Urban Environments & Health: Identifying Key Relationships & Policy Imperatives

Elspeth Mead
Jago Dodson
Claire Ellway

Urban Research Program
Research Monograph 10
October 2006
URBAN RESEARCH PROGRAM

The Urban Research Program (URP) was established in 2003 as strategic research and community engagement initiative of Griffith University. The strategic foci of the Urban Research Program are research and advocacy in an urban regional context.

The Urban Research Program seeks to improve understanding of, and develop innovative responses to Australia’s urban challenges and opportunities by conducting and disseminating research, advocating new policy directions, and by providing training assistance. We aim to make the results of our research and advocacy work available as freely and widely as possible.

URP RESEARCH MONOGRAPHS

URP Research Monographs are occasional papers that report research undertaken by the URP including investigations sponsored by external partners, which provide more extensive treatments of current urban policy problems and challenges than our more topical URP Issues Papers and scholarly Research Papers series.

All Issues Papers, Research Papers and Research Monographs can be downloaded from our website free of charge:

www.griffith.edu.au/centre/urp

Hard copies are available for purchase. Contact Ms. Joanne Pascoe, email: j.pascoe@griffith.edu.au.

The Authors of this issues paper:

Elspeth Mead, Senior Research Assistant with the Urban Research Program Email: e.mead@griffith.edu.au; Jago Dodson, Research Fellow with the Urban Research Program Email: j.dodson@griffith.edu.au; and Claire Ellway, Research Assistant with the Urban Research Program, Email: c.ellway@griffith.edu.au. Please direct enquiries to Jago Dodson.

This Research Monograph was prepared with the generous assistance of Queensland Health Population Health Services Branch. The authors wish to thank members of the Population Health Services Branch for their comments on a draft of this Monograph. Responsibility for the content of the Monograph lies with the authors and does not necessarily reflect the stated or implied views of Queensland Health or the Queensland Government.
# Table of Contents

Table of Contents........................................................................................................... vii

List of Tables.................................................................................................................... ix

List of Figures ................................................................................................................... ix

Executive Summary .......................................................................................................... 1

Chapter One - Introduction ............................................................................................. 3
  1.1 Project Statement...........................................................................................................  6
  1.2 Research Questions......................................................................................................  6
  1.3 Project Methodology....................................................................................................  7
  1.4 Literature Search.........................................................................................................  8
  1.5 Analytical Methodology ...........................................................................................  8
  1.6 Report Format ...........................................................................................................  9

Chapter Two - The Relationships - Health and Planning ................................................. 11
  2.1 Introduction.................................................................................................................. 11
  2.2 The Historical Link ..................................................................................................... 11
  2.3 Dividing Health and Planning..................................................................................... 12
  2.4 Urban Health – Basic Conceptions in the Literature .................................................... 14
  2.5 Obesity ....................................................................................................................... 15
  2.6 Sedentary Lifestyles................................................................................................... 16
  2.7 Physical Activity Required to be Healthy.................................................................... 17
  2.8 Urban Form, Physical activity and Health Promotion................................................ 18

Chapter Three - Built Urban Form and Health ............................................................... 20
  3.1 Introduction.................................................................................................................. 20
  3.2 Renewing the Health-Urban Link ............................................................................... 20
  3.3 Geographic Contexts................................................................................................... 22
  3.4 The Urban Form.......................................................................................................... 23
  3.5 Measuring Sprawl...................................................................................................... 25
  3.6 The Metropolitan Sprawl Index ............................................................................... 25
  3.7 Alternatives to Using an Index .................................................................................. 27
  3.8 Using Measured Urban Form to Assess Health Effects............................................. 28
  3.9 Using Alternatives to the MSI.................................................................................. 30
  3.10 Environmental Factors and Physical Activity......................................................... 33
  3.11 Proximity.................................................................................................................. 38
  3.12 Chapter Conclusion................................................................................................. 40

Chapter Four - Transportation Systems......................................................................... 42
  4.1 Introduction.................................................................................................................. 42
  4.2 Transport Planning..................................................................................................... 42
  4.3 Private Motor Vehicles as Health Risks.................................................................... 43
  4.4 Private Motor Vehicles and Obesity.......................................................................... 45
  4.5 Suburban Design....................................................................................................... 45
  4.6 Urban Form................................................................................................................ 47
  4.7 Public Transport........................................................................................................ 48
  4.8 Mixed-use Medium-density and Pedestrian Travel................................................... 48
  4.9 Proximity and Individual Factors............................................................................. 52
  4.10 Residential and Travel Preferences....................................................................... 53
  4.11 Chapter Conclusion.............................................................................................. 54

Chapter Five - Spatial Access to Health Services......................................................... 56
  5.1 Introduction................................................................................................................ 56
<table>
<thead>
<tr>
<th>Chapter Six - Initiatives and Policy</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Introduction</td>
<td>65</td>
</tr>
<tr>
<td>6.2 Health in Australian Planning Policy</td>
<td>65</td>
</tr>
<tr>
<td>6.3 The South East Queensland Regional Plan and Infrastructure Plan</td>
<td>66</td>
</tr>
<tr>
<td>Transport and health in the SEQ Regional Plan</td>
<td>67</td>
</tr>
<tr>
<td>Spatial Access to Services</td>
<td>68</td>
</tr>
<tr>
<td>Public Participation</td>
<td>68</td>
</tr>
<tr>
<td>6.4 Melbourne 2030</td>
<td>69</td>
</tr>
<tr>
<td>Urban Form</td>
<td>69</td>
</tr>
<tr>
<td>Transport</td>
<td>69</td>
</tr>
<tr>
<td>Spatial Access to Health Services</td>
<td>70</td>
</tr>
<tr>
<td>6.5 City of Cities: A Plan for Sydney’s Future</td>
<td>71</td>
</tr>
<tr>
<td>Transport</td>
<td>71</td>
</tr>
<tr>
<td>Spatial Access to Health Services</td>
<td>72</td>
</tr>
<tr>
<td>6.6 Network City: Community Planning Strategy for Perth and Peel</td>
<td>72</td>
</tr>
<tr>
<td>Transport</td>
<td>73</td>
</tr>
<tr>
<td>Spatial Access to Health Services</td>
<td>73</td>
</tr>
<tr>
<td>6.7 Hope for the Future: The West Australian Sustainability Strategy</td>
<td>73</td>
</tr>
<tr>
<td>6.8 Queensland – Integrated Planning Act (1997)</td>
<td>74</td>
</tr>
<tr>
<td>6.9 Brisbane City Council</td>
<td>74</td>
</tr>
<tr>
<td>Provision of Recreation Facilities</td>
<td>75</td>
</tr>
<tr>
<td>Transport</td>
<td>75</td>
</tr>
<tr>
<td>Spatial Access to Health Services</td>
<td>75</td>
</tr>
<tr>
<td>6.11 Australian Planning Policies and Health</td>
<td>76</td>
</tr>
<tr>
<td>6.12 Further Urban Policy Frameworks and Agendas</td>
<td>77</td>
</tr>
<tr>
<td>6.12.1 Healthy By Design: A Planners’ Guide</td>
<td>77</td>
</tr>
<tr>
<td>6.12.2 Agenda 21</td>
<td>78</td>
</tr>
<tr>
<td>6.12.3 Healthy Cities</td>
<td>79</td>
</tr>
<tr>
<td>6.12.4 Smart Growth</td>
<td>80</td>
</tr>
<tr>
<td>6.12.5 Active Living by Design</td>
<td>81</td>
</tr>
<tr>
<td>6.12.6 Addressing Car Dependence</td>
<td>82</td>
</tr>
<tr>
<td>City of Copenhagen Cycle Policy</td>
<td>83</td>
</tr>
<tr>
<td>TravelSmart Australia</td>
<td>84</td>
</tr>
<tr>
<td>6.13 Chapter Conclusion</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter Seven - Challenges and Opportunities</th>
<th>86</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Introduction</td>
<td>86</td>
</tr>
<tr>
<td>7.2 Challenges</td>
<td>86</td>
</tr>
<tr>
<td>7.3 Disciplinary Divides</td>
<td>87</td>
</tr>
<tr>
<td>7.4 Definitions</td>
<td>87</td>
</tr>
<tr>
<td>7.5 Conceptual Frameworks, Investigative Methods and Data Collection</td>
<td>88</td>
</tr>
<tr>
<td>7.6 Limited Policy Capacity</td>
<td>89</td>
</tr>
<tr>
<td>7.7 Fragmented Initiatives</td>
<td>90</td>
</tr>
<tr>
<td>7.8 Opportunities</td>
<td>90</td>
</tr>
<tr>
<td>7.9 Interdisciplinary Engagement</td>
<td>90</td>
</tr>
<tr>
<td>7.10 Major Conceptual Programs</td>
<td>91</td>
</tr>
<tr>
<td>7.11 Policy Engagement</td>
<td>92</td>
</tr>
<tr>
<td>7.12 Priorities for Future Research</td>
<td>92</td>
</tr>
<tr>
<td>7.13 Promotion of Future Research</td>
<td>94</td>
</tr>
<tr>
<td>7.14 Chapter Conclusion</td>
<td>94</td>
</tr>
</tbody>
</table>
Chapter Eight – Conclusions of the Review

8.1 Research Questions

8.2 Concluding remarks

References

Appendix A: Definitions

Appendix B: Major Electronic Databases Sourced

List of Tables

Table 1: Project Objectives

Table 2: Motor Vehicle Emission Pollutants Associated with Specific Diseases

Table 3: Projected Transport Infrastructure Expenditure ($M) by Mode (Excluding Rail Freight Infrastructure) for SEQ, 2006-2026

List of Figures

Figure 1: Street Hierarchy

Figure 2: Comparison of Travel Distances and Connectivity of Street Networks in Selected Neighbourhoods, Atlanta

Figure 3: Active Living by Design Community Action Model

Figure 4: Research Priorities
Executive Summary

Purpose of the Project

This Research Monograph investigates the relationship between urban environments and health. The project examines the empirical evidence for relationships between urban environments and health outcomes, focusing on three specific aspects of the urban environment: urban form, transport systems and the location of health services. The research was a collaborative project of Griffith University’s Urban Research Program and Queensland Health.

Findings of the Project

Overall Findings

The main finding of the research is that the evidentiary base for many expected relationships between urban form, transport systems, health services location and eventual health outcomes is underdeveloped. While some associations between urban environments and behavioural outcomes have been identified, there is insufficient evidence to identify specific causal relationships between urban form, transport systems, the location of health services within urban areas and specific health outcomes. This finding indicates that a much greater research effort is required into both health and urbanity to identify urban-health relationships.

Built Urban Form and Health

There is a relatively undeveloped research base that demonstrates connections between urban built form and health outcomes. While some associations have been found between urban form and individual behaviour, (such as greater levels of physical activity) social health outcomes remain uncertain. Some statistical associations have been identified at the metropolitan scale, but at the local level there is insufficient research to support strong conclusions about the relationship between urban form and health. This insufficiency, in part due to the low number of studies that have been conducted, is also a consequence of the weak conceptual and methodological frame of such studies.

Transport Systems and Health

Compared to urban form, the impact of transport systems on urban health outcomes has received comparatively little attention. Those studies that have been completed tend to focus on pedestrian travel, typically in relation to land-use destinations and route quality. Links between public transport and public health are very hard to find in the research literature. There is, in sum, an urgent need to study the relationship between transport systems and health outcomes.
**Spatial Access to Health Services**

This area of the literature is the most underdeveloped of the three urban aspects investigated by this project. There is some research to suggest a definite relationship between health outcomes and access to specific health services. Other studies suggest an association between health outcomes and the location of health services, but in general the broader literature does not provide evidence of demonstrable links. This area merits much greater attention from health and urban researchers.

**Initiatives and Policy**

This project reviewed recent major Australian metropolitan planning documents to assess the extent to which they seek to achieve urban health outcomes through planning instruments and policies. The review found that while there is some attention to health issues in Australian metropolitan strategy, there are very few specific measures that intentionally address health issues. Australian metropolitan strategy does not advance the improvement of urban health outcomes through urban planning. While some *ad hoc* planning programs may assist to improve urban health outcomes, the evidence supporting the effectiveness of such programs is uneven and limited.

**Challenges and Opportunities**

**Expansion of Urban Health Research**

This project demonstrates a clear need to improve the evidence base for perceived or assumed urban health relationships. The current literature lacks coherent conceptual and methodological frameworks. There is also a dearth of research studies available to support assumed relationships; while inter-jurisdictional research, too, is very limited. Researchers, policy makers and governments need to expand the quantity and quality of research into the relationship between urban environments and health outcomes.

**Collaboration Between Urban and Health Researchers**

The overall lack of an extensive and coherent research base and the divide that has emerged between health and planning researchers and professionals during the 20th Century needs urgent redress. It is essential that health and urban researchers engage intensively and extensively to build the research and evidence base for urban health investigations. Funding agencies need to reflect to this imperative in their disbursement strategies.
Chapter One - Introduction

Urban issues are returning to the health agenda. With the rise of public concern about the health impacts of cities and the growing interest in sustainable urban planning there is an opportunity to (re)connect reform in these two traditional urban issues in a new approach to urban public health. Amongst policy makers and researchers, at least, there is a growing awareness of the need to re-examine the link between the urban environment and the health of urban populations.

A range of anxieties about the uneven patterning of the urban socio-spatial process, urban form, transport systems and spatial access to health services, have been expressed in recent years. Urban health issues identified by Queensland Health include:

- The increase of road transport - increasingly associated with significant and serious impacts on health including air quality, noise and injury.
- Traffic emission. In the urban areas of Queensland, and particularly the south-east region, motor vehicle emissions account for 62% of NOx emissions, 68% of carbon monoxide emissions and a significant amount of VOC emissions.
- Respiratory health - the primary (ill)health outcome related to exposure to air pollutants.
- Physical activity in communities - linked to the physical environment as well as behavioural and social determinants.
- Proximity and density of places for physical activity within neighbourhoods - associated with physical activity participation.
- Lack of access to transport - due to affordability, safety, availability, convenience, and appropriateness of the type of transport can act as a barrier to people’s participation in a range of activities and access to services.
- The health impact of poor housing - often exacerbated by housing located in areas where there are high levels of unemployment, inadequate transport, environmental hazards, and violence.
- Housing that is poorly located – associated with isolation from historic community support networks.

(Queensland Health 2004)

Some of these connections are well understood. For example, ‘point source’ emissions of pollutants, noise and pathogens have long been identified as potentially contributing to adverse health risks. Numerous reports have also identified various forms of atmospheric and water pollution, that contribute towards poor health outcomes.

Social health determinants are also relatively well understood by health researchers, practitioners and policy makers. They are, however, but poorly addressed by urban planning. Social isolation and socio-economic deprivation are known to contribute to reduced health outcomes. The
connection(s) between health, social determinants and urban environments, including the built-form and urban structure, is much less well understood by either health practitioners or planners. There is, in short, scant appreciation of how planning can play a role in shaping urban environments to ensure positive relationships between health outcomes and urban processes.

This problem is in part the result of the complexity of the health-urban link, particularly where some urban health relationships are either less apparent or immediate. The case of physical activity is a good example. The benefits of regular moderate levels of physical activity are widely recognised by health practitioners while active, non-motorised transport is viewed by planners as more environmentally sustainable than motorised modes. However, understanding the influence of built form on physical activity levels is relatively limited and accounting for multiple influences on physical activity patterns is methodologically complex and challenging.

The impact of urban systems on health outcomes, such as the effects of transportation systems or land-use activity arrangements are also less well understood. Emerging examples of systemic factors include the role of physical activity in health maintenance, the impact of neighbourhood amenity on individual and community wellbeing, the effects of social isolation and polarisation on health and spatial access to health services and the relationship between built form and health. All of these factors may affect and shape the health of a given individual or group, but untangling the causal processes and their relative impact remains problematic for both urban and health researchers.

Spatial provision of health services is another area of common interest. Whilst planning purports to efficiently manage land-uses and activities in rapidly urbanising locations, mismatches between residential location and human and health service provision can occur. Such spatial mismatches between the need for health services and the capacity of individuals and households to access such services may impose costs on households that in turn result in health impacts, for example, through greater strain or stress on household resources, or more simply, through the inability to travel to services at the apposite time.

While there are many unknown dimensions of urban-health relationships, perhaps the most pressing problem in the urban environmental health nexus is the current inadequacy of planners’ understanding of the broader determinants of health and the particular and systemic health impacts of planning policies, processes, decisions and outcomes. The challenge of linking planning policies to subsequent urban outcomes and tracing the connection between such effects and health outcomes remains unmet. A further pertinent question is the extent to which health priorities would compete with other urban issues faced by planning in the production of planning policies. Even if definitive demonstrable links could be made between certain planning policies and health outcomes, planners may continue to subordinate health concerns relative to other strategic concerns - such as a desire to limit the regulation and cost of private development.
Planning scholars have, to date, failed to adequately illuminate this area of concern.

Also of import are the limits to health practitioners’ capacities to promote healthier urban policies due to lack of familiarity with the urban policy field. A particular example is the process of market-driven urban consolidation that increases residential densities whilst having the potential to simultaneously reduce living space and human amenities. Such changes to urban environments are the outcome of complex economic, social and political relationships that are the result of multiple, often interwoven, planning and other policy processes. These processes need to be comprehended from a health perspective to inform policy changes that avoid or mitigate adverse health effects. Empowering health practitioners and policy makers to critically and effectively engage with urban policies is a key task in addressing this issue.

Greater capacity to engage with health issues through the planning process requires evidentiary support. Evidence of the urban dimension of the health of populations is uneven, particularly for problems that are relatively recent, such as rising obesity rates or increasingly sedentary lifestyles. This uneven knowledge base is in part due to a lack of extensive research that can demonstrate urban-health links and the urban policy options needed to address the problems. When combined with an overall lack of strategic or program level knowledge, this limits the extent to which health objectives receive prominence in planning strategies. A similar policy gap exists in the understanding of specific policy instruments that can assist to avoid, mitigate or remedy adverse health outcomes through improved management of urban environments.

Until the broad health relationships within cities are better understood it is unlikely that planning will be able to make an innovative and positive contribution to the improvement of urban public health. Indeed, given the knowledge and policy vacuum described above we cannot be certain that some planning measures and urban development may not actually be worsening public health outcomes in some urban communities or among some population groups. Planning policy makers and scholars are potentially presently incapable of recognising these adverse relationships because they lack adequate knowledge. They are thus unable to make informed decisions about reforming existing practices, crafting new planning interventions to ameliorate adverse urban-health interactions, or promoting positive urban-health interactions.

There is also the added need to interpret international research for the Australian experience. The particular character and experience of urbanisation in Australia may generate relationships between urban environments and health that vary from other jurisdictions. This issue needs to be recognised when undertaking an international literature review. It is important not to uncritically juxtapose overseas urban-health assumptions and policies upon the Australian urban context.
The concerns and problems outlined above indicate the need to extend both the breadth and methodological sophistication of urban health research. Before this can be achieved, however, it is necessary to comprehend the current urban-health research terrain: to map out issues and areas that are well understood and to identify those parts that are poorly comprehended. It is this task the present report undertakes.

1.1 Project Statement

This report presents the results of research that charts the current scholarly and policy evidence base for understanding relationships between urban environments and health outcomes. The project was undertaken by the Urban Research Program at Griffith University in collaboration with Queensland Health.

The project focuses on three aspects of urban systems that, although considered by policy makers to strongly influence health outcomes, have yet to be adequately investigated. These are:

- **Urban form** - Specifically the external urban form rather than the interior of individual buildings. Hence the bulk and proximity of buildings is of concern, rather than the quality of interior conditions, such as structure, ventilation, lighting and humidity. Such interior matters are widely understood by researchers and are not considered here. Urban form in this research project does, however, include circulation and access systems via streets and footpaths that may impact on health.

- **Urban transportation systems** - Including physical infrastructure such as roads, footpaths, bike tracks and railway lines and the levels of service provided by public transport including connectivity and accessibility. Direct effects on health arising from transportation systems’ emissions and noise are currently well known and informed by a voluminous literature; these will not be considered in this project. Similarly, the health impact of transport accidents is also well known and will not be a focus of the present project.

- **Spatial access to health services**, including the interaction with transportation systems is however a matter over which planning can exert some influence. The project will, therefore, review literature on health access in urban space.

1.2 Research Questions

This research project is guided by the following research questions:

- What is the current state of local and international knowledge about the links between urban form, urban structure and health outcomes?
• What policy measures are available internationally to health and planning practitioners to secure and improve positive health outcomes?
• How effective have these policy measures been in maintaining and improving positive health outcomes?
• To what extent have health issues been considered in recent Australian planning policies?
• What scope exists for further inclusion of health concerns into urban planning frameworks and how might this be operationalised in policy and service provision?
• Where are the knowledge gaps and what urban-health issues and problems require further investigation?

1.3 Project Methodology

Table 1 sets out the rationale and ambition of the research.

<table>
<thead>
<tr>
<th>The major issues underpinning this research identified as:</th>
<th>Urban environments are re-emerging as a health issue in Australia and in Western countries generally. There is currently limited policy knowledge about urban environmental impacts on health and the potential for planning to moderate these impacts. A strategic research overview is required to inform the development of planning policies that are aligned with health objectives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>This research designed to be a preliminary investigation based on a review of secondary sources aimed to:</td>
<td>Conduct a systematic review of the international and Australian scholarly literature on the health impacts of urban environments and planning policy. Survey how Australian urban policies currently apprehend health as a planning issue. Identify policy directions for enhancing health outcomes via urban planning policy. Outline potential programmatic initiatives, such as training and collaborative projects, that would improve the alignment of planning and health policy agendas.</td>
</tr>
<tr>
<td>The objectives of this research are to assist health and planning policy makers to:</td>
<td>Inform strategic policy and service planning establish any need for further future investigations including specific issues for investigation Prioritise future primary empirical investigations of specific aspects of the urban-health nexus Identify preliminary opportunities for advancing urban health outcomes through both health and urban policies</td>
</tr>
</tbody>
</table>

This project does not collect or analyse primary data. The study methodology comprises four substantive components.

• A comprehensive and systematic literature review of the health, social psychology, environmental and planning literature. This review
focuses on the key issues of the health impacts of built form; the health impacts of transportation systems and the health dimensions of spatial access to health services. The review was undertaken via the application of a structured methodology to identify, organise and summarise research publications reporting on urban-health relationships.

- A major survey and review of the inclusion and consideration of health issues in relation to urban areas within recent and current State metropolitan urban policy and planning frameworks and strategies, based on a ‘desk review’ of key documents.
- An identification of opportunities for inclusion of health concerns into Australian policy and planning frameworks, at the Federal, State and Local levels.
- A gap analysis to identify and make recommendations for future directions for research and public policy in the planning and public health area.

1.4 Literature Search

The first phase of this project identifies literature relevant to the project research questions. The literature search focuses on articles in peer-reviewed scholarly journals across medical, health and social science disciplines. Major electronic databases searched are listed in Appendix B. Search terms such as ‘urban planning’ with ‘health’, ‘town planning’ with ‘health’ and ‘access’ with ‘health provision’ were used. Further terms included ‘mental health’, ‘access to green space’, ‘built environment’ and ‘human health’.

Whereas literature on ‘urban/built form’ and ‘transportation systems’ in relation to health is relatively well developed at a national and international scale, the literature concerning ‘spatial access’ and ‘health services’ appears to be more limited.

In addition to sourcing literature from databases, hard copies of articles and books were also referenced. The internet proved a valuable source of information and source of publications. A broad range of relevant internet sites were visited, although the list of the search engines and websites reported in Appendix C is by no means exhaustive.

1.5 Analytical Methodology

To assist with the systemic review, a matrix was devised to record and categorise aspects of the literature. The matrix included the following fields:
The project applied a gap analysis to the systemic review of the literature. This identified research which analyses what is known about the relationship between the urban form and health. Literature was identified with health objectives for populations living within urban environments as well as measures to achieve these objectives. Using the gap analysis method to identify shortcomings in what is occurring allows the issues that need attention to be identified.

1.6 Report Format

This Chapter has introduced the context for the project and its objectives; identified the research questions and described the method of investigation. Chapter 2 examines the historic relation between health research and urban planning and considers how ‘health’ is conceptualised in the literature, especially in relation to physical activity, obesity, and the urban form. The chapter finds a re-emerging relationship between the disciplines of health and urban planning.

Chapter 3 considers the relationship between the built urban form and health. Methods to measure urban form, urban proximities, and environmental factors that relate to health outcomes are discussed. The chapter focuses on the concept of urban sprawl and various metrics of this phenomenon. The use of such metrics in relation to health outcomes is reviewed.

Chapter 4 examines contemporary urban transport patterns and processes. It identifies those aspects of transport systems related to health outcomes such as circulation networks, mode patterns, spatial activity locations, household preferences and perceptions.

Chapter 5 assesses literature reporting a connection between the location of health services within urban areas and the spatial access to those services of both general and specific populations. The Chapter finds this aspect of the urban-health relationship to be particularly under represented in scholarly literature.
Chapter Six identifies reviews the extent to which health concerns are currently included in Australian urban policy. A selection of possible measures to improve health through urban policy frameworks is reviewed.

The Final Chapter of the monograph identifies challenges and opportunities. It finds a major research effort to refine and develop knowledge of the relationship between urban form and health outcomes to be imperative.
Chapter Two - The Relationships - Health and Planning

2.1 Introduction

Urbanisation has always been associated with public health issues. Yet in recent decades the shared origin of these two modern disciplines has been largely forgotten. The links between public health and urban planning deserve restatement as many of the current concerns about urban health can be linked to the separation of health and planning concern. Whereas this relationship was once well established with common concerns and responses, the relationship diminished as the most pressing problems were addressed and policy and program attention diverged.

This Chapter presents an overview of the relationship between the two disciplines of ‘health’ and ‘urban planning’, how the two disciplines originally developed in tandem but then grew apart, and how a renewed emphasis on public health concerns within urban planning could play a critical role in addressing contemporary health issues.

2.2 The Historical Link

In the 19th Century the emerging disciplines of public health and urban planning were inextricably intertwined, sharing mutual objectives of improving the physical and social conditions of urban populations, typically in reaction to the ‘horrors’ of new industrial cities. Medical thinking about health problems and disease viewed many conditions as being caused by excessive urban population densities which generated unsanitary and overcrowded living conditions. Few 19th Century cities provided adequate sanitation. This, combined with poor nutrition and contaminated water exacerbated disease, not only among the poor but within more affluent social groups (Corburn 2005).

In the 19th Century, rural migrants and foreign immigrants relocated to cities en masse, pulled by the lure of improved wages, greater work opportunities and social interaction. In the country, on the other hand, labourers leaving agricultural employment depressed the local economy, pushing population into towns and cities. In the industrial city low wages, high housing costs and an unequal distribution of wealth resulted in extreme overcrowding and deteriorated living conditions. The concentration of people in substandard living conditions exacerbated disease producing sporadic and alarming urban epidemics.

Physicians associated air-borne diseases such as Typhus, Yellow fever, Smallpox, Cholera and Tuberculosis with the squalid living conditions particularly evident in the poorer areas of the industrial cities. Reform movements, with their vanguard in a concerned middle class, supported
public intervention to combat the perceived moral and health dangers of the intensively urbanised industrial city.

The reform movements became embryonic health and planning programs. Reformers extended reticulated sewers and water supplies, paved streets, improved housing, and campaigned for personal hygiene. In the late-19th Century, slum clearances and relocation programs moved city dwellers away from overcrowded and squalid living conditions and factory contamination in the cities. Urban reformers in the USA introduced zoning laws and many jurisdictions imposed building codes to keep dwellings separate and to protect residential areas from noxious commercial and industrial enterprises. Single detached family dwellings were developed in middle and outer residential areas, with fresh air, clean water and space to grow vegetables. Transport systems played a key role in this process. Tramways opened up more distant, cheaper land for suburban residential for the poor and modest income groups.

Such health and planning programs rapidly reduced incidence of water- and air-borne diseases resulting in immediate health improvements. Overcrowding, seen as the major perpetrator spreading disease, was substantially reduced in the early decades of the 20th Century.

2.3 Dividing Health and Planning

The manipulation of the urban environment for health purposes located people away from intensively used and highly degraded urban cores. Such policy relied on a logical, preventative method: the use of space as a public health tool. Individuals and households were separated from one another, while various resource and waste streams, such as air, water and sewage, were also spatially separated via reticulation systems. On aggregate, these measures involved less complex and more broadly applicable therapy than the application of specific medical remedies to diseased individuals.

Having relieved the health crisis through the segregation of living place(s) from production and circulation space the discipline of health began to concentrate on curing specific diseases. Discipline attention shifted to public health strategies such as immunisation, vaccination and prevention at an individual level. With technological advances in the development of pharmaceutical treatment (e.g., antibiotics) the focus of public health became increasingly estranged from urban spatial concerns.

The discipline of urban planning, meanwhile, was also pursuing new theories – beyond a concern for public health. In the UK Ebeneezer Howard’s utopian ‘Garden City Movement’ planned for self sufficiency with the promise not only of improved public but an overall enhancement of society. Shops and services were to be located close to residential areas while spaces of production and employment were assigned to the outskirts of the city. Garden cities were planned with the intention of providing a better life for
working people, away from squalid overcrowded living conditions and removed from industrial pollutants (Bounds 2004; Stilwell 1993).

This early form of residential urban development was the inception of suburbanisation as we know it today. Wars and depression interrupted the achievement of democratic suburbanisation planners. After World War II, however, a long boom in (sub)urban housing supply, and the relocation of populations from crowded cities into nearby suburban areas or into new towns, proceeded apace. Under the influence of the Garden City Movement, urban density was restricted, while towns and cities were surrounded by green belts/buffers.

Planners focused on the rational use of space according to projections about population growth, the distribution of industry, and regional development, rather than on aesthetics of urban design or quality of city life. New satellite towns were planned near large cities, inner city slum areas were demolished to improve transport networks and maximise land values, and former inner-city residents were shunted out to dreary estates on the periphery of large cities or re-housed in high-rise blocks. (Jochelson 2004:6).

Such planning principles were applied, if somewhat unevenly, to Australian cities. The Victorian Housing Commission undertook a large slum clearance program in the 1970s. Howard’s Garden City inspired the design of many of that city’s suburbs under the control of the National Capital Development Commission.

With public health problems largely overcome by the mid-20th Century, the links between planning and health were loosened and then lost, to the longer term detriment of both enterprises. Nevertheless, vestiges of these early planning concerns can be seen in the contemporary concerns of planners for provision of open space and managing building bulk. Most local planning schemes in Australia, for example, retain a concern with minimum dwelling and allotment sizes that reflects the historic concern with limiting urban population densities and the potential for overcrowding. These historic origins are however largely forgotten; most local planning schemes provide little explanation as to the basis for their current regulations regarding housing layout, design and bulk.

Yet at a time when planning and health are at their point of greatest divergence, new health concerns about cities have arisen. Two issues have received particular attention: levels of obesity and levels of physical activity. Much recent attention has been directed to urban form and structure and whether these impact on health, and if so, how these impacts occur. Critical questions have been raised such as: What are the impacts of ongoing car-dependent urbanisation? What might be the impacts of higher dwelling densities? What relationships underlie these impacts? How can we identify causal factors and influences? How can planning be reformed to diminish adverse health impacts from urban systems? As yet these questions remain
largely unresolved in both health and planning literature. The remainder of this project identifies the current extent of knowledge and the policy and research steps needed to address gaps and inadequacies.

Chapters Two, Three and Four of this report review the extent to which public health and urban social science have addressed such concerns and what relationships have been demonstrated. But first, to assist with this review, a conception of what constitutes ‘health’ is required.

2.4 Urban Health – Basic Conceptions in the Literature

Given the concern in this project with the concept of health, it is relevant to identify how existing literature conceptualises and defines ‘health’, especially the aspects of health that may be impacted by urban environmental features such as urban form or transportation systems.

Initial engagement with the literature suggests that while research projects have examined particular health impacts of urban form, no single study has assessed the complete spectrum of health impacts that are conceivably influenced by urban factors. In fact, the very enormity of such a task makes it doubtful it could be undertaken successfully.

The literature review of health-urban in this project is restricted to non-communicable diseases. This project is concerned with urban causes of disease that are specifically not identifiably due to discrete biological organisms (e.g. classic urban contagions). Nor is the project concerned with the impact of toxins or substances on health, such as vehicle emissions or other forms of pollution. Such factors have been well-covered by the health literature and the processes of causality are well appreciated. The project defines the field of ‘health impact’ to concentrate on the causes of increased morbidity and mortality from chronic diseases. Examples of such diseases include diabetes and heart disease. However, the variables of chronic diseases are still considerable, and often not specifically related to urban environments, which could make the review conceptually and methodologically cumbersome.

An alternative strategy would be to consider health from a preventative perspective. Working backwards to the causes of increasing morbidity and mortality arising from chronic disease can assist to identify a common trigger. Thus for example, in the case of diseases associated with obese or overweight persons, there is a perceived association with insufficient levels of physical activity. Accordingly the urban dimensions of low-levels of physical activity are considered in this project. Much of the literature on the relationship between urban environments and health equates the achievement of positive ‘health’ with individual behaviour involving moderate levels of ‘physical activity’. In particular, populations with high-levels of overweight and obesity are viewed as displaying greater susceptibility to health conditions and chronic diseases such as cardiac conditions and
diabetes, than less obese populations. Given the broad range of obesity-related health impacts such conditions are of great concern to health practitioners and policy makers.

Sedentary lifestyles have been identified as contributing to high obesity levels and urban environments have been suggested as influencing levels of sedentary behaviour and physical activity. Therefore, identifying how urban environments impact on physical activity levels is a major focus of many contemporary research efforts into planning-health links. Necessarily the present report dedicates substantial attention to the issue of obesity and the urban factors associated it.

2.5 Obesity

The amount of body fat an individual carries is commonly calculated with the Body Mass Index (BMI). The Body Mass Index is the ratio of an individual’s weight in kilograms relative to the square of their height in metres. Thus, the BMI formula is:

\[ \text{BMI} = \frac{w}{h^2} \]

where \( w \) = weight and \( h \) = height.

Health practitioners use this index to categorise individuals as ‘underweight’ (\( \text{BMI} < 18.5 \)), having ‘normal weight’ (\( 18.5 \leq \text{BMI} < 24.9 \)) or as ‘overweight’ (\( 25 \leq \text{BMI} < 29.9 \)). Individuals with a BMI of \( \geq 30 \) are categorised as ‘obese’ (CDC 2005; US.DHHS 2001).

Obesity transcends most gender, age, racial, ethnic and socioeconomic factors. The importance of obesity as a public health issue has been asserted by numerous health agency and experts. For the World Health Organization:

… obesity is one of today’s most blatantly visible – yet most neglected – public health problems. Paradoxically coexisting with undernutrition, an escalating global epidemic of overweight and obesity – “globesity” – is taking over many parts of the world. If immediate action is not taken, millions will suffer from an array of serious health disorders…. In 1995, there were an estimated 200 million obese adults worldwide and another 18 million under-five children classified as overweight. As of 2000, the number of obese adults has increased to over 300 million (WHO 2003).

Obesity has been acknowledged as the precursor to multiple non-communicable health conditions and chronic disease. These include cardiovascular diseases such as heart attacks and strokes, colon cancer, type-two (non-insulin-dependant) diabetes, and hypertension (AIHW 2004b; AMA and RWJF 2005; Catford and Caterson 2003). In sum, obesity is associated with premature death and decreased quality of life, at a social level.

Obesity is a complex condition, associated with many behavioural and physiological factors, but at a basic level it arises from an excess of energy intake over energy expenditure. When an individual’s energy intake is not completely expended, the excess energy becomes stored in the body as

As only a minority of the population currently meet recommended levels of regular physical activity to maintain a healthy weight, a large proportion of the nation are accumulating stored nutritional energy, resulting in excess body-fat (Bauman, Sallis, Dzewaltowski et al 2002a; Brownson, Boehmer and Luke 2005; US.DHHS 2001; Wright, MacDougall, Atkinson et al 1996). In Australia researchers have noted that:

more than one in two Australian adults did not undertake leisure-time physical activity at levels recommended for health benefits, including almost one in six who reported no leisure-time physical activity at all (AIHW 2004a:xii).

2.6 Sedentary Lifestyles

Although low levels of physical activity and obesity have been attributed to many lifestyle factors, one of the most common denominators of the lack of energy expenditure is the spread of ‘sedentary’ lifestyles. Sedentary lifestyles, based on sitting down, require little physical exertion. Many dynamics contribute towards the modern sedentary lifestyle. For example:

- More time is spent at sitting at computers and viewing television
- Manual work is becoming replaced with labour-saving machinery.
- Residential dwellings are located further than comfortable walking distances to places of employment, recreation or services.
- Lifestyle schedules are busy; there is no alternative travel mode to driving between appointments.
- Long working hours leave less time for leisure physical activity.
- It is not considered ‘safe’ for children to walk to school, and they are chauffeured in private vehicles.

More recent drivers of obesity may include the shift to greater levels of infill development in Australian cities. When urbanised areas are consolidated with residential development to take locational advantage of existing infrastructures and services, typically:

- Small allotments may be subdivided from allotments with established homes.
- Larger houses are constructed on small size allotments
- Smaller allotments have small backyards not suited to children’s play.
- Residential consolidation does not provide opportunities for new open green spaces to be introduced.

Urban consolidation is a relatively new phenomenon requiring new research. It can be hypothesised, large homes on small allotments cannot provide the backyard traditionally used as an area for play and physical activity. On the other hand, much of the urban and health literature assumes that higher
residential densities may contribute to lower levels of obesity by providing greater opportunities for physical activity in the accessing of employment, transport and other services, whether by walking or cycling. Only further research can decide between the two contradictory assumptions.

Recent research confirms that sedentary activities, such as television viewing, are strongly associated with both overweight and obesity (Giles-Corti, Macintyre, Clarkson et al 2003). But it is not solely residential-based sedentary lifestyles that are problematic. Giles-Corti states:

...the work environment may also be important, particularly since increased use of technology minimizes energy expenditure at work (e.g., use of computers and elevators or escalators rather than stairs). (Giles-Corti, Macintyre, Clarkson et al 2003:97).

The most widely suggested solution to obesity to date is to modify human behaviours within the built environment. Examples of this are programs that promote physical activity and healthy body weight as a means of preventing disease.

Physical activity contributes to reduced overweight and obesity through raising energy expenditure and the amount of physical exertion undertaken largely determines the amount of energy any one individual expends and stores (AIHW 2004b; AIHW: T Dixon and Waters 2003). Because low levels of physical activity contribute to higher risks of the diseases such as chronic heart disease and diabetes, it is an independent risk factor for a range of chronic diseases and health conditions. Therefore engagement in physical activity is a critical dimension of obesity.

2.7 Physical Activity Required to be Healthy

The recommended amount of physical activity for well-being has varied with changes in medical knowledge. A recent standard view suggests at least 30 minutes of moderate activity on all or most days of the week as a basic minimum. This level is also recommended by National Heart Foundation of Australia (NHFA 2004).

Whereas it was once thought that moderate physical activity in 30 minute periods was of most benefit, it is now suggested activity accumulated in bouts of 10+ minute periods can also be beneficial (Hardman 1999; NHFA 2004). Ideally such exercise should be incorporated into everyday activity rather than solely through structured or organised sports.

At first glance, it may not appear that walking to school, to a transit stop, or to a restaurant can provide meaningful health benefits, but the fact is that these simple, routine activities provide a tremendous opportunity to accumulate physical activity throughout the day to achieve the recommended 30 minutes of exercise. This strategy is also a better approach than advocating sports, aerobics, or weightlifting because structured activities only resonate with a small percentage of the
Population. ACEs [Active Community Environments], on the other hand, could enable millions of sedentary Americans to integrate physical activity into their lives seamlessly. (Killingsworth and Lamming 2001:13).

Physical activity is considered a significant health issue as many non-communicable diseases are may be avoidable, simply through maintaining a healthy balance between physical activity and energy intake - eating appropriately and partaking in recommended amounts of daily/weekly physical activity. Participating in physical activity is related to, for example, reducing the occurrence of obesity, osteoporosis and depression and increasing the occurrence of psychological well-being and quality of life. The costs of falling levels of physical activity go beyond the individual. The growth of multiple non-communicable health conditions and chronic diseases places increasing demands on health resources. In addition these conditions impact on productivity and economy. In the United States:

According to the Centers for Disease Control and Prevention, the direct medical expenses associated with physical inactivity totalled more than $76 billion in 2000. This figure does not take into account indirect costs, such as lost productivity from the physical and mental disabilities to which sedentary behavior contributes. (NRC 2005).

2.8 Urban Form, Physical activity and Health Promotion

The built environment is critical to the promotion of human activity (Bauman, Sallis, Dzewaltowski et al 2002b; Brownson, Boehmer and Luke 2005; Owen, Humpel, Leslie et al 2004). Individual experiences in identical environments, although sharing similarities, will be subtly different (Bounds 2004). A person will experience the urban environment from their perspective as an individual, resulting in a personal cognitive map of that environment created at an individual level (Reese 2003; Tan 2004). To be successful, health promotion campaigns focusing on physical activity must take into account how urban environments affect levels of physical activity at the individual level.

The built environment can be manipulated to influence human behaviour and activities. The question, therefore, is what are the urban interventions that result in physical activity and positive health impacts? There is growing international awareness among public health researchers, practitioners and policy makers, and among scholars and practitioners within various urban fields, including architecture, urban design, urban planning and transport planning that the challenge to reduce the burden of disease from conditions associated with sedentary lifestyles needs to be addressed collaboratively between these disciplinary clusters. Various research programs are underway through which urban and health disciplines are investigating how urban environments can be manipulated to promote the health and wellbeing of populations.

However, the appreciation of the influence of the urban environment on health and health-promoting behaviour risks assuming that urban planning is capable of comprehensively manipulating the environment to influence
human behaviour. This assumption has underpinned much of the research to date. The combination of these concepts can be summarised as:

- the solution to morbidity and disease is to prevent underlying problems, such as overweight and obesity
- promoting energy expenditure though increased physical activity will reduce problems of overweight and obesity among populations
- physical activity is in part a function of the urban form
- variables of the urban form enables analyses to identify elements that foster the promotion of sedentary lifestyles, promoting overweight and obese populations
- identified urban form variables can be manipulated to influence human behaviour to promote healthy physical activities

Most commonly, these studies classify ‘physical activity’ as ‘walking’, which is considered an appropriate activity for all age groups as it:

- does not require excessive levels of energy expenditure.
- does not need specialised or costly equipment.
- most importantly, takes place within the existing urban form.

Thus the majority of available literature that analyses the relationship between the urban form and health, commences with the hypothesis that the environmental influences of urban form can either promote or discourage physical activity and as a consequence can influence susceptibility to disease; such studies substitute ‘physical activity’ as the proxy variable for ‘health’ when evaluating the influence of urban form on health. The next Chapter undertakes a comprehensive review of this literature and its implications for health, planning and research.
Chapter Three - Built Urban Form and Health

3.1 Introduction

This Chapter reviews studies that have investigated the relationship between health outcomes and the urban environment in terms of the urban form, deploying the analytical methodology set out earlier in this report. The Chapter is particularly concerned to report studies that have demonstrated a relationship between the built urban form and health. A further concern of the present Chapter is to identify different methods for assessing aspects of urban form. As noted in Chapter Two, the majority of studies that have investigated the relationship between health and urban form have typically focused on how urban form influences physical activity, and the dynamics of this influence.

3.2 Renewing the Health-Urban Link

In the United Kingdom, recent research investigated the possibility of an association between urban planning policies and the health of communities. Jochelson et al. (2004) reviewed existing health and urban literature and statistics to identify known links between health outcomes and three aspects of the built form:

- buildings
- transport
- public life

Jochelson et al. established there is evidence that poor urban planning does impact negatively on health. The features of the built form that impact on health are various. For example, urban design can encourage or discourage public presence and community use of public space, which in turn, impacts on the degree of civic engagement, facility use, vandalism, graffiti, crime and personal safety.

Fear of crime, among individuals, can lead to a sense of helplessness, induce chronic anxiety and distrust of others or lead to social withdrawal. It is also associated with poor self-rated health, higher blood pressure, and increased anxiety. (Jochelson 2004:8).

Areas with heavy traffic thoroughfares, with limited social and community services and which lack places that facilitate community interaction undermine social capital. Opportunities for residents of such areas to create informal social relationships are diminished. Jochelson et al. cite a number of studies that associate low social capital with urban form state:

... a 40 per cent excess risk of reporting fair or poor health, and higher neighbourhood death rates ... [as well as] ...an individual's positive perceptions of his or her neighbourhood in terms of housing and neighbourhood quality, also has an impact on health. ...[and that] ... the
degree to which individuals form close bonds with relations, friends and acquaintances is associated with higher life expectancy and personal well-being (Jochelson 2004:8-9).

The decline in urban public life has been linked to the growth of single-use areas where activities are fragmented into zoned precincts, in contrast to multi-functional spaces that promote a diversity of social interaction. Jochelson et al provide a UK example where local shops and services operating at a walking scale are in decline as they are unable to compete with large car-based shopping centres. This necessitates motorised trips for essentials, whilst dissipating opportunities for informal social interactions as well as incidental exercise. This loss of local social connectivity is associated with adverse impacts on personal well-being, quality of life, psychological health and life expectancy.

Frumkin, Frank and Jackson (2004) also acknowledge the adverse impacts the urban environment can have on mental health and social capital. Perceived declines in the ‘sense of community’ among many outer suburbs can be held responsible for adverse health outcomes, although many of the specific dynamics are uncertain. This can be attributed to many factors that include:

- Low density suburbs where the private car used for the majority of travel trips, results in lost opportunities within the neighbourhood for social interaction
- Little familiarity with residential neighbours from adjacent houses, or neighbours living in the same street
- Transient nature of populations and interstate migration
- The physical isolation of outer suburbs
- Not having an awareness of neighbours’ routine movements which makes crime by strangers easier
- Social anxiety, as both location and urban form contribute to impacts on real and perceived personal safety and security
- Urban design influential on what constitutes ‘place’ which then relates directly to social anxiety

Wilkinson and Marmot (1998) take this theory further and associate health and longevity not only with social influences but economic factors. They state:

...people’s lifestyles and the conditions in which they live and work strongly influence their health and longevity. Medical care can prolong survival after some serious diseases, but the social and economic conditions that affect whether people become ill are more important for health gains in the population as a whole. Poor conditions lead to poorer health. An unhealthy material environment and unhealthy behaviour have direct harmful effects, but the worries and insecurities of daily life and the lack of supportive environments also have an influence. (1998:6-7).
3.3 Geographic Contexts

Frumkin (2002) hypothesises that American suburbs comprised of low-density homogenous residential land-use are surreptitiously influencing health outcomes through their design characteristics. Frumkin suggests that the lack of connectivity and proximity within residential areas, combined with high quality road systems dissuades walking and cycling as modal choices. The result is a high level of dependence on motorised transport which removes incidental physical activity from everyday behaviour and the resulting sedentary activity patterns impact on health. Lopez agrees:

The consequences of urban sprawl include increased reliance on automobile transportation and decreased ability to walk to destinations, decreased neighbourhood cohesion, and environmental degradation. (Lopez 2004: 1574).

Capon (2003) identifies a similar relationship in Australia.

Evidence is mounting about links between contemporary public health epidemics, such as obesity and depression, and aspects of our urban environment [and that] pressing current public health dilemmas are epidemics of obesity [and among others have] emerged in parallel with the increasing suburbanisation of Australian cities. (2003:21).

Capon contends that the land use and transport components which comprise Australian suburbs influence the way that people are interpersonally and socially engaged within communities. These relationships also impact on health both physically and psychologically. Capon identifies issues of spatial proximity, car dependence and access to local facilities as urban characteristics that need to be addressed to achieve better future health outcomes.

In contrast to authors such as Frumkin and Capon, Corburn (2004) suggests that the urban-health challenge goes beyond basic social and behavioural relationships and to include an explicit social justice agenda that addresses four specific areas:

- Increasing attention paid to effects of land use on public health, with the two disciplines developing methods to understand the relationships between physical and social environments on human health
- Development of a coordinated and multidisciplinary approach to removing health inequalities linked to social and physical environments via the planning regime including transport, housing, neighbourhoods and social capital
- A concise strategy to improve the health of urban populations, to address socioeconomic and other social determinants of health, particularly for specific areas of social inequality
- A new conception of participatory democracy to ensure practices are accountable and that communities are valued for their capacity of contextual knowledge and included in decision making process
Rather than identify the physical attributes of the built environment that impact on health outcomes, Corburn (2004) suggests a completely new regime to address the issues. Such a proposal is highly radical given the current state of comprehension of urban-health issues. While there may be some merit in Corburn’s proposals, such a wide-ranging agenda of planning and health policy reform is unlikely in the absence of quality evidence to support the assumed relationships between urban environments and health outcomes.

However, despite the urgings of Jochelson et al, Capon and Corburn for immediate policy shifts, there remains a fundamental need for any urban-health reform agenda to be based on research outcomes that have been demonstrated to be conceptually and methodologically valid through conventional processes of presentation and publication. In the absence of such a rigorous intellectual and empirical basis, urban-health reform is likely to lack a decisive capacity to influence a broad range of planning policy areas, in particular the built form, land-use mix and transportation systems. Systematic and rigorous methods need to be applied to demonstrate the validity of perceived or claimed relationships. Given the 20th Century legacy of limited engagement between urbanists and health researchers, some methodological development is required to raise the quality and capacity of urban-health research. Recent developments in the approaches used to describe and comprehend urban form are instructive in this regard.

3.4 The Urban Form

‘Urban form’ refers to built quality of the urban environment which in turn is related to the density and intensity of land-uses within urban areas. A range of urban forms have been identified as contributing to unhealthy behaviour, in particular, sedentary behaviour. Conditions such as overweight and obesity have been linked to patterns of urbanisation such as ‘urban sprawl’. Much of this literature comes from US sources, where many attempts have been made by researchers to develop metrics to assess and describe ‘sprawl’. This literature has relevance internationally as the methodologies are potentially transferable from the US to other jurisdictions. However, it should be noted that the patterns of dispersed urban development prevalent in the US that are often described as ‘sprawl’ are not necessarily replicated in Australia (Troy 1996).

There remain a number of basic problems with attempts by scholars and policy makers to identify and measure urban sprawl. For example, there is no consensual scholarly definition as to what actually constitutes ‘sprawl’ which makes it extremely difficult to attribute population health impacts to an urban form that lacks a robust and common definition. The following exemplar definitions of sprawl suggested by the Sierra Club (1999), Frumkin (2002), and Downs (1999) give some indication of the degree to which scholarly agreement exists as identified.

The Sierra Club defined suburban sprawl in 1999 as:
low-density development beyond the edge of services and employment, which separates where people live from where they shop, work, recreate and educate - thus requiring cars to move between zones. (Sierra Club 1999)

For the Sierra Club, sprawl comprises low density dispersed development with functional land-use separation and car-dependent transport.

Frumkin (2002:201) summarises a number of definitions of ‘urban sprawl’ with the following extensive description:

In recent years, the rapid expansion of metropolitan areas has been termed "urban sprawl"—referring to a complex pattern of land use, transportation, and social and economic development. As cities extend into rural areas, large tracts of land are developed in a "leapfrog" low-density pattern. Different land uses -- housing, retail stores, offices, industry, recreational facilities, and public spaces such as parks--are kept separate from each other, with the separation enforced by both custom and zoning laws. Extensive roads need to be constructed; for suburban dwellers, most trips, even to buy a newspaper or a quart of milk, require driving a car. Newly built suburbs are relatively homogeneous in both human and architectural terms, compared with the diversity found in traditional urban or small town settings. With the expansion of suburbs, capital investment and economic opportunity shift from the center to the periphery. Regional planning and coordination are relatively weak.

These descriptions of homogenous low-density residential areas that consume green space and involve the differentiation and separation of land uses could, however, be applied to almost any form of new suburban development. More specifically Downs (1999:955-6) argues that:

Sprawl is not any form of suburban growth, but a particular form… [which has 10 traits]:
(1) unlimited outward extension of development,
(2) low-density residential and commercial settlements,
(3) leapfrog development,
(4) fragmentation of powers over land use among many small localities,
(5) dominance of transportation by private automotive vehicles,
(6) lack of centralized planning or control of land uses,
(7) widespread strip commercial development,
(8) great fiscal disparities among localities,
(9) segregation of types of land use in different zones, and
(10) reliance mainly on the trickle-down or filtering process to provide housing to low-income households.
These traits have dominated American metropolitan growth for 50 years. Most analyses of sprawl focus on only one or a few of them, thereby oversimplifying the problem.

These definitions demonstrate the variety and extent of elements considered to constitute sprawl. They do not however acknowledge the specifically US basis for what is considered sprawl. Australian urban areas do not necessarily contain all of these factors – development in Australia is rarely unlimited by governments.
The definitional diversity identified above demonstrates the lack of precise agreement among planners regarding the measurement and description of urban patterns, including how to classify different types of suburban form. This lack of agreement is problematic and works against planners and policy makers achieving agreement on descriptors and metrics for urban patterns. It also hinders assessment of the impacts the various types of urban form have on the health of populations. In the absence of a consistent definition of urban patterns there is great difficulty in attributing a particular health outcome to a specific type of urban form. This problem remains a critical dilemma for urban scholars and planners.

Inadequacies of definition confound the understanding of the direction and complexity of urban physical and behavioural relationships. In turn, this weakness limits the capacity of planners to accurately describe and quantify urban form. The measurement of urban form, such as 'sprawl' requires a form of quantification that provides a robust methodological basis upon which to develop hypotheses and obtain conclusions, whilst also reflecting the spatial and social complexity of the phenomenon.

3.5 Measuring Sprawl

Various efforts have sought to measure sprawl by means of an index of land-use and/or population density. Historically such measures have been rudimentary and have simply added to the differing and conflicting assessments of what urban sprawl entails.

For example, USA TODAY developed a 'Sprawl Index' that uses two density-related measures: the proportion of population living in urbanised areas within metropolitan regions, and the change in population residing in these urbanised areas between 1990 and 1999. In sum this index rates metropolitan regions according to population increases and decreases and the temporal variation of density indicates growth areas. (El Nasser and Overberg 2001). This is a relatively crude measure of sprawl – conceivably high density areas that would not typically be viewed as sprawl could fall into this index.

By comparison, Pendall (1999) define urban sprawl by including factors such as land values, local government spending and traffic congestion, while Glaeser and Kahn (2001) include employment distribution and density in their assessment of sprawl.

3.6 The Metropolitan Sprawl Index

The ‘Metropolitan Sprawl Index' (MSI) created by Ewing, Pendall and Chen (2002) is to date the most comprehensive and probably most valid approach to sprawl quantification. (Ewing has also been a key contributor to the understanding of urban-health relationships.)The MSI covers 83 of the largest metropolitan areas in America for the year 2000. To define, measure
and evaluate metropolitan sprawl in a way that could be used for health research purposes, the MSI distinguishes the basic four factors of sprawl as:

- Residential density
- Neighbourhood mix of homes, jobs, and services
- Strength of activity centres and downtowns
- Accessibility of the street network

These four factors encompass 22 variables covering such urban dimensions as: widely dispersed populations in low-density development; rigidly separated homes, shops, and workplaces; networks of roads demarked by large blocks and having poor access; and, a lack of well-defined, thriving activity centres, such as downtowns and town centres.

The most important aspect of the MSI is its capacity to generate a single rating for an area according to the particular combination of urban characteristics that it displays. The MSI is also versatile in that it is able to append identifiable residential attributes to specific locations, enabling highly detailed mapping of the urban characteristics of metropolitan areas. A range of residential attributes can be statistically or visually associated with locations’ index scores to identify local characteristics such as the presence of low-residential densities, land-use mix or street connectedness.

The capacity to extend the MSI beyond planning concerns was demonstrated by Ewing, Schmid, Killingsworth, Zlot and Raudenbush (2003) in their study of urban sprawl and health in both metropolitan and county areas. To ascertain the urban-health relationship at both the metropolitan and county levels, the MSI was adapted to create an additional ‘Country Sprawl Index’ (CSI). To identify the built form at a finer geographic scale, the residential density and street connectivity factors of the MSI which comprised six variables, were incorporated into the CSI. The resulting index quantified the urban form and enabled specific urban characteristics to be identified as having direct impact upon human behaviours.

Spatial scale remains a methodological issue. Ewing et al’s (2003) analysis operated at the County and Metropolitan scales, which are large areas compared to the discrete neighbourhood or suburb. Thus the urban form of the study areas was not able to be assessed in close detail. Influences that directly and indirectly impact on participating in healthy physical activity, such as footpaths, bicycle tracks, parks, topography, climate, and safety could not be taken into account in Ewing et al’s analysis.

These finer spatial and design details are of utmost importance within the suburb and neighbourhood scale. For example, residents’ movements could be quite different if they reside adjacent to a major freeway, in comparison to residing adjacent to a low traffic volume road shared with pedestrians. Specific characteristics such as this highlight the importance of accounting for locational factors to achieve robust analyses at any scale.

Another issue when considering the MSI and CSI is that although the methodology used to generate such indexes is transferable, the actual
indexes are not transferable to other areas, but are locationally specific. Therefore it could be problematic if an index such as the MSI, was transferred to locations that are substantially different.

In addition, the effectiveness of the MSI and CSI are susceptible to becoming diluted. For example, Ewing et al’s measures for sprawl was used by Sturm and Cohen (2004) in conjunction with health survey data to study the association between objective measures of the urban form and diseases. However, the use of the sprawl index was limited as the 60 sites of available health survey data only corresponded with the Healthcare for Communities (HCC) data of 38 metropolitan areas.

3.7 Alternatives to Using an Index

As an alternative to classifying and measuring urban form with indices, Berrigan and Troiano (2002) explored the use of housing age as an indicator of housing form. The underlying rationale is that suburbs of a similar age are often associated with similar characteristics of built form - such as building style, density and street design. Older suburbs are more likely to have a mix of residential and business use, footpaths and a high degree of connectivity, in contrast to newer suburbs. In sum housing age suggests itself as a proxy attribute for urban form and density measures. Three categories of housing age (pre-1946, 1946-1973 and post-1973) were used to investigate the association between urban form and physical activity.

Craig et al’s (2002) used ‘housing age’ to categorise urban form types within 27 ‘urban’, ‘suburban’ and ‘small urban’ centres in Canada. Housing ages of the neighbourhoods were categorised as ‘older established’, ‘post war years’ and ‘recent suburban design’. Using a 10 point Lickert Scale an overall local environmental rating was produced, using variables that included:

- Number of destinations, such as number of schools, shops, businesses, in the area.
- The different types of destinations within an area, i.e: homogeneity or mixed use.
- Inclusivity and exclusivity of pedestrian orientation ease of accessibility, paths/routes available, connectivity, and route choices.
- Social dynamics.
- Transportation systems, facilities, connectivity.
- Complexity of stimuli, visual and auditory amenity
- Neighbourhood connectivity.
- Traffic threats.
- Crime - both the potential for crime to occur and safety from crime.

A similar approach was used by Weich et al (2001) in London. Two similar wards located in the same Borough of North London were used to test the
validity of the site survey instrument. The wards were chosen for their similarities in socio-demographic composition and housing character. One ward (population of 6,260) was analysed as the experimental ward, while the other ward (population of 9,549) was used as the control ward. The wards were divided into discrete housing areas (33 in the experimental ward, and 53 in the control ward) and within each housing area, bus stops, doctors’ surgeries, food stores, newsagents, pubs and schools were mapped.

- Data was collected in the form of a Built Environment Site Survey Checklist (BESSC) that included housing type, age and design; plot ratio, setbacks and accessways; private and public open space; vehicular entrances; children’s play areas; and proximities to local services such as public transport and basic shops; as well as evidence of vandalism, disused buildings and neighbourhood watch signs.

Weich et al’s findings suggest it may be possible to rate built environment characteristics within an urban setting independent of residents’ subjective perceptions. The study concludes that further work is necessary to validate these measures in urban settings. Nevertheless it, and other studies, suggest housing age could be a useful proxy for classifying and measuring aspects of the urban form.

3.8 Using Measured Urban Form to Assess Health Effects

The following section outlines how the MSI and other alternatives were used to investigate relationships between urban form and health outcomes. Ewing, Schmid, Killingsworth, Zlot and Raudenbush (2003) used the Metropolitan Sprawl Index to investigate the relationship between urban sprawl, physical activity, obesity and morbidity. Participants for the study were selected from the BRFSS sample, subject to residing within areas for which urban sprawl indices were available. This made it possible to link urban sprawl indices directly to individual respondents’ health data.

The sample consisted of 206,992 respondents from 448 counties, and 175,609 respondents from 83 metropolitan areas, for the pooled 1998, 1999, and 2000 BRFSS. Using both MSI, and CSI for county areas, degrees of sprawl were linked to aggregated participant data. The BRFSS variables considered to be significant in the causal link between the physical environment and health included health risk factors such as:

- obesity
- behaviours such as leisure-time walking, and
- chronic health problems such as hypertension, diabetes, and coronary heart disease
Two tiers of modelling were used to account for personal and place-related influences on behaviour and health. After controlling for demographic and behavioural covariates, the research analysis concluded:

... sprawl appears to have a direct relationship to BMI and obesity, plus indirect relationships through the number of minutes walked, which varies with the county sprawl index. ... Those living in sprawling counties were likely to walk less, weigh more, and have greater prevalence of hypertension than those living in compact counties ... [providing] added support for the hypothesis that urban form affects health and health-related behaviours. [But] because this study is ecologic and cross sectional in nature, it is premature to imply that sprawl causes obesity, hypertension, or any other health condition. Our study simply indicates that sprawl [the urban form] is associated with certain outcomes. (Ewing, Schmid, Killingsworth et al 2003:54).

Sturm and Cohen (2004) used Ewing’s MSI in an investigation of the relationship between urban sprawl, mental health disorders and chronic medical conditions. Two waves (1998 and 2000/2001) of American Healthcare for Communities (HCC) household phone survey were conducted to collect data on age, gender, race, educational, income, marital status, family size, and employment status for 15,084 persons. As Ewing et al.'s MSI was only available for 38 metropolitan areas that corresponded with HCC sites, the study was reduced to a sample of 8,686 persons. For physical health, the main variables included the following 16 categories of chronic health conditions or symptom as:

- asthma
- diabetes
- hypertension
- arthritis or rheumatism
- physical disability (such as loss of arm, leg, eyesight or hearing)
- breathing troubles such as emphysema or chronic obstructive pulmonary disease
- cancer
- neurological condition
- stroke or paralysis
- angina/heart failure/coronary artery disease
- chronic back problems
- abdominal problems such as ulcer, colitis or enteritis)
- chronic liver disease
- migraine or chronic severe headaches
- chronic bladder problems or problems urinating, and
- other chronic pain conditions

The variables for mental health, included depression (major depressive and dysthymic disorder) and anxiety (generalized anxiety disorder and panic disorder). Health-related quality of life was also measured.

Sturm and Cohen (2004) found that of Ewing et al's four individual dimensions of sprawl, the street accessibility factor and land use mix factor
were significant in predicting the prevalence of chronic conditions among the sample population. The population density had lesser significance and the ‘degree of centring’ factor was not statistically significant. However, a reduction in hypertension and heart disease was significantly associated with the street accessibility factor (although not the overall MSI).

No adverse effects of sprawl on mental health were identified, disproving Sturm and Cohen’s initial research hypothesis of chronic medical conditions and mental health disorders associated with suburban sprawl. However, the study reports limitations including the scale of measurement and the lack of data at finer resolution which constrains sensitivity analyses. Hence:

This study provides some initial support to the hotly debated claim that suburban sprawl is bad for health. While research is at a very early stage, these results point to the possibility that urban form is a determinant of physical health of the population. It is particularly important to determine whether these findings from the USA generalize to other developed countries, many of which face similar challenges associated with suburban sprawl. If future research confirms our initial results, policies that address the built environment can play a critical role in the prevention of a wide variety of chronic diseases. (Sturm and Cohen 2004:495).

The Sturm and Cohen findings were supported by Frumkin et al’s (2004) research which suggests that important questions regarding mental health and the urban environment are currently emerging:

As the built environment continues to evolve, and as mental disorders continue to loom large in absolute and relative terms to our nation’s health profile, we need to remain alert to possible links between sprawl and public health (2004: 160).

3.9 Using Alternatives to the MSI

As an alternative to indexing the built environment or using housing age as a proxy for particular types of urban form, several studies used design elements to represent urban form. For example, similar aged suburbs typically may also share similar features such as road widths, housing styles, footpath availability and connectivity.

A recent pilot study undertaken by Saelens, Sallis, Black and Chen (2003) selected two non-adjacent neighbourhoods in San Diego, California to evaluate the relationship between residents’ weight and levels of physical activity, relative to the urban form of the areas. Whereas, one neighbourhood was selected for its mix of housing types and concentration of non-residential uses (considered conducive to walking), the other neighbourhood was selected for its homogenous family homes and small peripheral commercial strip (considered to discourage walking). The study sampled 54 participants from the high-walkability neighbourhood and 53 participants from the low-walkability neighbourhood. Participants wore activity monitors for seven consecutive days and completed two surveys. The data collected included:
• Residential density
• Proximity to, and ease of access to non-residential land uses
• Street connectivity
• Walking and cycling facilities
• Aesthetics
• Safety from traffic and crime

The main finding of the study was that residents of the ‘high-walkability’ neighbourhood undertook 70 minutes more moderate to vigorous physical activity per week than those in ‘low-walkability’ neighbourhoods. The levels of overweight differed markedly between the two study neighbourhoods. Residents of the low-walkability neighbourhood had a 60 percent likelihood of being overweight, while high walkability neighbourhood residents faced only a 34 percent likelihood of such condition. Saelens et al concluded that the urban form of residential areas does have an influence on physical activity and subsequently on levels of overweight and obesity. The specific nature of that influence requires further exploration however.

Research undertaken by Weich, Burton et al., (2001) also used an urban form typology to compare mental health changes amongst individuals of two wards, one of which would undergo urban regeneration. To investigate the validity of a site survey instrument two similar wards were chosen from within a Borough in North London. The wards were selected for their similar socio-demographic profiles and housing character. Bus stops, doctors’ surgeries, food stores, newsagents, hotels and schools were mapped and the wards divided into 86 discrete housing sub-areas. The prevalence of depression was assessed using the Center for Epidemiologic Studies depression scale (CES-D) with a 20-item self-report measure including four response categories. The authors reported:

> No statistically significant associations were found between the prevalence of depression and the distance from the centre of the housing area to the nearest bus stop, public house or school … It is still not known whether, or how, the built environment affects health, independent of individuals’ material circumstances. This study represents a preliminary attempt to develop a set of reliable measures of the characteristics of the built environment in urban settings, with which to further address these questions. (Weich, Burton, Blanchard et al 2001:287).

Using a similar approach Craig and Brownson et al (2002) selected 27 Canadian neighbourhoods with known diversities of urban design according to the following three segment typology: 7 ‘older established’, 10 ‘post war years’ and 10 ‘recent suburban design’ areas. To understand the influence of physical neighbourhood characteristics on physical activity, the study also categorised the neighbourhoods on a tripartite scale:

- Urban
- Suburban
- Small urban
Walking to work data, form census and direct observation, was used to measure ‘physical activity’. Travel by car was the most prevalent transport mode in the suburban neighbourhoods, with the highest percentage of people from urban areas, walking to work. The relationship between the neighbourhood environment ratings and walking to work was also considered of significance in ‘suburban’ and ‘urban’ neighbourhoods. However, the causal pathways of walking-to-work were not investigated. The study stated that it:

…cannot be determined whether people were more likely to walk to work due to environmental factors or whether people live where they do because of personal circumstances and preferences. To determine the effect of various environmental factors on the behaviour of residents, interventions or prospective studies examining the relationship of changes in the environment on changes to physical activity patterns are required. (Craig, Brownson, Cragg et al 2002:41)

Another approach to classifying and measuring urban form used the housing age of residential areas as a proxy. Using three categories of housing age (pre 1946, 1946-1973 and post 1973) Berrigan and Troiano (2002) examined the association between housing age and walking behaviours. Data for a sample of 14,827 persons from the Third National Health and Nutrition Examination Survey (NHANES III) included variables for:

- Walking behaviour
- Frequency of diverse forms of leisure-time physical activity
- Home age
- Rural versus urban or suburban locale
- Region of the country
- Demographic characteristics
- Health related activity limitations

The study did not identify the objectives of walking, such as activity destinations. However the authors found that adults who lived in homes constructed before 1946 and until 1973 were significantly more likely to walk one or more miles at least 20 times per month than those who lived in newer homes constructed after 1973. Housing age, and therefore conceivably the design of residential areas appears to be associated with differences in basic physical activity. This study did not however assess the extent of any differences in total physical activity between the study zones.

A more recent study conducted by King, Belle, Brach, Simkin-Silverman, Soska and Kriska (2005) also used home age to measure urban form in relationship to physical activity. The categories of home age were divided into:

- Pre-1950 to capture the predominance of suburbs with ‘grid’ streets
- 1950-1969 to capture the transition of ‘grid’ to ‘warped parallel’ streets
- Post-1967 to capture the transition of ‘warped parallel’ to ‘loops and lollipops’ streets

(King, Belle, Brach et al 2005:463)
Overall, these studies suggest housing stock age is a useful proxy for similar elements of residential urban form.

3.10 Environmental Factors and Physical Activity

Bauman, Smith, Stoker, Bellow and Booth (1999) conducted a study to determine the influences of a coastal location upon residential walking frequency and duration in Australia. A phone survey with 1000 adults was conducted in 1994 among each of the 16 New South Wales state health service regions, comprising a final sample of 16,178 respondents.

The survey included assessment of walking frequency and duration, as well as moderate or vigorous activities undertaken in the fortnight prior to the survey. Through logistic regression modelling the association between physical activity and 'coastal' location of residence was investigated. The authors reported that compared to respondents who lived inland, respondents who lived within a coastal postcode were:

- 23 per cent less likely to be classified as sedentary
- 27 per cent more likely to report levels of activity considered adequate for health
- 38 per cent more likely to report high (vigorous) levels of physical activity

The study authors concluded that:

> Characteristics of the physical environment in coastal postcodes are related to physical activity participation ... [and that] Physical environments may contribute to physical activity participation. Further efforts to conceptualise and measure these environmental influences is warranted. (Bauman, Smith, Stoker et al 1999:324).

However, although the Bauman et al study suggests that a relationship exits between the urban form and physical activity, it must be recognised that these relationships between the urban form and physical activity are not isolated from other factors. For instance, participating in physical activities is not solely due to locational or environmental factors, but also influenced by personal factors. The two major personal factors identified in research investigating the influence of the built environment on physical activity, are human perception and the related individual choices of behaviours.

In 1994, Shriver (1997) conducted a study in Austin, Texas to investigate the influence of environmental design in pedestrian behaviours. Four neighbourhoods were selected, with two neighbourhoods having contrasting transportation, land use, and design characteristics, but similar density, land use and housing population characteristics. All neighbourhoods were considered to be aesthetically pleasing and safe for walking.

- For analysis, the neighbourhoods with similar characteristics were paired:
• Hyde Park with Clarksville as both have traditional grid street pattern, with frequent intersections delineating short block sizes that are considered to be orientated towards pedestrian travel.

• Barton Hill with Wells Branch, as both are more recently developed and characterised with an automobile-oriented transportation system of curvilinear roads with off-set T-intersections leading to discontinuous street and cul-de-sacs.

• The aspects of the physical form taken into consideration included:
  - The transportation system - the potential ease for movement, street layout, connectivity, and directness of routes.
  - Land use – number, type, variety and location of destinations that can be reached by foot and match residents’ needs.
  - Urban Design – the potential for streets to encourage people to participate in street life.

Data was collected at pre-determined locations from passing walkers. The data discriminated between the quality of trips and graded the importance of the walking environments.

The survey results identified different walking patterns within the contrasting neighbourhood forms. In the traditional grid neighbourhoods, walks were predominantly shorter with utilitarian trips often involving secondary activities. Conversely, in the newer neighbourhoods, walking was characterised by longer, less frequent recreational walks involving fewer secondary activities.

The importance of walking in general and for specific purposes also varies with the relative levels of environmental variables. In the traditional neighbourhoods, walkable distances, access to transit, shops, and work are important, as is the opportunity to be outdoors. In the modern neighbourhoods, walkway continuity, trees, and interesting things to look at are more important environmental attributes, as is the opportunity to maintain health. (Shriver 1997:64).

Differences between neighbourhoods development types can therefore influence types of walking behaviour. In the older neighbourhoods walking tends to be for access, whereas in the newer neighbourhoods, walking appears to be largely for recreation. These results support the hypothesis that transportation, land use, and design characteristics influence residents’ perception of a neighbourhood and have an effect on their walking behaviour, in terms of destinations, distances and duration. The older neighbourhoods appear to support physical activity that is incorporated into daily activities to a greater extend than the more recent neighbourhoods.

De Bourdeaudhuij, Sallis and Saelens (2003) studied the environmental correlates of physical activity by examining the variance in sitting, walking, moderate-and vigorous physical activity related to the neighbourhood design and recreational environmental variables. In Ghent, Belgium, self-reported survey data was collated from a cross sectional sample of 521 adults aged between 18 to 65 years. An International Physical Activity Questionnaire (IPAQ) was used to quantify respondents' physical activity in last seven days.
To assess neighbourhood design and recreational environmental variables a questionnaire with 81 items was developed, which included:

- Residential density
- Land use mix (diversity of uses and access to local shopping)
- Ease of access to public transportation
- Footpath and bicycle track availability
- Neighbourhood aesthetics
- Perceived safety from crime and traffic incidents
- Street connectivity
- Neighbourhood services available and
- Overall satisfaction with the neighbourhood

The study found walking or moderate-intensity physical activity is related to footpath availability, access shops and public transportation while vigorous physical activity is related to access to recreational facilities. The findings of the study further support the theory that design and recreational characteristics are influential in physical activity variance. While this study found that both neighbourhood design and recreational environment variables have small but significant associations with multiple types of physical activity, it is not clear what environmental changes would have the ability to affect physical activity on a relatively permanent basis.

To explore how perceived neighbourhood characteristics influenced physical activity, Sallis, Johnson, Calfas, Caparosa and Nichols (1997) undertook a study of 110 college students. Forty-three self-reported items were used to assess environmental variation in homes, neighbourhoods and on frequently travelled routes. Access to physical activity opportunities were gauged, including both home equipment and convenient facilities and levels of self-reported physical activity correlated with scales. The environmental neighbourhood survey included a yes/no response from participants as to whether the neighbourhood had:

- Footpaths available
- Heavy traffic volumes
- Hills
- Street lighting
- Unattended dogs
- Enjoyable scenery
- Frequently seeing others walking or exercising in the neighbourhood
- High crime rate

Participants also rated (from 1-5) how safe they felt in their neighbourhood, their neighbourhood character (residential, residential and commercial, mostly commercial), as well as identifying exercise facilities within a five-minute drive from their place of residence or employment. The authors found that after adjusting for neighbourhood socioeconomic status, the only significant association via multiple regression analyses was the use of home exercise equipment with strength exercises.
This conceptualisation of residential and neighbourhood settings in conjunction to accessibility of recreational faculties, captures some of the multilevel complexities within the physical environment that can influence perception and behaviours.

A major contribution to the understanding of urban environmental factors and physical activity has been provided by the Study on Environmental and Individual Determinants of Physical Activity (SEID project)4 (Giles-Corti and Donovan 2002). SEID is a social ecological study of social and physical environments associated with recreational physical activity. The study measures social and physical factors influencing involvement in planned recreational physical activity and then examines the influences of and interaction between, environmental and individual factors and exercise. The study carried out in Perth Australia.

Between August 1995 and March 1996, 1,803 healthy working people aged between 18 to 59 years old participated in a cross-sectional survey. The survey instrument included measures of physical activity, social environment, cognitive and streetscape factors. Facility access indices were developed by:

- recording participant addresses (origin)
- geo-coding the location of recreational facilities using MapInfo (destination)
- determining network distances between origins and destinations,
- calculating access indices using distance decay parameters and rating the proximity of recreational facilities in 500 metre increments

In addition, a summary Access Index was developed for formal recreational centres including golf courses, gyms/health clubs, sport and recreational centres; swimming pools; tennis courts; public open spaces; and natural areas such as beaches and rivers. The function, appeal and spatial access of these physical environments were taken into account. Metrics of the physical environment included:

- Whether the street had a footpath (on either or both sides) or a visible shop in the street.
- The type of street (cul-de-sac, minor/major local road, highway or major thoroughfare).
- Whether the street was tree-lined and the quality of tree coverage
- Total spatial access to purpose built recreational facilities and open public spaces.
- Total spatial access to naturally occurring recreational facilities
  (Giles-Corti and Donovan 2002).

Overall, 59 per cent of study participants exercised at levels recommended by health guidelines. Unsurprisingly recreational facilities near residential
homes were used more frequently by residents than facilities located further away. The most frequently used recreational facilities were informal: the streets (45.6 per cent); public open space (28.8 per cent) and the beach (22.7 per cent) (Giles-Corti and Donovan 2002:1793). However, while most study participants walked for transport or recreation, only 17.2 per cent did a sufficient amount of walking to accrue health benefits (Giles-Corti and Donovan 2003:1585).

This study found that the influence of individual and social environmental determinants outweighed the role played by physical environmental determinants of exercising as recommended. Nevertheless, access to recreational facilities determined whether or not they were used, and in this way, support and enhance the achievement of recommended levels of physical activity behaviour by providing opportunities. Individual and social environmental determinants on the other hand, appeared more important in directly determining whether or not recommended levels of activity were achieved. In this sense, it appears that having good access to recreational facilities is necessary but insufficient to achieve recommended levels of recreational activity in the community. (Giles-Corti and Donovan 2002:1804).

Giles-Corti and Donovan’s (2002) interviews also delved into perceptions of spatial access to recreational facilities, tracking whether shops, walking and bicycling tracks were considered to be within walking distance. Overall the study found participants prone to overweight:

- Were more likely to live on a highway interval
- Perceived no walking or cycle paths within walking distance or a five-minute drive
- Had poor footpath access, with either no footpath or only one footpath on one side of the street

Participants in this study who were obese were nearly twice as likely as others to perceive no shop within walking distance and had poorer access to recreational facilities (Giles-Corti, Macintyre, Clarkson et al 2003).

These findings provide preliminary support for the concept that having poor access to environments that support physical activity may contribute to higher levels of overweight and obesity among urban populations. However, it would be premature to assume that access to supportive physical environments alone is sufficient to encourage incidental and planned physical activity. Giles-Corti and Donovan suggest:

> The physical environment provides cues and opportunities for physical activity. Its influence is passive through the design of the urban environment, domestic appliances and buildings which encourage or discourage incidental physical activity. Its influence is also active by providing physical activity opportunities that are accessible, convenient, safe and appealing. (Giles-Corti and Donovan 2003).

Clearly, behavioural factors also need to be analysed in conjunction with the quality and perceptions of the physical environment. Direct determinants of physical activity need to be identified within the context of a wider range of environmental factors. Most importantly, the self-selection of physical
environments that support an inherent preference for either an active or sedentary lifestyle needs to be investigated.

Following the SEID I study, an SEID II study was conducted to investigate the relationship between the physical environment and walking for recreation and for transport (Giles-Corti, Bull, Clarkson et al 2004). A three level framework of the physical environment was developed:

- Features - the overall factors that influence the physical environment
- Elements - factors that are components of the features, and
- Items - factors that have the potential to be changed to improve an element

In addition, functional, safety, aesthetic and destination were identified as influential to walking behaviours. These parameters guided the collection of observational data in local neighbourhoods within a 408 km² area in metropolitan Perth, Western Australia. The SEID II data was aggregated with respondents’ physical activity data from SEID I, yielding ratings for the SEID I neighbourhoods. The environmental correlates for walking near home revealed:

- Functional characteristics (included well-maintained and continuous footpaths, street network design, traffic volume, speed and calming devices) appeared more important for recreational walking home than safety, aesthetic or destination
- Destination characteristics appeared more important when walking for transport near home than functional safety or aesthetic features

The authors’ conclusions build on their earlier work and correspond to findings of others such as Saelens et al (2003).

The findings suggest those neighbourhoods with attractive and comfortable pedestrian facilities - safe, convenient places to walk; narrow streets, slower traffic, and verges that separate motor vehicles from pedestrians, and local destinations - were associated with walking. (Giles-Corti, Bull, Clarkson et al 2004).

These findings also cohere with many of the assumptions about the links between urban form, urban design and walking patterns – namely, areas that provide safe, convenient and attractive environments for walking will result in higher levels of walking activity.

### 3.11 Proximity

Common sense suggests proximity to destination is an important stimulus to physical activity. Sallis, Hovell, Hofstetter, Hackley, Elder, Caspersen and Powell (1990) investigate whether distance between home and facility is related to exercise frequency. The physical activity of 2,053 San Diego residents were surveyed. A total of 385 exercise facilities were identified and
the density and proximity of facilities relative to respondent homes determined.

The study discovered that although:

... distance seems like a simple variable, 2 km in a residential neighborhood can be very different from 2 km across several busy commercial streets.... A nearby facility may be desirable in some respects, but it may have inadequate parking, or have other undesirable characteristics so that it is seldom or never used. (Sallis, Hovell, Hofstetter et al 1990:183)

Sallis et al (1990) concluded that the relationship between physical activities and the density of recreation activities is ‘not large’. The authors also noted numerous methodological difficulties with their study relating to their selection of land-use activity. Income, for example, may determine the decision (not) to use a recreation facility notwithstanding of the density of such facilities within the immediate area. In sum, it seems that the spatial availability of priced recreation facilities does not appear to have a direct relationship with urban physical activity levels.

Powell, Martin and Chowdhury (2003) conducted a study to discover if proximity to places conducive to physical activity is associated with higher levels of physical activity. Using lists from the 2001 Georgia Behavioural Risk Factor Surveillance System, 4,532 persons were surveyed about levels of activity, awareness and proximities to places conducive to physical activity and neighbourhood perceptions. The places considered to be favourable for physical activity and considered proximate, convenient and accessible, included:

- Parks
- School tracks
- Gym or fitness centres
- Walking or running tracks
- Shopping mall, and
- Neighbourhood streets, roads or footpaths

The study found that a direct relationship exists between spatial convenience and activity. The neighbourhood street, footpaths and parks were most commonly reported as safe and convenient places for walking. The study found no significant correlations between ‘convenience’ and density of facilities - although a more detailed analysis may have revealed richer findings. However, the study provides evidence that proximity to facilities is associated with exercise behaviour, independent of demographic variables.

...People's lifestyles and the conditions in which they live and work strongly influence their health and longevity. Medical care can prolong survival after some serious diseases, but the social and economic conditions that affect whether people become ill are more important for health gains in the population as a whole. Poor conditions lead to poorer health. An unhealthy material environment and unhealthy behaviour have direct harmful effects, but the worries and insecurities of daily life and the
Ewing (2005a) discusses the influence of the built form on physical activity levels. Ewing equates levels of ‘physical activity’ with ‘weight’, ‘obesity’, health and morbidity outcomes, and identifies the following aspects of the built form as influential on human behaviour:

- Assessment of sprawl
- The “3 Ds” of neighbourhood - density, diversity, and design
- Travel behaviour
- Leisure time activity

Ewing notes environment determinism assigns significance to the physical environment in shaping behaviour, while the counterview sees social and economic factors as determinants of behaviour. Ewing concludes there is relatively strong evidence that compact development patterns are associated with active travel modes such as walking and transit, but that evidence is weaker when linking compact development with overall physical activity, and related weight and health outcomes (Ewing 2005b). Evidence for the simple direct link between urban form and specific health outcomes remains weak.

Hill, Wyatt, Reed and Peters’ (2003) investigate the causal pathway to obesity. They note that obesity is not a symptom of physical built form, but of the decisions and behaviours made within it. Lifestyle factors of over consumption, reduced physical activity, reduced hard labour, time pressures promoting pre-packaged foods and travel by cars, using elevators instead of stairs displays the need for behavioural changes as an exit pathway from obesity.

3.12 Chapter Conclusion

Research does support the idea that neighbourhood form, variously categorised and measured, is related to levels of physical activity (Saelens, Sallis, Black et al 2003). Although the study undertaken by Weich et al. (2001) found no statistically significant associations between depression and urban form, this study is significant as a preliminary attempt to develop a set of reliable measures of the built environment characteristics. Later research undertaken by Berrigan and Troiano (2002), Craig and Brownson et al. (2002) and King, Belle et al., (2005) all associated walking behaviours with housing age.

There remain a number of methodological problems with assessing how urban form impacts on physical activity levels and more specifically on critical health indicators such as overweight and obesity. While physical activity within urban localities can be measured the methodological conversion of such a metric into a quantifiable health impact remains unresolved. Similarly there remain a number of difficulties with the assessment and specification of different categories of urban form. There is no framework that can be consistently assess such features of urban areas such as walkability,
connectivity, amenity and safety and link these to health outcomes. Even comprehensive measures such as the Metropolitan Sprawl Index remain at best indicative rather than definitive of urban form typologies. Further problems exist with the transference of methods to other jurisdictions. It seems unlikely that the MSI could be readily used in Australian, and the same may hold for measures of urban form based on ‘housing age’.

It is apparent however that neighbourhood urban characteristics including urban form have some associations with physical activity. Some urban form types, such as higher density mixed use environments may enable higher levels of physical activity, even if they do not necessarily generate such behaviour. What remains uncertain is the quality and extent of enabling and generating relationships. Further research is clearly necessary to determine how, or even if, built form governs behavioural choices, and how it relates to overall physical activity and healthy lifestyles.
Chapter Four - Transportation Systems

4.1 Introduction

Modern urban form cannot be substantially divorced from the transport network. Urban scholars typically perceive higher density urban environments as associated with greater provision of public transport, and higher levels of walking and cycling, than dispersed urban environments dependent on automobile travel. The health impacts of different types of urban form, to the extent that these can be identified, are likely to reflect the transport modal choices made by individuals. This Chapter will briefly review past and present urban transport before discussing relationships between health and transportation systems identified in current literature.

4.2 Planning and transport

Prior to mass use of automobiles, residential development generally occurred proximate to spaces of production and circulation. In caricature worker housing would be next to the factory and the company store. Before WWII cars were, for the mass, an expensive curiosity. Cars, moreover, were not essential. The majority of urban facilities were within walking and cycling distance or accessible via public transport.

Most pre-war urban areas, particularly those in the USA, and to a lesser extent those in Australia, were constructed on a traditional grid pattern, with suburban blocks divided by streets interlinked with laneways evolved from night waste-collection routes. Roads and pedestrian paths were multi-use spaces for travel, bicycling and play. Although roads were designed for vehicles, they carried only low volumes of slow traffic. Urban navigation was easy, with accessible and direct routes to and from destinations. Travel by bicycle or foot was both safe and popular.

Existing street infrastructure also included profitable public transport networks serving dense urban forms with easy pedestrian access. The public transport of the day was available, affordable, and accessible, by walking or cycling, throughout networked inner suburbs.

Children playing in the street expended energy, and travel by non-motorised transport necessitated further physical activity. These factors contributed toward keeping populations at healthy weights, without recourse to deliberate and specific weight-loss regimes.

4.3 Transport Planning

A noted transport commentator Litman (2003:103) has suggested that:
Transportation planning decisions impact public health in three main ways: through traffic crashes, vehicle pollution, and physical activity.

There is already a substantial body of research that reports the health impacts of motor vehicle crashes and emissions on the health of populations. This report does not intend to discuss this literature extensively. However, the links between urban transport and health in terms of physical activity are less well understood. The present research therefore focuses on the links between transportation systems and health through the impacts on physical activity that have been reported as arising from various transportation infrastructure, services and modal choices.

The development of a dispersed urban form appears to promote higher rates of driving and car ownership, which in turn impacts on the quality of the urban environment due to, *inter alia*:

- Greater risks of fatal crashes
- Depressed rates of walking
- Limited public transport use, and
- Increased levels of ozone pollution
- (Ewing, Pendall and Chen 2002)

As dispersed urban development expands and becomes more prevalent, rates of vehicle ownership and car use for urban travel tend to increase at the expense of non-motorised travel modes. Such outcomes potentially pose risks to the health of urban populations. As yet however there is only a relatively small research base with which to support suggested relationships between the use of private automobiles for the majority of urban travel and the impacts on overall physical activity levels and subsequently on urban health.

4.4 Private Motor Vehicles as Health Risks

The growth in private vehicle ownership and the resulting incidence of traffic-related deaths and injuries has directed substantial research attention to traffic safety. In conjunction with mounting legislation to regulate driver behaviour multiple programs have sought to design safer roads. Motor vehicle safety, too, is constantly improving with the development of such design features as crumple zones, side bars and air bags.

As Australians have become more car dependant related environmental damage has emerged as a public issue.

Australians have amongst the highest per capita greenhouse gas emissions from transport use in the world. This is due to a range of factors including a high rate of ownership of passenger vehicles and a high level of domestic freight activity per capita arising from Australia's low population density and vast size. (AGO 2004)
A plethora of studies confirm the health risks of vehicle pollutants of which there are high concentrations in developed urban areas. These include carbon monoxide, nitrogen oxides and unburned hydrocarbons, which have been linked to chronic diseases, including cancer, respiratory diseases, and heart failure (see Table 2). The high concentration of vehicle pollutants, mainly in urban areas, has provoked government intervention to limit vehicle emissions. Table 2 notes some of the specific health impacts from motor vehicle emissions.

**Table 2: Motor Vehicle Emission Pollutants Associated with Specific Diseases**

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Health Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulates</td>
<td>• Reduces lung function</td>
</tr>
<tr>
<td></td>
<td>• Intensifies respiratory and cardiovascular disease</td>
</tr>
<tr>
<td></td>
<td>• Aggravates asthma respiratory problems</td>
</tr>
<tr>
<td></td>
<td>• Related to possible earlier deaths</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>• Ground level ozone causes changes in lung function</td>
</tr>
<tr>
<td>(ozone, dioxide)</td>
<td>• Nitrogen dioxide can precipitate or exacerbate asthma episodes</td>
</tr>
<tr>
<td></td>
<td>• Accelerates hospital admissions and death incidents</td>
</tr>
<tr>
<td></td>
<td>• Road transport contributes benzene and 1,3-butadiene to composition of the air we breathe - human carcinogens and genotoxic which cause damage to human DNA</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>• Reduces oxygen carrying capacity of the blood</td>
</tr>
<tr>
<td></td>
<td>• If susceptible, can bring on angina</td>
</tr>
<tr>
<td></td>
<td>• Hospital admissions</td>
</tr>
<tr>
<td></td>
<td>• Cardiovascular disease mortality</td>
</tr>
<tr>
<td></td>
<td>• Reduces mental performance</td>
</tr>
<tr>
<td>Lead</td>
<td>• Impairs the nervous system</td>
</tr>
<tr>
<td></td>
<td>• Damage the kidneys</td>
</tr>
<tr>
<td></td>
<td>• Impedes haemoglobin production</td>
</tr>
<tr>
<td></td>
<td>• High blood levels in children - associated with behavioural and concentration issues</td>
</tr>
<tr>
<td>Accidents</td>
<td>• Serious pedestrian and driver injury</td>
</tr>
<tr>
<td></td>
<td>• Death</td>
</tr>
<tr>
<td>Social effects</td>
<td>• Traffic noise - impedes memory, attention, and problem solving abilities</td>
</tr>
<tr>
<td></td>
<td>• Time-intensive commuting</td>
</tr>
<tr>
<td></td>
<td>• Busy roads hamper independence development in children</td>
</tr>
<tr>
<td></td>
<td>• Busy traffic is associated with fewer neighbourhood social support networks</td>
</tr>
</tbody>
</table>

Source: Jochelson (2004)
4.5 Private Motor Vehicles and Obesity

Beyond direct emissions and safety impacts, recent international research has begun to link car dependant urban systems to another dimension of health risk, namely obesity and overweight. Driving a vehicle is, clearly, less physically demanding than walking or cycling, requiring less (healthy) cardiovascular exertion. But this observation begs the question of why populations are becoming so reliant on private vehicles for transport?

One of the most frequently cited stimulants of private car use is the design of urban areas including both the street layout and the density and mix of land-use activities.

4.6 Suburban Design

Recent orthodox suburban development consists of an array of interlinked cul-de-sacs, organised around a hierarchy of streets. An example of this mode of suburban layout appears in the Australian Model Code for Residential Development (AMCORD) as shown in Figure 1. (CDHRD 1995).

Contemporary suburbs are typically serviced by major arterial roads that lead into intermediate collector streets and branch to local access places serving residential homes. Street hierarchy is constructed with street widths catering for gradated traffic volume. The hierarchy maximises flow on the residential periphery erecting a spatial barrier before through traffic in residential areas.
On one hand, therefore, street hierarchy is used by traffic engineers to restrict traffic on residential streets, minimising local traffic risk, noise and nuisance.

Road hierarchy in the contemporary Australian suburb is not based on the traditional grid pattern. Rather a collector street will typically meander, often in a layout related to the natural topography. Cul-de-sacs adjoin and branch from the collector street. This road layout serves to assist with traffic flow. The hierarchy of streets maintains low-traffic levels in residential streets by preventing access to nuisance or through traffic. It should be noted that the emphasis is on traffic, specifically motor-vehicle traffic which is able to travel relatively fast through such a street hierarchy. This model of traffic planning rarely involves consideration of the need to cater for pedestrian or cycling connectivity, or dedicated road space.

Street hierarchy also promotes Crime Prevention Through Environmental Design (CPTED):

> as the proper design and effective use of the built environment can lead to a reduction in the fear of crime and incidence of crime, and to an improvement in the quality of life. (Crowe 2000).

In suburbs where levels of local traffic are sufficiently low, residents can recognise neighbours and observe routine movements in the immediate neighbourhood, reducing the fear of crime (Crowe 2000). In addition, when possible, play activity on the street can be observed from inside the home. Factors such as ‘eyes on the street’ also offer the perception of personal safety in public space.. The combination of street hierarchy and CPTED principles look to incorporate the elements that 'worked' in urban form based on the grid pattern. Streets, suitable for children to play on, with low traffic volumes can constitute a ‘safe’ environment. Such suburb design is viewed as promoting neighbourhoods where participation within the community will generate high levels of social capital.

Such contemporary street design does not, however, provide the easy accessibility and networking for pedestrians and cyclists characteristic of traditional suburbs with grid patterns. The objective of maximising efficient traffic flow requires design that minimises vehicular interaction by limiting intersections. As a result such road hierarchies can be highly inconvenient to those wishing to travel by public transport, bicycle or on foot. The poorly connected streets of the cul-de-sac suburb often impose a lengthy walk on those wishing to access sites within close spatial proximity. Such designs therefore tend to limit the attraction of walking. This problem is illustrated in Figure 2, with aerial photos of two neighbourhoods in Atlanta. The traditional grid-based suburb on the left is compared to a typical contemporary cul-de-sac suburb on the right. (Frank, Engelke and Schmid 2003:119).

This issue is of considerable currency for transport planners concerned that many contemporary suburbs are barely, if that, located within reasonable walking or cycling distances of essential land-uses. Contemporary design adds to this constraint by imposing circuitous routes on public transport
services limits its the attraction as an alternative to the car. The outcome is a major set of disincentives for travel other than by motor vehicle to access everyday destinations such as places of employment, major shopping centres and places for leisure pursuits. In sum, the expectation the motor car will form the basis of urban travel, largely to the exclusion of other modes, is inherent in the cul-de-sac model of suburban design. The public health implications of this structural assumption are clear.

Figure 2: Comparison of Travel Distances and Connectivity of Street Networks in Selected Neighbourhoods, Atlanta.

4.7 Public Transport

In Australian cities the provision of public transport for new urban areas has, in recent decades, been highly uneven. Suburban developers and governments have been reluctant to provide high quality public transport services in new suburbs since WWII. This is in contrast to the traditional model of suburban development. In the early decades of the 20th Century, public transport services, typically involving rail infrastructure, were used to open up suburban tracts at a level of housing affordability suited to those on modest incomes. This model was abandoned in the latter decades of the 20th Century in favour of automobile based suburbanisation formed around detached homes on larger allotments.

Contemporary public transport in many Australian suburbs is bus-based if available at all. Buses, however, often provide poor services for passengers, due to poor route design, inadequate integration, ticketing complexity, and inadequate institutional vehicles to ensure proper planning (Mees 2000). In addition, public transport service quality tends to decline with distance from the CBD, except for locations proximate to the relatively few rail service
stations. The further a suburb is located from the city centre, the more limited services typically become, with evening services often poor or non-existent.

Many scholars have noted that urban development in Australia's suburbs continues to be planned for dependence on automobiles (Newman and Kenworthy 1999). Residents moving into outer and fringe urban areas appear resigned to the need for long journeys to both work and for retail and other services (Burnley, Murphy and Jenner 1997). The disutilities of such development, as yet, continue to be outweighed by the advantages of home ownership, In such a context, suburban development based on the private car remains the residential norm.

There is a growing awareness among planners that ongoing car dependence is detrimental to the use of physically active transport modes such as walking and bicycling. Importantly, inadequate provision for alternative methods of travel, such as public transport, walking or cycling is now seen as a potential contributor to sedentary behaviour and the attendant healthy risks of obesity. This concern has been expressed by a number of commentators.

In the suburbs, it is necessary to drive everywhere because most homes are out of easy walking distance to common destinations such as shops and workplaces... Suburbs are designed for automobile use, so it is inconvenient to use other forms of transport such as walking and cycling. (Sallis and Owen 1999).

Spread-out, isolated destinations typical of car-oriented suburban development also discourage walking and bicycling. Even in communities where most places are near enough to walk or bicycle, people may not feel safe because of high motor vehicle speeds and volumes. (Wilkinson, Eddy, MacFadden et al 2002).

Eight-lane thoroughfares, serpentine roads, incomplete sidewalk networks, far-flung retail plazas, campus-style business parks, and other distinguishing traits of contemporary America are said to conspire against walking and bicycling. (Cervero and Duncan 2003:1478).

Such concerns build on the considerable amount of literature, some of which has already been reviewed in Chapter Two that explores the relationship between walking and cycling as physical activities and the urban environmental influences on these behaviours. However, focusing specifically on walking and cycling as modes of travel rather than simply as physical activity enables us to comprehend the broader context of urban transportation planning and how it supports and accommodates these modes. Such a perspective implies that undertaking physical activity is not solely the responsibility of individuals. Rather, urban planning agencies have a role to play in providing urban environments where physical activity is deliberately generated and supported. Pedestrian travel is a clear example of such a travel mode that planners can support. It is worth therefore examining the research base of planning knowledge about pedestrian travel.

4.8 Mixed-use Medium-density and Pedestrian Travel
The mix of land use activities is considered by many authors to affect levels of walking and cycling (Newman and Kenworthy 1999). Moudon, Hess, Snyder and Stanilov (1997) examined the relationship between the availability of connected pedestrian routes and levels of pedestrian activity. Twelve localities within the Puget Sound area of Washington were examined. These localities contained neighbourhood and regional commercial centres surrounded by medium-density residential development in both urban and suburban locations.

The key dimensions of the pedestrian travel environment investigated by Moudon *et al* included:

- Pedestrian network connectivity
- Route directness of pedestrian paths between origins and destinations
- Completeness of pedestrian facilities

The primary variables of the urban form in the study were:

- Control variables - median income, mean car ownership, land-use and mix, population density, topography, weather conditions, day-of-week and time-of-day
- Independent variables – connectivity and safety of pedestrian facilities
- Independent variables – travel behaviour – volume of walking trips

Moudon *et al* (1997) found mixed outcomes from density, land-use mix and social variables such as income in predicting pedestrian travel volumes. However site design, and route directness did significantly affect the levels of pedestrian trips. The authors concluded:

> These findings suggest that given appropriate land use conditions, pedestrian facilities improvement programs in suburban areas can have a significant impact on mode choice and support pedestrian travel. (Moudon, Hess, Snyder *et al* 1997:54).

However Moudon *et al* (1997) gave little attention to other potentially important transport variables, such as the availability of public transport within suburban areas as a contributing factor to high levels of pedestrian travel.

Boarnet and Sarmiento (1998) noted a lack of conclusive evidence linking land-use to travel behaviour and undertook a study to investigate the link between non-work travel and land-use characteristics. Non-work car trips for 769 residents of Southern California were recorded over a two-day period. Metrics used to categorise residential context included:

- Population density of the neighbourhood
- The percentage of grid-streets (four-way intersections) in a quarter mile radii of respondent’s homes
- Retail employment divided by land area as a proxy for land use mix near respondents’ homes
• Service employment divided by land area as a proxy for land use mix of the neighbourhood

In addition, characteristics of residential locations included:

• Location specific amenities
• Demographic composition
• Age of housing stock

The data was then examined to identify potential links between land-use patterns at the neighbourhood level and non-work trip generation. Boarnet et al concluded that although a very complex relationship does exist between non-work travel and land-use characteristics, it is not sufficiently well understood to inform policy. Boarnet et al suggest the scale of the relationships needs to be given more attention, with comparison of land use and design patterns at different geographical levels.

Subsequent research conducted by Cervero and Duncan (2003) in the San Francisco Bay area analysed the links between the physical urban form and modes of non-motorised travel. Household activity data was selected from the ‘Bay Area Travel Survey’\(^5\), for the following ‘away-from-home’ activities:

• Socialising and/or visiting friends
• Meals/eating
• Personal services
• Recreation/entertainment
• Volunteer/civic/religious occupations
• Shopping for a period less than 15 minutes

A factor analysis was used to represent the urban design and land-use diversity of the built environment to account for:

• Street and city block characteristics
• Block size and intersection configurations
• Land use diversity of trip origins and destinations

The authors concluded that urban form has a modest and sometimes statistically insignificant impact on walking and cycling. Whereas well connected streets, small city blocks, mixed land uses and retail in close proximity induce non-motorised forms of transport, exogenous factors such as topography, darkness and rainfall had stronger influences. The authors noted that bicycling as a travel mode was equally influenced by density, diversity and design, with land use the strongest predictor of walking. Overall, Cervero and Duncan noted, the built environment influences travel behaviour by walking and cycling more than the availability of destinations (Cervero and Duncan 2003:1478).
Cervero and Duncan’s findings reflect those of Shriver’s (1997) study of the influence of neighbourhood design on pedestrian behaviours. As noted above, walking trips in the traditional grid neighbourhoods were predominantly shorter and utilitarian, often involving secondary activities. In the newer neighbourhoods, walking was characterised by longer, less frequent recreational walks involving fewer secondary activities. Critically, Shriver found that in traditional grid neighbourhoods, walking tends to be used as a mode of travel by which to access services and activities whereas in the newer less traditional neighbourhoods walking is typically undertaken as a leisure activity. Such an observation is critical as it suggests that grid neighbourhoods facilitate instrumental walking in combination with other activities, whereas in newer neighbourhoods walking is undertaken as a deliberate leisure decision on the part of the individual. With leisure-time constrained by various lifestyle factors, instrumental walking would appear to be a more sustainable way of achieving sufficient levels of physical activity to obtain health benefits, while leaving leisure-time for other pursuits (Shriver 1997:64).

Frank, Andresen, and Schmid (2004) added another dimension to evaluating the relationship between the built environment and physical activity through consideration of body weight. In a 13-county Atlanta region, Frank et al. recruited study participants on the basis of household income, household size and the density of residential locality. Self-reported travel data was collected via two-day travel diaries. Data included the time spent in cars as either driver or passenger, which served as a proxy for sedentary behaviour, and distances walked, as a proxy for physically active behaviour. Built environment variables included connectivity, residential density and land use mix. Study findings deserve restatement at length, in part because they are the result of one of the few major studies of travel by private motor vehicle and health outcomes.

- Land-use mix had the strongest association with obesity, with each quartile increase associated with a 12.2 per cent reduction in the likelihood of obesity
- Each additional hour spent in a car per day was associated with a six per cent increase in the likelihood of obesity
- Each additional kilometre walked per day was associated with a 4.8 per cent reduction in the likelihood of obesity
- Street accessibility and connectivity, as the influence of distance between destinations appears to either encourage or discourage walking
- The street factor (an element of the sprawl index) is associated with ‘a reduction in hypertension and heart disease, conditions for which a physical activity pathway is most plausible’
- No adverse effects of sprawl on mental health including depression, anxiety and psychological well-being
- People who live in neighbourhoods with a mix of shops and businesses within easy walking distance are seven per cent less likely to be obese
An average white male living in a compact community with nearby shops and services is expected to weigh ten pounds less than a similar white male living in a low density, residential-only cul-de-sac subdivision.

Study respondents were less likely to drive and more likely to walk if they lived within walking distances of businesses.

Frank et al (2004:87) concluded that multiple further factors played a role:

Measures of the built environment and travel patterns are important predictors of obesity across gender and ethnicity, yet relationships among the built environment, travel patterns, and weight may vary across gender and ethnicity.

A recent study by Wen, Orr, Millett and Rissel (2006) in New South Wales, Australia, similarly investigated the association between driving to work, physical activity and obesity. This study found:

- Approximately half of the study participants were overweight or obese (49 per cent)
- Cars were used by the majority of participants as the main travel to work mode (69 per cent)
- Higher frequency of car use was associated with overweight and obesity

The limited amount of research which empirically evaluates obesity and aspects of the built environment at the individual level, substantiates a relationship. The research thus supports health promotion and urban planning interventions that increase proximity to service and activity destinations through greater land-use mix as a means of achieving higher levels of walking for instrumental purposes.

### 4.9 Proximity and Individual Factors

Research investigating the relationships between walking trips to common destinations was undertaken by King, Brach, Belle, Killingsworth, Fenton and Kriska (2003). This study, focusing on older women, examined destinations within walking proximity and the overall suitability of the neighbourhood for walking. The research obtained data from 149 women as a 15-year follow-up to a Pittsburgh study in the early-1980s.. The study gathered data:

- The convenience, safety and aesthetics of walking to destinations in the neighbourhood
- Time needed to walk from home to 13 destinations (a bike/walk trail, bus stop, café, church, community centre, convenience/grocery store, department/hardware store, doctors, library, park, post office, restaurant/pub, and work)
- The frequency of walking trips to each destination
• Perceived quality of neighbourhood surroundings for walking, captured as a global neighbourhood 'walkability' rating

The research reports most participants indicated they rarely walked to destinations further away than 20 minutes away. The research did, however, find that residence within a 20 minute walk to a park, bike/walk trail, or department/hardware store was related to higher pedometer readings. A positive relationship was also observed between the walkability rating of participants' neighbourhoods and their activity levels. Overall the study suggests the ability to make instrumental walking trips from residential homes and perceived favourable neighbourhood surroundings are associated with increased walking-based physical activity levels in older women.

Following the King et al (2003) study, King, Belle, Brach, Simkin-Silverman, Soska and Kriska (2005) investigated objective neighbourhood attribute measures and levels of physical activity in older women. A randomized sample was selected of 158 overweight post-menopausal women in south-western Pennsylvania. The women wore pedometers for a week and their personal and physical characteristics were recorded. Participants' residential and business addresses, as well as activity destinations were geo-coded with relevant neighbourhood census data. A residential housing age method was used to measure urban form and density (see Chapter Four).

Multiple linear regressions tested associations between individual physical activity and neighbourhood characteristics. Living in a 1950-1969 neighbourhood was associated with higher physical activity levels than living in a pre-1950 neighbourhood. The study found that participants living within walking distance of such facilities as a golf course or post office walked approximately 2000 to 3000 steps per day more than those who did not. These findings offer some support that closer proximity of businesses and facilities to and within residential areas may increase physical activity levels of overweight and post-menopausal women.

Local activity proximities may not necessarily directly influence the level of walking trips to nearby destinations. Findings of the sort reported by King et al (2005) demonstrate that further research is necessary to clarify the role of environmental attributes that facilitate walking for urban travel.

4.10 Residential and Travel Preferences

Handy, Cao and Mokhtarian (2005) investigated the correlation between neighbourhood design and travel behaviour and whether transport mode preferences influence households’ selection of neighbourhood. In late 2003, data was collected from households in eight Northern Californian neighbourhoods. The eight neighbourhoods consisted of four ‘traditional’ and four ‘suburban’ areas. The traditional neighbourhoods differed from the four suburban neighbourhoods in terms of the street network design, age and
style of houses, as well as the location and design of commercial centres. Neighbourhood metrics included:

- Accessibility
- Physical activity options
- Safety
- Socialisation
- Outdoor spaciousness
- Attractiveness

Travel behaviour was elicited through a series of questions on commuting, non-work, and walking trips. The study used a quasi-longitudinal method to investigate the relationship between neighbourhood characteristics and travel behaviour while taking into account the role of travel and neighbourhood preferences to explain relationships. Multivariate analysis of cross-sectional data indicated differences in travel behaviour between suburban and traditional neighbourhoods, largely explained by individual respondent attitudes:

A simple comparison of different neighbourhood types shows significant variations in levels of driving. However, a multivariate analysis of cross-sectional data shows that these differences are largely explained by attitudes and that the effect of the built environment mostly disappears when attitudes and socio-demographic factors have been accounted for. (Handy, Cao and Mokhtarian 2005:442).

Handy, Cao and Mokhtarian noted however that a quasi-longitudinal analysis of changes in driving and changes in the built environment demonstrated significant associations providing support for a causal relationship between neighbourhood design and travel behaviour.

The Handy et al (2005) study shares some similarities with that of Booth, Owen, Baumann, Clavisi and Leslie (2000) who investigated a range of social-cognitive and perceived influences associated with levels of physical activity undertaken by older Australians. A randomly selected sample of 449 persons aged over 60 years old recorded levels of physical activity. Participants also responded to environmental factors at a local scale including:

- safely or difficulty walking in the neighbourhood, and
- access to facilities that could be used for exercise purposes

Although Booth et al’s sample were able to conclude that safe active travel infrastructure, such as footpaths, and access to local facilities are significantly associated with physical activity, suggesting local access to such facilities may encourage older populations to participate in walking for transport.

4.11 Chapter Conclusion
This Chapter has reviewed literature which provides insights into the relationship between transport systems and physical activity.

In contemporary Australia transportation and urban land-use arrangements appear not to promote alternatives to private motor vehicles. In particular, many Australian suburbs have been engineered for car dependence and this has resulted in a poor connection between travel behaviour and physical activity. What is of particular concern is that, even as recognition of the multiple ill health and negative environmental impacts from motor vehicles is growing, automobile use for urban travel is expanding.

Researchers are beginning to understand how private motor vehicle use and the design of urban space contributes to adverse health outcomes, reducing the opportunities for incidental activities served by alternative modes of transport. To some extent, this problem is the result of homogenous areas of low-density housing with few local activities or services and poor public transport provision. Often, such areas are insufficiently dense or proximate to destinations to support quality public transport. In addition, the layout of the street networks can limit the viability of alternative modes making the use of the private vehicle close to mandatory.

There is a growing recognition of the need to promote urban planning that supports alternative transport modes that improve health. To encourage physical activity, such recognition includes the appreciation of the relationships between the:

- Local neighbourhoods and physical activity
- Distribution of activities and services and
- Availability and quality of public transport

There remains, however, the need for a concerted effort between the disciplines of health and urban planning to lead policy change with empirical research that shows in greater detail the relationship between urban form, transport and health.

While the link between urban form and physical activity is reasonably well appreciated, if not conclusively understood, the link between physical activity and public transport service quality is poorly comprehended. There have been no studies to date that specifically assess the extent to which the availability and quality of public transport and the connectivity that such services provide to various land-use activities promotes physical activity. Intuitively there would seem to be a relationship if only because public transport typically involves a walk to the local stop or station. Yet so far no research has investigated this specific relationship. Given that a ten-minute walk to a public transport service combined with a ten-minute return walk would meet two thirds of daily physical activity requirements for health benefits investigating this issue could be a fruitful direction for health research.
Chapter Five - Spatial Access to Health Services

5.1 Introduction

A further critical dimension of the relationship between urban environments and health is access to health services. This Chapter reviews research into spatial access to health services. Spatial access to health services is a qualitatively different dimension of the relationship between urban environments and health when compared to the behavioural impact of various types of urban form or transport systems. The siting of health services within urban environments is a result of deliberate locational decisions made by health providers and planners, rather than an outcome of the design of particular urban features, such as density. Nor are health services a destination to which walking, cycling and public transport are regular activities, unlike local shops, schools or employment. However access to health services within walking or cycling distance or by public transport remains a potential health issue.

5.2 The Concept of Access

In health policy and related research, ‘access’ is an important concept that can be defined as the entry to all levels of health care and the factors that influence and characterise the entry into this health care. Typical definitions of health access include:

The degree to which individuals are inhibited or facilitated in their ability to gain entry to and to receive care and services from the health care system. Factors influencing this ability include geographic, architectural, transportational, and financial considerations, among others. (BIREME 2005).

Access - The patient's ability to obtain medical care. The ease of access is determined by such components as the availability of medical services and their acceptability to the patient, the location of health care facilities, transportation, hours of operation and cost of care. An individual's ability to obtain appropriate health care services. Barriers to access can be financial (insufficient monetary resources), geographic (distance to providers), organizational (lack of available providers) and sociological (e.g., discrimination, language barriers). Efforts to improve access often focus on providing/improving health coverage. (Pam Pohly's NetGuide 2005).

5.3 Dimensions of ‘Spatial Access’

There is limited empirical research into the relationship between physical urban form and spatial access to health services. As with attempts to define ‘sprawl’ or even to classify dispersed suburban patterns, there is no clear and agreed definition that encompass the complexities of ‘spatial access’ to health services. Haynes, Lovett and Sünnenberg (citing Moseley's 1997) note that:
There is no accepted measure of physical accessibility. It is commonly measured in terms of distance to services or the costs of travel, but neither of these can fully capture the differences between ease of access in travelling by private car or public transport, on a motorway or on a minor road. (Haynes, Lovett and Sünnenberg 2003:98)

In fact, much of the available literature concentrates on issues associated with accessing health care in terms of social or economic access, and typically does not include the 'spatial dimension'. Rather, it concentrates on:

- Particular aspects of access to health care services
- Access to health care facilities for disadvantaged people
- People with specific health needs accessing health care

Gulliford, Hughes et al. (2001), seeking to provide an overview of the key issues in access to health care, define access to health care, for example, as having the following four aspects:

- If services are available, in terms of an adequate supply of services.
- The financial, organisational and social or cultural barriers that limit utilisation including physical accessibility
- The services available must be relevant and effective.
- The availability of services, and barriers to utilisation, have to be evaluated in the context of the differing perspectives, health needs and the material and cultural settings of diverse groups in society.

(Gulliford, Hughes, Figeroa-Munoz et al 2001:6-7).

Although each of these four aspects do not specifically mention 'spatial access' to facilities, all aspects include an element of spatial access. The availability, utilisation, effectiveness and appropriateness of health care services each contain a spatial dimension.

Gulliford et al's research concerning spatial access to health services notes, as expected, that the distance from a service is inversely associated with its use, especially if it is a specialist service,. Other factors, however, such as access to reliable transport as well as travel times and cost of travel are often more likely to be the critical factor(s) than simple physical distance when accessing doctors.

This appears to be consistent with Pechansky and Thomas' (1981:128) definition of access as 'a concept representing the degree of 'fit' between the clients and the system'. They classify the dimensions of health access as:

- Availability of a range of health services, adequate to meet demand
- Physical accessibility and spatial barriers relative to location
- Accommodation of service functions relative to needs
- Affordability including finances, time and energy costs
- Mutual acceptability between users and providers
Pechansky and Thomas assessed patient access to healthcare services in Rochester, New York. A questionnaire administered to 267 respondents asked:

- How satisfied are you with how convenient your physician’s offices are to your home?
- How difficult is it for you to get to your physician’s office?

Levels of satisfaction were scored on a five-point Lickert scale ranging from 'very satisfied' to 'very dissatisfied'. Overall, travel time was a strong predictor of level of satisfaction. Socio-economic differences also played an important role. Thus unemployed females perceived times and distances to arrive at health care differently than other persons in the study population:

> It was noted that variations in access are presumed to influence not only patient satisfaction, but service utilization and provider practice patterns as well. (Pechansky and Thomas 1981:139)

This finding highlights the importance of 'fit' between health care services and patient need.

A similar study was completed in the UK by Lovett, Haynes, Sününenberg and Gale (2002). They investigated accessibility to doctor surgeries. Data included:

- Patient register information from the Family Health Service Authorities (FHSAs)
- Doctor’s surgery locations
- Road types, networks and travel speed characteristics
- Bus routes and timetables
- Community car and dial-a-ride transport services

This information was spatially coded for GIS analysis that estimated accessibility to surgeries by public and private transport. Lovett et al. found:

- Ninety per cent of residents lived within a ten minute car drive to a doctor.
- Approximately 13 per cent of the population could not reach medical services by daily bus.
- For five per cent of the population, the car journey to the nearest doctor was more than ten minutes and there was no suitable bus service each weekday.
- Residents in the remotest parishes experienced the lowest levels of personal mobility.
- Many with high health needs lived in areas where there was no daily daytime bus service and no community transport.

Clearly a combination of spatial distance and access to alternative travel options affects the access of populations to health services. Lovett et al’s (2002) study reinforces the critical importance of good spatial access to health care services for users. When access to medical facilities is within a
spatial dimension that is perceived as acceptable to the patient, it is used. However, when accessibility to health care provision is either not available or not perceived as within an acceptable spatial dimension, it is used less, and in the cases Lovett et al identified, may impact negatively on the health of those with the highest health needs.

Both physical and perceptual space are clear barriers to accessing health services. However, it is not clear from these studies what the specific impacts of impedances to health care access are, in terms of patient care and health outcomes. The difference between mobility and accessibility, and the spatial unevenness of these attributes is critical in such an area of planning and health understanding.

5.4 Primary Care Supply and Access

Shi and Starfield (2001) assess whether income inequality and the supply of primary-care doctors had different effects on mortality rates among black people, compared to mortality rates among white people in US urban areas. Federal Office of Management and Budget US Metropolitan Areas were used as units of analysis to statistically assess income inequalities and the supply of primary care. The research indicated that:

- State level income inequalities and the supply of primary care doctors were significantly associated with population health indicators
- Income inequality and primary care doctor supply were significantly associated with white mortality
- The effect of income inequality on black mortality remained significant after the inclusion of the socioeconomic status covariates

Overall, Shi et al found that residents in areas with greater primary care presence are also more likely to have better health, supporting the theory that the fewer doctors in a locality the worse health outcomes.

Gulliford (2002) drew on Shi et al’s findings regarding better access to primary care and lower mortality in US cities to investigate the relationship between population health and the local availability of primary care doctors in the United Kingdom. Data from the UK Department of Health’s statistical publication were used to estimate resident population size and the number of doctors proportional to residents. Health indicators included:

- Long-standing illness
- Infant mortality rate
- Standardised mortality ratio for all cause mortalities
- Hospital admissions
- Conception rates

Gulliford found that the association between the spatial concentration of doctors within an area and mortality was not robust. However, Gulliford noted that the higher the concentration of doctors within an area, the lower
the use of hospitals for acute or chronic conditions. Overall, the more affluent areas had:

- More doctors.
- General practices with better facilities.
- More services.
- Longer consultations.
- Higher quality of care.

To increase the effectiveness of primary health care services across the study region, Gulliford argued that spatial inequalities in the supply and availability of doctors should be reduced and advocated the imperative ‘to link the geographical allocation of resources for hospitals and primary care services’ (Gulliford 2002:254). While these findings are not necessarily directly transferable to the Australian context, a valid question may be raised as to whether the local spatial availability of high quality basic medical care impacts on the broader health of populations and on medical services by ensuring that treatment is accessed at a non-acute disease stage. Clearly further research is necessary into this critical relationship and the potential for lessening the disease burden on spatial populations and the broader medical system.

5.5 Spatial Access and Travel Behaviour

The local presence of health providers does not alone constitute access to health care services. Bashshur, Shannon and Metzner (1971) investigated whether residents within the greater metropolitan area of Cleveland primarily accessed the medical facilities closest to their homes. Medical care facilities included:

- Hospitals
- Physicians
- Dentists
- Pharmacies

Bashshur et al (1971) observed that there is a general assumption that a distance limit exists beyond which people are unwilling or unable to travel in order to obtain medical services. However, they also noted:

> Distance to medical services is important, but its effect as a barrier is a function of paths and goals. The nature of the roads and streets, the public or private means of transportation, the values of users, the severity of the problem, and ability to pay are all involved. (Bashshur, Shannon and Metzner 1971:74).

Travel patterns to health care facilities do not necessarily involve a visit to the nearest facility as a matter of spatial proximity but rather to a facility of choice, which is also influenced by factors such as attractiveness or receptivity.
This finding is also evidenced in the Gulliford et al (2001) study which notes that although people may have good spatial access to health services, they may not use them. Individual attitudes, beliefs and perceptions result in personal acceptance or rejection of health services and therefore impact on the health service accessibility. These factors need to be addressed to create health services that are more accommodating and encourage health service access for those with certain medical conditions, needs or beliefs.

Such observations should however be tempered with the recognition that while individuals may not necessarily use health services in closest proximity to their residential location, the lack of local availability of primary health services is linked to adverse health outcomes, particularly for lower socio-economic groups.

5.6 Access and Mortality

The link between spatial access to health services and mortality has been examined by Jones and Bentham (1997). They demonstrate a link between asthma-mortality and the spatial availability of health services for asthma-management. The research collected statistics for asthma-related fatalities in the UK in people aged 5 to 55, between 1988 and 1992. To gauge the relationship between geographic isolation and mortality independent variables sourced from 1991 data included:

- Access to a car
- Social class
- Household in bedsits
- Weighted population density
- Average distance to the nearest acute hospital (200+ beds)

The authors found that although asthma mortality is associated with poorer communities and those without access to a car, after controlling for social factors, the incident of mortality also increased with the residential distance from hospitals (Jones and Bentham 1997).

A subsequent study by Jones, Bentham and Horwell (1999) investigated health service accessibility and asthma related deaths in 536 electoral wards of East Anglia in the UK. Two measures of health accessibility were measured for all the residential wards with estimated mean travel times to the:

- Nearest main or branch general practitioner surgery, and
- The nearest large hospital for the residents within each ward

The study found no strong association between increased asthma mortalities and increased travel time to surgeries. However, the findings of this study verified that asthma-mortalities increase with travel time to acute hospital facilities, consistent with the findings of the Jones and Bentham.
It is as yet unknown whether the greater likelihood of mortality reflects the severity of the asthma condition in relation to the medical facility from which treatment was sought, or if the medical facility sought was a preferential decision made by the medical seeker. It is possible that the mean travel time estimated neglected transport mode or transport availability, as the study area was located where alternatives to the private motor vehicle may have not been available.

In sum, the asthma studies suggest improving the spatial availability of health services could improve the management of chronic illness.

5.7 Access to Health Care Aligned with Transport

The specific relationship between spatial access to health care and the transport system has been considered by some authors. Lucas, Grosvenor and Simpson (2001) used qualitative methods to assess urban residents spatial access to health care. These authors found that factors such as transport options, accessibility, location and proximity of services were critical dimensions affecting access to health services, especially for mothers with children.

Poland, Ager and Olson (1987) investigated barriers pregnant women face when seeking prenatal care. They found the main factors impacting on access to prenatal care included social, financial and personal factors such as insurance, attitudes to health providers, perceived importance of care, as well as knowledge of the pregnancy, delay telling others and initial emotions of being pregnant. Poland et al. also found women who received less prenatal care were more likely to be public transport users. These pregnant women believed public transport to be an access barrier to prenatal care, due to unreliable bus services, dangerous conditions and poor weather conditions.

The UK Social Exclusion Unit (SEU) (2003) has suggested that the level of access to health care is related to the quality of individuals and households’ transport access. Not having a car and/or lack of available and affordable public transport is significant.

Over the course of a year over 1.4 million people miss, turn down or simply choose not to seek healthcare because of transport problems. (SEU 2003:111).

The SEU notes the results of a National Statistics (UK) survey to assesses the proportion of healthcare patients who experience difficulties getting to various services:

- Hospital: 15 per cent
- Doctor’s surgery: 6 per cent
- Dentist: 5 per cent
The SEU concluded that poor access to health services impacts negatively on individuals’ health outcomes. This, in turn, imposes costs on both the patient and the health. Specifically:

- Patients experience poorer health through missed appointments
- Disease is not diagnosed in formative stages
- Advanced illness is treated in place of early intervention
- Health care simply not sought
- Patients require longer inpatient hospital periods

In one conclusion the SEU argue that key to the provision of effective health access are public transport options that are reliable, affordable and temporally aligned with appointment periods.

Clifton and Lucas (2004) note that in the UK, hospital services have been rationalised to fewer but larger hospitals. These facilities service broad tracts of urban areas, but are often difficult to reach without a car. As Clifton and Lucas observe:

This can mean that illnesses are not discovered or treated so quickly, with an adverse implication for the success rate and cost for certain treatments. (Clifton and Lucas 2004:31).

Public transport also featured in studies into access to prenatal care for Detroit women. McCray (2000) examined what the transportation-related barriers inhibit women of low socioeconomic status from seeking healthcare. Data from focus groups was correlated with GIS analysis of residential location and bus routes to healthcare facilities.

McCray reported a set of transportation-related barriers to seeking care that included:

- Difficulties in using public transit – such as cost, unreliable bus schedules, travelling times, bad weather, and personal safety issues
- Accessibility of routes – including access to indirect routes necessitating bus changes, residing outside comfortable walking proximity to transport provision
- Language barriers – prohibiting public transport use as routes and destinations are unknown to the passenger

These research findings indicate transportation problems can directly impact access to healthcare. Poor transport options, lack of local facilities and difficulties reaching hospitals can result in missed appointments. As such, it needs to be addressed to improve health care access.

5.8 Chapter Conclusion

The few studies that have so far examined the link between the location of health services within urban areas and eventual health indicate there is a relationship that needs to be further understood. Those with lower levels of
spatial access to health services seem likely, on the basis of this research, to experience worse outcomes than those with better access.

This is a critical issue for both land-use and health service planners in Australia. The literature cited above, however, is from international cases rather than the Australian experience. We could find not study that investigated whether Australian cities are different to European or US cities and therefore deserve to be examined as to their particular spatial distribution of health care services. There is thus an urgent need to develop a research base that can assist to comprehend these spatial health and access relationships in the Australian context.
Chapter Six - Initiatives and Policy

6.1 Introduction

In most Australian cities the regulation of urban form, transport and the location of services within urban areas are governed by strategic planning documents. The past five years has seen a resurgence of Australian planning strategy commencing with the Melbourne 2030 Metropolitan Strategy released by the Victorian government in 2002. This Chapter considers the conceptualisation of urban health in these recent metropolitan policies and identifies how they relate to research-based knowledge of the relationship between urban form, transportation systems, services location and health outcomes. The policies are evaluated in terms of the extent to which health issues are considered and the extent to which any policy prescriptions are applied to pursue health outcomes. The discussion focuses on metropolitan-level strategies rather than local plans. The volume of local policies mitigates against a comprehensive review of such documents. While it would be desirable to include consideration of international examples of metropolitan plans that directly address health issues, this is not feasible given the scope of the present project. Attention to international urban-health policies is however provided in the later sections of this Chapter.

6.2 Health in Australian Planning Policy

To ascertain how ‘health’ is conceptualised in Australia planning policies, the following Australian planning policies were examined:

- South East Queensland Regional Plan 2005 – 2026
- Melbourne 2030: Planning for Sustainable Growth
- City of Cities: The Sydney Metropolitan Strategy
- Network City: Community Planning Strategy for Perth and Peel
- Hope for the Future: West Australian Sustainability Strategy
- Brisbane City Council strategies and policies

The review of these policies was quite specific. The analysis focused on references to health or wellbeing, whether a health-urban link was posited or noted, and whether any specific policies were included in the strategy to expressly address health outcomes through management of the urban environment.

Before delving into discussion of the individual plans, some overall observations are relevant. In these planning documents, ‘health’ is rarely discussed as a separate policy objective, but is often given some cursory attention amongst general considerations of transport, infrastructure and social objectives. References to health are often folded into social infrastructure matters, but typically as a secondary consideration.. When the
objective of improved health is identified within components of planning policy, there is a lack of:

- Definition to specify what ‘health’ or ‘health outcomes’ actually entail
- Actions required to set out the necessary steps to actually achieve health outcomes

These definitional problems are illustrated in the following sections which identify how Australian metropolitan plans address health issues in relation to the key areas of:

- Urban form and structure
- Transportation systems
- Spatial access to services

6.3 The South East Queensland Regional Plan and Infrastructure Plan

The South East Queensland (SEQ) Regional Plan recognises health as an important dimension of the region’s strategic move toward urban sustainability. Healthy communities are outlined as a key objective, and given specific attention in “Principle 6.4: Safe and Healthy Communities”. However there is a lack of specific action(s) to articulate the apparent purpose of Principle 6.4 into a program.

The SEQ Regional Plan recognises the inclusion of health issues in the definition of ecological sustainability. It restates the Integrated Planning Act 1997 (IPA) definition of ecological sustainability as a balance that includes the:

...maintenance of the cultural, economic, physical and social wellbeing of people and communities. [The Plan’s vision for future sustainable communities includes] healthy, safe communities and high levels of physical activity. (OUM 2005b:22-23).

The “Desired Regional Outcome 1: Sustainability”, lists “good health” as one of the “things that matters most” and which needs to be protected (OUM 2005b:22). Health however, is not included in State of the Region sustainability indicators to be regularly monitored (OUM 2005b:25).

Urban form and health in the SEQ Regional Plan

Specific recognition of health as a key objective is included in the Plan’s “Desired Regional Outcome 6: Strong Communities”. The link between the design of the urban environment and health is acknowledged in “Principle 6.4: Safe and Healthy Communities”. The Plan affirms:

[There are strong links between the physical environment, socio-economic issues and community health and wellbeing. (OUM 2005b:53).]
A number of policies are outlined to achieve the objective of safe and healthy communities, including:

6.4.1: Improve community health and safety by using best practice urban design, local transport investment, community engagement and social planning practice.
6.4.3: Incorporate community health and safety issues in the planning and development of new urban areas and redevelopment sites. (OUM 2005b:53)

The Plan identifies the characteristics of “safe and healthy communities” to include those that:

- use best practice urban design to create built environments which foster and enhance community safety.
- allow for mobility and access by all members of the community.
- encourage increased physical activity through the provision of cycling and pedestrian networks, open space, and informal and formal sport and recreation facilities.
- provide inclusive public spaces for community interaction and activity. (OUM 2005b:53)

These policy statements clearly identify health as a key objective and recognise the impact of the urban environment on health and wellbeing. However, there is limited detail on the specific actions required to achieve this objective. As such it is unclear as to what strength of implementation measures are required to achieve the health objectives of the plan.

**Transport and health in the SEQ Regional Plan**

The SEQ Regional Plan promotes walking and cycling as healthy active transport modes. It holds:

> [Walking and cycling networks provide flexibility as well as significant health and environmental benefits. (OUM 2005b:106).]

Again, however, there is little detail as to how this is to be achieved. The Plan also notes the link between community wellbeing and access to transport, asserting:

> [The quality of life for people living in SEQ relies on a transport system to connect the wider community with goods, services and employment. (OUM 2005b:106).]

Much of the detail of the intended transport infrastructure arising from the SEQ Regional Plan is contained in the attendant SEQ Infrastructure Plan. It is worth noting the balance of projected transport funding in this plan as an indicator of the extent to which the stated health objectives are to be realised.

The funding figures provided in the SEQ Plan indicate that the plan supports further use of the private motor vehicle on roads in preference to walking, cycling and public transport. Public transport accounts for less than 35 per cent of planned expenditure, while walking and cycling combined will receive
approximately 1.6 per cent of planned investment (OUM 2005a:12, 15, 18, 21). Given what is known regarding the probable links between urban environments and physical activity, there is grave cause for concern that health impacts from infrastructure investment choices have been largely ignored in the planning of the region.

Table 3: Projected Transport Infrastructure Expenditure ($M) by Mode (Excluding Rail Freight Infrastructure) for SEQ, 2006-2026.

<table>
<thead>
<tr>
<th>Area</th>
<th>Public Transport</th>
<th>Walking/Cycling</th>
<th>Roads</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Brisbane</td>
<td>2554</td>
<td>210</td>
<td>5555</td>
<td>8319</td>
</tr>
<tr>
<td>Western Corridor (excluding Toowoomba)</td>
<td>615</td>
<td>20</td>
<td>2323</td>
<td>2958</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>2205</td>
<td>50</td>
<td>1425</td>
<td>3680</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>2151</td>
<td>50</td>
<td>3727</td>
<td>5928</td>
</tr>
<tr>
<td>Total:</td>
<td>7225</td>
<td>330</td>
<td>13030</td>
<td>20885</td>
</tr>
</tbody>
</table>

Spatial Access to Services

Good spatial access to health services is a key feature of future SEQ communities (OUM 2005b:9). In the Regional Plan however, confines health services are subsumed under the rubric of social infrastructure. Health services thus appear in a list of other “...community services and facilities required to provide quality of life and community wellbeing” (OUM 2005b:51). The Plan, in short, does not address the provision of health services separately, nor specifically address issues of access to and location of health services.

Public Participation

In the SEQ Regional Plan public participation in the planning process is viewed as contributing to wellbeing. The plan highlights the need to:

[s]upport community engagement in planning processes, enabling local communities to identify, articulate and enhance their sense of place and wellbeing. (OUM 2005b:54).

An integrated approach, that includes public participation, to health issues is also advocated:

[i]mproving community health and safety requires good working partnerships between all levels of government, the development industry and the community. (OUM 2005b:53).
Nevertheless, there are few policies in the SEQ Regional Plan that set out how public participation is to be included in subordinate local planning programs in a way that demonstrable enhances community wellbeing.

In conclusion, while the SEQ Regional Plan contains a number of references to better health outcomes detail of specific planning policies to achieve these outcomes remains sparse. While the inclusion of health concerns in the SEQ Regional Plan is a positive initial step, given the plan is the region’s first, there is clearly more work to be done to better define, articulate and implement policies to achieve positive health outcomes through the regional planning process.

6.4 Melbourne 2030

The Melbourne 2030 Metropolitan Strategy engages with health issues in relation to the provision of and access to health services, and the promotion of walking and cycling as more sustainable transport options. Overall, health is categorised as a social infrastructure management issue, with limited attention given to health as an urban issue in its own right. However, the document does identify high health standards as one of Melbourne’s current strengths under the category of liveability (DSE 2002:23).

**Urban Form**

Melbourne 2030 acknowledges the link between the quality of the built environment and health, particularly in relation to social interaction and community participation. The Plan states:

> The physical environment affects people’s ability to participate in community activities, access services and facilities, and undertake their daily lives. It also affects their sense of community and security. Urban design, including the design of buildings, streets and neighbourhoods, can foster or discourage interaction and participation in civic life. (DSE 2002:92).

Again, however there are few specific actions or initiatives in the Plan that address health as an issue of urban form.

**Transport**

Melbourne 2030 advocates a built form that supports walking and cycling to improve health and wellbeing. It declares:

> Emphasis will be placed on fostering healthy lifestyles through initiatives such as creating walkable neighbourhoods where it is easy and attractive to walk or cycle to facilities and services. (DSE 2002:100).

The document has strong emphasis on walking and cycling not only as sustainable alternative to cars, but as a health issue:
For many trips, walking and cycling are the most energy-efficient and effective means of mobility, minimising the environmental impacts of travel and providing direct benefits for personal health and social wellbeing. (DSE 2002:158).

Specific guidelines within the document on how this is to be achieved are included in discussion of the TravelSmart pilot program that attempts to discourage car use. The Travelsmart program is examined later in this chapter. It is also worth noting that the Melbourne 2030 plan does not include a discussion of specific transport projects, save one major freeway. Accordingly there is little basis within the plan to assess the extent to which the rhetorical references to the achievement of health outcomes through planning for alternatives to the car are to be converted into actual programmatic change.

Spatial Access to Health Services

Access to health services is identified as an objective of Melbourne 2030 (DSE 2002:12, 26). The plan also frequently cites access to health services as a consideration for both newly developing and existing urban developments. ‘Key Direction 6’ of the plan states:

…[b]y working with local communities, gaps will be identified in major social and cultural facilities in areas such as health, education, justice, recreation and the arts. (DSE 2002:39).

Again, health services are included amongst a long (wish?) list of other services and facilities usually consolidated in the category of social infrastructure.

While improved spatial access to health services is promoted in planning policy, again there is a lack of detail of how this is to be accomplished. Melbourne 2030 (DSE 2002:53), sets out Performance Criteria for local commercial and service Activity Centres that include:

- Making a wide range of facilities and services and facilities more accessible to all persons
- Maintaining or improving public health

Regrettably there is no discussion or guidelines to illustrate how these performance criteria are intended to be assessed or evaluated.

Access to health services is also discussed in Melbourne 2030 document from the perspective of equitable distribution of infrastructure. The plan argues:

[Inadequate access to social infrastructure] affects people’s sense of wellbeing, quality of life, and can exclude them from full participation in society. (DSE 2002:118).
In addition, Melbourne 2030 also includes a list of current Government initiatives to improve wellbeing such as:

- The Metropolitan Health Strategy: “developed to guide the future level, mix, distribution and quality of health services across Metropolitan Melbourne (DSE 2002:119).

- The Physical Activity Framework: which “includes as a key objective a focus on improving the places in which physical activity occurs, recognising that a key factor underpinning the ability of people to build physical activity into their daily lives is the availability and accessibility of supportive environments” (DSE 2002:119).

However, despite references to health Melbourne 2030 contains few implementation methods to achieve the desired objectives regarding the generation of physical activity by the arrangement of the urban form, the encouragement of active transport or the adequate spatial provision of services. In contrast there has been much criticism of the Victorian government’s ongoing preference for roads and motor vehicles over more active and healthy transport modes. Melbourne 2030 can thus be best understood as a weak document in terms of measures to promote improved health outcomes through urban planning.

6.5 City of Cities: A Plan for Sydney’s Future

The draft of the City of Cities Sydney Metropolitan Strategy was released in early December, 2005. The City of Cities strategy has a strong focus on employment and economic growth. Discussions of health are largely confined to consideration of the location of health facilities and their role in employment generation. Health is not specifically identified in the five stated aims of the Plan, but is discussed throughout the document in relation to the first aim: “enhanced liveability” (DIPNR 2005:3).

Transport

The City of Cities Transport Strategy, however, does discuss health.

Transport affects both physical and mental health directly and indirectly. While accidents and safety are an obvious impact on health, there is increasing awareness of the health impacts of air pollutants and noise emissions from transport. Transport can also affect health and well-being indirectly through people’s ability to participate in community life and access health services. Active transport — walking, cycling and using public transport — contributes to good health through increased physical activity. The decline in walking is one factor in increasing levels of obesity in the community. (DIPNR 2005:159).

The Plan promotes walking and cycling to improve public health. It states that “[t]he more people use active transport such as walking, cycling and public transport, the more the health of the community improves” (DIPNR
Strategies to encourage this shift are outlined in the policy “D3: Influence Travel Choices To Encourage More Sustainable Travel” (DIPNR 2005:181). The actions identified are:

- D3.1.1: Improve local and regional walking and cycling infrastructure through the implementation of the Planning Guidelines for Walking and Cycling.
- D3.2.1: Develop and implement a metropolitan-wide parking policy to encourage use of public transport to centres and ensure a consistent approach across centres.
- D3.3.1: Implement TravelSmart voluntary travel behaviour change programs targeted at households, schools and centres and other locations which generate travel. (DIPNR 2005:181-3).

The strategy also gives some attention to consolidating development around centres; locating services and facilities within walking distance of homes (DIPNR 2005:80, 130).

An improvement to health through increased physical activity is also heavily advocated in the Sydney plan. The strategy for parks and public places promotes physical activity as a means to reduce health costs and increase general productivity in the community (DIPNR 2005:232).

**Spatial Access to Health Services**

Reference to spatial access to health services is limited. Suggested sustainability criteria for new Greenfield developments include evaluation of accessibility to services such as health (DIPNR 2005:262). Overall, however, the Strategy gives limited attention to health issues, with health generally only discussed as a secondary consideration. Without further development the plan is likely to have only a limited impact on existing relationships between Sydney’s urban environments and the health of its population.

**6.6 Network City: Community Planning Strategy for Perth and Peel**

For the Perth metropolitan strategy, as for other metropolitan strategies, health is not a major substantive issue, although it is included in the strategy’s key aims and principles. The strategy holds “…providing for healthy lifestyles in safe communities” (WAPC 2004:23) to be a planning principle to guide implementation. Health is included as an important component of the strategy’s definition of liveability. Access to health facilities is recognised as a key determinant of liveability (WAPC 2004:36). Once again however, health issues often only arise as derivatives of other discussions such as, for example, employment location.
Transport

The Perth strategy identifies, as part of its transport strategy, the objective of walking and cycling as more sustainable transport modes, stating:

[a] more balanced transport system is … desirable for social benefits such as improved health and fitness and improved accessibility for those without car access” (WAPC 2004:76).

The Perth strategy does outline a number of actions to achieve this objective, and assigns responsibility for each action to the relevant state government department.

Spatial Access to Health Services

One of the key actions outlined in Chapter Seven of the strategy proposes health be clustered together with other services near transport routes to increase efficiency and accessibility (WAPC 2004:83). Another issue noted in the Perth plan is the increased need for health services as a result of an ageing population. The Perth strategy acknowledges that “…the ageing population will increasingly demand particular types of services such as health care facilities…” (WAPC 2004:79).

6.7 Hope for the Future: The West Australian Sustainability Strategy

The Sustainability Strategy, of the West Australian Government, was developed at the State level across a number of agencies and in conjunction with local government. It thus neglects the specifically (Perth) metropolitan area. The West Australian Sustainability strategy suggests a list of actions to improve health. These include the use of health impact assessments as a component of the “sustainability assessment process”, and improved links between government agencies to address health issues (DPC 2003:243). Thus the Sustainability Strategy differs from the specifically urban strategies discussed above. It is an example of spatially realised government policy in which extensive emphasis is placed on health issues.

Community health is identified as one of the key components of the definition of ‘sustainability’ (DPC 2003:24). A dedicated section of the strategy - : “Sustaining Healthy Communities” – discusses health as a sustainability issue. The strategy proposes:

[A] population’s health, both physical and mental, is a sensitive indicator of the health of the physical and social environment. [The strategy then affirms that] ... health needs to be partnered with town planning processes, [and advocates] [p]artnerships with planning agencies to develop friendly and health promoting urban developments... (DPC 2003:237, 239, 240).

In contrast to aforementioned metropolitan policy, the role of urban planning in health is, in West Australia, clearly recognised.

Queensland’s Integrated Planning Act 1997 (IPA) is a regional planning framework that guides development through local government planning schemes. The framework includes:

- The Integrated Development Assessment System (IDAS), which integrates the majority of development related controls under a single statutory system,
- Integrated infrastructure planning and provision for identifying future infrastructure intentions,
- Private Certifier assessment responsibilities, outside local governments or State agencies.

The IPA requires local governments to produce two key documents. The first, the ‘Strategic Plan’, outlines future development within the jurisdiction. The second key document, the ‘Planning Scheme’, (often called the Town Plan’ or ‘City Plan’), sets out criteria for assessing development at the regional level.6 The Planning Scheme incorporates the IDAS model for development proposal, assessment and determination, regardless of the nature of the development.7 As the majority of development related controls are integrated in the IDAS model, planners cannot approve proposals in conflict with for example, the Standard Building Regulations. Development Assessment occurs at the local level of government and assesses whether a proposal for development meets legislative criteria and is in accord with the Strategic Plan for that region.

Some areas use a further planning instrument, called the ‘Local Area Plan’ (LAP). The LAP sets out the strategic direction for planning at a localised scale and is another tier of regulation that can be applied to a Development Proposal.

6.9 Brisbane City Council

An example of how health issues are addressed at a local government level is provided by the planning policy documents published by the Brisbane City Council. The documents examined are:

- Living in Brisbane 2010 (BCC 2003a)
- Transport Plan for Brisbane 2002-2016 (BCC 2003b)
- Guidelines for Sustainable Development in Brisbane (BCC 2005a)
- Principles for Sustainable Development in Brisbane (BCC 2005b)
The last two documents listed above, are detailed brochures distributed by the Development Assessment Sustainability Team to guide the preparation of development applications. The main references to health in these documents concerns the provision of sport and recreation facilities, and strategies to encourage residents to participate in physical activity (BCC 2003a; BCC 2005a). In addition, walking and cycling as alternative transport modes that also increase physical activity are mentioned in Brisbane City Council’s Transport Plan for Brisbane 2002-2016 (BCC 2003b).

**Provision of Recreation Facilities**

The *Living in Brisbane 2010* strategy includes an “Active and Healthy City” policy which promotes physical activity, through the provision of recreation facilities and increased opportunities for walking and cycling (BCC 2003a:16-7). The strategy proposes the development of:

…neighbourhood precincts for sport and leisure that suit the needs of the whole community by linking existing facilities, developing new ones and using them to create opportunities for residents to participate in more local recreational activities (BCC 2003a:17).

**Transport**

The *Transport Plan for Brisbane 2002-2016*, states “[a] community that walks and cycles is a healthy community where people feel connected to their local areas” (BCC 2003b:12). The Plan also acknowledges that “[t]he lifestyle and transport investment choices we make now will have long-term implications for our health, natural environment and quality of life” (BCC 2003b:3). In addition, both the *Principles for Sustainable Development in Brisbane* and the *Guidelines for Sustainable Development*, encourage the provision of walking and cycling facilities (BCC 2005a; BCC 2005b). The Sustainable Development documents do provide some guidance on ways to incorporate these facilities into development proposals. On the other hand, it is worth noting that the largest project currently promoted by the Brisbane City Council is a suite of major road tunnels. The likely impact on public health is yet to be fully determined.

**Spatial Access to Health Services**

The issue of spatial access to health services and facilities is given limited attention by the Brisbane City Council policy. The Brisbane Transport Plan limits itself to the observation there will be an increased need for health services as the resident population ages. (BCC 2003b).

In sum, Brisbane City Council strategy acknowledges the need for increased levels of physical activity and addresses the objective by way of council’s role in the provision of recreational facilities. Walking and cycling are promoted as healthy alternative modes of transport and the *Guidelines for Sustainable Development* illustrates broadly how they might be encouraged.
6.11 Australian Planning Policies and Health

Australian planning policy, as the above examples suggest, rarely highlights health as a separate policy objective. Regrettably, health, in the main, is often given derivative attention as it arises in the general considerations of transport, infrastructure and social objectives. References to ‘health’ are most often folded into discussion of social infrastructure, where it appears as a generalised and secondary issue subordinate to primary planning objectives.

Even when planning policy identifies objectives of improved health there is commonly a lack of:

- Definition to specify what ‘health’ actually entails.
- Actions required to set out the necessary steps to achieve health outcomes.

The planning link between health and the urban form is ambiguous. As outlined in the literature, most health considerations relate to an extension of the relationship between physical activity having healthy outcomes. This is an implied and indirect relationship and not stated as an obvious relationship. Consistently, the objective of ‘health’ is devoid of definitions, details or actions to guide the achievement of health objectives through the urban form.

A common theme running throughout contemporary urban planning policy is the promotion of walking and bicycling as modes of transport to improve individual health. There is limited detail however on methods to achieve this, with the exception of some attempt in the Sydney and Perth metropolitan strategies. As discussed throughout the literature, increasing physical activity as a route to better health is linked to encouraging walking and cycling as alternative transport modes.

A number of planning policies examined do acknowledge the importance of spatial access to health services and facilities. Once again, whilst improved spatial access to health services is advocated in the policy, there is a lack of detail of how this is to be accomplished. Also health services and facilities are rarely identified separately as a defined category within discussions of infrastructure provision or accessibility. Health is frequently located amongst a long list of other facilities such as education and recreation.

Health is generally not identified as a primary objective within planning policies, and is only given passing reference. Health issues are commonly only addressed amongst general considerations for transport, infrastructure and social objectives.

The one consistent dimension of ‘health’ embodied in Australian planning policy is that of physical activity, seen achievable through the capacities for local governments to influence transport mode choices such as walking and bicycling. At present it is reasonable to assert that health dimensions of
urban environments are generally subordinated to other considerations such as economic or traffic concerns. In part this effect is due to the limited awareness among planners of the links between urban environments and health and the lack of a substantial and rigorous evidence base to bolster the suspected relationships. This is a particular problem in the case of transport planning where benefit and cost assessment models have historically been poor at incorporating social, environmental and health impacts into the assessment of transport projects.

6.12 Further Urban Policy Frameworks and Agendas

While contemporary Australian urban planning policy has limited objectives for health, there is a developing, if not yet coherent or forceful, policy awareness that urban form and transport systems influence physical activity levels and that this influence has health implications. In response to this awareness, a range of initiatives that promote physical activity within urban environments are emerging internationally. Such policy does not directly address urban form, but rather considers how to encourage health promoting behaviours within the urban form. Non-motorised transport modes are a particular focus, as a means of encouraging sufficient incidental activity to be deemed healthy. When changes to the urban form of cities are recommended such proposals are typically aimed at encouraging pedestrians activity through the introduction of footpaths and car free areas. Many of these initiatives are not mandatory, but have been encouraged internationally as voluntary programs to be taken on board by all levels of government and organisations. We discuss them not as exemplars of policy making to achieve health-supporting urban form and transport systems but rather as examples of potential policy programs. Indeed it is precisely because they are situated outside of mandatory regulatory provisions for urban planning and transport that such voluntary programs are noticeable. If planning was to adopt such strategies as mandatory elements in the design and layout of cities, while removing provisions that support unhealthy urban form and transport, then it is likely that the programs we describe would no longer be necessary. The programs we discuss are exemplary but not exhaustive. There remains a plethora of such guidance frameworks at the local, sub-national and national scale across many jurisdictions.

6.12.1 Healthy By Design: A Planners’ Guide

The Australian publication Healthy By Design: A Planners’ Guide To Environments For Active Living was published by the Victorian Division of the National Heart Foundation of Australia specifically as a resource to assist planners and related professionals (NHFA (Vic) 2004). The guide was developed in response to local government requests for practical guidance in designing walkable, and ultimately more liveable, communities. It includes the following themes:

- Walking and cycling routes
Healthy urban planning is deemed as ‘planning for people’ and encourages decision-making based on human health and well being as a priority. Victorian planning legislation advocates a comprehensive and sustainable approach to planning for all citizens and this guide presents opportunities where planners can prioritise health impacts and incorporate design considerations, equally, with other planning issues. The guide is endorsed by the Victorian division of the Planning Institute of Australia and aims to support the range of professionals involved in the processes of urban development to ensure a sustainable approach to future development.

However, unlike other mandatory elements of planning policy, such as building height and bulk regulations, or the standards set for roadway dimensions and construction, the “Healthy by Design” document is only a guideline. This means that there is little compulsion on regulatory authorities, such as Local Governments, to impose design or service conditions on new developments. While over time Local Governments may voluntarily introduce design regulations to improve the health outcomes from urban development this is likely to be a much slower process than if design for health was mandated by legislative or strategic policy frameworks.

6.12.2 Agenda 21

Agenda 21 is an international agreement for pursuing global sustainable development. It has been endorsed the Australian Government. Agenda 21 is a framework of actions for governments, organisations, industries and the community to achieve sustainability.

The broad objective of Agenda 21 is the international alleviation of poverty, hunger, sickness and illiteracy while arresting ecological damage to systems that sustain life. These are categorised in the four sections outlined below. Australia's commitment to Agenda 21 is reflected in national responses to meet obligations under this international agreement.

Although sustainability measures do not focus on the manipulation of the urban form to influence health per se, many measures have secondary outcomes that are beneficial to health. Under Agenda 21 many European cities have initiated urban policies to improve urban quality via such initiatives as reductions to traffic, noise, pollution and the reinforcement of non-motorised modes of travel, such as walking and bicycling.

Although these initiatives do not include health objectives specifically, physical activity occurring as a derivative of alternative transport modes
potentially results in more healthy outcomes for an individual, than previously they encountered when using for example, a private car for transport trips.

6.12.3 Healthy Cities

The World Health Organisation (WHO) initiated the Healthy Cities programme in 1987. The programme is now in its fourth (2003-2007) phase. More than 1200 cities and towns from more than 30 countries in the WHO European Region are Healthy Cities via national, regional, metropolitan and thematic networks. In addition programmes of physical activity and active living, the other major thematic foci are:

- Healthy ageing
- Healthy urban planning
- Health impact assessment
Australia is a part of the *Healthy Cities* initiative. Australian local governments have voluntarily committed to principles of healthy urban planning. Current local programmes include:

- The Townsville Healthy City Planning Project commenced in 2002 as part of Council Policy 2000 initiatives to identify local health and environment needs and document strategies to address the health issues of the City (TCC 2005).
- Healthy Cities Canberra is a network of volunteers who take a holistic and ecological approach to creating a sustainable healthy future - focusing on the total picture of health, people, communities and the environment (HCC 1998)
- Caboolture Healthy City engaged high school geography students to conduct health profiles of the area as part of their school work (Mason 2003).

The extent to which the Healthy Cities program has had any specific or systemic effect on the quality of urban planning in Australia remains uncertain. The present review was unable to find any evaluations of the program in Australia.

### 6.12.4 Smart Growth

*Smart Growth*, developed in the US, encourages the perception of communities not only as places to live but as vehicles to promote health and well-being. This initiative emerged with the growing concern that suburban development was having negative repercussions on people’s lives (SCN 2005) and the anxieties about urban sprawl discussed in previous Chapters. Sustainable Communities Network (SCN) emphasises the transport dimensions of urban health:

> The way in which we design our communities directly impacts public health. Conventional community design, with its wide streets and absence of sidewalks, contributes to increased vehicle use and vehicle miles traveled (VMT) even for short trips. …. Most communities today were
designed to accommodate the automobile and do not have many sidewalks to facilitate walking and biking. (SCN 2005).

SCN views conventional suburban development in the US as encouraging car dependence and sedentary lifestyles, to the detriment of healthy incidental activity. To overcome this, Smart Growth has developed a set of principles for communities to offer options for a more active, healthy lifestyle. These include:

- Mixed land use to integrate a variety of pedestrian-oriented destinations within close proximities to promote viable modal options such as walking or cycling, as an alternatives to driving
- Use of compact building design with reduced footprints, making efficient use of land and resources
- Provision of a range of housing choices suitable and affordable to the needs of diverse households, in the vicinity of neighbourhood transit areas, commercial centres, and other services
- Creation of walkable neighbourhoods with safe, connective walking corridors to make pedestrian activity possible
- Provision of a variety of transportation choices to link areas of housing, shopping and services.

Smart Growth has been a controversial issue in the US where regulatory frameworks have typically not allowed direct governmental regulation of land-use activities except where mandated by specific democratic ballots. There is no Federal agenda for Smart Growth with the result that this policy agenda is largely left to the discretion of state and local government. Accordingly the application of Smart Growth principles to new urban development in the US has been highly uneven and fragmented. Similarly there is relatively weak support from the US health sector for the regulatory mechanisms to achieve positive health outcomes through Smart Growth principles.

Perhaps the greatest barrier to smart growth is the diversity and number of stakeholders required to move the process forward ... private-sector developers ... financing ... government ... residents ... At a fundamental level, smart growth requires all of those stakeholders to work together. (Schmidt 2004:627).

The jurisdictional differences between Australian and the USA and the uneven application of Smart Growth programs to US urban areas makes conclusions regarding the potential applicability of such measures for the achievement of health outcomes in the Australian context difficult.

6.12.5 Active Living by Design

Active Living by Design (ALbD) is a collaborative program of the Robert Wood Johnson Foundation and the University of North Carolina School of Public Health (ALBD 2005a). Active Living by Design funds 25 partnerships across the United States to increase active living by integrating physical activity into daily routines through community design, public policies and
communications strategies. Each partnership receives funding as well as technical assistance to assist with community design, land use, transportation systems, and recreational areas that can contribute towards healthier lifestyles.

*Active Living by Design* use a community action model based on a logic model concept to demonstrate how active living can be incorporated into a community, leading to community change and healthy levels of human activity. The approach of the *Active Living by Design* program is presented schematically in Figure 3 (ALBD 2005b).

![Active Living by Design Community Action Model](image)

Overall, *Healthy Cities*, *Smart Growth*, and the *Active Living by Design* initiatives challenge urban behavioural habits and promote new ways to build, work, and live. These initiatives, consider health in relation to the urban form, typically promoting medium-density mixed-use development, combined with support for non-motorised forms of transport so as to integrate physical activity into daily routines. Physical activities such as walking and bicycling are encouraged as travel modes. This reflects Shriver’s (1997) discussion of the importance of walking for specific purposes as an opportunity to maintain health. In addition, it also operationalises the findings of Frank *et al.* (2004), where medium-density, mixed-use urban form associated with destinations within walking distances, resulted in healthier weight. Initiatives such as these encourage people to look at communities not only as places to live in but as governmental methods for the promotion of sustainable health and well-being.

6.12.6 Addressing Car Dependence

As discussed previously in this report, car dependence is increasing (Cervero and Duncan 2003; Sallis and Owen 1999:1478; Wilkinson, Eddy, MacFadden *et al.* 2002). Much of this growth is attributed to the pattern of urban form where trip destinations are not within walking or cycling distance and where there are no real alternatives to the private motor car. Private vehicle dependence arises from such urban characteristic as:
• Low-density, single-use residential areas
• Limited access to public transport
• Lack of local activity centres and facilities
• Places of employment not in close proximity
• Non accessible street networks

Presently, with the growing recognition that the urban form promotes car dependence, it appears that private cars are so integral to the way people mobilise, that change is impossible. The following selected examples, however, show this not to be true. These examples are presented in basic outline as there is little comprehensive evaluation material available that can provide sufficient critical assessment of the impact of such policies at the level of engagement sought by this project.

**City of Copenhagen Cycle Policy**

The purpose of the City of Copenhagen’s *Cycle Policy 2002-2012* is to develop cycling as an effective and environmentally desirable mode of transport. Currently, one third of Copenhagen citizens cycle to work. The policy aims to increase the number of cyclist and the distance they travel. To improve transport quality the policy focuses on:

• Security
• Safety
• Travelling speeds
• Heath
• Comfort
• The bicycling experience

Promoting bicycling as a modal choice for work trips the policy notes that:

From a socioeconomic point of view the health benefits derived from cycling, in the form of improved quality of life and state of health, vastly outweigh the risk of being injured or killed in traffic. Air pollution also poses a health risk, but probably does not play a significant role in a calculation involving other factors such as casualties and exercise. (City of Copenhagen 2002:18).

**Carfree Cities**

Crawford’s Carfree Cities (1996) program is based on the belief that sustainable development can only be achieved by reducing or even eliminating car use within cities. This initiative discards the common concept that motorised private transport in cities is inevitable. Crawford offers the solution to problems of automobile dependence by removing private motorised transport modes from cities while supporting improved personal mobility with efficient and fast public transport, transit nodes within close proximities and the introduction of economical freight transport alternatives. Using ‘car free city’ principles, Crawford argues that existing urban areas can
evolve into cities revitalised through pedestrian and bicycle travel modes that support healthy physical activity, to destinations within near proximities. Policies to achieve some Carfree Cities objectives have been introduced in various European jurisdictions.

**TravelSmart Australia**

‘TravelSmart Australia’ (2005) brings together community and government based programs that promote sustainable travel behaviours. The initiative is not governed by regulation, but rather the targeted promotion of modes such as public transport, cycling, walking and car pooling via:

- Raising general awareness
- Improving access to information
- Opportunities to use environmentally friendly transport
- Promoting individuals to make voluntary changes in travel choices
- Promoting health benefits gained through opportunities for incidental exercise

*TravelSmart* seeks to promote health benefits gained through physical active modal choices as an alternative to sedentary car travel.

'Active transport' is about walking and cycling, or other physically active ways of traveling, that can be done alone or combined with catching public transport, often involving the benefits of climbing stairs. Brisk walking and cycling can be appealing and enduring ways for people to obtain the required 30 minutes of moderate physical activity daily. Many car trips can be less than 2km, and can be easily replaced by using walking or cycling, helping to save time and costs by combining needs for exercise with needs for travel. (*TravelSmart Australia* 2005).

Current *TravelSmart* initiatives include the following targeted components:

- Workplace programs to provide information and motivation to reduce peak hour commuter trips, to result in reduced traffic congestion and improved air quality
- Schools programs to raises awareness among children regarding car use and ways to reduce car use in the community including school trips
- Local Government program to collaborate with local governments and communities to develop and implement local plans to influence travel behaviour
- Destination programs which collaborate with major travel destinations such as schools and hospitals to develop and implement travel behaviour change programs
  - (*TravelSmart Australia* 2005).

*TravelSmart* is controversial. Proponents of *TravelSmart* suggest that such programs can effect urban travel behaviour leading to environmental, social and health benefits. Evaluation of some *TravelSmart* initiatives support this
contention. However Morton and Mees (2005) argue that many of the perceived gains from TravelSmart programs are illusory. They criticise the concepts of TravelSmart and point to methodological inadequacies in the selection of participants and in the assessment of behavioural change. Morton and Mees (2005) argue TravelSmart tends to select participants according to profiles of likely behavioural change. The intensive engagement with the participants is likely to produce psychological responses that result in the participants overstating the extent of their subsequent behavioural change. Such problems make assessing the impact of TravelSmart difficult.

Morton and Mees (2005) further consider that targeted behavioural modification programs such as TravelSmart fail to address the fundamental or structural dynamics that underpin unsustainable or unhealthy transport choices. Such critique points to the overall planning and transport system as producing existing behavioural outcomes and suggests that reversing poor travel choices will not come from targeted marketing approaches such as TravelSmart. Attempting to achieve lasting change through limited interventions with small groups are thus likely to be frustrated by the behavioural inertia generated by planning policies that work directly against such change. In essence, individual change is unlikely to effect structural reform. Thus, while the objectives of TravelSmart are commendable, the methods are essentially not up to the scale of the problem.

6.13 Chapter Conclusion

Given the recent emerging awareness that urban environments contribute to health outcomes, it is of concern that contemporary planning documents consider health only as a secondary objective. Even when ‘health’ comes to planning attention it is typically:

- Poorly conceptualised,
- Ill defined
- Not supported by clearly articulated policy actions

In our survey of recent Australian planning strategies, the West Australian Sustainability Strategy contains the most comprehensive treatment on health. The document advocates making the promotion of public health and its assessment integral to urban planning.

Notwithstanding Australian planning longstanding neglect of health policy, there is dawning awareness that urban form and transport systems influence physical activity level that, in turn, is vital for individual health. As a consequence a range of voluntary initiatives are emerging to promote physical activity within urban environments. While these initiatives do not directly address structural issues of urban form, they do encourage healthy individual behaviour in the city. Most of these initiatives have no regulatory authority. They are voluntary programs largely developed overseas and adopted into Australia. If planning, as a first step, were to adopt such strategies as mandatory to the design and layout of cities, significant progress toward healthy urban living would be achieved.
Chapter Seven - Challenges and Opportunities

7.1 Introduction

This Chapter outline the challenges and opportunities that have arisen from the literature review in the preceding Chapters. The review found, at the very least at the level of association, links between healthy physical activity and urban form (e.g. residential density, activity clusters) and urban function (e.g., transport systems) Progress towards the re-integration of public health and urban planning, however, is highly uneven. Regardless of conceptualisation, theoretical framework, research method and research results there is one uniform conclusion across all levels of investigation into the various relationships between the urban form, transport systems and access to health services, namely.

… the characteristics of the built environment most closely associated with physical activity remain to be determined. … Furthermore, the literature has not established the degree of impact of the built environment and its various characteristics on physical activity levels; the variance by location (e.g., inner city, inner suburb, outer suburb) and population subgroup (e.g., children, the elderly, the disadvantaged); or the importance to total physical activity levels, the primary variable of interest from a public health perspective. (NRC 2005:7).

However, few studies capable of demonstrating a causal relationship have been conducted, and evidence supporting such a relationship is currently sparse. (NRC 2005:7).

Across the board, there is a limited amount of evidence to support a causal link between urban form and health outcomes. In short we do not know enough and as we need to know more. Quality health and urban form data at local, regional, national scales remains scarce. The literature makes clear the need to reconnect urban planning and health. These two disciplines are connected through their influence on human health yet their division limits scholarly and government capacity to achieve shared objectives.

7.2 Challenges

Our review has exposed a void in the knowledge base of the relationships between the urban form and health outcomes. This presents a series of challenges to be overcome. Further research is necessary to fully assess the way in which urban environments impact on health outcomes through the specific dimensions of built form, transportation systems and service locations.
7.3 Disciplinary Divides

One of the most crucial challenges is that the links between urban environments and health are not sufficiently comprehended by both urbanists and health researchers. It is apparent from current plans that planners do not adequately understand the particular and systemic health impacts of planning policies, processes, decisions and outcomes. The need to link planning policies to subsequent urban outcomes and tracing the connection between such effects and health outcomes largely remains unmet in urban planning scholarship.

Similarly, health disciplines are increasing coming to suspect urban form influences individual behaviour and its manipulation offers an opportunity to promote healthy urban living. Specifically many health policy makers and practitioners are seeking to encourage higher levels of physical activity within the built environment. As yet, however, health practitioners lack of familiarity with urban processes, research methodologies and policy frameworks, and the complex economic, social and political relationships that comprise the urban sphere.

Although both planning and health disciplines comprehend that human behaviour is influenced by urban environments and that urban environments can strongly influence human wellbeing, a disciplinary divide has developed which limits cross-disciplinary engagement. Studies that engage planning and health researchers to cross this divide remain relatively rare. Overcoming such divisions would be an essential step in developing research programs to comprehend planning processes from a health perspective that can also inform policy. As Craig et al (2002) state:


Given the urgent need for research to guide environmental interventions, collaboration among public health practitioners, urban planners, and transportation researchers is essential to rapidly advance knowledge by integrating findings across sectors. (2002:42).

7.4 Definitions

In order for both the disciplines of health and planning to have meaningful input to encourage health outcomes in the urban policy field, common definitions need to be developed. For example, there is no consensus on the definition of ‘sprawl’. This becomes problematic when quantifying 'sprawl' and seeking to identify health impacts. The American ‘Metropolitan Sprawl Index’ (MSI) is regarded as a valid approach to sprawl quantification so far and is recognised for its capacity to append identifiable residential attributes to specific locations. However, locationally the Index uses indicators for sprawl that are location specific and as such, the index can not easily be transferred to other jurisdictions, such as for instance to SEQ.

‘... there is still considerable debate over the consistency and interpretation. ..... The identification of measures of urban form available in existing and ongoing surveys that include measures of physical activity will
facilitate research on the environmental correlates of activity’. (Berrigan and Troiano 2002:77-9).

The scale at which the MSI operates is also problematic. Within a region, the index does not identify finer spatial and design elements that are essential components of the urban fabric. To identify the finer detail of the urban form the measuring tool needs to take into account the direct influences of the urban elements.

The elements that constitute the urban form are generally recognised to have known capacities. A footpath located adjacent to a road is recognised as a means of thoroughfare between origins and destinations for pedestrians and cyclists. A footpath may be wide and well-lit, protected from the road traffic with buffering vegetation on one side and have security from the other side via ‘eyes-on-the street’ development. Alternatively footpaths may be narrow, semi-sealed and close to the traffic on the road. These are critical dimensions of the suburban and neighbourhood environment and accounting for these is crucial in comprehending the possible relationships that can be experienced within the urban environment. Each of these elements needs to be singly identified and quantified in order to identify how these elements interact, influence use and impact on health outcomes. As Giles-Corti et al argue (2003:93&100):

Objectively measured neighborhood environment factors warrant further investigation. … It is recommended that future studies objectively measure a wider range of environmental factors that are hypothesized to be important..

It is possible that the methodology used to create the MSI is transferable, by manipulating the individual components to become locationally applicable. However, this would also create another index that is locationally specific.

Overall, these issues of definition and quantification create a critical problem for planners and health practitioners alike. Inadequacies of definition hinder understanding the complexity of urban physical and behavioural relationships. This thwarts planners’ abilities to accurately describe and quantify urban form, let alone assess the impacts of various types of urban form on the health of populations. Therefore it is critical that urban patterns can be quantified in a meaningful manner while retaining vital complexities. Such methods would then enable better assessments of the impacts of urban environments on health outcomes. These could then also be incorporated into definitions of health and health interventions.

7.5 Conceptual Frameworks, Investigative Methods and Data Collection

The validity of conceptual frameworks used to investigate the effects of the urban environment on health outcomes needs investigation. For example, urban literature typically conceptualises ‘health’ not as a full spectrum of health, but as an aspect of health, resulting in a very mono-directional
perception of what health entails. Associations are made to determine ‘health’ which includes indicators such as:

- Physical activity
- Overweight, Obesity and BMI
- Walking
- Proximity to exercise facilities
- Sedentary activities

This initial conceptualisation is then woven through the investigative methodology and data collection. Without a sound theoretical framework to guide an appropriate research methodology, it is likely that the most pertinent data relevant to the urban from and health outcomes will not be collated. Data deficiencies then impact negatively on the evidence that is able to be forwarded to substantiate the link between the urban planning and health disciplines. (King 2001:442).

Another methodical caution is that the literature, in the main, reports cross sectional studies, snapshots in time, to the neglect of longitudinal data that tracks variations through time. A sound theoretical base that realises the data to be collected would drive a longitudinal methodology to evidence findings that are both robust and empirical.

7.6 Limited Policy Capacity

The lack of empirical evidence is apparent in current policy measures where objectives for health incorporated into urban planning policy are generally fragmented and poorly articulated. ‘Health’ is not stated as an aim in its own right, but mentioned as a secondary outcome to an objective such as ‘healthy neighbourhoods’ or ‘neighbourhood wellbeing’. Even as a secondary consideration health policy, is often undermined by a dearth of detail of what, for example, is a ‘healthy neighbourhood’ or what ‘neighbourhood wellbeing’ actually entails or how it can be achieved. Our literature review clearly demonstrates the need more closely define what are, at present, often vague formulations of worthy objectives.

There is also a need for a significant engagement with planning by the health disciplines to articulate health knowledge into planning discourse. Such engagement should not only define health concepts in a way that planning can comprehend, but also begin to ensure that the policy measures that are subsequently put in place will achieve its objectives. At present the research base is not sufficiently developed to provide concrete direction as to the specific ways in which planning instruments may influence urban environmental and behavioural outcomes across multiple dimensions and spatial scales.
7.7 Fragmented Initiatives

Due to the poor uptake of health initiatives into urban planning policies, and to address the growing preponderance of overweight and obese populations, various ad hoc initiatives have evolved to encourage physical activity behaviours in urban environments. The goal of such programs as Healthy By Design or TravelSmart is to change individual behaviour through exhortation. The programs are not mandatory and do not seek structural change. They are, in short, the beginning of the beginning.

Other initiatives do take up the challenge of urban structure and design. Healthy By Design: A Planners’ Guide To Environments For Active Living is exemplary. These Victorian guidelines address many key dimensions of healthy urban form.

Regrettably, however, most, urban health initiatives are applied irregularly and unevenly and, typically, rely on voluntary adoption by a given jurisdiction, especially at the local level. They are, in sum, found on the shifting sands of goodwill and not the rock of political will and legislation. Corburn (2004) suggests a social justice perspective for city planning and further that planners and health workers be empowered to facilitate multidisciplinary decisions in collaboration with professionals and local community representatives.

7.8 Opportunities

Having reviewed the challenges the remainder of this Chapter outlines further opportunities for engagement between planning and health disciplines both in terms of research and policy development. This collegial engagement would promote mutual agendas to protect health and promote healthy communities.

7.9 Interdisciplinary Engagement

This research review has stressed the disciplinary divide that exists between the professions of planning and health. There are many as yet unexplored opportunities to bridge this divide with inter-disciplinary engagement. Such engagement would:

- Identify common definitions and understandings of issues
- Conduct inter-disciplinary dissemination
- Agree on research objectives
- Initiate collaborative investigations

The tasks of collaborative engagement would be to clarify conceptual and methodological issues, develop robust measures of the urban-health relationships and prioritise initiatives. As Capon (Capon 2003) notes:
We must invest in ecological research to improve our understanding about these relationships and in potential actions to address them. … There is a need for interdisciplinary research through networks comprising researchers from public health, urban planning, urban ecology, economics and other disciplines.

Handy et al agree:

‘… many questions remain … The challenge is to understand the interrelationship between the built environment and human behavior and then to develop models that can predict the environmental conditions under which humans will be more physically active. … Collaborative research efforts that build on the research paradigms of the fields of both urban planning and public health are essential to making further progress in the effort to build healthier and more liveable communities’. (Handy, Boarnet, Ewing et al 2002:72-3).

7.10 Major Conceptual Programs

There is a clear need for planning and health research to deliberately and systemically set in place inter-disciplinary research collaborations. Such collaborations would produce common definitions, develop conceptual frameworks, construct robust research methods and collect data.

It is essential that any urban-health reform agenda is soundly grounded in research that is conceptually and methodologically validated through conventional processes of presentation and publication. Methodological development is also necessary to raise the quality and capacity of urban-health research. Currently the absence of a rigorous intellectual and empirical basis is undermining the capacity of broad range of planning policy areas to influence, in particular land-use activity planning and transportation systems.

… stronger evidence on the importance of urban landscapes in shaping foot and bicycle travel is needed if the urban planning and public health professions are to forge an effective alliance against car dependant sprawl. (Cervero and Duncan 2003:1478).

… urban form could be significantly associated with some forms of physical activity and some health outcomes. More research is needed to refine measures of urban form, improve measures of physical activity, and control for other individual and environmental influences on physical activity, obesity, and related health outcomes. (Ewing, Schmid, Killingsworth et al 2003:47).

Mechanisms to encourage inter-disciplinary alliances would entail:

- Mutual associations
- Capacity building
- Joint conference/symposiums
- Collaborative grant seeking
- Collegial corp. bodies
- Institutional processes
- Government support and funding
7.11 Policy Engagement

Policy agencies both within the health and planning spheres need to become significantly more aware of the cross-portfolio impacts of planning and health policies. Inter-departmental, inter-governmental and inter-disciplinary engagement is necessary to facilitate policy makers to empower health practitioners for effective engagement with urban policies. Statutory weight would also empower both institutional capacity and practitioner capacity to promote health within the urban environment. This problem has been recognised in much of the research into urban environments and health to date:

Researchers need to refine hypotheses about how specific environmental variables might be related to particular types and purposes of physical activity. Policy makers need to consider how to build communities so they facilitate physical activity for transportation, recreation, and other purposes. (De Bourdeaudhuij, Sallis and Saelens 2003:91-2).

Whether the environment is actually determining travel choices, how the environment relates to overall physical activity, and how the environment affects downstream weight and health remain issues for future research. (Ewing 2005a:74-5).

7.12 Priorities for Future Research

Significant urban health issues identified by this project that still require further attention are illustrated in Figure 6. The issues are:

- Yellow - aspects of the urban form, such as location, type of urban form and proximity to destinations. These are the foundation to all activities within the urban form with potential for both positive and negative health outcomes.
- Mustard - geographic distance is not the sole determinant of access. Proximity, affordability and medical and cultural appropriateness all play a role in the decision making process.
- Orange - modal choices are influenced by perceptions, preferences and behavioural dimensions.
- Maroon - areas of potential physical activity.
- Red - areas this research identifies as the most significant. As the choice, accessibility and availability of travel modes within the urban form play such an important role in individuals accumulating incidental activity, it is imperative that a variety of non-motorised travel modes be supported. Reliance on private motor vehicles is associated with periods of inactivity in cars and lack of incidental exercise, which is instrumental with promoting health issues. However, this relationship appears to be a mishmash of relationships and assumptions, for which programs and incentives are devised. Not only does the relationship between the built from and health outcomes need to be clarified, but evaluations need to be put into place.
Figure 4: Research Priorities

BUILT FORM AND HEALTH
- Historical relationship
  - EXTERNAL URBAN FORM
    - Location
      - Sprawl
      - Consolidation
    - Opportunities for healthy activity?
      - Environments?
        - Ease of Access
        - Footpaths
        - Street types
        - Cycle paths
      - Incidental activity promoted?
        - Travel mode supported
          - Promotes or discourages healthy activity
          - Health issues
            - Known health relationships
              - Environment
              - Risks
                - Accident
                - Fatality
              - Pollution
                - Air
                - Noise
                - Water
            - Relationships
              - Assumptions
              - Incentives
              - Programs
                - Socio-economic & special needs aspects
  - CURRENT ISSUES
    - Proximity to destinations
      - Modal availability
      - Modal choices
        - Pedestrian
        - Private - car
        - Cycling
        - Public transport
          - Travel mode supported
            - Promotes or discourages healthy activity
            - Health issues
7.13 Promotion of Physical Activity in Daily Routines

The research reviewed in this project supports the hypothesis that urban form, including transportation, affects individual physical activity. The structural dimensions of this link are far from clear, although research has discovered some promising avenues for further investigation (e.g. residential density, land-use diversity, public transport, etc.). Policy, however, need not wait for the completion of this further research. Even in ignorance of the interrelation between urban structure and public health, it can attempt to ameliorate the situation by promoting healthy personal behaviour.

Although there is insufficient evidence to confirm the thesis that contemporary urban environments have negative impacts on health it is well-documented that urban populations are living more sedentary lives. And it is indisputable that sedentary lifestyles contribute to both overweight and obesity and, ultimately, to chronic disease and premature mortality. It seems logical therefore to promote initiatives that encourage physically activity behaviours at any and all levels.

Some literature has touched on the behavioural and perceptual and preferences that influence participation in urban physical activity. These insights need to be translated into policy and design effects. A start has been made with urban design to improve non-motorised modal choice. Provision for walking and cycling by developing networked footpaths, bicycle paths, and traffic calming features, is one example. Integrating the walking and cycling networks with well served public transport nodes is another. In general, design for active recreation and non-motorised transport needs to be pushed to the limit.

This does not mean that people will immediately incorporate walking and cycling into their lifestyles. At this stage of development in Australia, much of the existing low-density development patterns could not be immediately re-designed to become more supportive of physical activity. However provision of a robust non-motorised transport system to suit residential movements would introduce new opportunities for incidental activity in daily neighbourhood life.

7.14 Chapter Conclusion

The literature has suggested that an association between urban form, transport systems and health outcomes exists even if this has to date not been fully explored or explained. The opportunity exists to initiate research at an empirical level that would not only inform Australian policy but also contribute to international debates over the urban-health relationship.
Chapter Eight – Conclusions of the Review

This report has reviewed the literature concerning the relationship between urban environments and health. The present Chapter concludes the project via a discussion of the Research Questions that guided the research review.

8.1 Research Questions

Research Question 1 - *What is the current state of local and international knowledge about the links between urban form, urban structure and health outcomes?*

The literature we have reviewed suggests that knowledge of the broad impacts of urban form, urban structure and transportation systems in relation to health are sufficiently well developed to demonstrate that a relationship exists. Yet, while the literature suggests a high degree of certainty regarding known relationships, this review suggests that many of these assumptions are not based on direct empirical evidence. The evidence base is not sufficiently well developed to the extent that specific relationships can be concluded between urban environments and health, of the sort considered in this research review.

Until the multiple and intricate health relationships within cities and within policy fields are better understood it is unlikely that planning will make a positive contribution to the improvement of urban public health. It is essential that any attempts to engage with this area of knowledge and inquiry have a clear conceptual basis.

The following proceeding questions ask: ‘What policy measures are available to health and planning practitioners to secure and improve positive health outcomes?’ and ‘How effective have these policy measures been in maintaining and improving positive health outcomes?’

The absence of a rigorous intellectual and empirical base, is reflected in urban-health reform lacking a decisive capacity to influence a broad range of planning policy areas, in particular land-use activity planning and transportation systems.

Policy measures, both internationally and nationally lack the effectiveness to secure, provide and improve positive health outcomes. This negates the evaluation of maintaining and improving positive health outcomes.

There remains a fundamental requirement for any urban-health reform agenda to be based on research outcomes that have been demonstrated to be conceptually and methodologically valid through conventional processes of presentation and publication.
Research Question 2 - What policy measures are available internationally to health and planning practitioners to secure and improve positive health outcomes?

A number of policy measures have been proposed to address health issues relating to the built urban environment. This report has discussed a number of these, such as Healthy Cities by Design and TravelSmart. There are a number of problems associated with these programmatic approaches. The first problem is that the evidence base is not sufficiently developed to support some of the assumptions underpinning these policy programs. Thus while it is likely that urban environments are associated with health outcomes, or that higher levels of physical activity occur in some density or land-use mixes compared to others the degree of evidentiary support for these relationships remains weak. This in turn raises questions about the capacity of various planning interventions, such as those described in Chapter Six of this study, to generate substantive health gains.

Further, there is a dearth of evidence that evaluates the impact of some of these programs. That evidence which does exist is often mixed. The case of TravelSmart suggests that much more research and evaluation needs to be undertaken to assess whether such urban-health programs are having the assumed impact on behaviours.

A final observation regarding specific programmatic approaches to achieving better urban health outcomes relates to the scale and breadth at which they are applied. A targeted program like TravelSmart may change some travel behaviour a local scale, but if the aggregate/structural setting of urban planning and transport policy favour conservative behaviour then the overall gains will be muted or negated. Thus an urban jurisdiction may obtain some local urban health benefits through TravelSmart but obviate these gains at the metropolitan scale through continued support for car-dependent urbanisation. This recognition suggests that systemic policies rather than targeted strategies are likely to be more successful in achieving broad and lasting improvements in urban health relationships.

Research Question 3 - What scope exists for further inclusion of health concerns into planning frameworks and how might this be operationalised in policy and service provision?

There remains a yawning scope for the inclusion of health concerns into planning frameworks. This review of Australian planning policies undertaken in this project suggests that health issues receive only very limited consideration in metropolitan plans. Planning policies urgently need to begin considering the role that urban form, transport systems and services location play in determining urban health and wellbeing. While the evidence base remains underdeveloped there is no reason why policy measures to achieve higher levels of physical activity within the built environment could not be pursued.
The scale at which new policies should be implemented deserves substantial further discussion and assessment. Spatially limited and selective programs, such as *TravelSmart* or context specific programs such as urban design improvements, need to be assessed as to whether they can, in any reasonable time frame, achieve meaningful aggregate change. Amending planning instruments to cover all new development affords greater opportunity to achieve change than simply relying on ad-hoc stand-alone programs. Again, further assessment is required regarding this issue.

It is clear from this review that planning agencies and urban scholars need to markedly improve their record of research and evaluation of the relationship between urban environments and health in terms of urban form, transport systems and spatial access to health services. There is a clear need for major research programs into these areas that can in turn inform better policy making.

**Research Question 4 - Where are the knowledge gaps and what issues and problems require further investigation?**

Systematic and rigorous methods need to be applied to questions relating to urban form, transport systems, the location of health services and the resulting health outcomes experienced by urban populations to demonstrate the validity of claimed or perceived relationships. While there has been relatively limited inclusion of health concerns into planning policies, there are some indications that the policy advisory literature relating to urban environments and health has advanced beyond the point of clear evidentiary support from medical, health and urban research base. Some particular issues require much further attention:

- There have been insufficient studies undertaken to clearly demonstrate the relationship(s) between public health and built form and/or transportation systems.
- The literature concerning 'spatial access to health services' is particularly underdeveloped.
- The role of public transport systems in facilitating or generating health-supporting levels of physical activity remains highly underdeveloped.
- The generation of non-deliberate physical activity through the modulation of urban form, transport systems and services location needs to be far better understood than is presently the case.
- Comprehension of the role of modal choices and their relation to other behavioural and lifestyle patterns needs to be better understood.
- The impact of existing planning policies on urban health need to be evaluated.
- The Australian research base regarding the specific and local relationships between Australian cities, their built form, transport systems and spatial distribution of health services is weak. There needs to be a substantial and sustained research effort to develop a detailed picture of the relationship between Australian urban environments and the health outcomes they generate.
8.2 Concluding remarks

The urban environment has already begun to loom as a critical health issue. This, despite the relatively limited attention that academics and health researchers have so far dedicated to the issues. Further research is needed to catch up with the emerging popular anxiety about the urban environment. The task before such research is to illuminate the science behind the health-urban relationship(s) by, as science often does, first elucidating the gaps and weaknesses in existing knowledge.

To meet the challenge of ensuring that urban environments provide a health context for human beings and support rather than hinder healthy behaviour a much greater effort than has previously been exerted needs to be applied by health and urban professionals. This report has contributed to this task by outlining some of the major contemporary deficiencies in urban health knowledge. It is hoped that the project will assist in stimulating new efforts to overcome these gaps and weaknesses.
References


DHS-Vic (2003). Community and Women’s Health Services Information Resource: Health Promotion Reporting 02-03 and Planning and Reporting 03-04, Community and Women's Health Services, Department of Human Services, State Government of Victoria, Australia.


DPC (2004). South Australia’s Strategic Plan: Creating Opportunity, Department of Premier and Cabinet, Government of South Australia.


Appendix A: Definitions
In order to have a common understanding of the terminology used in this report, this Appendix discusses definitions and then identifies the contextual definition that is relevant to this research.

Health
The World Health Organisation (WHO) defines health as::

... a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being, without distinction of race, religion, political belief or economic and social conditions (WHO 1994:2).

This definition is cited internationally, as ‘the’ ultimate objective for health standards for humanity. However, this all-encompassing definition of ‘health’, overreaches the conventional understanding of physical well-being that can be achieved via professional medical intervention. ‘Complete, physical, mental and social wellbeing’ is a goal beyond the scope of medical intervention and that can only be attained by making the goal a responsibility in the public domain, as a responsibility of all. It reflects a population perspective for the collective responsibility for health – for ‘public health’. It also reflects the need for the perception of ‘public health’ to evolve as society and understanding develops.

Public Health
In the 1980s the impetus of ‘public health’ refocused on the underlying determinants of health. It became evident that to achieve better health for the populations, public, professional and government bodies needed to collaborate and work together.

The Ottawa Charter for Health Promotion adopted at The First International Conference on Health Promotion, was the first document to outline the key targets of ‘public health’. These include:

- Build healthy public policy
- Create supportive environments
- Strengthen community action
- Develop personal skills
- Reorient health services
(BO 1986)

In 1988, the Report of the Committee of Inquiry into the Future Development of the Public Health Function defined ‘public health’ as

the science and art of preventing disease, prolonging life and promoting health through the organised efforts of society. (Acheson 1988).
This definition highlights that both art and science are necessary to attain ‘public health’ through the collective focused actions of multi-disciplinary organisations. For example, moving from the narrow focus of medical intervention to foci of policy that identifies the underlying socio-economic determinants of health, or in this case, the underlying determinants of the built environment of health.

**Australia**

Australia, having WHO membership status, also reflects the objectives and definitions of the WHO Constitution. However, neither ‘health’ nor ‘public health’ are well defined in Australian legislation (DH-WA 2005:21).

**Canberra**

In Australia, the Public Health Act 1997 (ACT) defines ‘public health’ as:

(a) the health of individuals in the context of the wider health of the community; or
(b) the organised response by society to protect and promote health and prevent illness, injury and disability. (ACT Parliamentary Counsel 2005:136).

The Australian National Public Health Partnership expands this definition and states:

"Public health" is the organised response by society to protect and promote health, and to prevent illness, injury and disability. Public Health Interventions … [include] … Developing policy, setting priorities for action, developing plans, implementing and coordinating services, strategies and interventions aimed at prevention, protection and promotion of the health of the community. This ranges from strengthening community capacity to manage and reduce health risks; through investigation of disease and risk factors; through management of contemporary regulatory approaches to ensure a healthy and safe environment; through organised population wide prevention or early detection; to informing optimal planning of health services delivery (NPHP 2003:6).

**Queensland**

The Queensland Department of Health adopts the WHO definition of ‘health’ and cites:

Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. (Queensland Health 2002:5)

**New South Wales**

Public health activities are those activities organised by our society that focus on health at a population level. They aim to protect and promote health and to prevent illness, injury and disability.

Public health measures the occurrence of, and the factors that contribute to health and illness in society.

Public health seeks to understand the causes of health and illness, the personal and social circumstances in which health and illness occur and are experienced, and the personal and social consequences of health and illness.
Public health acts, primarily at a community or societal level, to create circumstances which promote health, to reduce risks to health in the social and physical environment, to inform people about behaviours which support health, and to provide services which prevent injury and disease or detect disease at an early stage in order to reduce its consequences. (HD-NSW 2000:1)

**Victoria**
The Victorian definition of health highlights the importance of understanding health and disease burden within the personal, social and cultural context specific to the person or community whose health is being considered. It is not possible to decide how best to support the improvement of health without understanding this context. Health Promotion is:

the process of enabling people to increase control over, and to improve, their health. [Health is defined as] a complete state of physical, mental and social wellbeing, not merely the absence of disease or infirmity. (DHS-Vic 2003)

**Western Australia**
Firstly, public health being a relationship between individuals and their communities; that if persons are to keep healthy, the social and built environments in which they live must be addressed. An understanding of this intertwined relationship allows an understanding of individual health outcomes being more than personal choice or good luck. It makes the various determinants of both good health and ill health which can be seen ‘in the wider health of the community’ important as issues that must be identified and addressed.

Secondly, public health is also a process that can be described, namely as the principles and practice that operate at a community level (an organised response) to promote health, prevent illness and to respond to disease and injury. (DH-WA 2005:21-2).

**South Australia**
The South Australian Strategic Plan defines the State priorities for ‘Improving Wellbeing’ as:

… to focus on further improving our quality of life and the wellbeing of the community and individual citizens. The focus will be on being healthier and fitter, having less crime and feeling safer. The emphasis will be placed on preventative measures including education programs (DPC 2004:24).

**The Northern Territory**
Public health today aims to:

- prevent health problems and work on strengthening the determinants of good health in the places where people live, work and play
- focus on health issues as they affect groups in the community, and on planning and implementing interventions with the full participation of those groups
- improve health of those in the community whose health is poor compared with others.” (Department of Health and Community Services (NT) 2002 (2nd ed.))

**Tasmania**
The Tasmanian Department of Health and Human Services Policy framework for the prevention and management of chronic disease defines health as:
1. Health and wellbeing is not purely the absence of disease, illness, injury or social problems, but the attainment of physical, mental, emotional, spiritual, cultural and social wellbeing. 2. Health and wellbeing improvements can be made by reducing risk factors and promoting protective factors. ... 4. A combination of universal and targeted approaches and multilevel strategies in different settings are required to improve health and wellbeing across populations and within groups that experience health disparities. 5. A systems approach with collaborative, integrated stakeholder participation is required to maximise effectiveness across communities and sectors. 6. Interventions should be based where possible on evidence of the most effective options for producing maximum health gain. (DHHS-Tas 2005:2)

Urban Form
‘Urban form’ is a term used to describe the physical elements within a city. It refers to the arrangement, function and aesthetic qualities of the design of buildings and streets, which overlay the ‘land use’ and the ‘transportation system’.

This project focuses on the external urban form and not the internal urban form. For example, a neighbourhood designed primarily for residential homes, accessed by attractive tree lined streets that relates to residential health is of prime importance to this research. The health effects caused by of a resident living within a particular dwelling is a discrete field of research, and is not a focus of this research.

Built Environment
The constructed or transformed elements of the physical environment are known as the ‘built environment’. This consists of ‘urban form’, ‘land use’, the ‘transportation system’.

Physical Environment
The ‘physical environment’ comprises of the built and natural environment that are influential in the choices and patterns of physical human activity. This research will concentrate on the elements within the physical environment that are particularly influential in the decision making of human activity patterns.

Transportation System
The physical infrastructure of roads, footpaths, bike tracks, railway lines, etc., that provide the physical connection between activities is identifiable as the ‘transportation system’. Travel time, comfort and safety are factors that determine the quality of transportation systems. ‘Transportation system’ is also a term that can be used to describe the level of service provided - such as accessibility to public transport, their routes, frequencies and connectivity.

Land Use
‘Land use’ refers to the location and activities within a geographic area. Often activities are grouped into relatively basic categories, such as residential, industrial, recreational, and commercial.

Mixed Use
'Mixed Use' development refers to a mix of activities within a geographic location. An example of this would be residential apartments located above retail outlets, neighbouring an office block.

**Zoning**
Land 'zoning' is a method used by regulatory bodies to confine certain activities and land uses to specific localities within geographic jurisdictions. The practice of 'zoning' was introduced to separate activities believed to be detrimental to health, while promoting similar type activities to operate as neighbours. Zoning seeks to prevent conflicting activities and land uses to be located adjacently, but in the contemporary Australian context zones operate as the spatial bases for land-use regulations.

**Urban Sprawl**
Urban sprawl is a highly contested concept and term. In general it refers to a metropolitan development pattern that typically comprises single-use residential development with a widely dispersed population, few urban centres and ill functioning open spaces. Road networks demark large block sizes, which contributes to poor accessibility. Given its predominant residential component ‘urban sprawl’ is often referred to as ‘suburban sprawl’ (Ewing 2005a:70). See the discussion in Chapter Two of this monograph for further discussion.

**Urban Consolidation**
Infill development that occurs in established areas is referred to as ‘urban consolidation’ in the Australian context. This type of development is viewed as containing population growth within an existing area to take advantage of the existing infrastructures and amenities. Urban consolidation policies advocate denser populations, a mix of land uses, activity centres and high quality public transport. Urban consolidation remains a highly contested concept and policy in Australian urban planning.

**New Urbanism**
This approach to neighbourhood design seeks to promote pedestrian engagement, a mix of land-uses and dwelling styles and densities and the provision of interconnected networks of streets and pathways. New Urbanism is that communities designed for the pedestrian also accomplish pleasing public places in urban form (see also The Three ‘D’s). New Urbanism arose in the early-1980s and is most prominent in the US planning context.

**The Three ‘D’s**
The three ‘D’s of Neighbourhoods are Density, Diversity and Design.
- ‘Density’ is usually measured in terms of population, or residential housing units within a given urban area.
- ‘Diversity’, refers to the extent of mix of different land uses within a neighbourhood.
- ‘Design’ within a neighbourhood includes street network characteristics such as dense grids of highly interconnected streets to sparse suburban networks of curvilinear non-connecting streets.

(Cervero and Kockelman 1997; Ewing 2005a)
### Appendix B: Major Electronic Databases Sourced

<table>
<thead>
<tr>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJOL – Australian Journals Online</td>
<td>AJOL is the National Library of Australia's database of Australian electronic journals, newspapers, magazines, webzines, newsletters and e-mail fanzines. It provides details and links to over 2000 titles that include local and overseas works with Australian content, authorship and/or emphasis.</td>
</tr>
<tr>
<td>Blackwell Synergy</td>
<td>A collection of 800+ ejournals in the social sciences and humanities and in science, technology and medical fields, Blackwell Synergy is the online journals service from Blackwell Publishing. It holds the content for most of Blackwell's journals, the majority of which are published on behalf of international scholarly and professional societies.</td>
</tr>
<tr>
<td>CINAHL - Cumulative index to nursing and allied health literature</td>
<td>This service provides access to virtually all English-language nursing journals and primary journals from 13 allied health disciplines including health education, medical records, occupational therapy, physical therapy and radiologic technology. Also included are selected articles from approximately 3,200 biomedical journals indexed in Index Medicus, from approximately 20 journals in the field of health science librarianship, and from educational, behavioural sciences, management, and popular literature</td>
</tr>
<tr>
<td>DOAJ – Directory of open access journals</td>
<td>Published by Lund University Libraries, this database provides freely available ejournals in full-text. Subject areas include: agriculture and food sciences; arts and architecture; biology and life sciences; business and economics; chemistry, earth and environmental sciences; health sciences; history; archaeology; languages and literatures; law; political science; mathematics and statistics; philosophy and religion; physics and astronomy; social sciences; technology and engineering.</td>
</tr>
<tr>
<td>Expanded Academic ASAP Plus</td>
<td>A combined index and full-text journal database covering the titles indexed in the Humanities Index, Social Sciences Index and General Science Index plus 360 titles from Public Affairs Information Service (PAIS). Also includes full-text articles from over 530 journals for the period from 1992 to the present including several Australian titles. Major multidisciplinary database covering the arts and humanities, social sciences, general science and current affairs.</td>
</tr>
<tr>
<td>Factiva</td>
<td>This collection boasts 8000 global business news sources including the full text, full archive of News Limited publications, the deep full text Fairfax archive, selected content from the ABI Inform database, the Financial Times and exclusive access to Dow Jones and Reuters wires and the Wall Street Journal (Asian and American editions). Key Australian news and business publications are also supported by an archival backfile drawn from ABIX (Australasian Business Intelligence) database.</td>
</tr>
<tr>
<td>GEOBASE</td>
<td>Interdisciplinary database covering physical and human geography, geology, ecology, and their related disciplines. Includes citations and abstracts published in several print</td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td>H&amp;S – Health and Society database</td>
<td>This database is a subset of Australian family and society abstracts. It indexes and abstracts articles from published and unpublished material on research, policy and practice issues about, or of relevance to families in Australia.</td>
</tr>
<tr>
<td>Informit Search</td>
<td>Informit Search is a search and retrieval interface for accessing the multi-subject Informit collection of Australian and selected South-East Asian databases. The collection includes full text access to: AGIS Plus Text; Australian Education (A+ Education); Australian Public Affairs (APAIS); MEDITEXT; and access to over 50 bibliographic index and abstract databases.</td>
</tr>
<tr>
<td>IngentaConnect</td>
<td>A full-text e-journal service which provides access to the article content of the journals produced by a selective range of publishers. The database has broad subject coverage, and the capacity to deliver the full-text of many of the articles retrieved by a subject search.</td>
</tr>
<tr>
<td>ISI – Web of Science</td>
<td>The Web of Science is a multidisciplinary journal index database which abstracts and indexes articles from some 5,100 journals in science and technology; 1,700 journals in the social sciences and 1,200 journals in the arts and humanities. Virtually all subject disciplines are covered to some degree in the database. The database also includes details of the references that are cited in the articles that are published in these journals.</td>
</tr>
<tr>
<td>ProQuest</td>
<td>The ProQuest service is a suite of full-text journal databases, covering a broad spectrum of subject areas and collectively indexing around 10,000 journals. Full-text content is available for approximately half of these journals with some content going back as far as the mid-eighties. The ProQuest service allows searches across the complete collection of databases.</td>
</tr>
<tr>
<td>PsycINFO</td>
<td>PsycINFO covers the academic, research and practice literature in psychology for more than 45 countries and in over 30 languages covering the period from 1983 to date. It includes relevant information from related disciplines such as medicine, psychiatry, education, social work, law, criminology, social science and organizational behaviour. The database also includes the full-text content of approximately 280 psychology journals.</td>
</tr>
<tr>
<td>SCANfile</td>
<td>Bibliographic database - indexes and abstracts journal articles. Subject coverage includes science and technology policy, R&amp;D management, social and economic issues of R&amp;D, human resources management, and commercialisation of innovation.</td>
</tr>
<tr>
<td>ScienceDirect</td>
<td>ScienceDirect is a Web database for scientific research that contains the full text of more than 1,000 Elsevier Science journals. Subject coverage includes the life, medical, technical, social and physical sciences.</td>
</tr>
</tbody>
</table>