

# NSW PUBLIC HEALTH BULLETIN

## Cities, sustainability and health – part 2

### Healthy, just and eco-sensitive cities: moving forward

#### GUEST EDITORS

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*...there should be more equality in the use of cities, and in the distribution of costs and benefits to their people.<sup>1</sup>*

A quarter of a century ago, historian Hugh Stretton<sup>1</sup> put forward an ‘impressionistic’ treatise – *Ideas for Australian cities* – that foreshadowed a major issue confronting today’s urban planners, health planners, ecologists and social geographers: what values underpin alternative ways of city living? How this question is answered, he said, would illuminate the practical efforts needed to address the gulf in living conditions between rich and poor.

An important recent academic development has been the systematic incorporation of an equity perspective into urban health analyses.<sup>2–5</sup> These studies reveal how particular urban configurations generate not only a substantial burden of disease but an unjust patterning of disease.

Inspired by Stephen Boyden’s ecological approach to understanding urban settlements,<sup>6</sup> the first special issue on this topic in the *NSW Public Health Bulletin* (Vol. 18, Issue 3–4) provided a series of frameworks laying out the health challenges posed by postindustrial cities. This issue builds on that perspective, with contributors exploring the systems thinking, urban planning, research and governance approaches that are needed to achieve Stretton and Boyden’s shared vision of a more equitable distribution of the costs and benefits of city living.

#### The papers in this issue

Beginning from the premise that the obesity epidemic is an effect of a complex ecological system, Newell and col-

leagues first provide an introduction to systems thinking and then apply this to an analysis of obesity in our society. Their examples highlight how policy makers concerned with obesity are required to operate outside their immediate portfolios and to work together on the interplay between the characteristics of human populations and the localities in which they live.

Strazdins and Loughrey make a strong plea to consider time as a system variable that contributes to population health and environmental problems and solutions. As Strazdins argued at the 2006 Fenner Conference, *Urbanism, Environment & Health*, if urban designs increase time demands, they are likely to have unanticipated health costs, disadvantaging those in the community who are busiest.<sup>7</sup>

Berry argues for more research on the urban system’s unforeseen impacts on mental health. Like Raphael and Wooding,<sup>8</sup> Berry concludes that we do not know which urban configurations contain greater mental and emotional stresses. She proposes an original schema for examining urban living and mental health relationships, providing a useful template for organising future research.

The three papers that follow offer different examples of urban design approaches that have the potential to improve the physical and mental health of city inhabitants. Carlisle for the National Heart Foundation of Australia (Victorian Division) describes *Healthy by Design*, the result of collaboration between the National Heart Foundation and various stakeholders representing the planning, recreation, health,

transport and community building sectors. The tool aims to arrest the 'activity transition' (diminished activity levels) underway in modern societies, which is caused in part by car use and sedentary leisure pursuits.<sup>9</sup>

Cozens addresses an issue raised by Berry and others<sup>10</sup> regarding the relationship between poor mental health and physical and social incivilities, which include derelict housing, graffiti, vandalism and fear of crime. Cozens describes Western Australia's Crime Prevention Through Environmental Design framework. He suggests that Crime Prevention Through Environmental Design has the potential to enhance urban sustainability because it encourages holistic thinking about the likely impacts of the built environment on personal safety and security, and public well-being.

Giles-Corti and colleagues describe an ambitious, prospective evaluation for another planning tool adopted by the Western Australian government. Like *Healthy by Design*, the *Liveable Neighbourhood Community Design Code* focuses on physical activity. The evaluation's multi-level, multi-variable and longitudinal nature is entirely sympathetic with the systems perspective advocated by other contributors.

### Urban design and urban nutrition

In his keynote address at the 2006 Fenner Conference, Larry Frank provided evidence that the built environment is an important predictor of physical activity.<sup>11</sup> Much of the discussion at the conference was focussed on urban design interventions to address the physical activity transition.

We would commend urban design approaches that also address the urban 'nutrition transition' (diets high in meat and fats, as well as sugar and refined carbohydrates, and low in vegetables and legumes). There are numerous reasons for this dietary transition,<sup>12-14</sup> including the symbiotic relationship between an industrialised food supply and the way urban living is associated with occupational patterns less compatible with home food production and consumption.

Not only is population health compromised by an industrial food system, so is the biophysical environment. Traditionally, cities have been the launching pad for the nutrition transition because they contain large numbers of affluent consumers. Cities that are highly dependent on food from outside their region or country are imposing a greater ecological footprint than those that are relatively self-sufficient in food. In part, this is due to the high water and feed input requirements of, and greenhouse emissions incurred by, the staples of urban diets: red meat and dairy food.<sup>15</sup> In addition, the dominant model of food distribution based on air and road transport systems generates

carbon emissions which increase in volume with the distance that foods travel, or their 'food miles'.<sup>16</sup>

It is important to remember that local food systems existed until quite recently. Less than 50 years ago in Australia, large numbers of suburban residents produced vegetables, fruit and eggs in their backyards: the most accessible and affordable food source we know. Delivery vans plied suburban streets with milk, fish and bread, augmenting what was not being home produced. This convenient provisioning strategy was supplemented by walks to the local, suburban strip of shops, which supplied mainly fresh foods sourced from city wholesale markets and local bakeries. As in other countries, Australia's strip shops have mostly disappeared due to the dominance of the supermarket oligopoly,<sup>17</sup> and urban design that has made cars, and not pedestrians, the primary consideration.

Ethnographic evidence suggests that what can be called 'car-centred diets' are becoming more pervasive. They range across a continuum from fast-food snacks to the several-times-a-week consumption of heat-and-serve meals, through to the festive meal based on imported and local ingredients sourced from across-town specialist providers.<sup>18</sup> Moreover, commercial food deliveries are skewed in favour of fast food, with auto-delivered pizza being an easier option than deliveries of fruit and vegetables.<sup>19</sup>

However, a small renaissance is underway in local food production, distribution and shopping possibilities. Most Australian capital cities now have community food gardens attached to public high-rise buildings, schools or local government run allotments. These are readily accessible to nearby residents and offer cheap produce in return for the labour and other inputs from participants. They are the logical replacement to the backyard garden given that many inner and outer suburban dwellings now have little space for cultivation. In addition, farmers' markets and community-supported agriculture schemes allow city people to engage directly with the food producer. As Whitelegg,<sup>20</sup> who recently designed a sustainable food distribution hub for the City of London, has argued, feeding cities in a sustainable and equitable fashion requires the relocalisation of production and distribution.

The human health benefits of a more sustainable food system were recently highlighted in an article on livestock production, climate change and health. If consumers in industrialised countries halved their dietary intakes of red meat, then not only would agriculture's share of greenhouse emissions decline but consumer health would improve through reductions in risk of ischaemic heart disease, obesity and colorectal cancer.<sup>21</sup> There are potential equity dimensions to affluent consumer reductions in red meat, with other consumers perhaps being able to afford this protein source as it becomes cheaper.

While there is little research linking psycho-social conditions (stress and depression) and the nature of the food supply, the idea of gastro-anomie has dominated food sociology for 20 years now.<sup>22</sup> According to Fischler, the concept's progenitor, this condition afflicts societies which lose connection to their agricultural and culinary systems through embracing corporatist food systems.<sup>23</sup> Discontent and anxiety arise when eating is reduced to individual health and nutrients rather than being about shared enjoyment and social cohesion.<sup>24</sup>

Some years ago, Susan Parham argued that town planners could ameliorate conditions like gastro-anomie by designing-in opportunities for conviviality, rather than leaving people's eating experiences to the market and their socio-economic status. She recommended the use of gastronomic maps to plot the relationship of people to their food environment,<sup>25</sup> and for local governments to work with residents to improve access to pleasurable food experiences. More recent studies support her conjecture that access to cafes and fresh food markets are unequally distributed.<sup>26,27</sup> The popularity of farmers' markets and community-supported agriculture schemes, and the demand for organic food growing at 15% annually,<sup>28</sup> reflect a desire by middle classes at least to reclaim some mastery over the food supply.

Sustainable urban agriculture with a health equity focus is high on the agenda for the Western Sydney consortium pursuing the application of Health Impact Assessment as part of the Sydney Metropolitan Strategy. Their inspiration is drawn from initiatives like the Hawkesbury Harvest in Sydney's northwest, which is beginning to demonstrate how sustainable agriculture has the potential to contribute to long-term triple bottom line outcomes.<sup>29,30</sup> See also [www.hawkesburyharvest.com.au](http://www.hawkesburyharvest.com.au).

## Conclusion

The emerging evidence about relationships between our urban environments and contemporary health problems presented in these two special issues could usefully inform supplementary decision support tools with a focus on population health. What has been largely neglected are design considerations that support urban agriculture and edible landscapes,<sup>19</sup> locally and regionally centred food distribution systems, ecologically sustainable supply chains for rural products, and enhanced opportunities for consumers to access enjoyable food experiences. A paddock-to-plate refashioning of the urban and agri-food interface would benefit from the National Heart Foundation's *Healthy by Design* approach to physical activity.

We would be well on our way to achieving Stretton and Boyden's ideas for just, healthy and sustainable Australian cities if the suggestions described in this issue for urban research, planning tools and design approaches were adopted.

## Acknowledgements

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## Further information and useful resources

### NSW Premier's Council for Active Living

The NSW Premier's Council for Active Living (PCAL) aims to strengthen physical and social environments to enable active living. The PCAL comprises representatives from government agencies, business and the community sector. It was established in 2004, building on the work of the NSW Physical Activity Taskforce from 1996 and reports to the Premier through the Minister for Health. PCAL's priorities include healthy urban planning, community inclusion and the liveability of NSW cities and towns. It provides advice to government and promotes guidelines, policy, and legislation to increase the level of physical activity of all people in NSW.

*Designing Places for Active Living* is a free PCAL web-resource which provides design considerations for walking and cycling routes, public transport, streets, open spaces and shopping centres as well as links to references and other resources for more detailed guidelines and specifications. The resource is directly applicable for strategic planning, transport planning, road and traffic design, open space recreation planning and health planning. Further information is available at [www.pcal.nsw.gov.au](http://www.pcal.nsw.gov.au).

### World Health Organization's Healthy Cities program

The World Health Organization's Healthy Cities program engages local governments in health development through a process of political commitment, institutional change, capacity building, partnership-based planning and innovative projects. It has a special emphasis on health inequalities and urban poverty, the needs of vulnerable groups, participatory governance and the social, economic and environmental determinants of health. Healthy Cities is a global movement, with networks in all six WHO regions. Further information and resources are available from [www.euro.who.int/healthy-cities](http://www.euro.who.int/healthy-cities).

### World Health Organisation Centre for Health Development, Kobe Japan

Over the next ten years, the research programme of the WHO Kobe Centre is focussed on urbanization and health equity. Through its project on "Healthy Urbanization: Optimizing the impact of social determinants of health on exposed populations in urban settings", the Centre will contribute to the generation of new knowledge and stimulate action to confront the issue of health inequity in urban settings in both developing and developed countries. For further details of the field research sites see <http://www.who.or.jp/sites/sites.html>.

### US Centers for Disease Control and Prevention's Healthy Places initiative

The Centers for Disease Control Healthy Places initiative supports the design and development of healthy environments. The Centers for Disease Control facilitates a Listserv that addresses issues related to health and the built environment. A regular e-newsletter that includes relevant news articles, latest research, other publications, and updates on conferences and events related to liveability is sent to all subscribers. Further information and resources, including details of how to join the Listserv, are available from [www.cdc.gov/healthyplaces](http://www.cdc.gov/healthyplaces).

### Active Living by Design

Active Living by Design is a program of the Robert Wood Johnson Foundation, based at the School of Public Health, University of North Carolina at Chapel Hill. The program establishes innovative approaches to increase physical activity through community design, public policies and communications strategies. Further information and resources are available from [www.activelivingbydesign.org](http://www.activelivingbydesign.org).

### Sustain

Based in London, Sustain advocates food and agriculture policies and practices that: enhance the health and welfare of people and animals; improve the working and living environment; promote equity; and enrich society and culture. It represents around 100 public interest organisations working at international, national, regional and local level. Among other roles, Sustain advises and negotiates with governments and other regulatory agencies to ensure that legislation and policies on food and agriculture are publicly accountable and socially and environmentally responsible. Its website contains research reports, popular publications and details of community campaigns: <http://www.sustainweb.org/>.

### The Slow Cities movement

This movement consists of cities that are committed to improving the quality of life of their citizens, especially with regard to food issues. Slow Cities are cities which implement an environmental policy designed to maintain and develop the characteristics of their surrounding area and urban fabric, placing the onus on recovery and reuse techniques. They encourage the production and use of foodstuffs produced using natural, eco-compatible techniques, excluding transgenic products, and setting up, where necessary, presidia to safeguard and develop typical products under threat of extinction. Further information is available from [www.matogmer.no/slow\\_cities\\_citta\\_slow.htm](http://www.matogmer.no/slow_cities_citta_slow.htm).

### David Mason's blog

The blog began as a diary of an eight week international study tour of urban agriculture undertaken as a Winston Churchill Fellow. The website is being developed as an international point of reference for those interested in agriculture in urban and urbanising environments. It is structured to provide a systemic appreciation of urban agriculture. See the useful linkages and resources at <http://www.urbanagricultureworldwide.com/>.

Also see the website for the **Resources Centres on Urban Agriculture & Food Security** <http://www.ruaf.org/>.

# Seeing obesity as a systems problem

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**Abstract:** Obesity has reached epidemic proportions in many countries and persists despite continuing efforts to find solutions. Such ‘stubborn problems’ often signal the influence of ‘feedback systems’. In the case of the obesity epidemic, this possibility can be investigated using available system analysis tools. The investigation must begin with a study of the interplay between the full range of human and environmental factors. This paper outlines the nature of feedback and briefly discusses some of its management implications. A practical way to initiate a ‘systems approach’ to the obesity problem is suggested and four principles to guide the management of complex human–environment systems are presented.

It is likely that the obesity epidemic is a ‘systems effect’. That is, there are good reasons to believe that it has emerged from interactions between the variables that characterise human physiology and psychology, and those that characterise urban environments.<sup>1,2</sup> Interactions of this kind are dominant in such human–urban systems and can give rise to unexpected and unwanted policy outcomes.<sup>3</sup> In these circumstances it is not useful to look for the main cause of a management problem. Instead it is necessary to develop hypotheses about significant causal links between key system variables. In particular, it is necessary to move beyond thinking in terms of ‘causal chains’ to develop an ability to see ‘causal loops’.

Causal loops are prevalent in complex systems and give rise to ‘feedback’ behaviour, where the effects of a change act to amplify or oppose the original change. Feedback can generate stubborn management problems. To attack such problems, managers and policy makers must have ways to (a) investigate the causal structure of complex systems, (b) identify possible feedback mechanisms and the behaviours they drive, and (c) identify ‘leverage points’ where

pressure on selected system variables (or the severing of selected causal links) will produce the desired outcomes. These are the elements of a ‘systems approach’.

## Feedback and its effects

The ‘behaviour’ of a human–urban system, the way that its variables change over time, emerges from interactions between these variables.<sup>4–6</sup> When a change in the value of a system variable is *amplified* by the system, the effect is called ‘positive feedback’. The term ‘positive’ indicates only that changes are reinforced – it does not mean that the effects are necessarily good. Positive feedback effects are sometimes called runaway effects, bandwagon effects or vicious circles. They can lead to exponential growth or collapse.

When a change is *opposed* by the system the effect is called ‘negative feedback’. Negative feedback effects work to hold system variables at established levels, thus stabilising the system. Note that the term ‘negative’ indicates only that changes are resisted – it does not mean that the effects are necessarily bad. The various homeostasis mechanisms that maintain stable conditions inside the human body are all examples of ‘good’ negative feedback.

These effects can be illustrated using ‘causal loop diagrams’ (the commentary associated with each of the following three figures explains how to approach a causal diagram). Figure 1 provides an example of a systems effect that is commonly called ‘policy resistance’ – a major cause of stubborn problems. The diagram can be read as follows: a desire for a high level of outdoor activity leads to an increase in the amount of open space preserved in the neighbourhood. Open space increases the popularity of the area. Increased popularity leads to a demand for additional housing. Finally, the demand for new housing leads to development pressures that can result in a *reduction* in the availability of open space. In this case, a possible leverage point involves breaking one of the links in the feedback loop – for example, the policy resistance can be removed if the pressure to develop open space is resisted.

The example shown in Figure 2 illustrates the amplifying effect of positive feedback. There is a negative feedback loop that operates to maintain the extent of the obesity problem. In this loop an increase in the number of obese individuals causes an increase in the popularity of weight-loss programs. Then, the increase in the popularity of weight-loss programs reduces the extent of the obesity problem. But the tendency to see weight-loss programs as ‘the solution’ reduces efforts to identify and address the

underlying drivers of obesity. This reduced focus allows urban population and lifestyle factors to increase the power of the drivers, which further increase the number of obese people. Over time the positive feedback loop shifts the balance point maintained by the negative feedback loop. Thus, the overall extent of the obesity problem increases slowly in response to the steady growth of urban populations and the excesses of Western urban cultures.

Complex systems have a large number of ‘parts’ that interact, via a network of feedback loops, to influence and constrain one another’s behaviour. A human–urban system comprises the city’s inhabitants plus the ecological, cultural, social and economic entities that make up their environment. Figure 3 shows a portion of the complex human–urban structure that might be expected to drive the obesity epidemic. Even though the diagram illustrates only a part of the possible structure, it is complex enough to show why a systems approach must be adopted when looking for leverage points that can help the community to tackle the epidemic. Note that, if commuting time increases, then the reinforcing loops R1 and R2 have the potential to amplify unhealthy behaviours (decreased time spent cooking and exercising). Such ‘lock-in effects’ are another major source of stubborn problems.

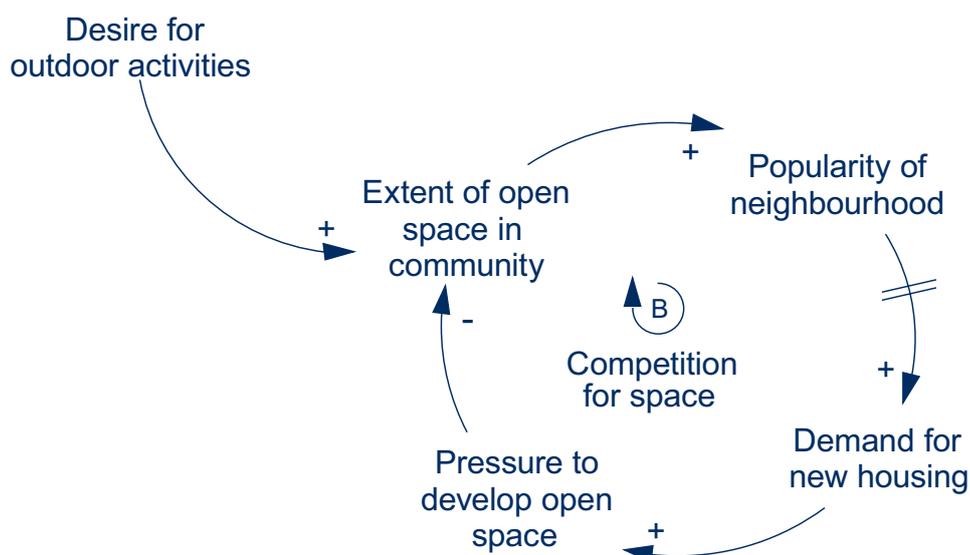
### Taking a systems approach

There are well-developed system analysis tools that can be used to investigate the causal structure of human–environment systems. These range from influence

diagrams to sophisticated modelling techniques that allow the construction of working simulations.<sup>4,8–10</sup> It is possible, however, for an interdisciplinary group to make significant progress working with no more than influence diagrams. Influence diagrams can be thought of as causal loop diagrams (as presented here) without polarities assigned to the arrows. They are easier to produce than causal loop diagrams and so support an unconstrained approach that helps participants to capture their current understanding and intuitions. This freedom also helps to weaken the influence of conceptual barriers between disciplines.<sup>11</sup>

As a first step toward the construction of an influence diagram it is valuable to generate lists of the variables that might be relevant to the target problem. The initial versions of such lists should be compiled in ‘brain-storming’ sessions involving people from a wide range of disciplines and sectors. See Table 1 for a starting list of variables that are likely to be relevant to the obesity problem. The variables listed include (a) cultural and social factors, (b) the beliefs that constitute community and individual world-views (mental models), and (c) individual actions that might affect system behaviour.

The lists should be merged and the variables sorted into groups according to their status as (a) system variables, (b) external drivers of the system, and (c) irrelevant to the problem.<sup>4</sup> Diagrams can then be constructed showing the influence links that are likely to exist between the



**Figure 1.** A causal loop diagram illustrating policy resistance.

This ‘causal loop diagram’ illustrates a negative feedback mechanism that can contribute to obesity by reducing opportunities for physical activity. The *blocks of text* represent selected system variables. The *curved arrows* indicate flows of influence between these variables. Each arrow has a symbol that shows its ‘polarity’. A plus sign (+) indicates that a change in the variable at the tail of the arrow will cause the variable at the head of the arrow to change in the *same* direction, assuming that no other causal influences act to cancel out the effect. A minus sign (–) indicates that a change in the variable at the tail of the arrow will cause the variable at the head of the arrow to change in the *opposite* direction (all else being equal). The *short parallel lines* drawn across one of the influence arrows indicate a delay in the system. The *encircled B* in the centre of the feedback loop labelled ‘competition for space’ indicates that this is a ‘balancing’ (negative feedback) loop that acts to counteract any change in any of its four variables.

variables. On this basis the team can then go on to identify possible feedback loops within the system (as was done in Figure 3).

Influence diagrams can provide the starting point for more extensive studies of the dynamics of human–urban systems. Our experience has shown, however, that the process of constructing and discussing influence diagrams can itself help a group to develop a greatly enhanced understanding of the behaviour of their system of interest. Such an endeavour, carried out collaboratively by public-health researchers, policy makers, and providers could provide valuable new insights into the drivers of the obesity epidemic.

### Principles for managing complex human–environment systems

Recent work by Newell and Proust has led to a focus on four principles that can help guide attempts to manage in complex human–environment systems.<sup>9,10</sup> These principles, expressed in a form appropriate to the obesity problem, can be used to summarise the above discussion:

**Principle 1:** *Feedback effects are important drivers of behaviour in human–urban systems.*

**Principle 2:** *Any action taken in a human–urban system will have multiple outcomes, some wanted and some unwanted. The unwanted outcomes will usually be delayed and therefore may go unrecognised.*

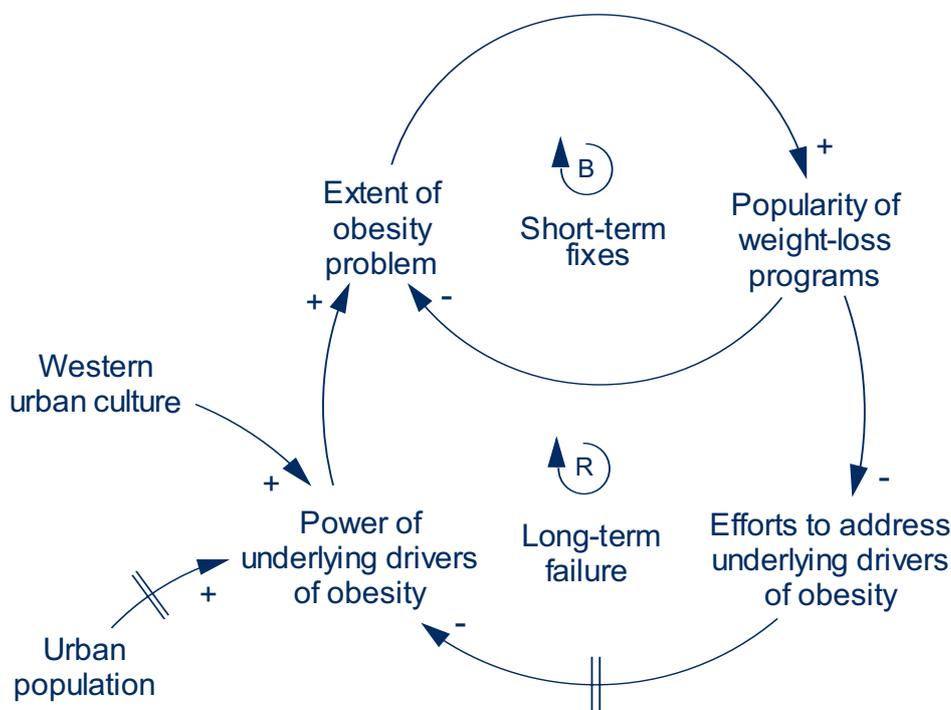
**Principle 3:** *The behaviour of a human–urban system cannot be optimised by optimising the behaviour of its parts taken in isolation from one another.*

**Principle 4:** *The design of effective policies for the management of human–urban systems requires an integrative approach that crosses existing professional and institutional boundaries.*

Principles 1 and 2 capture generic aspects of system behaviour as observed in a wide range of situations. The phenomenon of policy resistance, as discussed above, is typical. Principles 3 and 4 capture two characteristics of systems that must be taken in to account in any management intervention. They are intended to counter the natural tendency of managers and policy-makers to focus on sub-problems and to institute policies intended to solve each sub-problem separately.

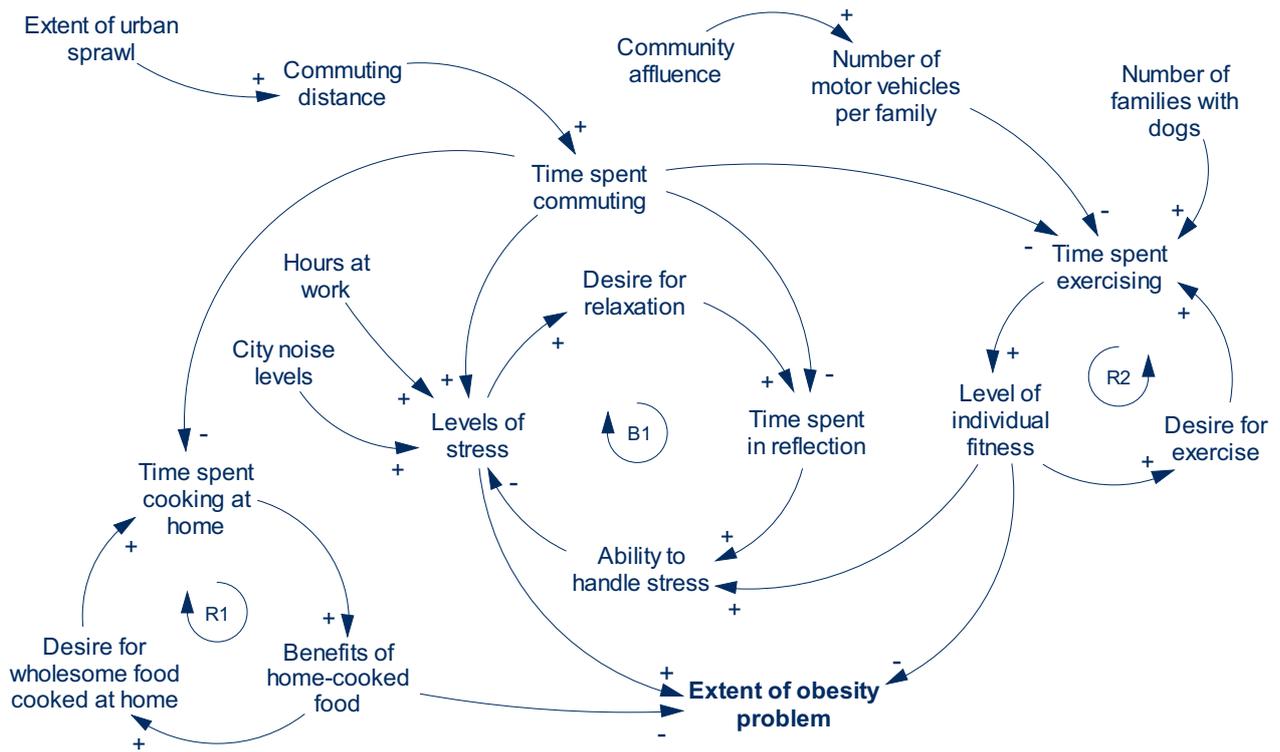
### Conclusion

Feedback system concepts are a natural and necessary component of an integrative approach to the obesity epidemic. Public health policies that are informed by these concepts, and the above system principles, have a good chance of proving effective in the face of this highly stubborn problem.



**Figure 2.** A causal loop diagram illustrating fixes that fail.

This diagram illustrates a commonly occurring situation that can be represented using a causal structure that Senge calls the ‘Fixes that Fail’ system archetype.<sup>7</sup> In this structure a rapidly operating negative feedback loop acts to ‘fix’ (balance out) the symptoms of a basic problem while a more slowly acting positive feedback loop acts steadily over time to make the basic problem worse. The encircled *R* in the centre of the feedback loop labelled ‘long-term failure’ indicates that this is a ‘reinforcing’ (positive feedback) loop that acts to amplify a change in any of its four variables.



**Figure 3. Causal structure proposed for a part of the human–urban system that produces obesity.** This diagram summarises possible systemic effects. To keep the diagram simple a number of influence links have been omitted. For example, the three driving variables shown at the top of the diagram (extent of urban sprawl, community affluence, number of families with dogs) are themselves parts of more extensive feedback loops. There are three feedback loops related to eating (R1), relaxation (B1) and exercise regimes (R2). The variable ‘number of families with dogs’ is included to stress the need for initial system analyses to include as wide a range of variables as possible.

**Table 1. Variables that can affect an individual’s body weight**

A. Variables conducive to healthy body weight		
Cultural and social	Worldviews	Individual actions
Availability of information about healthy living	Belief in the importance of a healthy lifestyle	Building in time to achieve a balanced lifestyle
Access to healthy food	Understanding of healthy eating regimes	Consuming healthy foods
Opportunities for physical activity	Understanding of the benefits of time spent exercising	Participation in physical activities
Neighbourhood design to support walking and cycling	Belief that outdoor activities are essential	Walking and cycling rather than driving
Local employment opportunities	Belief in the value of local employment	Acceptance of lower-paid work with reduced travel overheads
B. Variables detrimental to healthy body weight		
Cultural and social	Worldviews	Individual actions
Time pressure; availability of labour-saving devices	Belief in competing demands on time; inclination to save time	Buying and using labour-saving devices
Population growth; urban sprawl	Belief that growth is essential and has no limits	Dependence on motor vehicles; workplaces beyond the local community
Consumerism	Belief in market-based commodities and services, seen as preferable to self-sufficiency	Succumbing to unhealthy, unnecessary purchases
Inducements to unhealthy eating traditions	Belief in eating as reward and pastime; acceptance of fast-food culture	Acceptance of diets high in fat, sugar, salt and alcohol; consumption of excessive portions
Characteristics of The Entertained Society	Desire to be entertained; lack of belief in ability to initiate activities	Excessive TV watching; lack of imagination and initiative

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# Too busy: why time is a health and environmental problem

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**Abstract:** Time pressure is emerging as a modern malaise. It is linked to changes in working life, with longer work hours and faster work pace, and it is compounded in families; nowadays both parents must combine working with caring. Time pressure also challenges urban, health and environmental policy because many interventions have an unacknowledged time dimension. People need time to keep healthy, to exercise and to maintain strong social and family bonds. If urban designs or environmental solutions can reduce time demands they may directly improve health and social outcomes. However, where they increase time demands they may have unanticipated health costs, create disincentives for the uptake of interventions and disadvantage those who are most time poor.

Daily exercise and good nutrition could reduce the modern epidemics of obesity, Type 2 diabetes, and heart disease. At the same time, urban environmental problems such as heatwaves and air pollution are related to carbon dioxide emissions and hence car use, which public transport, cycling and walking would help to alleviate. Yet despite the twin benefits for health and the environment less than 5% of people walk to work each day and only 1% cycle. Instead, four out of five Australian commuters travel by car.<sup>1</sup>

Why hasn't behaviour change occurred on anything like the scale required? How can policy respond to these public health and environmental threats? We argue that current solutions often have an unacknowledged time dimension, one vital factor constraining their uptake. The availability of free time has declined, and if interventions are to succeed they must avoid adding to time burdens. Like income, time is a resource. It is limited and has become more precious because of changes in the nature of work,

how long people are working, who is working and the time costs of care. This paper briefly reviews why time pressure has become so widespread, who is most affected and the likely time consequences of the ageing population.

## Work intensification

One hundred and fifty years ago, long work hours were a feature of the Australian economy. It was not until 1856 that an eight hour day became a right, at least for a few. Work hours did not reduce immediately (in 1890 they still averaged over 50 hours a week),<sup>2</sup> nor did they change for all employees, but average hours gradually declined until the early 1980s, when Australian full-time workers averaged less than 40 hours per week.<sup>3</sup> The decade of the 1970s marked a turning point. Global competition accelerated because of widespread financial deregulation, the strengthening of global economic institutions (e.g. the World Trade Organization and the International Monetary Fund), the growth in multinational corporations and international movement of capital. Some public sector services were downsized or privatised and businesses began competing much more in global markets. As a result, flexible and insecure employment increased in many developed economies.<sup>4</sup> In Australia, employees began to work longer and harder and average full-time work hours rose.<sup>5</sup>

Currently, one third of the Australian labour force puts in unpaid overtime,<sup>6</sup> one-third of men in full-time jobs work more than 50 hours a week<sup>7</sup> and the average Australian full-time employee works nearly 42 hours per week.<sup>8</sup> But it is not only the number of hours spent at work that generates time pressure. The pace and intensity of work adds to the experience of busyness. Across European nations work intensity has increased for the past 20 years, with more people working harder, at very high speed and under a great deal of tension.<sup>9</sup> Data for Australia does not cover that whole time span, but what evidence there is indicates similar trends here.<sup>9,10</sup> Technological advances such as laptop computers, email and mobile phones further complicate the boundary between work and free time, adding to the experience of overload.

## The reconfiguration of work and family life

Women are now nearly half of the Australian labour force, and much of this increase has been driven by the workforce participation of mothers. In 2001, over 72% of Australian mothers with dependent children worked for pay, compared to 46% of mothers in the 1980s.<sup>11</sup> Even mothers with very young children show a similar trend. In

2000, 45% of Australian women with children aged under four were in the paid workforce compared to 29% in 1985.<sup>12</sup>

A less visible consequence is the transformation of free time. For families, the combined work times of both parents reveals how much time use has changed. Three decades ago, most couple families in the United States (US) had mothers at home, and in these households the time devoted to paid work (by fathers) averaged 45 hours per week. Now, dual-earner families are the most common family type and in the US the time devoted to paid work (from both parents combined) averages 82 hours per week.<sup>13</sup> In Australia the figure is lower, closer to 70 hours per week.<sup>14</sup>

Families with employed parents may have more income, but they are now ‘time poor’, and the pressures of time poverty are especially acute for mothers. Adding together paid and unpaid work, the total time demands on full-time employed parents is 14 hours per day for mothers and 12 hours per day for fathers.<sup>15</sup> Child care helps but does not solve the problem because parents still strive to preserve time with their children.<sup>16</sup> What is lost is leisure time. Men and women without children average 35 and 31 hours of leisure time per week respectively, but fathers and mothers of infants (when care demands are high) only average eight hours and two hours per week.<sup>15</sup> Now, a significant proportion of adults struggle to find time free from working and caring.

### Time for health

Yet, people need time to keep healthy. In an Australian survey on obesity, one in five experts ranked time pressure as the single most important social trend underlying the rising rates of obesity.<sup>17</sup> Both sedentary and active individuals cited lack of time, ahead of either income or knowledge, as the barrier to regularly exercising.<sup>18</sup> Similarly, a quarter of Australian women said that exercising five or more times per week was definitely not feasible<sup>19</sup> and finding time for exercise is especially a problem for mothers.<sup>18</sup> Preparing nutritious meals also takes time, and in a European survey of 14 000 people one third of respondents listed lack of time as a major barrier to healthy eating.<sup>20</sup> One reason why people eat ‘fast food’ is to save time.

### Travel time

Time costs also shape travel choices. Two thirds of drivers in Sydney said that they would use public transport if it were as quick as car travel. Time spent waiting for public transport is viewed as particularly wasteful, so both the actual journey time and the waiting time act as disincentives.<sup>21</sup> Initiatives to increase the use of public transport may not consider the potential compounding time impacts for adults who both work and care. In these time-poor

families, daily travel must fit in children’s activities alongside parents’ work, so walking, cycling or public transport are almost never time-feasible.

### The ageing population

The ageing population could exacerbate time shortages. In 2004, 13% of Australia’s population was aged 65 years and over. In 2051, this is projected to increase to between 26 and 28%.<sup>22</sup> The consequences are threefold: there will be proportionally fewer working age adults and they will face more pressures to work; the need for elder care will increase; and more people will be combining work with family care. For some households paid work will need to be combined with caring for both children and ageing parents.<sup>8</sup>

### Saving time

The solutions to urgent public health and environmental problems are competing in what is a time-scarce market. Work has intensified and work hours are rising, while demographic trends create acute pressures for adults combining working with caring. Meanwhile the modern epidemics of obesity, diabetes and heart disease are putting pressure on health service costs. The challenge is to design interventions that will succeed.

What are the opportunities for policy makers and urban planners? First, time impact assessments should be part of any design brief, with particular attention given to different demographic groups. Second, time savings should be a goal of each proposed health and environmental intervention and should inform the decision whether to implement the intervention or not. Workplaces, schools, childcare and community centres for elders could be located along a single bus or train route, and there must be more investment in high speed public transport. Where time savings are not possible, creative solutions and cross-sector collaborations will be required. Time trading schemes (like carbon trading) could be considered, underwritten by estimated savings to health services. For example, the US civil rights lawyer, Edgar Cahn, pioneered the notion of time banks in the early 1980s. Under these schemes, time currency is earned for caring or community work. Credit can be used to call on other members’ time or on goods and services like public transport and refurbished computers.<sup>23</sup> Perhaps tax incentives could be offered to businesses that curb long working hours similar to the tax deductions provided for research and development expenditure. Policy makers, planners and corporate leaders should also advocate for a culture of time awareness, and cost–benefit analyses ought to include time as well as money. Meanwhile awards and publicity could be given to businesses that make time and workload allowances so their employees can use public transport or exercise during the work day.

Why not tackle time? Maybe the issues seem too hard or too complex, outside the usual authority of environmental

and public health policy. It is not certain, for example, if time savings in one domain (such as travel) would result in spending more time on exercise or preparing healthy food. Indeed some travel researchers argue that time allocations are quite fixed so that increasing transport speed simply leads to more trips or traveling greater distances (see Schaefer and Victor,<sup>24</sup> and for a counter view Mokhtarian and Chen<sup>25</sup>). Perhaps, because the problem of time has not yet been solved, people assume it can never be solved. On the other hand, there is a market for anything that can save time; holidays, services, technologies and even medication advertisements are already tapping it. Solutions to health and environmental problems, if they are to be feasible and widely embraced, need to capture this market too. Otherwise simply adding to time burdens could inadvertently penalise the nation's productive, caring and regenerative base, making it even harder to achieve public health and environmental goals.

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# 'Crowded suburbs' and 'killer cities': a brief review of the relationship between urban environments and mental health

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**Abstract:** Most of the world's population now lives in cities, with 90% of Australians living in urban settlements of more than 10 000 people. Urban environments help shape population health, particularly among disadvantaged people, where poor health is concentrated. A growing body of research has focussed on the association between cities and mental health. Three hypotheses have been proposed to explain this association: psychosocial stressors; concentrated disadvantage; and social drift. It remains unclear, however, how the characteristics of urban environments are related to each other and to mental health, and what might be the pathways underpinning the experience of different individuals. With one in five Australian adults meeting the diagnostic criteria for a mental disorder each year, investigation of the relationship between urban environments and mental health is urgently needed. This paper briefly reviews recent studies linking disadvantaged urban environments with mental health and proposes a hypothetical model to help guide future research.

Half of the world's people now live in cities;<sup>1</sup> by 2030 this proportion will increase to nearly two thirds.<sup>2</sup> In Australia, 75% of people already live in cities with a population of more than 80 000 and 90% live in urban settlements of 10 000 or more.<sup>3</sup> There is growing concern expressed in the media over the possible health-damaging effects of city life, including commentary on the dangers of 'crowded suburbs',<sup>4</sup> a facet of modern 'killer cities'.<sup>5</sup> Cities are a 'potentially powerful force'<sup>6</sup> in shaping population health, particularly that of disadvantaged people.<sup>7</sup> The aims of this paper are to review briefly studies linking disadvantaged urban environments with poor mental

health and to propose an explanatory model to guide future research.

Cities differ substantially from one another, as do neighbourhoods within cities.<sup>8–10</sup> Poor health is often 'highly concentrated' in a small proportion of neighbourhoods<sup>11</sup> that share health-damaging characteristics:<sup>12</sup> inadequate or 'substandard' housing<sup>12,13</sup> that limits access to shelter, connectedness, and a sense of 'home',<sup>14</sup> including pride in one's home and home as a refuge;<sup>15</sup> poor access to transport, co-location with 'undesirable land uses', such as bus depots and busy roads;<sup>12</sup> lack of access to healthy food and overexposure to unhealthy food, alcohol and tobacco;<sup>7</sup> limited access to and poor design of recreational and green spaces; and exposure to the clearly visible symbols of poverty and degradation<sup>16</sup> that send 'powerful messages' that nobody cares about the neighbourhood or its residents.<sup>12</sup> These characteristics generate direct health risks, for example, by facilitating the spread of disease and discouraging physical activity,<sup>8</sup> while encouraging negative health behaviours, such as reduced health care-seeking.<sup>16</sup>

While most studies have examined cities and their effects on physical health, some have investigated mental health. Mental health problems have been associated with social disorganisation and living in deprived neighbourhoods.<sup>6</sup> Increasing population density has also been linked to mental health problems, including elevated rates of psychosis and depression.<sup>17–19</sup> However, density alone does not necessarily determine disadvantage: for example, Potts Point in Sydney and Southbank in Melbourne are densely populated areas associated with advantage rather than disadvantage. More likely, population density is health damaging when it occurs in conjunction with other risk factors in the physical and social environment. These include lack of access to the natural environment and, especially, high levels of socio-economic deprivation,<sup>20</sup> including overcrowding.<sup>21</sup> Prospective studies have concluded that improvements in the built environment are associated with decreasing psychiatric morbidity. In a follow-up of 503 people in Oslo, Norway, mental health problems declined among participants living in an initially poorly functioning neighbourhood that improved over a decade.<sup>22</sup> Relocation can achieve similar results. In the American 'Moving to Opportunity' study, families selected at random moved from deprived to non-deprived

neighbourhoods.<sup>23</sup> In 550 such families, three years later, parents were less distressed and sons less anxious and depressed than were their peers who remained in public housing.

Qualitative studies of urban renewal and mental well-being have corroborated epidemiological findings. In-depth interviews with 16 Londoners indicated that enhanced safety and community facilities were associated with improved daily coping.<sup>24</sup>

### Health-damaging characteristics of urban environments

Built environments may be conceptualised in terms of ecological (neighbourhood) characteristics, such as type of housing, roads and public places,<sup>25</sup> and of individual dwellings. Disadvantaged neighbourhoods exhibit substandard housing,<sup>12</sup> which has been directly linked to poor mental health,<sup>26,27</sup> and ‘physical incivilities’.<sup>25</sup> These physical incivilities include derelict buildings, extensive graffiti, litter, vandalism, excessive traffic, urine, dog faeces, a small proportion of private gardens (and a correspondingly higher proportion of shared recreational spaces),<sup>25</sup> visibly deteriorating buildings, external walls, windows, stairs or lifts, structural fires and dirty streets or pavements.<sup>6</sup>

Substandard housing is most prevalent in poor neighbourhoods<sup>25</sup> and among dwellings built since 1970, with deck access (a means of access to flats above ground level via stairs or lifts that lead to long corridors onto which residents’ front doors open directly) or floor-level access. This type of housing features one or more structural problems: damp,<sup>13</sup> leaking roofs, rot, pests,<sup>25</sup> toilet breakdown, non-functioning kitchens, inadequate heating, repeated heating breakdown during winter, peeling plaster or paint, internal leaks,<sup>6</sup> overheating in summer<sup>13</sup> and lack of affordability.<sup>11,15</sup> People’s perceptions about their housing may be influenced by their neighbourhood, and negative perceptions about both incline people to relocate, increasing residential instability.<sup>28</sup> This breaks social ties that promote mental health.<sup>29</sup>

Disadvantaged social environments exhibit social incivilities, such as the presence of crime, teen gangs,<sup>25</sup> noise (for example, from trucks and aeroplanes<sup>30</sup>), foul air,<sup>27</sup> neighbourhood poverty<sup>6</sup> and diminished social capital. Socio-demographic disadvantages also prevail, including overcrowding, unemployment, poor education, single parenting, ethnicity, renting, no car or van access,<sup>25</sup> poverty<sup>6</sup> and being an immigrant or refugee.<sup>17</sup>

The built and social environments and mental health are entwined.<sup>6,25</sup> In a study of 1887 residents of two London wards, people living with socio-demographic disadvantages, substandard housing and physical incivilities were more likely to report depression than were their less dis-

advantaged peers.<sup>25</sup> Even after adjusting for socio-demographic characteristics and attributes of individual dwellings, significant associations remained between depression and deck access, post 1970s housing and few private gardens. Similar findings emerged from a study of depression and the built environment in 59 neighbourhoods in New York City.<sup>6</sup> Controlling for socio-demographic factors, substandard housing and physical incivilities were significantly associated with elevated rates of depression.

### How do cities influence mental health?

Three explanations for the direct and indirect<sup>2</sup> associations between urban environments and mental health have been proposed:<sup>6</sup> psychosocial stressors, concentrated disadvantage and social drift.

#### *Psychosocial stressors*

Pearlin and colleagues<sup>31</sup> described ‘the stress process’ as negative life events creating strain in people’s lives, with this strain eroding positive self-concepts such as confidence and sense of worth, leaving people psychologically vulnerable, especially to depression. Exposure to physical and social incivilities in cities generates psychosocial stress; both are associated with diminished feelings of safety and security in one’s home, which is related to mental health.<sup>15</sup>

#### *Concentrated disadvantage*

The concentrated disadvantage explanation suggests that the density of city populations concentrates physical and social problems, intensifying their effects and inflating pressures on mental health. Consistent with this explanation, physical incivilities, substandard housing, social incivilities and socio-demographic disadvantage are significantly positively correlated, as are their constituent components.<sup>6,25</sup> The mental health effects of concentrated disadvantage may be mediated by psychosocial factors, such as collective efficacy<sup>32</sup> and loss of control, social support, and recreation.<sup>27</sup>

#### *Social drift*

The social drift explanation proposes that the socio-economic circumstances of people with severe and enduring mental health problems gradually deteriorate, necessitating relocating into progressively disadvantaged neighbourhoods and lower quality accommodation.<sup>33</sup> This explanation does not preclude the possibility that disadvantaged urban environments might also contribute to mental health problems. Indeed, while social drift contributes to the concentration of psychosis in disadvantaged neighbourhoods, urban environment causation seems more important than selection;<sup>19</sup> controlling for individual income and neighbourhood socio-economic status, a relationship has been found between the urban environment and depression.<sup>6</sup>

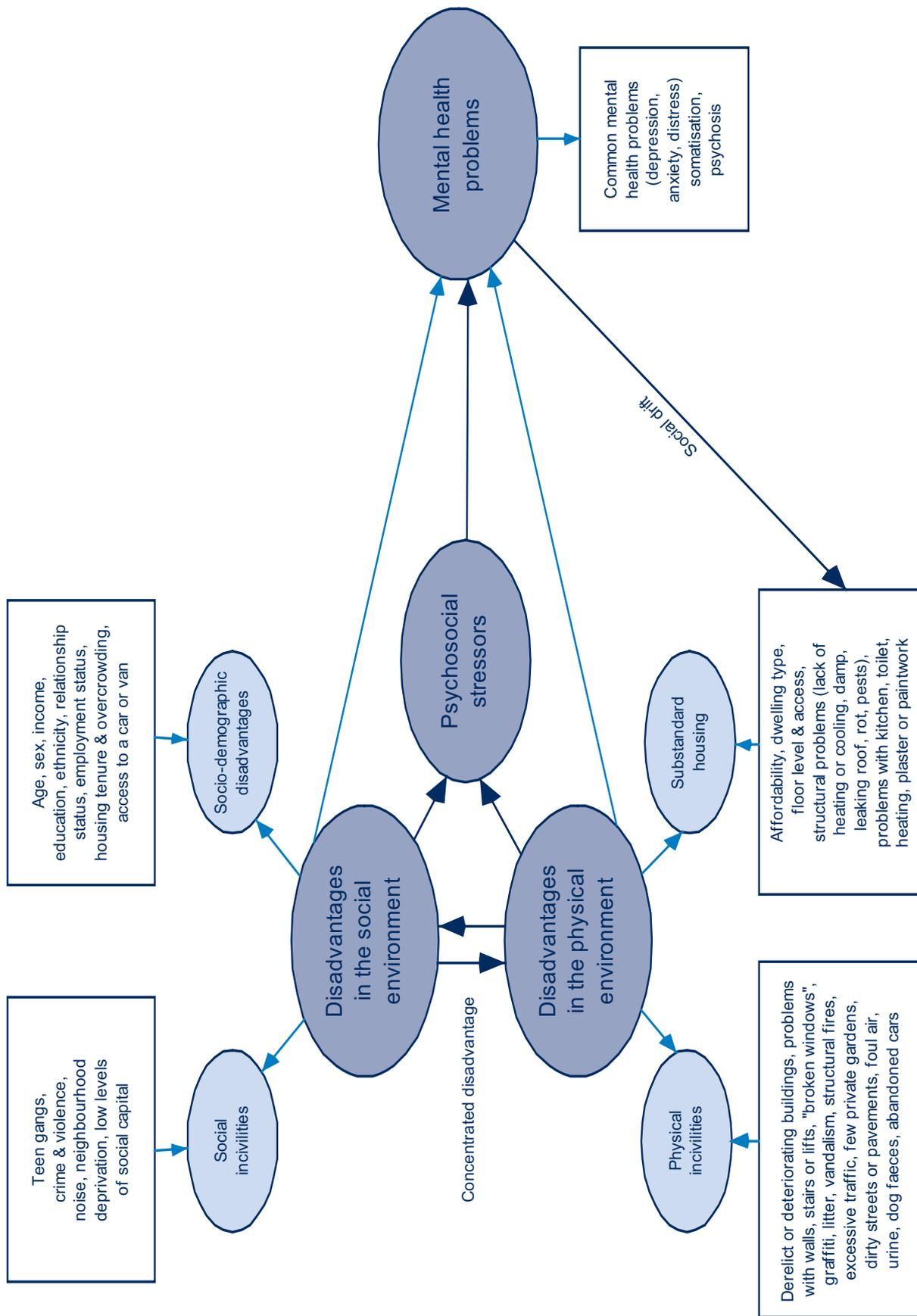


Figure 1. Hypothetical model of the relationship between disadvantages in the built environment and mental health, illustrating the concentrated disadvantage, psychosocial stressors and social drift explanations.

### Cities and mental health: a conceptual model

While there is evidence that built environments may influence mental health and that mental health problems predispose people to live in disadvantaged environments, it is unclear exactly how environmental and social factors are related and how different explanatory hypotheses might be accommodated within a pathways model that allows for different individual experience. Figure 1 is a conceptual model of how disadvantaged city environments might be linked to mental health problems. The Figure includes only factors for which there is direct empirical evidence for a link with mental health, as summarised in the literature review above.

Constructs (in ellipses) have been presented together with lists of factors (in boxes) that have been empirically associated with the built environment and mental health. Darker arrows denote the direction of relationships among constructs as suggested by the concentrated disadvantage, psychosocial stressors and social drift explanations.<sup>6</sup> Lighter arrows indicate relationships for which there is empirical evidence but which do not feature in the three explanations. The explanations are not mutually exclusive.<sup>6</sup> Instead, they describe different aspects of a bigger picture, which must also take account of the size, density, diversity and complexity of a city's population and its global, national, political, economic and social contexts.<sup>1</sup>

### Urban environments and mental health: an urgent research priority

One in five Australian adults meets the diagnostic criteria for a mental disorder each year,<sup>34</sup> with mental health problems (particularly depression and anxiety<sup>35</sup>) being the leading cause of non-fatal disease burden.<sup>36</sup> The prevalence of mental health problems is increasing.<sup>37–39</sup> This trend is likely to continue,<sup>40</sup> involving massive costs to healthcare<sup>41–45</sup> and Australian society,<sup>42,46–52</sup> with profound implications for the intergenerational transmission of mental health problems<sup>53–55</sup> and disadvantage.<sup>56</sup> Though we live predominantly in cities,<sup>30,57</sup> we do not fully understand how cities influence mental health;<sup>58</sup> the social environment's contribution to this relationship remains 'neglected' in research as a 'possible [explanatory] mechanism'.<sup>18</sup> The fields of social ecology and community psychology, together with social capital theory, could usefully contribute to filling this gap.

It is essential<sup>59</sup> to begin systematic investigation of pathways models that describe how features of the social and built environments of Australian cities may be related to mental health. Urban environments are amenable to modification and, with the potential to affect vast proportions of the world's population,<sup>2</sup> this is urgently needed.<sup>11,13</sup> Insufficient investment has been made<sup>27</sup> in the challenging task<sup>60</sup> of developing sophisticated conceptual frameworks (pathways models) of how the built environment may

affect mental health. Frameworks must (i) be theory-based, empirically tested and continuously refined,<sup>60</sup> (ii) be constructed within a population health approach, with prevention in mind, and with interventions evaluated via 'report card[s]' that are not reliant on primary data collection and are 'grounded' in local realities,<sup>10</sup> and (iii) include health-promoting features of built environments, such as contact with nature<sup>61,62</sup> and easy access to parks and walking.<sup>58,60,63</sup>

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# Healthy by Design: an innovative planning tool for the development of safe, accessible and attractive environments

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**Abstract:** The *Healthy by Design* guidelines were developed by the National Heart Foundation of Australia in 2004 to assist planners to deliver plans for residential developments that support active living. This article provides an overview of the contents of this resource. It also provides examples of its application and influence in the planning sector.

*Healthy by Design: a planners' guide to environments for active living (Healthy by Design)*<sup>1</sup> was released by the National Heart Foundation of Australia (Heart Foundation) in 2004. The guide is one of the more recent resources produced to build upon the Supportive Environments for Physical Activity work which commenced in Victoria in 1998. It followed initial research and development by the Heart Foundation in South Australia in 1996<sup>2</sup> and 1999.<sup>3</sup> *Healthy by Design* aims to demonstrate ways in which planners can influence the health and well-being of communities through their urban planning and design practice. The development of *Healthy by Design* was assisted by key stakeholders representing the planning, recreation, health, transport and community building sectors, with support from VicHealth and the Planning Institute Australia – Victoria Division.

*Healthy by Design* presents design considerations that facilitate 'healthy planning', resulting in healthy places for people to live, work and visit. 'Healthy urban planning' is about planning for people. It puts the needs of people and communities at the heart of the urban planning process and encourages decision-making based on human health and well-being.<sup>4</sup> Since its release, the Heart Foundation has concentrated efforts on disseminating *Healthy by Design* to local and state government planners, private

planners and planning consultants, developers, urban designers, engineers, landscape architects, land surveyors, health planners and relevant community organisations.

Two series of workshops for local government planners were held in 2004 and 2005 to provide them with a grounding in the principles that inform *Healthy by Design* and to demonstrate practical applications using local government case studies. Some limited interim evaluation has been undertaken, which has assisted in guiding the Heart Foundation's future directions for *Healthy by Design*.

By investing efforts in a 'supportive environments' approach to physical activity, the built environment will have better capacity to sustain people who choose to walk or cycle as part of their daily routine.

## Response to a planning need

The Heart Foundation developed *Healthy by Design* to assist local government and associated planners in the implementation of a broader set of Supportive Environments for Physical Activity (SEPA) guidelines. The concept arose in response to feedback from local government planners and engineers who requested practical guidance in designing walkable communities. The original SEPA resource *SEPA Guidelines for Local Government*<sup>3</sup> provided planners with an introductory framework to the built environment and physical activity. However, after two pilot projects were conducted with local governments, it was clear that more detailed direction was required to assist planners in the process of incorporating 'health' into their planning. When approaching the design of parks, re-vitalising local areas and adding new bike paths, planners were seeking more specific guidance to make the process of implementation easier.

In addition to this, the Planning for Health Benchmark Survey addressing planners' views, conducted by the Planning Institute Australia – Victoria Division, revealed that the majority of respondents (89%) thought they had a role in creating a healthier, more physically active community; however, 49% said they infrequently or never considered health issues in their daily planning work.<sup>5</sup>

There is an increasing trend toward physical inactivity. Data from the 2000 National Physical Activity Survey show that about 54% of Australians aged 18–75 years were

not undertaking leisure-time physical activity at the levels recommended to obtain a health benefit, including 15% who reported no physical activity at all.<sup>6</sup> Mortality figures show that more than 8000 deaths per year are associated with physical inactivity. In addition over seven million adult Australians are now considered overweight or obese.<sup>7</sup>

There are many ways to address this trend and the associated health impacts. One solution is designing environments that support the community being active as part of everyday life, such as providing for walkers and cyclists of all ages. The Heart Foundation therefore encourages planners and decision makers to be creative in their design of new urban developments and use budgets allocated for development or renewal of urban environments in ways that result in positive outcomes for public health.

Urban designs, such as mixed land uses, that increase the ability for people to walk or cycle to shops, schools, parks, services, facilities and public transport are more likely to increase physical activity and create more socially vibrant

communities. This in return delivers a range of health, social, economic and environmental benefits.<sup>8</sup>

### Design considerations

*Healthy by Design* provides planners with: supporting research; a range of design considerations to promote walking, cycling and public transport use; a practical design tool; and case studies.

The ‘design considerations’ demonstrate ways planners can improve the health of communities through their planning and design. This is encouraged by providing:

- well-planned networks of walking and cycling routes,
- streets with direct, safe and convenient access,
- local destinations within walking distance from homes,
- accessible open spaces for recreation and leisure,
- conveniently located public transport stops,
- well designed supporting infrastructure such as seating, signage, lighting, fencing and walls, and
- local neighbourhoods fostering community spirit.<sup>1</sup>

**Table 1. Outline of design objectives and considerations presented in *Healthy by Design: a planner's guide to environments for active living***

Aspect	Objective	Design considerations (outline)
Walking and cycling routes	To provide an accessible, integrated network of walking and cycling routes for safe and convenient travel to local destinations and points of interest.	<ul style="list-style-type: none"> <li>• Make connections</li> <li>• Create safe places for people to walk and cycle</li> <li>• Create stimulating and attractive routes</li> <li>• Design safe, accessible footpaths</li> <li>• Shared path design</li> </ul>
Streets	To design street networks that provide direct, safe and convenient pedestrian and cycle access. To position pedestrian crossings along streets and roads with heavy traffic volumes.	<ul style="list-style-type: none"> <li>• Slow traffic for safe streets</li> <li>• Provide safe places to cross streets</li> <li>• Support on-road cyclists</li> <li>• Keep routes clear, direct and easy to navigate</li> <li>• Create attractive and welcoming streets</li> </ul>
Local destinations	To provide local destinations to support lively, walkable and rideable neighbourhoods.	<ul style="list-style-type: none"> <li>• Support mixed use, walkable neighbourhoods</li> <li>• Provide a community ‘heart’</li> <li>• Support pedestrian access to local destinations</li> <li>• Provide amenities for comfort and convenience</li> </ul>
Open space	To provide a range of public open spaces within walking distance from dwellings. To clearly define walking and cycling routes that pass through open spaces and incorporate these routes into the broader walking and cycling network.	<ul style="list-style-type: none"> <li>• Provide open spaces within safe, comfortable walking distances</li> <li>• Connect to the broader walking and cycling network</li> <li>• Encourage active recreation</li> <li>• Create pleasing places to be</li> <li>• Promote safety and amenity</li> <li>• Provide for comfort and convenience</li> </ul>
Public transport	To establish and promote clear and direct walking and cycling routes to public transport stops, and appealing and convenient facilities for users.	<ul style="list-style-type: none"> <li>• Make public transport an easy option</li> <li>• Provide safe, visible stops</li> <li>• Provide facilities for comfort and convenience</li> </ul>
Supporting infrastructure	To provide supporting infrastructure that enables the safe and comfortable use of pathways and streets by all pedestrians and cyclists.	<ul style="list-style-type: none"> <li>• Address provision of seating and lighting to create comfortable walking distances and provide security at night</li> <li>• Provide clear navigational signage for walkers and cyclists</li> <li>• Ensure fencing and walls enable clear connection and sight lines between private property and the public realm</li> </ul>
Fostering community spirit	To develop built environment and community participation strategies that foster active communities and a sense of community spirit.	<ul style="list-style-type: none"> <li>• Involve the community in planning activities</li> <li>• Create spaces for community activity</li> </ul>

Source: National Heart Foundation of Australia, 2004.

Table 1 provides a brief summary of the design prompts covered in each of the above sections. Design considerations detailed in the guide suggest optimal design approaches to encourage active living. The design considerations may be used in a variety of settings to:

- prepare plans (e.g. open space master plans),
- design proposed developments,
- develop design guidelines or checklists,
- develop innovative built environment projects,
- assess development proposals,
- influence strategic directions,
- embed 'health' into Municipal Strategic Statements,
- influence planning scheme provisions, and
- contribute to the ongoing development and enhancement of open spaces.<sup>1</sup>

Planners are required to consider a range of guidelines that affect health, safety and access, often in isolation from each other. *Healthy by Design* features 'Design for Safe & Healthy Communities: the Matrix of Like Design Considerations'.<sup>1</sup> This matrix is a tool that demonstrates the synergies between the different guidelines that influence built environment design, all of which contribute to positive health outcomes.

### Key achievements and outcomes

Since its release, evaluations have demonstrated that local governments, planning bodies and community organisations have been utilising *Healthy by Design* in a variety of ways.

Examples of local government use are listed below.

- The interim *Healthy by Design* evaluation (via dissemination workshops) indicated that 95% of participants said the guide would 'definitely' (63%) or 'probably' (32%) enhance their current or future work activities.<sup>9</sup>
- A follow-up review of workshop participants revealed that *Healthy by Design* is being used as a reference document in most councils surveyed and as a policy platform in a small number of others.<sup>10</sup>
- The collection of case studies has revealed that local councils' use of the resource has evolved. For instance the Macedon Ranges Shire has produced *Designing in Health and Wellbeing: Guidelines for Residential Subdivisions in the Macedon Ranges*, and the City of Port Phillip has developed its *Walk Plan 2005–2007* utilising the *Healthy by Design* concepts.

In addition, the adoption of *Healthy by Design* is growing.

- A leading Victorian property developer has utilised the guide in the development of a 'Sustainability Charter', having direct bearing on delivery benchmarks for each of their projects.
- *Healthy by Design* was recommended by the Victorian State Department of Human Services as a key source

of information for their Public Health Research Project Funding 2004–2005 and in particular for 'built environment and health' research submissions, forming a key resource for new projects in the area of walking and the built environment.

- The guide has been acknowledged in many reports and plans, including the *Inquiry into Sustainable Urban Design for New Communities in Outer Suburban Areas*<sup>11</sup> and *Age-friendly built environments: Opportunities for local government*.<sup>12</sup>

Following the development of *Healthy by Design*, a local neighbourhood audit tool has been developed titled *Healthy Urban Environments: Site Assessment Audit*.<sup>13</sup> This is a complementary tool available for planners or community organisations wishing to assess the walkability of local areas. This tool was developed in conjunction with VicHealth, The Cancer Council Victoria and the Planning Institute Australia – Victorian Division.

### Conclusion

*Healthy by Design* continues to gain momentum with local council planners. In the long term, plans reviewed by local governments that have utilised the *Healthy by Design* approach should result in an urban environment conducive to good health and ultimately contribute to measurable health outcomes.

As Trevor Budge, past President of the Planning Institute of Australia – Victoria division, commented, "The *Healthy by Design* guide... covers all of the aspects that will enable planners and subdivision engineers to plan healthy and cost-effective communities. It is a... major contribution to integrated planning and will enhance sustainable outcomes."<sup>14</sup>

*Healthy by Design* demonstrates that when planning and health are integrated, the outcome is not only well planned neighbourhoods, but also neighbourhoods that positively influence health, wellbeing and the overall quality of community life.

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# Public health and the potential benefits of Crime Prevention Through Environmental Design

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**Abstract:** Studies have consistently found that safety and security are major public concerns; however, crime is rarely considered as an outcome in public health. The recent shift by planning policy towards promoting compact, ‘walkable’ communities close to public transport aims to redress many of the problems associated with urban sprawl. However, communities that do not feel safe are less likely to be active citizens. This paper argues that Crime Prevention Through Environmental Design has potential benefits for public health in the provision of local crime risk assessments and in delivering safer environments, which can support active living, walkable communities and public health.

Human settlements have always sought to provide for the safety, security and the well-being of their residents. However, industrialisation and urbanisation created a range of new threats to public health and well-being. The rapid, unplanned and ‘laissez faire’ expansion of cities in the 20th century resulted in overcrowding, pollution, poverty, disease, ‘anomie’<sup>1</sup> and crime, with cities becoming locations of problems as well as places of vitality and excitement.

Today, crime is still a public health problem and studies consistently find that safety and security are the first priority of the urban poor.<sup>2,3</sup> In Australia, the financial costs of crime to the community have been estimated to be approximately \$32 billion per annum<sup>4</sup> and studies consistently reveal that significant sections of the community are fearful for their personal safety when using or visiting the city.<sup>5</sup>

Crime and the fear of crime are not evenly distributed throughout the city either spatially or temporally, and the notion of ‘hot spots’ of crime (where/when crime and/or the fear of crime are highly concentrated) has received increasing attention in recent years.<sup>6-9</sup>

Crime and public health issues have similar origins<sup>10</sup> and outcomes can be improved using similar approaches (e.g. improving socio-economic conditions and enhancing social capital). The effect of the built environment on crime and public health indicates that its design and modification can be used as an effective planning tool.

During the public health era (19th century USA, Great Britain and Australia) people with tuberculosis and people who engaged in criminal behaviour were both categorised as threats to society, and governments used early examples of Crime Prevention Through Environmental Design (CPTED) thinking to tackle both issues simultaneously.<sup>11</sup> This paper argues that CPTED has various potential public health benefits for present and future generations.

## Crime Prevention Through Environmental Design

CPTED, also known as Designing Out Crime, is a place-based strategy which argues that ‘the proper design and effective use of the built environment can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in the quality of life’.<sup>12</sup> It builds upon strategies of territoriality (sense of ownership), surveillance and access control and promotes activities within space including higher densities and mixed-use development in order to optimise the number of potential ‘eyes on the street’.<sup>13</sup> Evidence also supports the routine maintenance and management of urban space and the discouragement of the under-use of space (e.g. dereliction and/or vacancy) as crime prevention strategies.<sup>14-16</sup> This ‘image’ element is also critical to CPTED.<sup>17</sup> CPTED has application at the micro (building security), meso (street/neighbourhood) and macro (town/city) levels, where risk assessments and community participation are vital components of the CPTED process. CPTED is best applied at the design stage but is also used to modify existing urban environments. Research has reported positive reductions in levels of recorded crime and fear of crime for CPTED-style developments in the UK,<sup>18-21</sup> and more recently a major international review of CPTED firmly demonstrates its efficacy as a crime prevention strategy.<sup>22</sup>

Criminological research has consistently indicated that crime is most prevalent in societies with significant disparities in the quality of life of its citizens,<sup>23,24</sup> and within these societies crime and the fear of crime concentrates in specific places and at specific times.<sup>6,7</sup>

**Public health and crime**

Criminology and public health have traditionally focussed on the behaviour and characteristics of the individual. However, the fields of injury prevention and crime prevention both now recognise the importance of investigating the characteristics of the event itself.<sup>25</sup>

A large proportion of crime is dependent on the opportunities provided by the environmental setting.<sup>7,10,26,27</sup> Increased levels of crime have been associated with locations where people congregate, including transit stations (rail and bus), drinking establishments and alcohol outlets, car parks and shopping malls.<sup>6,7</sup> The environment can also affect opportunities for public health outcomes<sup>10</sup> such as the proximity to playgrounds,<sup>28</sup> walking and cycling amenities,<sup>28-30</sup> alcohol outlets<sup>31</sup> and the presence of boarded-up houses.<sup>15-17</sup>

Crucially, Wallace et al.<sup>32,33</sup> have identified the deterioration of inner cities as contributing to the spread of HIV and tuberculosis, violence and a variety of health disparities and highlight the potential importance of the physical environment in reducing these opportunities and influencing health.

The current policy support for New Urbanism and the promotion of compact, high-density, mixed-use, walkable environments close to public transport clearly seeks to reduce the problems associated with urban sprawl such as car-dependency, congestion and pollution. These ideas also promote active living (e.g. walking) and seek to address the public health issues of sustainable development and the rising levels of obesity. CPTED has potential public health benefits by reducing opportunities for crime

at the design stage to support initiatives to encourage walking and social activities.

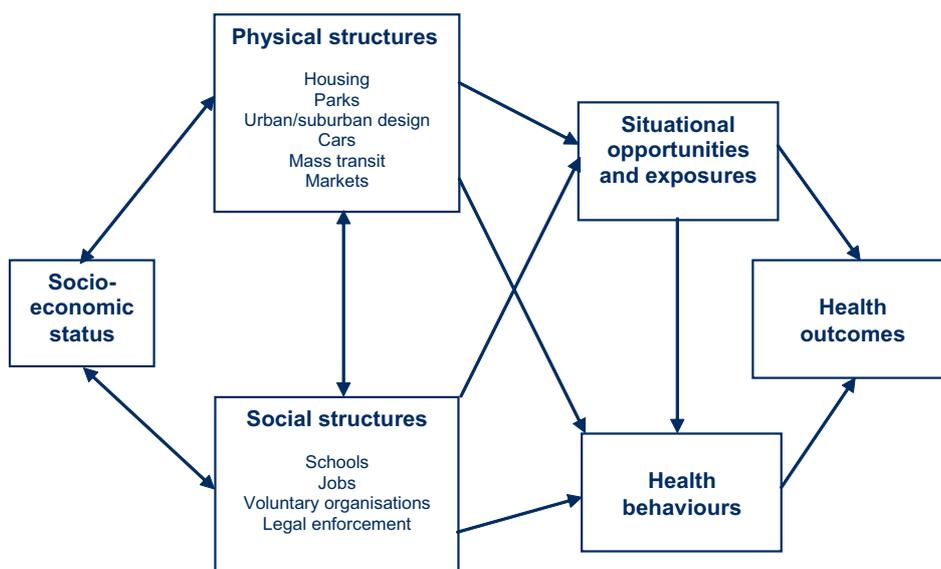
A study by Cohen et al.<sup>34</sup> suggested that one of the factors that should be considered in attempting to improve the health of communities is the level of physical deterioration of neighbourhood buildings – a central component of CPTED. Figure 1 illustrates how situational factors can affect health outcomes.

Crime is a mirror of the quality of the social environment and an indicator of community well-being, and ‘physical conditions are not merely a consequence of social structures; rather, they are likely to be in dynamic relationship with social structures’.<sup>35</sup>

Indeed, the presence of surveillance opportunities does not necessarily ensure that surveillance is taking place and urban space can become ‘undefended’<sup>36</sup> by residents. As a result, Second Generation CPTED<sup>37</sup> has recently evolved and seeks to engender positive social activities and diversity to encourage neighbours to take ownership of space and to take advantage of natural surveillance. This concept promotes neighbourhood capacity and community culture, cohesion and connectivity.<sup>38,39</sup> CPTED is also being applied to products in order to reduce vulnerability to crime.<sup>40</sup> The use of tempered glass to reduce violent incidents of ‘glassing’<sup>41</sup> is one example, which has obvious potential benefits for public health.

**Implementation and future direction in Australia**

At the national level, the Australian and New Zealand Crime Prevention Senior Officers Group has endorsed

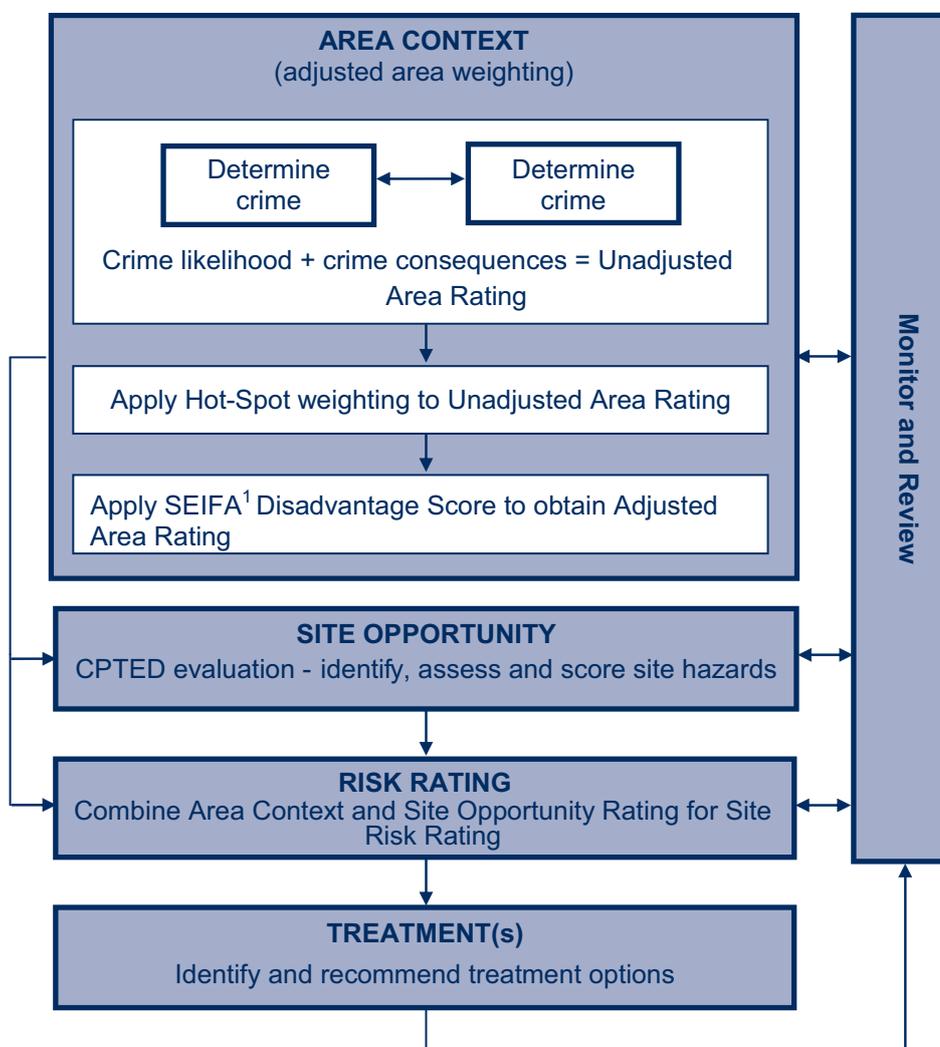


**Figure 1. Environmental influences on health.**  
 Source: Cohen DA, Mason K, Bedimo A, Scribner R, Basolo V, Farley TA. Neighborhood physical conditions and health. *Am J Public Health* 2003; 93: 468.<sup>34</sup> (Figure 1). Reprinted with permission from the American Public Health Association

CPTED codes and principles and all states are implementing such programs. This national body is seeking to amend the Australian Building Codes and to embed CPTED principles within the planning process. This would ensure that the criminogenic potential of new urban developments is considered and minimised at the initial design stage.<sup>42,43</sup>

The national commitment to CPTED is arguably one example whereby the precautionary principle is being implemented. In WA, housing projections for 2031 estimate that 375000 new homes will be required<sup>44</sup> and that most (60%) will be built in existing urban areas. The publication of *Designing Out Crime Planning Guidelines*<sup>42</sup> supported by *Planning Bulletin No.79*<sup>43</sup> and a State Designing Out Crime Strategy ([www.crimeprevention.wa.gov.au](http://www.crimeprevention.wa.gov.au)) to embed such ideas within the planning process and within product design clearly represent a commitment to development that will help to meet the needs of the present – and those of future generations. In New South Wales the *Safer By Design*<sup>45</sup> program uses CPTED risk assessments and introduced Crime Prevention Legislative Guidelines to Section 79C of the *Environmental Planning and Assessment Act (1979)*. This requires that authorities ensure that development provides safety and security to users and the community.

Significantly, the UK's Home Office has recently released a new crime strategy *Cutting Crime: A New Partnership*,<sup>46</sup> which among other strategies, promotes CPTED. The report notes 'there are now over 100 documented case studies showing how crime has been reduced by



<sup>1</sup>SEIFA is a socio-economic index for communities developed by the Australia Bureau of Statistics.

**Figure 2. Crime Prevention Through Environmental Design Crime Risk Evaluation Matrix.** Source: adapted from McCamley P. Minimising Subjectivity: A New Risk Assessment Model for CPTED. *The Journal of the International Crime Prevention Through Environmental Design Association* 2002; 1(1): 25–34.<sup>54</sup>

modifying places, products and services and removing the opportunities for theft, violence or vandalism.<sup>46</sup>

However, firm policy support for CPTED does not guarantee that CPTED is being implemented or that crime is being considered at the planning stage of the development process. Currently, the consideration of CPTED in Australia and the UK is largely optional for developers and crime risk assessments are not statutory (with the exception of NSW).

Environmental Impact Assessments (EIA) have been implemented in Australia since the early 1970s; however, human health considerations have been limited.<sup>47</sup> Social Impact Assessments (SIA) are often carried out as part of, or in addition to, EIAs and seek to manage the intended and unintended social consequences of development. However, the International Principles Social Impact Assessment<sup>48</sup> does not mention crime, and crime risk assessment is not part of the EIA process.

Health Impact Assessments (HIA) seek to predict the health impact of a development before implementation and early in the planning stage. The need for HIAs to be conducted explicitly in any environmental or economic decision-making process was strongly endorsed by the National Health and Medical Research Council in 1992. Crime is not part of the current HIA process.

Crime Risk Assessment (CRA) is not included in EIAs, SIAs or HIAs. In terms of HIAs for new developments, Northbridge and Sclar<sup>49</sup> argue that 'it is imperative to reinvigorate the historical link between planning and public health'. They discuss integrating urban planning and public health with other frameworks such as the ecosocial perspective,<sup>50</sup> health and human rights,<sup>51</sup> the precautionary principle<sup>52</sup> and sustainable production<sup>53</sup> to better understand and practise HIAs.

Until more formal CRA processes become available, the CPTED process represents a tool for assessing crime risk associated with new developments. Figure 2 illustrates a model developed by McCamley<sup>54</sup> which 'employs qualitative and quantitative measures of the physical and social environment to create a contextually adjustable approach for the analysis and treatment of crime'.

Although it will be a challenging task, integrating existing assessment frameworks such as EIAs, SIAs, HIAs and CRAs represents a more holistic approach to assessing the multiple impacts of any development.

This paper argues the case for crime to be included in these frameworks and suggests CPTED is a useful process for conducting local CRAs and in reinvigorating the links between public health and urban planning.

## Conclusion

CPTED is *not* a panacea, and although it does not guarantee that a city is safe from crime and the fear of crime, it can help create supportive physical environments for social and economic initiatives.<sup>55</sup> It works best as part of a broad range of crime prevention strategies, which include the criminal justice system and both offender and victim-focused approaches. Crucially, Brantingham and Brantingham<sup>7</sup> have argued for a broader consideration of CPTED within planning, and likewise within the public health arena there are similar calls to consider place-based crime prevention strategies.<sup>10</sup> McDonald<sup>56</sup> has observed 'public health can make a valuable contribution to violence prevention and cover a much broader spectrum than can the criminal justice system alone.' As a proactive crime prevention strategy, CPTED represents a multidisciplinary approach that has application for public health, planning and crime prevention practitioners. CPTED also represents a process for collaboration across disciplines.

In the absence of any crime risk assessment model, CPTED represents a process for assessing local crime risk at the design stage. It can also reduce crime and fear of crime and contribute towards the design and management of urban space to support active living, walkability and public health.

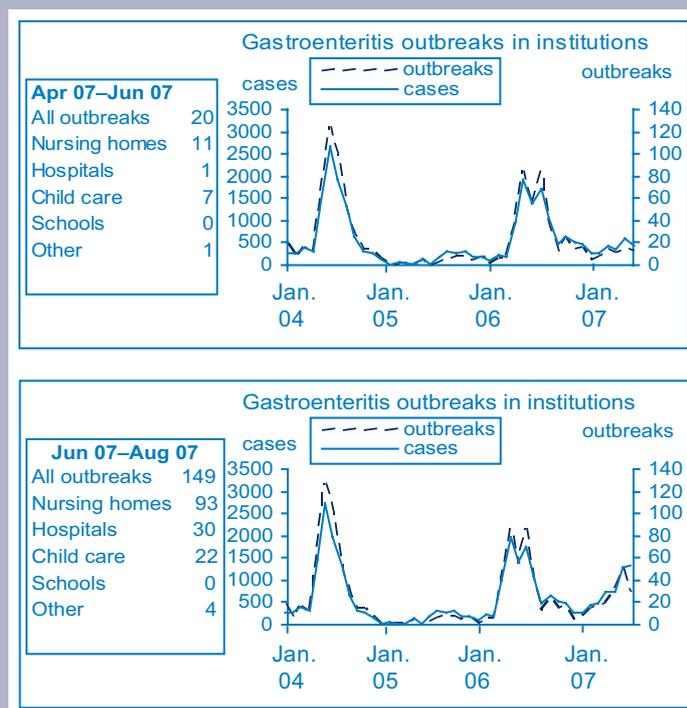
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**Erratum.** In the Communicable Diseases Reports for July and August (*N S W Public Health Bull* 2007; 18(7–8): 145) and September and October (*N S W Public Health Bull* 2007; 18(9–10): 205), the data in the graphs ‘Gastroenteritis outbreaks in institutions’ are incorrect as the x-axis (year) was incorrectly labelled. The following corrections for these graphs should be noted.



# Can the impact on health of a government policy designed to create more liveable neighbourhoods be evaluated? An overview of the RESIDential Environment Project

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**Abstract:** There is growing interest in the impact of community design on the health of residents. In 1998, the Western Australian Government began a trial of new subdivision design codes (i.e. *Liveable Neighbourhoods Community Design Code*) aimed at creating pedestrian-friendly neighbourhoods to increase walking, cycling and public transport use. The trial provided a unique opportunity for a natural experiment to evaluate the impact of a government planning policy on residents. Nevertheless, evaluations of this kind present a number of methodological challenges in obtaining the highest quality evidence possible. This paper describes the RESIDential Environment Project's study design and discusses how various methodological challenges were overcome.

For decades there has been increasing concern about the unsustainability of post-World War II planning principles adopted in the United States of America (US) and Australia, characterised by segregated land use, disconnected streets, low residential density, limited public transport and local employment and high motor vehicle

dependency.<sup>1,2</sup> However, until relatively recently little attention has been given to the impact of these planning principles on the physical and mental health outcomes of local residents.

A growing number of studies show that urban sprawl, typical of development on the fringe of Australian and US cities, is associated with obesity, hypertension and lower levels of walking, because it encourages driving and discourages active modes of transport, and often results in long commutes.<sup>3</sup> In Australia, two-thirds of men and one-half of women are overweight or obese,<sup>4</sup> as are between 19 and 23% of Australian children and adolescents.<sup>5</sup> Moreover, only about one-half of Australian adults are sufficiently active to benefit their health (i.e. undertaking as little as 30 minutes of daily moderate physical activity), and levels of physical activity appear to be declining.<sup>6,7</sup> While a multitude of factors are implicated in these trends, there is growing international attention on the contribution made by so-called 'obesogenic' environments,<sup>8,9</sup> including urban development, which discourage physical activity.

This paper contributes to the methodological literature. It describes the design of an evaluation of a state government land subdivision design code which aims to encourage more walking, cycling and public transport use by local residents. It begins with a background to the development of the *Liveable Neighbourhoods Community Design Code*, before describing the evaluation's study design. It then goes on to discuss methodological issues that have arisen for consideration in future natural experiments of this type.

## New Urbanism

One response to concerns about the unsustainability of urban sprawl has been a new approach to planning known as 'New Urbanism', which aims to create more pedestrian-friendly neighbourhoods.<sup>7,10-12</sup> Based on traditional planning principles, neighbourhoods designed according to these principles have connected street networks, higher density of development, mixed-use zoning (i.e. a combination of commercial and residential development) and access to public transport.<sup>13,14</sup> A study from the United Kingdom found that traditional neighbourhoods generated

about 57% fewer vehicle miles,<sup>15</sup> while a small study by Saelens and colleagues<sup>16</sup> found that ‘high walkable’ neighbourhoods in the US generated more weekly transport walking trips than ‘low walkable’ neighbourhoods (3.1 compared with 1.4 walking trips per week). There is growing cross-sectional evidence that community design policy is an effective tool for increasing walking, cycling and public transport use, thereby reducing driving and improving air quality.<sup>17,18</sup>

In Western Australia, the state government is responsible for subdivision policy (Western Australian Planning Commission) and assessment of all subdivision proposals (Department for Planning & Infrastructure). In 1998, it began a trial of the *Liveable Neighbourhoods Community Design Code*,<sup>19</sup> which is based on New Urbanism principles. By creating more ‘liveable’ neighbourhoods with greater access to services and more efficient use of land, it is hoped that car use will be reduced and walking, cycling and public transport use will be increased.<sup>7</sup>

### The RESidential Environment Project

The extent to which a new government policy can influence active transport behaviour is the subject of the Healthway-funded RESidential Environment project (known as RESIDE). Commencing in 2003, the principal aim of RESIDE is to study the impact of the state government’s *Liveable Neighbourhoods Community Design Code* on the walking, cycling and public transport use behaviour of local residents. RESIDE is a longitudinal study of people building homes in new housing developments, some of which are designed according to the *Liveable Neighbourhoods Community Design Code*. The study was developed in response to the need for causal evidence on the relationship between the built form and physical activity.<sup>3,18</sup> Hence, its longitudinal design will enable the study of selection: do individuals choose environments that match their preferred behaviour or does the environment shape their behaviour?

#### Study design

RESIDE involves three data collections over five years

with each collection undertaken in the same season. The timing of these collections is:

- (1) baseline – before participants moved into their new home;
- (2) 1st follow-up – 12 months after moving into their new home; and
- (3) 2nd follow-up – two years later.

On each occasion, participants complete a self-completion questionnaire and wear a Yamix Digi-walker pedometer (SW-200-024) for seven days. The pedometer is a small motion sensor worn on the belt that measures the number of steps taken. It provides an objective measure of overall physical activity behaviour irrespective of the type and where it takes place.

#### Selection of housing developments

All structure plans for new housing developments in Western Australia are approved by the Department for Planning and Infrastructure. During the Liveable Neighbourhood trial period, structure plans developed using the *Liveable Neighbourhoods Community Design Code* were subjected to a separate review process. The key elements of conventional and liveable neighbourhoods as defined by Jones<sup>12</sup> are presented in Table 1. Developments with many but not all of the Liveable Neighbourhood elements were assessed as ‘hybrid’ developments.

Accordingly, 18 of the 74 RESIDE developments were assessed as Liveable Neighbourhood developments, 45 as conventional developments and 11 as ‘hybrid’ developments. All Liveable Neighbourhood developments and ‘hybrid’ developments that sold land for housing during the recruitment period were included in the study areas. Attempts were made to match the conventional developments to the Liveable Neighbourhood developments and ‘hybrid’ developments in terms of stage of development, lot value and proximity to the ocean.

#### Selection of participants

Participants were selected from households that had purchased land in the 74 housing developments. Recruitment

**Table 1. Key elements of conventional and Liveable Neighbourhoods**

Characteristic	Conventional	Liveable Neighbourhoods
Land use diversity	Single use; predominantly residential, with designated areas of clustered retail; segregated use base	Integrated mixed-use; neighbourhood based with integrated residential, retail, commercial and service industrial
Street pattern and type	Curvilinear and hierarchical from district distributors, to collectors, to access streets, to cul-de-sac; traffic collected and channelled	Inter-connected network; a flatter hierarchy of types; traffic dispersed
Dominant retail type	Regional ‘big box’ shopping centres, chain stores	Neighbourhood independent retailers
Dominant planning objective	Create comfortable housing	Create community; create affordable housing; jobs containment

Source: Jones E. Liveable Neighbourhoods. *World Transp Policy Pract* 2001; 7(2): 38–43.

occurred in waves every six months from September 2003 to March 2005. To be eligible, participants needed to be proficient in English; 18 years or over; planning to move into their new house by December 2005; and willing to complete surveys and wear a pedometer for seven days on three separate occasions over four years. The Water Corporation, the state water agency, wrote to all its customers building houses in the study areas inviting their participation and requesting return of a reply-paid card if they were ineligible or did not want to be contacted by the study team ( $n = 10193$ ). The names and addresses of people who did not return the card within 10–14 days were matched to the electronic white pages and telephoned by trained interviewers at the School of Population Health's Survey Research Centre ( $n = 5286$ ) and screened for eligibility. Those who could not be contacted by telephone after six follow-up calls and for whom no telephone contact details were available ( $n = 3862$ ) were invited to participate by letter. Three follow-up letters were sent. All participants received written information about the study and provided written consent before completing the baseline questionnaire.

### Measures

RESIDE is an ecological study,<sup>20–23</sup> in that it will measure multiple levels of influence on behaviour. RESIDE study participants will complete comprehensive questionnaires that measure a range of individual-level (e.g. demographic and health-related characteristics, attitudes, perceptions), social environmental (e.g. social support for physical activity) and physical environmental (e.g. perceptions of the local neighbourhood) factors that might influence participation in active modes of transport. To complement the objective measure of overall behaviour using pedometers, self-reported physical activity is also being measured using the Neighbourhood Physical Activity Questionnaire. This questionnaire measures the frequency and duration of usual walking and cycling undertaken within and outside the neighbourhood as well as other moderate- and vigorous-intensity physical activity.<sup>24</sup> The tool was specifically designed for use in longitudinal studies of the impact of urban design on physical activity and makes it possible to differentiate walking and cycling behaviours that take place within and outside the neighbourhood. This allows the impact of the government's *Liveable Neighbourhoods Community Design Code* on behaviour undertaken locally to be studied.

In addition to individual-level data, a key objective of RESIDE is to develop objective measures of the physical environment surrounding the study participants' homes (both at baseline addresses and in new neighbourhoods), using Geographic Information System data. A walkability index based on that developed by Frank and colleagues<sup>25,26</sup> has been developed for this study by Learnihan.<sup>27</sup>

### RESIDE study participants

RESIDE includes 1813 study participants who have returned completed baseline questionnaires (33.4% response rate overall). Overall, 40.5% of the RESIDE participants are male and the average age at baseline was 40 years (SD 11.9). Given that study participants are home buyers, not surprisingly only one-quarter have a household income of less than \$50 000 per annum (24.5%). At baseline, there was no difference between the transport-related or recreational walking undertaken by the study participants living in the different types of neighbourhoods.<sup>28</sup> Only 20% of the total walking undertaken at baseline was transport-related walking and undertaken within the neighbourhood. Given that the *Liveable Neighbourhoods Community Design Code* aims to increase local walking, it will be important to monitor any increase in the amount of transport-related walking. The baseline data collection was completed in December 2005, and first follow-up questionnaires were completed by December 2006. Distribution of the second follow-up questionnaire commenced in September 2006 and is due for completion by December 2008.

### Discussion

There is growing recognition that neighbourhood design can influence both health and environmental outcomes, but there is limited causal evidence of its impact. RESIDE seeks to redress this gap by prospectively evaluating the impact of a new government planning policy on local residents. Its longitudinal design will contribute to evidence about whether neighbourhood design simply facilitates the behaviours of those already predisposed to use active forms of transport or whether it can be used as a policy tool to change behaviour. Importantly, the collection of data on multiple levels of influence of behaviour (i.e. individual-level, social environmental and physical environmental) allows the study of the impact of neighbourhood design relative to individual-level attitudes and social norms. These data will inform future educational and policy interventions.

There are synergies between health, sustainability and planning agendas, as each sector attempts to encourage active modes of transport. While the objectives of these agendas differ markedly (i.e. to produce health, environmental or traffic management outcomes), the strategies required to achieve these policy outcomes are similar.<sup>22</sup> Thus, in this area there are unprecedented opportunities for collaborative effort across disciplines and sectors to devise multiple-level interventions, transdisciplinary approaches to research<sup>29</sup> and advocacy campaigns designed to hasten policy changes to redress these problems.

The *Liveable Neighbourhoods Community Design Code* represents an attempt by a state government to create pedestrian-friendly neighbourhoods and is receiving

national and international attention as a best-practice policy. Given the potential for government policy to create supportive infrastructure that can influence behaviour and produce health and environmental outcomes, it is important to monitor positive (and unintended negative) outcomes.

RESIDE involves a collaborative study with the policy makers (Department of Planning and Infrastructure and the Western Australia Planning Commission) and will prospectively monitor the impact of this policy on the health and social outcomes of local residents. It seeks to overcome a number of methodological challenges in studying the impact of community design on various health behaviour outcomes.

First, it is longitudinal and surveys residents before they move into their new homes. This will allow study selection to be studied. Fortunately, at baseline there were few differences between those moving into Liveable Neighbourhood developments and other types of neighbourhoods in terms of their demographic or behavioral characteristics.<sup>28</sup> Second, RESIDE included all Liveable Neighbourhood and hybrid developments being built during the study period, and where possible, it sought to match these with conventional developments on the basis of distance from the ocean, stage of development and price. Apart from attempting to control for socioeconomic status and quality of access to facilities and services, there was also an attempt to avoid a 'coastal effect' which suggests that those living in coastal locations are more physically active than others.<sup>30</sup> Third, the study collects both self-report and objective measures of walking, cycling and overall physical activity. Fourth, the self-report measures are behaviour and context-specific<sup>31</sup> with study participants reporting separately about recreational and transport-related walking and cycling behaviours undertaken within, and outside, the neighbourhood.<sup>24</sup> Fifth, the behavioural questionnaire uses 'usual' behaviour rather than behaviour in the last seven days or a diary. We believe that usual behaviour will be a more stable measure, which is preferable in a longitudinal study. Sixth, the study has been designed to take into account seasonal effects and seeks to resurvey study participants in the same season that they completed the baseline survey. Seventh, it includes both perceptions of the neighbourhood and objective measures of the neighbourhood and has a consistent definition of what constitutes a 'neighbourhood' in both the questionnaires completed by study participants and the objective measures of the neighbourhood. Finally, using a modified version of a method proposed by Dillman,<sup>32</sup> the study attempts to maximise the response rate by incorporating a comprehensive system to contact and re-contact study participants during the recruitment and follow-up phases.

Despite attempts to overcome methodological challenges, the study has a number of limitations. It is restricted to people building homes in new housing estates, and, therefore, is not representative of a general population sample, nor does it include lower socioeconomic groups. Despite attempting to maximise the response rate from the outset, the initial response rate was only 33%. Undoubtedly, this was partly due to the fact that study participants were made aware from the outset about the study requirements (as was required by the University's Human Ethics Committee). Not only did this involve an extensive questionnaire, but it also required the study participants to wear a pedometer for a week and to complete a pedometer diary.

Regardless of these limitations, at this stage, RESIDE is unique internationally. Moreover, studies of this type are important to inform the development of future policy and practice with the aim of optimising neighbourhood designs to produce health, planning and sustainability outcomes.

### Acknowledgements

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# Climate change and infectious diseases

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It is now widely accepted that the earth's climate is changing as a result of the accumulation of greenhouse gases in the atmosphere. Climate change is in turn causing environmental and ecological changes that have, and will increasingly, influence human health.

Australia's continental-average temperature has risen by 0.7°C from 1910 to 1999, with most of this increase occurring since 1950.<sup>1</sup> Recently, the United Nations Intergovernmental Panel on Climate Change predicted that under a continued high greenhouse gas emissions scenario global mean temperatures could rise by 6.4°C (range 2.4°C to 6.4°C) by 2099; under a low emission scenario temperatures are expected to rise between 1.1°C and 2.9°C over the same period.<sup>2</sup>

The World Health Organization estimates that the global burden of climate change is 150 000 deaths (0.3% of global mortality) and 5.5 million disability-adjusted life years (0.4% of the global total) per year.<sup>3</sup> This burden is not borne evenly across the globe, with poorer, less adaptable communities at lower latitudes carrying significantly larger burdens.<sup>4</sup>

When estimating or modelling the health impacts of climate change, there are many uncertainties due to inconsistencies and gaps in global knowledge about climate variability, lack of reliable data across populations, poor applicability of global models to local scenarios and incomplete (yet growing) understanding of the climate–health relationship,<sup>3</sup> particularly related to human adaptability to the effects of climate change. These issues, coupled with a delay between the causes of climate change and the effects, mean that models should be interpreted as a guide rather than an exact predication of the future impact.

Globally, climate change will have major impacts on health by influencing temperature-related illness, malnutrition, diarrhoeal disease, injury, malaria and other vector-borne diseases.<sup>3</sup> The influence that climate change

will have on each of these causes of ill-health will not be distributed evenly. For example the relative risk of death due to malnutrition in parts of South-East Asia is predicted to be as high as 1.33 by 2030 while remaining unchanged in Australia.<sup>3</sup>

The impact climate change is likely to have on health in NSW will primarily be related to more frequent, intense and longer periods of high temperature, predominantly in the central-western areas of the state,<sup>1</sup> causing heat stress and exacerbating sensitive cardiac and respiratory medical conditions. More frequent and intense storm activity will also increase the risk of injury.<sup>5,8</sup>

Malaria and dengue 'receptive zones' may extend southward in northern Australia; however, there is little evidence to suggest that increases in infection predicted for other parts of the world will occur in NSW due to environmental, vector and health service dynamics.<sup>6,7</sup> NSW may, however, experience an increase in imported vector-borne diseases due to increased incidence in other regions.<sup>6,8</sup>

There is evidence to suggest a link between climate change and microbial food-borne disease, with a positive correlation between seasonal and latitudinal temperature variability and the amount of food-borne and diarrhoeal illnesses observed. It is likely that climate change will cause an increase in food-borne disease notifications; however, caution is required in inferring a direct link due to the multiple and complex confounding factors. Changing climate may also influence human exposure to natural and man-made toxins such as risk of exposure to blue-green algal blooms.<sup>9</sup>

It has been hypothesised that there will be indirect social, economic and/or political impacts from climate change that will impact on health, such as regional civil unrest, economic disturbances or population migration.<sup>6</sup>

The significance climate change will have on public health practice in NSW will vary depending on geographic area and the ability of populations to adapt to any increased risks posed.

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# Yellow fever

## What is yellow fever?

Yellow fever is a viral disease transmitted to humans by mosquitoes in parts of South America and Africa.

## What are the symptoms?

Symptoms of infection include a sudden onset of fever, chills, muscle pain, backache, headache, nausea and vomiting three to six days after the virus enters the body. After three to four days most patients improve and their symptoms disappear. However, about 15% of patients will go on to have bleeding (from the mouth, nose and eyes and/or stomach), jaundice (yellowing of the skin and eyes), abdominal pain with vomiting and problems with kidney function. Half of these patients recover but the remaining half die within 10–14 days of developing these symptoms.

## How is it spread?

Humans and monkeys are the main animals infected by the virus.

- Certain species of mosquitoes known as *Aedes aegypti* are required to spread the virus.
- It takes three to six days for the illness to begin once a person is bitten by an infected mosquito.
- Infected people can transmit the infection to mosquitoes for up to five days after the onset of symptoms.
- The infection is not spread directly from person to person or animal to person.

## Who is at risk?

Yellow fever only occurs in Africa and South America in countries located near the equator.

## How is it prevented?

Vaccination is the most effective way to prevent yellow fever.

- Vaccination must be administered at an approved vaccination centre and an international yellow fever vaccination certificate must be provided. Your local public health unit can provide a list of approved vaccination centres.
- Under the *Commonwealth Quarantine Act, 1908*, any person over one year of age must hold an international yellow fever vaccination certificate if they have stayed overnight or longer in a declared yellow fever infected country within the six days prior to their arrival in Australia. A list of yellow fever declared countries can be found at: <http://www.health.gov.au/internet/wcms/publishing.nsf/content/health-publth-strateg-communic-factsheets-yellow.htm>.

- Countries may refuse entry to any person without a valid yellow fever vaccination certificate who has recently been in a yellow fever infected country, and some of these may only allow unvaccinated people to enter after they are vaccinated at their border. The sterility of the vaccine given in such situations may not always be guaranteed.
- Persons arriving in Australia from a yellow fever infected country without a yellow fever vaccination certificate will be interviewed on their arrival by officers from the Australian Quarantine Inspection Service (AQIS). AQIS officers may only permit unvaccinated people to enter Australia if they agree in writing to notify health authorities if they develop any symptom of yellow fever infection in the six-day period following their departure from a declared yellow fever infected place.

Travellers in yellow fever infected countries should also take measures to avoid being bitten by mosquitoes:

- Wear loose fitting, long sleeved clothing
- Apply mosquito repellent (containing DEET or picardin) to exposed areas
- Stay in mosquito proof accommodation (e.g. use bed nets).

## How is it diagnosed?

Yellow fever is difficult to recognise in its early stages as there are a number of infections that may have similar signs and symptoms. Diagnosis requires a blood test.

## How is it treated?

- There is no specific treatment for yellow fever. Patients can be treated for dehydration and fever. Intensive care may be needed for seriously ill patients.
- In areas in which the *Aedes aegypti* mosquito lives (such as North Queensland) patients should be cared for in mosquito proof rooms.

## What is the public health response?

Laboratories and hospitals are required to notify cases of yellow fever to the local public health unit. Public health units investigate possible cases to identify the risk factors for the disease and prevent the infection of mosquitoes in susceptible areas in Australia.

For more information, please contact your doctor, local public health unit or community health centre.

# Communicable Diseases Report, New South Wales, September and October 2007

**Communicable Diseases Branch,  
NSW Department of Health**

For updated information, including data and facts on specific diseases, visit [www.health.nsw.gov.au](http://www.health.nsw.gov.au) and click on **Infectious Diseases**.

Tables 1 and 2 and Figure 1 show reports of communicable diseases received through to the end of September and October 2007 in NSW.

## Influenza

Influenza activity – measured by the number and rate of people presenting with influenza-like illness to selected emergency departments, and by the number and rate of people testing positive for influenza at selected laboratories – returned to baseline levels in September. Overall, NSW experienced a moderately severe influenza season, with presentations to emergency departments peaking in mid-August (9/1000 presentations), a rate not seen since 2003. Most cases of influenza were due to influenza A virus. For more information see <http://www.health.nsw.gov.au/infect/pdf/flureport.pdf>.

## Meningococcal disease

In September, 10 people were notified in NSW with meningococcal disease and one of these died. A further 11 cases were notified in October. In total, 91 cases have been notified in NSW in 2007, including three deaths. Of the 2007 cases, nine were due to serogroup C meningococcal bacteria (which is covered by the vaccine recommended for one to 23 year olds) and 56 were due to serogroup B (which is not covered by the vaccine). For the first 10 months of 2006, 91 cases were notified including six deaths. For more information see [http://www.health.nsw.gov.au/infect/pdf/mening\\_update.pdf](http://www.health.nsw.gov.au/infect/pdf/mening_update.pdf).

## Mumps

The number of notifications of mumps has steadily increased in the last few months. In 2003, 35 cases were reported in NSW. This number has steadily increased each year from 28 in 2001 to 153 in 2006. Through to September 2007, 148 cases were reported for 2007. Only laboratory reports of mumps are counted in NSW, so this

figure likely underestimates the true cases of mumps circulating in the community. Among the 168 cases reported in the 12 months to September, 116 (69%) were aged 15–34 years, and in this age group 67% were males, compared with only 54% in other age groups. Compared with older people, people aged 15–34 years are less likely to have been infected with the mumps virus as children, and compared with younger age groups, are less likely to have received mumps-containing vaccine (first introduced in 1980) as part of their routine childhood immunisation. In NSW, year 7 girls were vaccinated through a school-based immunisation program until 1998, but boys were included only for the last two years of this program. In 1998, the national Measles Control Campaign aimed to vaccinate all children in primary school with MMR (measles mumps rubella) vaccine and reduced the age of the booster dose from 10–16 years to four to five years. Consequently the year 7 MMR program was discontinued.<sup>1</sup>

Symptoms of mumps include fever, followed by swelling and tenderness of the salivary glands, especially the parotid glands. Orchitis, usually unilateral, affects 20 to 30% of post-pubescent males, but sterility is extremely rare. Close to half of cases can have respiratory symptoms. Aseptic meningitis can occur in up to 10% of cases, but other complications are unusual and include meningitis, encephalitis, pancreatitis, spontaneous abortion and hearing loss. Mumps is spread via respiratory droplets or from person to person via direct contact with infected saliva. Symptoms begin two to three weeks after exposure to an infectious person. People are infectious for up to nine days after swelling of the salivary glands begins. To prevent spread, people with mumps should stay at home for nine days after the onset of swelling.<sup>2</sup>

Mumps vaccine is given to infants in the MMR vaccine as part of the standard vaccination schedule. Two doses are recommended, at 12 months and 4 years of age. Everyone born during or since 1966 should ensure they have received two doses of MMR vaccine.

The challenge for public health and clinical care workers alike is to motivate young adults to get vaccinated. Clinicians are encouraged to use every opportunity (including presentations for medical reasons, or for health and travel checks) to urge patients who are aged up to their early 40s to get vaccinated unless they have evidence of past immunity to measles, mumps and rubella.

For more information on mumps, see <http://www.health.nsw.gov.au/infect/pdf/mumpscdfs.pdf>.

### Enterics

In September, NSW public health units investigated 44 outbreaks of gastroenteritis, including two suspected food-borne outbreaks and 42 outbreaks suspected to be caused by viruses spread from person to person. This compares with 63 outbreaks in August of which three were suspected food-borne and 60 spread from person to person.

Among the two suspected food-borne outbreaks, one involved a restaurant and the other a commercially catered meal. The cause of these outbreaks was not determined. Among the 42 suspected viral outbreaks, all were reported from institutions. Of these, 29 were reported in aged care facilities and affected more than 360 people; seven were reported in hospitals and affected 39 people; four were reported in child care centres and affected 41 children; and there was one outbreak in a primary school affecting 36 children. The remaining outbreak affected approximately 150 people in a large residential facility.

In October, NSW public health units investigated 70 outbreaks of gastroenteritis, including two suspected food-borne outbreaks and 68 suspected to be caused by viruses spread from person to person.

Of the food-borne outbreaks, one affected three people after they ate chicken schnitzel in a restaurant, and the other caused vomiting and diarrhoea in seven of 25 people 36 hours after they ate several foods at their work place. The causal agent was not identified in either outbreak. Among the 68 outbreaks suspected to be caused by viruses, three were reported by people calling the NSW Food Authority complaints line following functions. In

each case it seems that infection spread to others from a single ill attendee. Of the 65 outbreaks reported from institutions, 35 were reported in aged care facilities and affected more than 480 people; 14 were in hospitals and affected 151 people; 14 were in child care centres and affected 136 children; two were in primary schools and affected 36 children; one was in a rehabilitation unit and affected eight people; and one was in a large residential facility and affected about 25 people. This is twice the number of outbreaks reported in October 2006 and the highest number of institutional outbreaks reported in October since 2002.

People with vomiting and diarrhoea should excuse themselves from functions where food is served to avoid inadvertently infecting others.

Two cases of **listeriosis** were reported in September. Both cases were older women with weakened immune systems. Listeriosis is a rare but serious disease that affects pregnant women and their babies, and people with lowered immunity. Listeriosis can be prevented by avoiding high risk foods. Examples of high risk foods include sliced meats, soft cheeses such as brie and camembert, and prepared salads. Pregnant women and people with weakened immune systems should talk their doctor about listeriosis. For more information on listeriosis see [http://www.health.nsw.gov.au/infect/pdf/listeria\\_cdfs.pdf](http://www.health.nsw.gov.au/infect/pdf/listeria_cdfs.pdf)

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With regard to Figure 1 from the Communicable Diseases Reports for July and August (*N S W Public Health Bull* 2007; 18(7–8): 145) and September and October (*N S W Public Health Bull* 2007; 18(9–10): 205, please refer to the Erratum on p. 235.

**Figure 1. Reports of selected communicable diseases, NSW, January 2002 to October 2007, by month of onset.**

Preliminary data: case counts in recent months may increase because of reporting delays.

BFV, Barmah Forest virus infections; RRV, Ross River virus infections; Lab Conf, laboratory confirmed;

Men Gp C and Gp B, meningococcal disease due to serogroup C and serogroup B infection;

Other/unlk, other or unknown serogroups.

NB: multiple series in graphs are stacked, except gastroenteritis outbreaks.

NB. Outbreaks are more likely to be reported by nursing homes and hospitals than by other institutions.

NSW Population	
Male	50%
<5 y	7%
5–24 y	27%
25–64 y	53%
65+ y	13%
Rural	46%

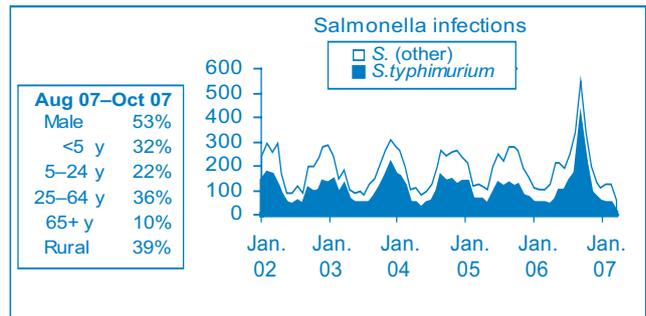
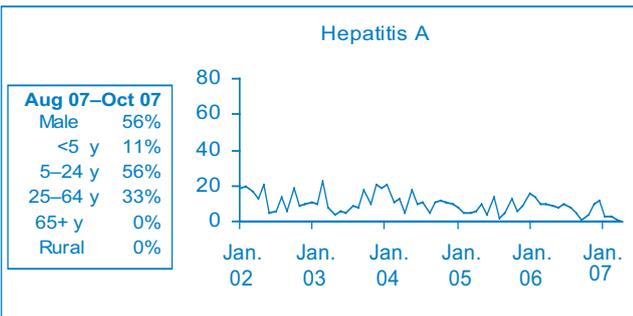
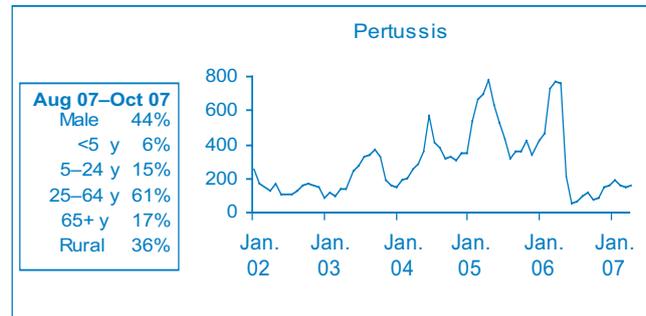
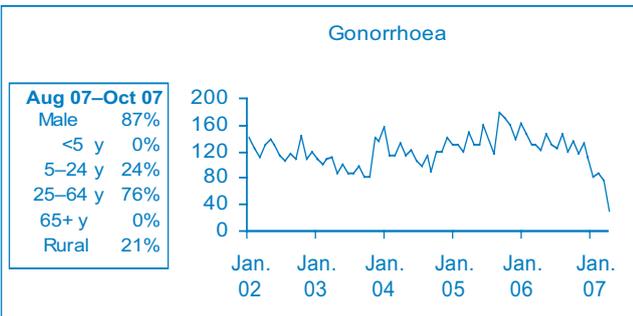
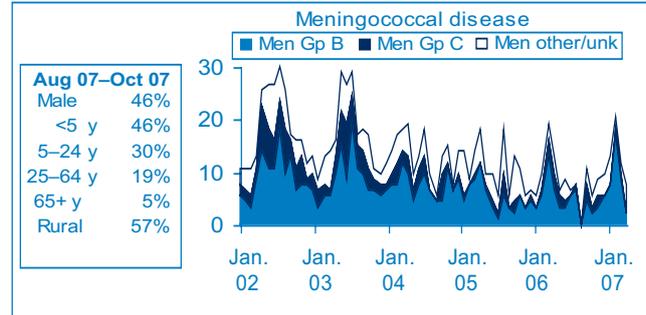
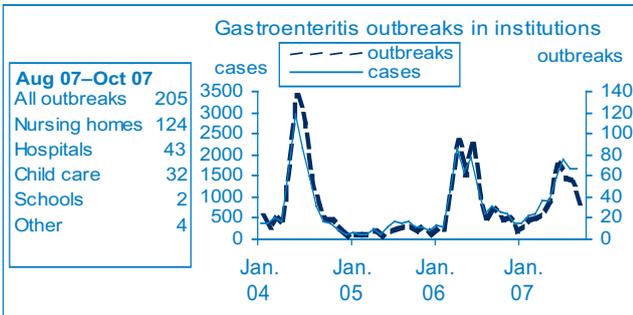
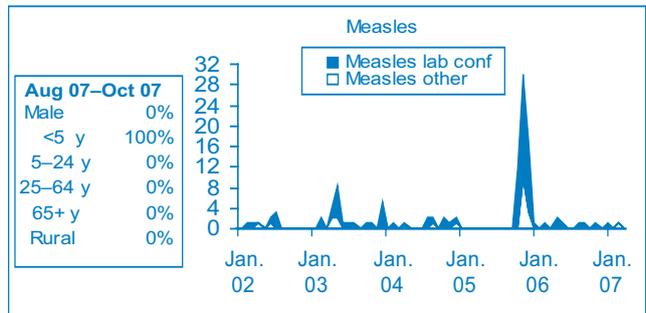
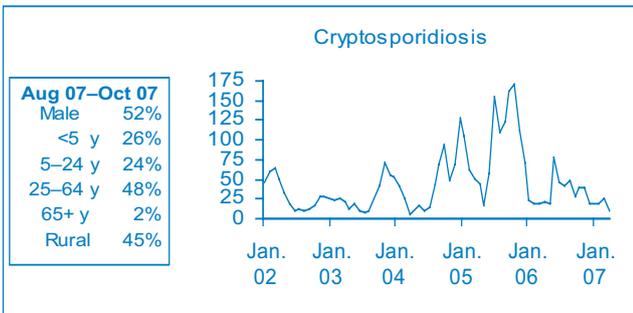
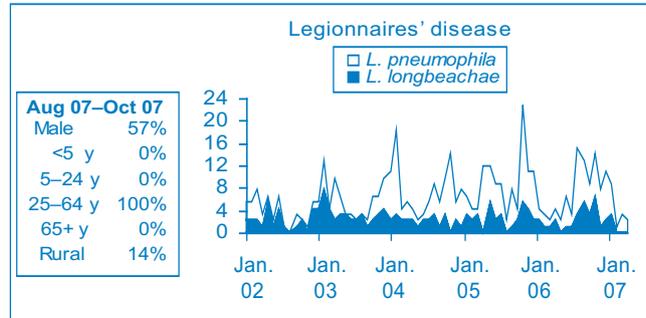
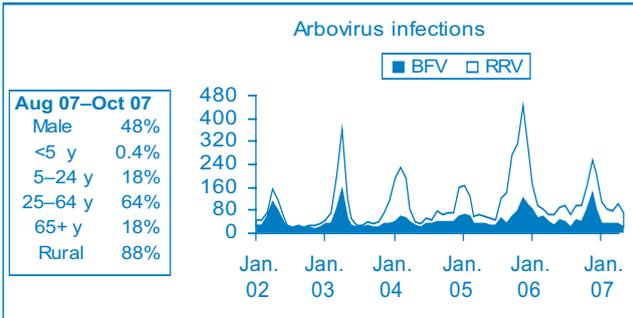


Table 1. Reports of notifiable conditions received in September 2007 by Area Health Services

Condition	Area Health Service (2007)										Total For Sep. <sup>c</sup>	Total To date									
	Greater Southern GMA SA	Greater Western FWA MAC MWA	Hunter/New England HUN NEA	North Coast MNC NRA	Northern Syd/ Central Coast CCA NSA	South Eastern Syd/Illawarra ILL SES	Sydney South West CSA SWS	Sydney West WSA	JHS												
<b>Blood-borne and sexually transmitted</b>																					
Chancroid <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-								
Chlamydia (genital) <sup>a</sup>	38	17	8	13	45	93	40	26	50	30	84	40	160	86	42	32	81	6	897	9539	
Gonorrhoea <sup>a</sup>	-	-	-	-	-	9	1	-	-	1	3	2	35	12	2	1	6	-	74	1079	
Hepatitis B - acute viral <sup>a</sup>	-	-	-	-	-	2	2	2	4	3	25	8	35	51	186	6	29	5	369	2787	
Hepatitis B - other <sup>a</sup>	2	1	-	2	-	1	2	3	-	-	-	-	-	-	-	-	-	3	33	-	
Hepatitis C - acute viral <sup>a</sup>	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	564	5016	
Hepatitis C - other <sup>a</sup>	14	12	1	7	33	45	11	27	26	37	22	15	48	53	113	22	44	32	564	5016	
Hepatitis D - unspecified <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-
Lymphogranuloma venereum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Syphilis	-	3	-	1	2	3	-	9	1	5	6	1	27	17	14	1	14	2	108	928	-
<b>Vector-borne</b>																					
Barmah Forest virus <sup>a</sup>	1	-	-	2	-	6	2	10	5	2	1	5	1	1	-	-	-	-	36	482	-
Ross River virus <sup>a</sup>	8	-	1	5	-	12	4	7	3	5	-	1	2	1	-	-	2	-	52	614	-
Arboviral infection (other) <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-	4	65	-
Malaria <sup>a</sup>	1	1	-	-	-	2	-	-	-	-	-	-	-	1	1	-	3	-	9	75	-
<b>Zoonoses</b>																					
Anthrax <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brucellosis <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
Leptospirosis <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-
Lyssavirus <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psittacosis <sup>a</sup>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q fever <sup>a</sup>	-	-	-	4	-	1	2	5	-	-	-	2	-	-	-	1	-	-	15	157	-
<b>Respiratory and other</b>																					
Blood lead level <sup>a</sup>	-	1	-	17	-	1	1	16	1	8	22	11	14	-	3	1	-	-	25	204	-
Influenza <sup>a</sup>	14	10	2	4	32	25	15	4	37	7	22	6	6	4	11	22	32	-	280	1597	
Invasive pneumococcal infection <sup>a</sup>	3	4	-	1	-	7	6	-	4	-	7	3	6	-	8	1	6	-	67	415	
Legionella longbeachae infection <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	25	-
Legionella pneumophila infection <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	53	-
Legionnaires' disease (other) <sup>a</sup>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
Leprosy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Meningococcal infection (invasive) <sup>a</sup>	1	-	-	2	-	1	1	1	1	1	1	1	1	-	1	-	2	-	10	80	-
Tuberculosis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	281	-
<b>Vaccine-preventable</b>																					
Adverse event after immunisation <sup>b</sup>	6	-	-	-	-	2	-	-	1	2	4	5	4	1	-	2	8	-	35	170	-
H. Influenzae b infection (invasive) <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-
Measles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Mumps <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	1	-	19	4	3	2	4	-	34	152	-
Pertussis	10	3	2	4	1	21	7	8	5	3	15	9	24	9	17	6	32	176	1364	-	
Rubella <sup>a</sup>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	13	-
Tetanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
<b>Enteric</b>																					
Botulism	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cholera <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Cryptosporidiosis <sup>a</sup>	5	1	-	2	1	13	2	3	1	2	3	4	2	3	2	3	3	21	249	-	
Giardiasis <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	1551	-
Haemolytic uraemic syndrome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	-
Hepatitis A <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	1	-	1	1	2	-	-	5	54	-	-
Hepatitis E <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-
Listeriosis <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Salmonellosis <sup>a</sup>	5	3	-	1	1	12	2	3	8	3	17	4	16	4	11	6	12	107	2059	-	
Shigellosis <sup>a</sup>	-	-	-	2	-	1	-	1	-	-	-	3	3	2	1	-	-	9	57	-	-
Typhoid <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	35	-
Verotoxin-producing E. coli <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-
<b>Miscellaneous</b>																					
Creutzfeldt-Jakob disease	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Meningococcal conjunctivitis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-

<sup>a</sup>laboratory-confirmed cases only. <sup>b</sup>HIV and AIDS data are reported separately in the Public Health Bulletin quarterly. <sup>c</sup>includes cases with unknown postcode.  
 NB: From 1 January 2005, Hunter/New England AHS also comprises Great Lakes, Gloucester & Greater Taree LGAs. Sydney West also comprises Greater Lithgow LGA.  
 NB: Data is current and accurate as at the preparation date. The number of cases reported is, however, subject to change, as cases may be entered at a later date or retracted upon further investigation.  
 GMA, Greater Murray Area; MAC, Macquarie Area; NEA, New England Area; FWA, Far West Area; WSA, Western Sydney Area; CSA, Central Sydney Area; NSA, Northern Sydney Area; MWA, Mid Western Area; SWS, South Western Sydney Area; HUN, Hunter Area; CCA, Central Coast Area; WEN, Wentworth Area; ILL, Illawarra Area; SES, South Eastern Sydney Area; NRA, Northern Rivers Area; JHS, Justice Health Service; MNC, North Coast Area.



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