducted during April and May 2010.

There was a dominance of literature related to physical activity – the *Getting People Active* domain – with 769 references located. It was subsequently decided to use a 'review of reviews' methodology to examine this vast literature. Thirty seven reviews focusing on the built environment and physical activity were identified. Selection of reviews was based on the knowledge of the authors, experts in the field and a search of the physical activity references for the word 'review' in the key words or title. In relation to the *Connecting and Strengthening Communities* domain we found 224 references. For the *Providing Healthy Food Options* domain a total of 138 references were located. For these two domains, we used the primary references rather than the 'review of reviews' methodology in analysing the research evidence.

Having identified the latest research, we undertook an analysis of all sources, grouping the evidence under key themes in each domain. We now discuss these findings.

THE BUILT ENVIRONMENT AND GETTING PEOPLE ACTIVE

There is a well established link between the qualities of the built environment and our ability to be physically active (Booth et al. 2000). Contemporary understandings of the relationship between physical activity and health benefits have grown concurrently with increasing mortality from non communicable chronic diseases and sedentary lifestyles. The research of Morris and Crawford in the 1950s confirmed the hypothesis that sedentary workers suffer more heart disease than those in active jobs. This early study importantly recognised that an absence of movement in daily life is unhealthy. Physical activity is also linked to overall community well-being (Wood et al. 2010) through the encouragement of social interaction and community engagement (Echeverría et al. 2008). Moreover, there are economic and environmental benefits to physical activity that go beyond an individual's health (Bauman et al. 2008; Shoup & Ewing 2010).

The built environment can be modified to facilitate or constrain physical activity. It can be structured in ways that increase opportunities for, and reduce barriers to physical activity. Characteristics of the built environment influence physical activity. These characteristics differ depending on population groups (e.g. children, youth, the elderly, socially and economically disadvantaged and differently abled), for varying purposes of physical activity (e.g. transportation, exercise), and in diverse contexts (e.g. inner city, suburban, regional, rural). The form of the built environment – such as residential and commercial density, land use mix, connectivity and accessibility – also influences the way we move and what we do within that environment. In particular, the built environment can shape travel behaviour, including the quantity of walking, cycling, public transport and car travel, as well as the amount of leisure time that is available for other healthy pursuits. The built environment can also facilitate opportunities for recreational physical activity, by providing well maintained and useful open spaces, in addition to safe and amenable streets for non-utilitarian walking and cycling.

Accessibility and the Importance of Distance

Accessibility is generally measured as the distance between origin and destination. In the majority of the literature, distance is significantly correlated with active transport. Longer distances discourage all mobility, particularly those involving physical activity. Shorter distance represents increased convenience and therefore reduced cost to the individual through time and effort required to use physically active transport modes. Both perceived and actual distance between destinations are significantly and positively correlated with physical activity (TRB 2005; Bauman & Bull 2007). Increases in trip distance result in cycling having a much lower share in mode choice (Heinen et al. 2010). Bicycle commuters tend to live closer to their work when compared with other types of commuters (Rissel & Garrard 2006). In addition, proximity and walkable distance are more often associated with both utilitarian and recreational walking (Wen et al. 2010; Bauman & Bull 2007). Further, Feng et al. (2010) found significant associations between sprawl and physical activity. It is the poor accessibility and increased distances between land uses characteristic of 'sprawl', rather than sprawl as a tangible concept, that discourages physical activity, particularly in relation to utilitarian physical activity.

Residential Population Density

It makes sense that higher densities will essentially lead to shorter distances between origins and destinations. As established above, shorter distances encourage active transport. Land-use concepts, such as new urban designs, link higher density levels with increased shares of non-motorised travel. This suggests that in denser urban areas, distances between locations are shorter, and consequently can be bridged more easily on foot or by bicycle. Nevertheless, the research evidence is not straightforward.

Leck (2006) assessed the importance of urban form characteristics related to residential density, with several travel variables. It was found that residential density was the most important built environment element that influenced active transport modes. Heinen et al.'s (2010) review concluded that higher densities lead to a greater cycling share. Litman (2007) established that higher densities are related to lower levels of car ownership and car use. In turn, this has positive effects on walking and cycling environments. Witlox and Tindemans (2004) found that inhabitants of higher density city centres choose the bicycle as a mode of transport more often than residents in the suburbs. Finally, Bauman and Bull (2007) rate population density as significantly associated with physical activity.

Nevertheless, residential density may be a proxy for other built environment variables (TRB Report 2005). A higher density neighbourhood will typically have less parking, a greater variety of land use, more people out and about, houses and shops which abut the street, and the presence of footpaths, straight roads and small blocks, together with better public transport services. Higher residential densities often shorten aggregate trip distances. Increasing levels of residential density alone will not serve to promote more active transport. It has to be done in tandem with mixing and connecting land uses to bring services and other destinations closer to where people live and work. Accordingly, density, mixed use and micro-design elements *in some combination* are most likely to influence levels of physical activity.

Destinations and Mixed Uses

Mixed land uses can result in shorter distances between origins and destinations, which generally encourage people to be more physically active. Associations between mixed use development and active travel behaviour have been consistently reported. Leck (2006) and Gebel et al. (2005) found mixed land use and the provision of destinations to be an overwhelmingly significant built environment element influencing active travel behaviour.

Ewing and Cervero (2010) report that walking is most strongly related to measures of land use diversity, intersection density and the number of destinations within walking distance.

Both density and land use mix are significantly and positively related to mode share by public transport and walking for work trips. They are negatively related to work trips by car (Frank & Pivo, 1994 cited in TRB Report 2005). Further, propensity to walk for transport is most elastic (i.e. sensitive) to employment-housing balance and distance to shopping and services (Ewing & Cervero, 2010). These are both features of an urban landscape characterised by mixed use.

Urban Form, Safety and Building Qualities

Evidence suggests that legible and direct street networks are particularly important in encouraging active transport in more vulnerable demographic groups such as children and the elderly. Grid-like street network patterns with high intersection densities create better street connectivity and decrease distances between origins and destinations. Such street patterns are also easier to navigate. These characteristics welcome and encourage walkers and cyclists. A wide range of detailed design features in the built environment allow people to feel safe, confident and comfortable when walking or cycling. Our review confirmed a strong evidence base that such feelings increase people's propensity to walk and cycle as a form of travel (Kent et al. 2011, pp.53-55). For cyclists, secure bicycle parking, end of trip facilities including showers and lockers, together with a supportive culture of cycling acceptance, are all positive enhancements. For walkers, the research indicates that well maintained footpaths are a significant and positive correlate to walking. Safety, both perceived and real, is of paramount importance to all forms of active travel, as well as recreational physical activity.

Building design can provide people with easy-to-access opportunities to be physically active as part of everyday mobility. For example, point-of-decision prompts can effectively encourage stair use as a substitute for taking escalators or elevators within buildings (Nocon et al. 2010). Point-of-choice prompts in this study were posters and banners at public transport stops, shopping malls and office buildings. A study by Eves et al. (2009) demonstrated that people are generally willing to use the stairs instead of an escalator in peak periods if the width of the stair well is sufficient to cater for demand.

The built environment provides opportunities for people to be active in public parks, walking trails and on footpaths and streets. Through land use zoning and regulation, the built environment can also support opportunities for recreation provided by indoor facilities from publicly operated leisure centres to privately owned health clubs. People who live close to a variety of recreation facilities are more physically active than those who do not enjoy such proximity (Wendel-Vos et al. 2007). Access to physical activity facilities is consistently correlated with physical activity levels in multiple population groups (Bauman & Bull 2007; Black & Macinko 2008). However, environments that encourage utilitarian walking and cycling are not necessarily conducive to walking and cycling for recreation. Perceived and actual safety remain of primary importance (Spangler-Murphy et al. 2005), as does the provision of street networks that are legible and well maintained, with footpaths, shade and lighting (Saelens & Handy 2008). Aesthetics, however, replace destinations and network density, with recreational walkers not particularly interested in taking the most direct route (Agrawal et al. 2008).

From this discussion, it is clear that the built environment has a critical role in supporting physical activity as a key component of human health and well-being. While the evidence for strong policy interventions is mounting, to be effective, built environment interventions will need to be supported by a mix of social, economic and political policies. We now consider the situation in relation to our second domain of the built environment and health – that of community support and connection.

BUILT ENVIRONMENT AND CONNECTING AND STRENGTHENING COMMUNITIES

A sense of community and belonging within the places where people live, work and travel, is an influential determinant of mental and physical health (Kent et al. 2011, p. 65). Belonging fosters perceptions of security, confidence and comfort that encourage people to be physically active in their neighbourhoods, as well as socially connected to others. Being 'out and about' provides opportunities for incidental interactions – the day-to-day meeting and greeting of people who live, work and travel in the same spaces during the same times. Incidental interaction augments connection and caring, increases perceptions of safety and decreases feelings of loneliness and isolation, all of which have proven links to positive mental health. The research shows that the built environment can foster a sense of community through enabling day-to-day interaction with people, nature

and other environments. This interaction occurs on streets and in public spaces that are safe, accessible to all, responsive to local cultural context, as well as aesthetically pleasing. Opportunities to promote community connectedness also apply well beyond the neighbourhood to the work environment, commercial centres, recreational facilities and spaces of mobility such as roads and footpaths, and whilst travelling on public transport. Fostering a sense of belonging, caring and commitment, for example, among commuting cyclists or public transport users, increases the perception that these activities are safe.

Green Open Spaces

The presence of green, natural settings is important in facilitating good mental health and community connection, as well as promoting physical activity. This is well supported by a raft of research studies (see Kent et al. 2011, pp 66-68). With foundations in the biophilia hypothesis (Wilson & Kelling 1984) the research indicates that there is an instinctive bond between human beings and other living systems. An environment devoid of nature (including both views over, and direct experience of natural areas) has negative effects on health and quality of life. This is demonstrated in different studies – both international and Australian. Health benefits include the promotion of mental well-being through stress reduction, social engagement, reducing feelings of loneliness, and enhancing participation in a community. Parks commonly set the stage for neighbourhood social interactions, thus serving as a foundation for health and well-being (Cohen et al. 2008; Sugiyama & Ward Thompson 2007).

There is research evidence that contact with nature is particularly important in highly urbanised environments (Hartig 2008; Maller et al. 2010). Small scale encounters with nature and people within natural settings are equally as significant to health as access to large areas of natural open space. As cities densify, urban green space will be more important than ever to alleviate the stresses often associated with higher density living, including noise and lack of privacy. Interviewees in an Australian study focusing on public open space in dense urban environments said they preferred trees, parks, or bodies of water in such spaces (Maller et al. 2010). They expressed that simply having a view of natural elements induced feelings of relaxation. Some residents had access to rooftop gardens which were described as important in providing a range of nutritional, physical, social, and psychological benefits. Not the least was an opportunity to better accommodate companion animals - a consistently cited catalyst for social capital and mental and physical health (see Cutt et al. 2007). These findings are supported by other researchers (see Kent et al. 2011, pp 66-68).

Community gardens, a particular type of green open space, are forums for incidental and organised social interaction where people can establish and maintain contact with community and nature. Research consistently and increasingly reveals different physical and mental health benefits of such spaces. These include connecting individuals from diverse cultural backgrounds and enhancing a sense of belonging in multicultural neighbourhoods (Bartolomei et al. 2003).

Streets and Neighbourhood Spaces

There is a considerable body of research that suggests sprawling suburbs are not healthy. As discussed under the first domain, it is argued that they restrict opportunities for physical activity. It is also posited that suburban sprawl undermines social capital. This is generally attributed to increased distances between uses, overt reliance on car travel and privatised individualistic residential urban form. The hypothesis is that these factors reduce opportunities for social interaction and result in feelings of disconnectedness and isolation. However, the research outcomes on the impact of sprawl on social capital and interaction are mixed.

Nguyen (2010) found that some elements of social capital were actually strengthened in lower density, 'sprawling' suburban areas. More compact, higher density areas displayed particularly low scores on different social interaction variables. This finding is consistent with the discussion on the relationship between physical activity and density to be found in Kent et al. (2011, pp 47-52). Increasing density alone will not necessarily bring about the intended consequences for healthy built environments. Establishment of community groups and programs, as well as provision of places and spaces for informal interaction, are just as important in higher density areas as in suburban neighbourhoods, to develop social capital and promote interaction.

The link between traditional neighbourhood design (as distinguished from suburban 'sprawl') and social capital has been further explored in other research. Residents forcibly relocated from a neighbourhood with a consolidated street layout to a lower density area characterised by a curvilinear street pattern, experienced unwanted isolation, deterioration in collective identity and weakened social support (Speller & Twigger-Ross

2009). Lund (2003), who examined new urbanist neighbourhoods in California, also found empirical support for the idea that neighbourhoods with consolidated grid like streets, nearby access to shopping, and good pedestrian environments, exhibit increased casual social interaction compared to more suburban cul-de-sac designs. Cozens and Hillier (2008) undertook a detailed examination of street layouts and their impact on social interaction in European and Australian contexts. They found that while some research shows social interaction is higher in communities with grid-like street layouts, other studies dispute this finding. From this work it can be concluded that using design of street layouts to encourage social interaction is complex and requires an holistic approach that encompasses nuanced understandings of local and cultural conditions.

In relation to residential density, increasing the distance between dwellings has been found to reduce the likelihood of social ties forming (Hipp & Perrin, 2009). This contrasts with Bramley et al. (2009) who discovered that scores of 'social sustainability' were low in high density places. Perhaps sounding a warning bell for the psychological impact of high density areas, in a large review of European housing and health status for the World Health Organization (WHO), Braubach (2007) found significant relationships between noise exposure and depression. Overall, the research suggests that there is a threshold to be found between high and low densities for the formation of social networks and social interaction generally. People need to be able to retreat to their private space, but they also require opportunities to randomly interact - whether that be in shared driveways, corridors or at the mail box.

There is research suggesting that streets designed for walking and cycling will, in addition, promote social interaction. This relates to the fact that both utilitarian and recreational walking and cycling increase the chance of incidental social interaction. This relationship has been the subject of various studies (see for example, Lund 2002; Brown et al. 2007). Richard et al. (2009) found regular walking to be a strong predictor of social participation by the elderly living in Montreal, Canada. Mehta (2007) observed commercial streets to examine their influence on social interaction. It was concluded that there is popular demand for high quality commercial streets as social spaces for strolling and meeting, rather than simply channels of movement. Seating, places to meet in the foyer of buildings, and street furniture in town centres, were all found to be particularly important in creating social and convivial streets. Highlighting the complexity of the link between walkable streets and social and psychological aspects of health, du Toit et al. (2007) used data from an Australian sample to explore the proposition that more walkable neighbourhoods encourage local social interaction, a sense of community, informal social control and social cohesion. They concluded that the relationship was weak and that sociability in general is impacted by more than urban form.

Studies have also explored the importance of 'third places'. These provide opportunities for informal and unorganised social interaction. They can be public, such as a children's playground or park bench, or private, such as a pub, cafe or shopping mall. They can be large, such as a town square or train station, or smaller, such as a stairwell or common entry to a building. The research suggests that third places encourage connected networks of community, although this varies with spatial design and the population groups involved. Privately owned third places, such as town squares, pedestrian malls or pocket parks, sometimes exclude different users (e.g. homeless persons). Planning for public spaces therefore needs to go beyond simply allocating space, and consider design and long term management.

Private development foyers, stairwells and other common spaces can facilitate day-to-day interactions (Zhang & Lawson 2009). Rear laneways, a key element of new urbanist design, also act as a third place for social interaction. Laneways allow more pedestrian-oriented and sociable streets, thereby facilitating casual social interaction. Several studies have found that these spaces are used for many purposes, including informal socialising with neighbours (Kent et al. 2011, p. 69). Nevertheless, this can be complex depending on rear and front street design, as well as useage. In some cases, there are concerns about safety. Indeed, while sense of community and social interaction are key determinants of health, a large body of research suggests that people will not interact within, or feel part of a community that they perceive to be unsafe. We now turn to consider some of these issues in relation to enhancing community connection.

Safe Spaces and Creating Community

The broader link between safety and health – including overweight and lack of physical activity – has been extensively examined. Much of the research shows clear links between feeling unsafe in one's own neighbourhood, overweight status and low levels of physical activity (Kent et al. 2011, pp. 74-75).

Research exploring the link between feelings of safety and interaction in the neighbourhood has also been conducted. Highlighting the power of perception, Hynes and Howe (2004) found that community gardens and other natural and open public spaces are most common in localities where threat from crime is perceived as low. An Italian study found that consistent use of public places for play in childhood resulted in less intense fear of crime and a better perception of community empowerment in adolescence (Prezza & Pacilli 2007). Examining the impact of fear of crime on mobility, Evans (2009) concluded that fear of crime, rather than actual criminal activity, limits engagement with the transport system and opportunities for wider social inclusion. Permentier et al. (2007) found a strong link between a neighbourhood's reputation for crime, disorder and dislocation with the likelihood of interaction and community engagement. Designing spaces to prevent criminal activity is therefore just as important for its role in allaying public fears and potential political inaction as well as actual crime levels (Foster & Giles-Corti 2008).

Another element of the built environment associated with safety and social interaction, feelings of connection and stress, is neighbourhood 'upkeep'. The extent to which the built environment is cared for and maintained can act as a physical indicator to underlying social disorder or fragmentation. Different studies confirm a high level of neighbourhood upkeep is associated with both strong social capital and feelings of safety (Kent et al. 2011, p. 73). Urban environments characterised by physical and social 'incivilities' have also been associated with poor mental health. Berry (2007) highlights the cumulative and lasting impact of derelict buildings, litter, excessive traffic and general over-crowding.

BUILT ENVIRONMENT AND HEALTHY FOOD OPTIONS

Our third domain is that of the built environment and the extent to which it can support healthy eating. Zoning and land use regulation can be used to create environments that support or inhibit healthy eating options. These all potentially impact on a community's access to healthy food. So what does the research say about access to food and health?

Food Accessibility

Echoing the direction of healthy built environment research, study of food environments has shifted to an examination of contextual, structural and environmental factors influencing food choices. This includes the geographical accessibility to supermarkets and fresh food stores, as well as the variety and price of foods within these stores (White 2007; Coveney & O'Dwyer 2009). The accessibility of healthy food is at the heart of this issue. A number of studies indicate convenience of food access as a determinant of food choice (Jilcott et al. 2009; Powell & Bao 2009). Various studies in the USA have convincingly linked exposure to energy dense foods, often featured in convenience stores and fast-food outlets, and exposure to healthier choices offered by supermarkets, with weight status. Neighbourhoods with a high density of fast-food outlets are positively associated with higher body weights. Proximity of fresh fruit and vegetable outlets has been identified as important in ensuring a greater intake of such foods (Kent et al. 2011, pp. 86-88).

Nevertheless, there are ongoing debates about this relationship, particularly in relation to the influence of socio-demographic factors (Oreskovic et al. 2009). Good access to chain supermarkets was, for example, related to a higher weight status for women (Wang et al. 2007). Another study found that residents in New Zealand neighbourhoods with the furthest access to a multinational fast-food outlet were more likely to eat the recommended intake of vegetables, but also be overweight (Pearce et al. 2009). The results of this study are reinforced by research in Australia examining the relationship between density of, and proximity to fast-food outlets (Crawford et al. 2008).

Various methods and measures have been used to calculate the dietary and health impacts of exposure to healthy versus unhealthy foods, with an array of conclusions the only tangible result. Clearly, it is not simply exposure to fast-food that is the issue. As hypothesised by Mehta and Chang (2008, p. 127), 'it is the availability of fast-food relative to other away from-home choices that appears salient for unhealthy weight outcomes'. An inverse relationship between fast-food exposure and averages of body mass index (BMI) was explained by the possibility that 'neighbourhoods, which have many fast-food outlets, also have many other types of food outlets where 'healthier' foods are available, thus diluting the exposure to fast-foods' (Crawford et al. 2008b p. 253). It is therefore important to understand the nature of what food is available in all food outlets, rather than to simply quantify the number of fast-food outlets in a neighbourhood. This analysis is required before the relationship between exposure to fast-food outlets and obesity can be dismissed.

Food Accessibility and Socio-Economic Status (SES)

Measures of the impact of food accessibility on health often rely on the socio-economic stratification of the prevalence of overweight and obesity. Different research in Australia has revealed significant relationships between SES, food shortages and likelihood to purchase foods recommended for good health. Many studies explore the hypothesis that the socio-economic gradient to poor health is partly a result of healthy food being more expensive and more difficult to purchase in socio-economically deprived areas (Kent et al. 2011, pp. 88-89). The debate linking SES and accessibility to healthy food has subsequently informed the development of the concept of 'food deserts' – defined as places where 'cheap and varied food is only accessible to those who have private transport or are able to pay the costs of public transport if this is available' (Acheson 1998, p65, cited in Wrigley 2002). Although the actual existence of food deserts continues to be debated, research has been undertaken attempting to quantify the relationship between the location of food outlets, SES and poor health. Residents of lower SES neighbourhoods are consistently found to have the poorest access to supermarkets and that inequalities in this access have increased over time (Kent et al. 2011, pp 88-89).

Land Use Around Schools

The socio-economic gradient to the obesity epidemic also applies to children. This relationship is related to differential exposure to food sources in school environments. 'School food environments' are conceived as the food provided within the school, as well as outlets serving foods within the vicinity. While the built environment has little sway over the interior food environment of schools, planning processes can, through land use zoning and regulation, influence the types of uses near educational establishments, including the density of fast-food outlets. Research has concentrated on proving a relationship between density of fast-food outlets around schools and obesity in children. Higher accessibility to fast-food outlets for schools in lower SES suburbs is consistently found to be associated with childhood obesity and unhealthy eating (consuming fewer servings of fruits and vegetables and drinking more soft drinks) in the research (Kent et al. 2011, pp 90-91). Nevertheless, research on school environments needs to be viewed in the context of the proven influence of parental food intake, which is a very strong determinant of childhood obesity. Once again, the message is that simply changing a single element of the built environment will not necessarily result in the desired health outcome.

Farmers' Markets and Community Gardens

The community-based promotion and marketing of local agriculture is steadily gaining popular attention as demonstrated by the increasing numbers of farmers' markets and community gardens across Australia and abroad. Urban agriculture provides many health benefits including opportunities for physical activity and social connections (as discussed earlier in the paper). Importantly, farmers' markets and community gardens provide healthy food options as well. Our comprehensive review of the literature demonstrates that they increase the availability of fresh vegetables and fruit, thereby resulting in more of these healthy foods being consumed. Further, attitudes to buying, preparing and eating healthy food are positively influenced. Farmers' markets and community gardens can also increase competition for nearby food stores, decreasing the price of fresh produce (Kent et al. 2011, pp 92-93).

The Built Environment and Larger Scale Food Production

The importance of preserving urban agriculture, including market gardens and farming, on the peri urban lands around large cities is increasingly recognised in the developed world, including Australia (Mason & Knowd 2010). As well as supplying fresh quality produce to cities, local food production is an integral component of community building. Farmers' markets also rely on local food production. The use of viable agricultural land around Australia's cities for low density urban development has been the focus of recent attention. There is growing concern about how suburban development is destroying viable agricultural lands close to cities (Sinclair 2009). However, utilising the urban fringe for agriculture poses particular difficulties for planners (Merson et al. 2010). In an effort to accommodate an ever increasing population, areas of arable land are being re-zoned for residential purposes, often at the expense of food production (Mason & Knowd 2010). The pressures of climate change, particularly the impact on oil based transportation systems, make the preservation of productive lands in close proximity to consumers an imperative for the creation of a healthy planet able to support healthy people (Knight & Riggs 2010; Pearson et al. 2010). Land use zoning and regulation can be used to influence food production systems by protecting peri-urban agricultural lands capable of producing accessible healthy food.

The Built Environment and Mass Media Advertising

Finally, zoning and regulation can be employed to limit marketing and advertising infrastructure such as billboards and signs. Billboards are a relatively inexpensive method of advertising which typically has high impact in that people tend to view the same billboards regularly. The built environment can influence the use and location of billboards to advertise unhealthy food options, particularly in the vicinity of schools. There are New Zealand and Australian based studies suggesting that the advertising landscape around schools is dominated by the promotion of unhealthy food (Maher et al. 2005; Kelly et al. 2008). If co-located with food shops, unhealthy food advertising messages will generally reach students, thereby presenting an opportunity for immediate purchase of promoted items at the nearby outlets (Walton et al. 2009).

The link between food accessibility, exposure, choice, SES and health is generally accepted. Nevertheless, research results are mixed and fail to indicate an enduringly consistent or quantifiable relationship. This is particularly so for environments outside the USA, as discussed in detail in Cummins and MacIntyre (2006). The mixed results prompt consideration of the possibility that there is a strong cultural attachment to the way food is purchased and consumed, compared with the way that people move and interact with their environment. The built environment's ability to provide healthy food options is potentially very sensitive to the specificities of cultural and social norms within place. Accordingly, reliance on an evidence base collated across geographical, legislative and social boundaries is unhelpful and potentially misleading. This suggests the need for qualitative, culturally relevant research which is more attuned to the idiosyncrasies that define our complex relationship with food – both its purchase and consumption. The lack of such studies is a major weakness in this domain.

CONCLUSION

Our paper, based on a systematic and comprehensive review, reveals a burgeoning research literature on healthy built environments across the three identified domains of built environment to support health and well-being:

1. Getting people active
2. Connecting and strengthening communities
3. Providing healthy food options.

And while there is strong evidence across these three domains from which built environment professionals can draw to develop policy, there remain gaps in our knowledge, particularly in relation to the contextual issues. Policy responses will differ according to spatial context, demographic and cultural character, environmental quality and temporality. Recommendations for standardised measurements risk underestimating the diversity of people and place, particularly when attempts are made to compare results between and across populations and locations. And while there is a role for standardising some variables (such as the use of BMI as a way to define the healthy weight range), standardised measures should not be viewed as a prerequisite to 'prove' the relationship between the built environment and health.

Acknowledging contextuality in relation to research into the health determinants of place must not be viewed as an impediment to the search for elements of commonality. It needs to be taken seriously in both the application of research to policy, and the design of future research agendas. Various studies reported here discuss ways to avoid the excuse of context, with the strongest recommendation being that methods should be transparent and at least situated within, but not necessarily echoing, the existing research agenda. This implies that future research should build on the findings of previous work, and comprehensively detail the measures and methods used.

Modifications to the built environment that support health and well-being need to be part of a policy mix to be successful across the three domains. The importance of the policy mix is encompassed by Ewing and Cervero's (2010) 'elasticity' theory. This states that active transport is unresponsive to small scale built environment modifications but responsive to an integrated range of built environment modifications, educational programs, incentives and restrictions. To be successful, behavioural change encouraged by a policy mix requires consistent and meaningful interdisciplinary collaboration. This necessitates seeking new, potentially more comprehensive ways of understanding the impacts of policy development, amendment and implementation. It also demands that both researchers and practitioners from the built environment and health recognise that their accepted wisdoms and assumptions are not necessarily shared, nor understood, beyond their own disciplinary boundaries. Successful healthy built environment partnerships rest on deliberative interdisciplinary engagement.

At its heart is an eagerness to listen and learn about the other. This extends from disciplinary culture to ways of collecting and measuring data, reporting results and the subsequent translation into policy.

The research evidence reveals a strong relationship between people's health and the built environment. This relationship is complex and contextual. By focusing on the three domains identified here, built environment professionals can enhance their effectiveness in this area. Nevertheless, successful interventions will only happen if built environment professionals work together with other stakeholders in supporting the health and well-being of all communities.

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