

Urban design and health: Progress to date and future challenges

Melanie Lowe, Claire Boulange & Billie Giles-Corti, The University of Melbourne

Manuscript for *Health Promotion Journal of Australia*

Abstract

Over the last 15 years, a growing body of Australian and international evidence has demonstrated that urban design attributes are associated with a range of health outcomes. For example, the location of employment, shops and services, provision of public and active transport infrastructure and access to open space and recreational opportunities are associated with chronic disease risk factors such as physical activity levels, access to healthy food, social connectedness, and air quality.

Despite the growing knowledge base, this evidence is not being consistently translated into urban planning policy and practice in Australia. Low density neighbourhoods with poor access to public transport, shops and services continue to be developed at a rapid rate in the sprawling outer suburbs of Australian cities.

This paper provides an overview of the evidence of the association between the built environment and chronic diseases, highlighting progress and future challenges for health promotion. It argues that health promotion practitioners and researchers need to more closely engage with urban planning practitioners, policymakers and researchers, to encourage the creation of healthy urban environments through integrated transport, land use and infrastructure planning. There is also a need for innovative research to evaluate the effectiveness of policy options. This would help evidence to be more effectively translated into policy and practice, making Australia a leader in planning healthy communities.

23 **Introduction**

24 The impact of city planning on health was clearly demonstrated during the 19th century, when
25 it was successfully used to reduce the spread of infectious diseases in European cities by
26 improving sanitation, housing and separating polluting industrial land uses from residential
27 areas.¹ The urban planning and public health disciplines were born out of these efforts.^{1,2} Once
28 basic living conditions improved, concern about the influence of city planning on health became
29 somewhat dormant. However, this interest has been reignited, with the recognition that car
30 dependence and continued separation of land uses in ever-expanding residential suburbs is
31 having unintended negative consequences for human health and wellbeing.^{1,3}

32 Chronic diseases such as cardiovascular disease, cancer, mental illnesses and Type 2 diabetes
33 have now overtaken infectious diseases as the leading cause of death and disability amongst
34 urban populations,^{1,4-6} creating a large healthcare and financial burden.⁷ These diseases share
35 a number of common lifestyle risk factors, including physical inactivity, unhealthy diets,
36 smoking and excessive alcohol consumption.^{4, 5} Many inter-related features of the built
37 environment, such as levels of housing density, the layout of streets, and the location of
38 employment and essential infrastructure and services directly or indirectly contribute to chronic
39 diseases and their risk factors.^{8, 9} With over 90 per cent of Australians now living in urban
40 areas,³ it is vital that we create built environments that support, rather than undermine health
41 and wellbeing.

42 The view that urban design impacts on health is consistent with the ‘social-ecological model of
43 health’. This model recognises that there are multiple levels of influence on health, with many
44 of these located outside of the health sector.¹⁰ The physical, social, economic and political
45 factors that shape health outcomes have been termed ‘social determinants of health’, and
46 contribute to creating health inequities.¹¹ In cities, the various social determinants of health
47 interact in multi-directional ways to create a complex system.¹²

This article begins with a brief narrative review of the evidence of the association between urban design and health. The focus is on the impact of urban design on key chronic disease risk factors – physical activity, social connectedness, diets, alcohol consumption and air quality. The article also considers health promotion achievements to date, and highlights future challenges and opportunities for closer collaboration between urban planning and health promotion practitioners and researchers, and more consistent translation of research evidence into urban planning policy and practice.

Evidence of the impact of urban design on chronic disease risk factors and outcomes

Recently, significant progress has been made in understanding how specific characteristics of the built environment directly and indirectly affect population health.¹³ In Australia, physical inactivity is the fifth leading contributor to the disease burden,⁶ with almost 60 per cent of Australians aged 15 years or older being insufficiently active to benefit health.⁵ The literature establishes strong links between neighbourhood design and levels of physical activity, particularly walking for transport.¹⁴ Higher residential densities, good street connectivity based on grid networks, mixed land use and high-quality active transport infrastructure are associated with higher levels of walking and cycling for transport. This type of urban form creates shorter and more convenient walking and cycling routes between homes and jobs, retail and essential infrastructure and services.^{9, 15, 16} The literature also indicates that shorter distances to public transport stops are associated with higher levels of walking, especially among people on lower incomes who are more reliant on public transportation.¹⁷ Furthermore, having accessible and attractive public open space and recreation facilities is associated with higher levels of recreational physical activity, particularly walking.^{9, 15} Traffic volumes and perceived traffic safety are also associated with children walking and cycling to school.¹⁸ For example, children attending schools located in neighbourhoods with both low traffic volumes and highly-connected street networks are significantly more likely to walk to school than other children.¹⁸

In this context, urban design is increasingly seen as an important intervention for promoting physical activity and health.

The literature indicates a number of other associations between chronic disease risk factors and urban design attributes. In addition to increasing physical activity, good access to attractive and safe streets and public open and green spaces can also have mental health benefits. It is thought to do so by fostering formal and informal social interactions and exposing people to nature.⁹ For mental health, the quality rather than the quantity of public open and green space appears to be important.¹⁹

Unhealthy diets are the leading cause of the chronic disease burden in Australia.⁶ Poor access to healthy food outlets has been shown to be associated with poor diets and higher levels of obesity.²⁰ Conversely, having a source of healthy food such as a supermarket nearby is associated with healthier diets.⁹ A number of studies have also found positive relationships between alcohol outlet density and domestic violence,²¹ assault,²² and harmful consumption of alcohol,²³ with some support for a modest effect on hospital contacts for anxiety, stress, and depression.²³

The design of urban areas can also affect air quality, particularly from traffic, with poorer air quality contributing to respiratory disease and exacerbating other chronic illnesses such as cardiovascular disease.²⁴ For example, poorly designed higher density housing located on heavily trafficked roads, increases exposure to traffic-related pollution with concomitant impacts on respiratory illness.¹⁶

Despite the rapidly growing evidence-base, there is still much to be understood about the complex processes that shape urban population health and, in particular, health inequities.²⁵

Challenges for healthy urban design

Amongst health promotion practitioners there is a growing understanding of the links between the built environment and health, and increasingly urban planners in Australia recognise the role their profession plays in creating healthier communities.²⁶ Indeed, a growing number of planning policies and guidelines in Australia encourage the creation of healthier urban environments. Leading examples include Victoria's *Environments for Health* state-wide framework for Municipal Public Health Plans. Introduced in 2001, this framework encourages the integration of urban planning and health planning at the local government level.²⁷ The National Heart Foundation of Australia has also developed guidelines such as *Healthy Spaces and Places* (developed in collaboration with the Planning Institute of Australia and the Australian Local Government Association)²⁸ and *Healthy by Design* for South Australia and Tasmania,^{29,30} all of which aim to assist urban planners to design healthier urban environments. In addition, there is increasing consideration of factors that influence health in state planning strategies such as Western Australia's sustainable cities initiative, *Liveable Neighbourhoods*,³¹ state legislation such as Victoria's *Transport Integration Act 2010*,³² and draft metropolitan planning strategies such as those for Melbourne³³ and Sydney.³⁴

Despite this progress, the principles of healthy urban design are not being consistently incorporated into planning policies in Australia. Moreover, there remains a gap between the evidence and urban planning practice. A study conducted in Victoria in 2007 found that only 26 per cent of the urban planners surveyed frequently considered health issues in their day to day planning work.²⁶ Meanwhile, low density neighbourhoods continue to be developed at a rapid rate on the fringes of Australia's major cities. Typically, these new suburbs have segregated land uses and are car-dependent, with poor access to shops, jobs and services and public transport.^{1, 3} While inner city areas generally have better access to employment, education, jobs and services by public transport, walking or cycling, these areas suffer from

problems associated with housing affordability and traffic congestion. Importantly, urban design differences between neighbourhoods may be contributing to health inequities within cities.²

Planning healthy urban environments

So what approaches could assist policymakers and planners to create healthier urban environments? Importantly, there is a need for greater alignment between health promotion and urban planning.^{35, 36} To deliver health enhancing communities, integrated planning involving collaboration across sectors and levels of government is required to achieve coherence and consistency of policy goals and policy instruments.³⁷ Integrated planning seeks to overcome the problems associated with governments operating within traditional sectoral silos, resulting in fragmented governance, inefficiencies, and/or sub-optimal outcomes.^{37, 38} In Australia, there has been increasing interest in integrated planning that promotes positive health and wellbeing outcomes, particularly at the state level in South Australia where there is a whole-of-government mandate for utilising a Health in All Policies approach.³⁹ However, there remains a need for well-integrated land use, transport and infrastructure planning in many jurisdictions.

Health impact assessment is a methodology that can assist with promoting health through integrated planning. It allows policymakers to accept, reject or amend policies or plans in any sector based upon their potential or current effects on population health.⁴⁰⁻⁴² Whilst health impact assessment activity in Australia has increased since the 1990s, more widespread and consistent use of health impact assessment could increase consideration of health in planning decision-making.⁴³

There are a number of other conditions that are critical for effective policymaking and planning, including planning that promotes health. First, community participation in the planning process is important,⁴⁴ as it ensures that community concerns are considered and assists policy implementation by giving community members a sense of ownership of the policy or program.⁴⁵

For community participation to be effective, the process should be transparent with frequent communication between all parties.⁴⁶ Second, it is essential for policies to include a comprehensive implementation plan, with clear actions, targets and delegation of responsibility.^{28, 47} This ensures that policies are clear statements of intent, rather than just aspirational documents. Third, it is vital to evaluate the implementation and effectiveness of policies and plans, to measure progress against targets, and keep the urban planning process open and transparent.⁴⁸ Finally, mechanisms are required to ensure timely translation of research evidence on healthy urban design attributes into planning decisions, in keeping with the idea of evidence-based practice.⁴⁹

Research approaches to facilitate evidence-based healthy urban design

While there is a mounting body of evidence supporting the association between the built environment and health outcomes, to date this has mostly been examined using cross-sectional study designs.⁵⁰ These are descriptive studies in which data are collected to provide a snapshot of a population at a single point in time. As these studies assess environmental characteristics and health outcomes simultaneously, it is difficult to establish causation. More recently a number of longitudinal studies have commenced,⁵¹⁻⁵⁴ which are better able to establish causation. These studies follow individuals over time and measure changes in both environmental variables and health outcomes. In so doing, they are able to assess whether the environment changes people's behaviour, or whether people pre-disposed to certain behaviours choose environments that match their preferences. Preliminary longitudinal evidence supports cross-sectional findings suggesting that increasing access to supportive environments positively changes behaviour and that the impact of the built environment may be causal.⁵²

Nevertheless, more policy-relevant research is required. 'Natural experiments' are now being used in a range of research disciplines, including public health, behavioural economics and education, to study the impacts and outcomes of policies.⁵⁵ Natural experiments allow

researchers to observe and study the direct and indirect health effects of changes in the built environment (e.g. provision of cycling or walking paths, or a new planning policy) that are implemented by policymakers or practitioners.⁵⁶ Australian capital cities are growing and changing rapidly through housing redevelopment and renewal programs, the construction of new residential estates and transport networks. These urban transformations are all opportunities to conduct natural experiments in collaboration with policymakers and practitioners. The outcomes of built environment interventions may take some time to manifest. By monitoring progress over time, natural experiments can act as an early warning system, should there be unintended negative consequences of decision-making, and provide evidence to guide timely adjustments to policies.⁵²

Complex-system modelling could also inform urban design decision-making. There is a growing recognition that cities are complex systems, with networks of inter-related urban design features interacting in complex, non-linear ways to determine health outcomes.¹² It is challenging for researchers and urban planners to account for this complexity. Complex-system modelling assists with this by simplifying reality into a conceptual model,⁵⁷ which can then be used to predict the potential effects of a policy or plan on a range of inter-related health risk factors. Even though the real world is considerably more complex than any model could be, a well-designed complex-system model can make explicit the dynamics that underlie a problem and reveal potential unintended consequences. A well-defined model that incorporates the most significant aspects of a problem can thus be an invaluable tool in decision-making. The Foresight report *Tackling Obesities: Future Choices* diagrammatically represents the very complex system created by the various social, environmental and economic determinants of obesity, and the multi-directional interactions between them.⁵⁸ While this level of complexity would be difficult to model, simplified models of the sub-systems, may nevertheless help advance research, policy and practice.

What role for health promotion researchers and practitioners?

To help advance this field, health promotion researchers and practitioners need to be more closely engaged with urban planning practitioners, policymakers and researchers. Although not without challenge, there has been a recognition of the need to reconnect the planning and health disciplines for more than a decade.^{35, 36} Working in partnership with planners and urban designers will assist in health outcomes being considered as communities are planned and could facilitate the translation of research evidence into planning practice. However, to be effective in this role, health promotion practitioners and researchers require training in healthy community planning to ensure that they have the requisite knowledge and skills.⁵⁹ Hence, during this period a number of built environment and health training programs have emerged in North America,⁶⁰ the UK⁶¹ and Australia.⁶² Helpfully, Botchwey and colleagues⁶⁰ provide an overview of US programs, including a suggested curriculum for built environment and health course work programs. To progress this work, health promotion academics could work in partnership with planning academics to develop healthy community planning programs within universities across Australia, and to deliver professional development short courses for those already in the field. This has already commenced in Australia with a number of planning⁶² and transport (Carey Curtis, Curtin University; Matthew Burke, Griffith University) academics leading the way within their own disciplines, supported by the work of leading public health and planning agencies (e.g. the Heart Foundation^{63, 64} and the Planning Institute of Australia²⁸). However, the number of interdisciplinary programs in Australia is limited⁶² and this represents a major opportunity for Australian academics to contribute to reconnecting health promotion and planning researchers, policymakers and practitioners.

Conclusion

A substantial body of literature demonstrates that specific features of the built environment are associated with risk factors for major chronic diseases. Whilst there is still much to be understood about the complex causal processes that shape urban population health and health inequities at local, regional and national scales,²⁵ the research to date is consistent and sufficient to inform many health-promoting urban design choices.⁵⁶ The challenge is to effectively translate research evidence into policy and practice. Integrated planning utilising collaborative approaches across the public and private sectors and levels of government, could assist policymakers to create healthier urban environments. Innovative policy-relevant research approaches and closer engagement between urban planners and health promotion practitioners and researchers could assist in encouraging integrated transport, land use and infrastructure planning, based on the urban health research evidence. There needs to be greater emphasis in public health and planning degrees and professional development on re-connecting the two disciplines, building upon emerging efforts to enhance knowledge and skills in planning healthy communities.^{35, 36}

References

1. Kent J, Thompson S, Capon A. Healthy planning. In: Thompson S, Maginn P, eds. *Planning Australia: An overview of urban and regional planning*. 2nd ed. Port Melbourne, Victoria: Cambridge University Press; 2012.
2. Macintyre S, Ellaway A. Neighborhoods and health: An overview. In: Kawachi I, Berkman L, eds. *Neighbourhoods and health*. Oxford, UK: Oxford University Press; 2003:20-42.
3. Capon A. The way we live in our cities. *Med J Aust*. 2007;187(11/12):658-661.
4. World Health Organization. *Global status report on non-communicable diseases 2010*. Geneva (SWITZERLAND): World Health Organization; 2011.
5. Australian Institute of Health and Welfare. *Australia's Health 2012*. Canberra: Australian Institute of Health and Welfare; 2012.
6. Institute for Health Metrics and Evaluation. *GBD profile: Australia*. Seattle (WA): IHME; 2013.
7. Australian Bureau of Statistics. *Year book Australia, 2009-10*. Canberra: Australian Bureau of Statistics; 2010.
8. Frumkin H. Urban sprawl and public health. *Public Health Rep*. 2002;117:201-217.

9. The Healthy Built Environments Program. *Healthy built environments: A review of the literature. Fact sheets*. Sydney (AUST): The Healthy Built Environments Program, Cities Futures Research Centre, The University of New South Wales; 2012.
10. Sallis J, Cervero R, Ascher W, Henderson K, Kraft M, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health*. 2006;27(297-322).
11. Marmot M. *Fair society, healthy lives. Strategic review of health inequalities in England post-2010*. London: UCL Institute for Health Equity; 2011.
12. Rydin Y, Bleahu A, Davies M, et al. Shaping cities for health: Complexity and the planning of urban environments in the 21st century. *Lancet*. 2012;379(9831):2079-2108.
13. Galea S, Vlahov D. Urban health: evidence, challenges, and directions. *Annu Rev Public Health*. 2005;26:341-365.
14. Saelens BE, Sallis JF, Frank LD, et al. Neighborhood environment and psychosocial correlates of adults' physical activity. *Med Sci Sports Exerc*. 2012;44(4):637-646.
15. Sallis J, Millstein R, Carlson J. Community design for physical activity. In: Dannenberg A, Frumkin H, Jackson R, eds. *Making healthy places: Designing and building for health, well-being , and sustainability*. Washington, DC: Island Press; 2011.
16. Giles-Corti B, Ryan K, Foster S. *Increasing density in Australia: Maximising the benefits and minimising the harm*. Melbourne (AUST): National Heart Foundation of Australia; 2012.
17. Ewing R, Cervero R. Travel and the built environment: A meta-analysis. *J Am Plann Assoc*. 2010;76(3):265-294.
18. Giles-Corti B, Wood G, Pikora T, et al. School site and the potential to walk to school: The impact of street connectivity and traffic exposure in school neighborhoods. *Health Place*. 2011;17(2):545-550.
19. Francis J, Wood L, Knuiman M, Giles-Corti B. Quality or quantity? Exploring the relationship between public open space attributes and mental health in Perth, Western Australia. *Soc Sci Med*. 2012;74(10):1570-1577.
20. California Center for Public Health Advocacy, PolicyLink, UCLA Center for Health Policy Research. *Designed for disease: the link between local food environments and obesity and diabetes*. Los Angeles (CA): UCLA; 2008.
21. Livingston M. A longitudinal analysis of alcohol outlet density and domestic violence. *Addiction*. 2011;106(5):919-925.
22. Livingston M. Alcohol outlet density and assault: A spatial analysis. *Addiction*. 2008;103:619-628.
23. Pereira G, Wood L, Foster S, Haggard F. Access to alcohol outlets, alcohol consumption and mental health. *PLoS ONE*. 2013;8(1):e53461.
24. Samet J. Community design and air quality. In: Dannenberg A, Frumkin H, Jackson R, eds. *Making healthy places: Designing and building for health, wellbeing, and sustainability*. Washington, DC: Island Press; 2011.
25. Diez Roux A. Complex systems thinking and current impasses in health disparities research. *Am J Public Health*. 2011;101(9):1627-1634.

- 295 26. Whitzman C. Barriers to planning healthier cities in Victoria. *The International*
296 *Journal of Environmental, Cultural, Economic & Social Sustainability*.
297 2007;3(1):145-153.
- 298 27. Department of Human Services. Environments for health: Promoting health and
299 wellbeing through built, social, economic and natural environments. Municipal public
300 health planning framework. Melbourne: Department of Human Services, Victorian
301 Government; 2001.
- 302 28. Planning Institute of Australia, Australian Local Government Association, National
303 Heart Foundation of Australia. *Healthy spaces and places: A national guide to*
304 *designing places for healthy living - an overview*. Kingston, ACT: Planning Institute
305 of Australia; 2009.
- 306 29. National Heart Foundation of Australia. *Healthy by design: A guide to planning and*
307 *designing environments for active living in Tasmania*: National Heart Foundation of
308 Australia; 2009.
- 309 30. National Heart Foundation of Australia. *Healthy by design SA: A guide to planning,*
310 *designing and developing healthy urban environments in South Australia*: National
311 Heart Foundation of Australia; 2012.
- 312 31. Western Australian Planning Commission. *Liveable neighbourhoods: A Western*
313 *Australian Government sustainable cities initiative*. Perth (AUST) 2007.
- 314 32. Victorian Government. Transport Integration Act 2010. Melbourne: Victorian
315 Government; 2010.
- 316 33. Department of Transport Planning and Local Infrastructure. *Plan Melbourne:*
317 *Metropolitan planning strategy*. Melbourne: Department of Transport, Planning and
318 Local Infrastructure, Victorian Government; 2013.
- 319 34. NSW Government. *Draft metropolitan strategy for Sydney to 2031*. Sydney: NSW
320 Government; 2013.
- 321 35. Corburn J. Confronting the challenges in reconnecting urban planning and public
322 health. *Am J Public Health*. 2004;94(4):541-546.
- 323 36. Corburn J. Reconnecting with our roots: American urban planning and public health in
324 the twenty-first century. *Urban Affairs Review*. 2007;42(5):688-713.
- 325 37. Rayner J, Howlett M. Introduction: Understanding integrated policy strategies and
326 their evolution. *Policy and Society*. 2009;28(2):99-109.
- 327 38. Kidd S. Towards a framework of integration in spatial planning: An exploration from
328 a health perspective. *Planning Theory & Practice*. 2007;8(2):161-181.
- 329 39. Health in All Policies Unit. *The South Australian approach to health in all policies:*
330 *background and practical guide, Version 2*. Adelaide, South Australia: Department of
331 Health, Government of South Australia; 2011.
- 332 40. Forsyth A, Slotterback CS, Krizek KJ. Health impact assessment in planning:
333 Development of the design for health HIA tools. *Environmental Impact Assessment*
334 *Review*. 2010;30(1):42-51.
- 335 41. Harris P, Harris-Roxas B, Harris E, Kemp L. *Health impact assessment: A practical*
336 *guide*. Sydney: Centre for Health Equity Training, Research and Evaluation, UNSW
337 Research Centre for Primary Health Care and Equity, UNSW; 2007.
- 338 42. Hensgen S. *Planning for health: A study on the integration of health and planning in*
339 *South Australia*: SA Health; February 2009.

43. Harris P, Spickett J. Health impact assessment in Australia: A review and directions for progress. *Environmental Impact Assessment Review*. 2011;31:425-432.
44. Thompson S, Gallico T. Are metropolitan planning frameworks healthy? The broader context. *State of Australian Cities conference* Brisbane, Queensland: Griffith University; 2005.
45. Aboelata M, Ersoylu L, Cohen L. Community engagement in design and planning. In: Dannenberg A, Frumkin H, Jackson R, eds. *Making healthy places: Designing and building for health, well-being, and sustainability*. Washington, DC: Island Press; 2011.
46. Sanoff H. *Community participation methods in design and planning*. New York: Wiley; 2000.
47. World Health Organization. *Healthy urban planning: Report of a consultation meeting*. Kobe, Japan: Centre for Health Development, World Health Organization; 10-11 March 2011.
48. World Health Organization, United Nations Human Settlements Programme. *Hidden cities: Unmasking and overcoming health inequities in urban settings. Joint UN-HABITAT/WHO report*. Kobe, Japan: World Health Organization and UN-HABITAT; 2010.
49. Krizek K, Forysth A, Slotterback CS. Is there a role for evidence-based practice in urban planning and policy? *Planning Theory & Practice*. 2009;10(4):459-478.
50. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW. Correlates of physical activity: why are some people physically active and others not? *Lancet*. 2012;380(9838):258-271.
51. Burton N, Haynes M, Wilson L-A, et al. HABITAT: A longitudinal multilevel study of physical activity change in mid-aged adults. *BMC Public Health*. 2009;9(76).
52. Giles-Corti B, Bull F, Knuiman M, et al. The influence of urban design on neighbourhood walking following residential relocation: Longitudinal results from the RESIDE study. *Soc Sci Med*. 2012;77:20-30.
53. Sugiyama T, Ding D, Owem N. Commuting by car: Weight gain among physically active adults. *Am J Prev Med*. 2013;44(2):169 –173.
54. Ogilvie D, Bull F, Cooper A, et al. Evaluating the travel, physical activity and carbon impacts of a ‘natural experiment’ in the provision of new walking and cycling infrastructure: Methods for the core module of the iConnect study. *BMJ Open*. 2012;2(1):e000694.
55. Brownson RC, Baker EA, Leet TL, Gillespie KN, True WR. *Evidence-based public health*. 2nd ed. New York (NY): Oxford University Press; 2011.
56. Jackson R, Wendel A, Dannenberg A. Healthy places research: Emerging opportunities. In: Dannenberg A, Frumkin H, Jackson R, eds. *Making healthy places: Designing and building for health, well-being, and sustainability*. Washington, DC: Island Press; 2011.
57. Newell B, Proust K, Dyball R, McManus P. Seeing obesity as a systems problem. *New South Wales Public Health Bulletin*. 2008;18(12):214-218.
58. Butland B, Jebb S, Kopelman P, et al. *Foresight: Tackling obesities: future choices - project report*: Foresight Programme, UK Government Office for Science; 2007.

- 384 59. Allender S, Cavill N, Parker M, Foster C. 'Tell us something we don't already know or
385 do!' - The response of planning and transport professionals to public health guidance
386 on the built environment and physical activity. *J Public Health Policy*.
387 2009;30(1):102-116.
- 388 60. Botchwey N, Hobson S, Dannenberg A, et al. A model curriculum for a course on the
389 built environment and public health: training for an interdisciplinary workforce. *Am J*
390 *Prev Med*. 2009;36(2 Suppl):S63-S71.
- 391 61. Pilkington P, Marco E, Grant M, Orme J. Engaging a wider public health workforce
392 for the future: A public health practitioner in residence approach. *Public Health*.
393 2013;127(5):427-434.
- 394 62. Thompson S, Whitehead A, Capon A. The healthy built environments program: A
395 joint initiative of the NSW Department of Health and the University of NSW. *NSW*
396 *Public Health Bull*. 2010;21(5-6):134-138.
- 397 63. Heart Foundation's National Physical Activity Advisory Committee. *Position*
398 *statement: The built environment and walking*. Melbourne: National Heart Foundation
399 of Australia; 2009.
- 400 64. National Heart Foundation of Australia. *Blueprint for an active Australia. Key*
401 *government and community actions required to increase population levels of physical*
402 *activity in Australia - 2010-2013*. Melbourne: National Heart Foundation of Australia;
403 2009.