Urban and health service planning to reduce the health impacts of climate change in Australia:

Planning as an adaptation tool

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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“Work hard, do the best you can, don’t ever lose faith in yourself and take no notice of what other people say about you.” Noel Coward
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Abstract

Climate change is likely to be one of the greatest challenges that humans will face in the 21st century bringing increases in extreme weather events, droughts, heatwaves, sea-level rise and species extinction on an unprecedented scale and speed. In Australia, climate change is expected to have an impact across the environmental, economic, political, physical and social wellbeing of the community. This study hypothesised that the capacity to adapt to the health impacts of climate change in Australia is dependent upon urban planners and health service planners understanding the health impacts of climate change, and being able to enact this understanding in their planning activities.

Using an interpretivist qualitative research approach an in-depth investigation of the knowledge of health service planners and urban planners about the health impacts of climate change was undertaken. These professions were chosen because they are integral in planning for and adapting cities and services to the impacts of climate change in their everyday work.

A total of 43 urban planners and 16 health service planners participated in this research and were asked to reflect on information including the interview questions provided in a background paper prior to interview.

Interviews with both health service planners and urban planners showed that the majority of participants were aware of climate change, but that they were largely unaware of the health impacts of climate change, particularly the indirect impacts. As such, neither professional cluster was planning for the health impacts of climate change.

Within the two interview clusters participants identified that there was a litany of compounding shortcomings that included: not identifying the health impacts of climate change as an issue at all; significant knowledge gaps; devolution of responsibility; poor organisational culture; political influence; bureaucracy; systems issues; demographics; and the sheer scale and complexity of the problems that climate change brings being perceived as overwhelming.
Participants in each cluster also identified strengths within the respective systems, upon which an adaptive response to climate change could be built. Governance, investment, existing knowledge and the multidisciplinary nature of planning were all seen as strengths that could contribute to adaptation to climate change.

Recommendations from this study include that contemporary health service planning must take a broader approach than traditional service planning has, and should incorporate the following:

- Undertake strategic, long-term service planning with a view to the health impacts of climate change;
- Undertake broader workforce education and development with regard to the health impacts of climate change;
- Incorporate climate projections in health service modelling to inform strategic planning;
- Increase disaster preparedness in order to cope with the increase in severe weather events;
- Increase ties with health promotion to increase community resilience;
- Plan for the expansion of health protection services to control of enteric and vector borne disease; and
- Ensure that healthcare spending is based upon appropriate planning and data modelling.

Similar to health service planning urban planning too must take a broader approach than traditionally seen and incorporate the following:

- Undertake strategic long term planning with a view to increasing community resilience and reducing the health impacts of climate change;
- Undertake broader workforce education and development with regard to the health impacts of climate change;
- Incorporate climate projections in urban planning modelling to inform strategic planning and minimise of the negative health effects of climate change. This data can inform tools such as Health Impact Assessment to
identify and ameliorate potential health outcomes of urban policies and development;

• Recognise the role that urban planning plays within health promotion and increase collaborative partnerships with health departments, the university sector and non-government organisations;

• Increase disaster preparedness by strengthening urban environments to both cope with disasters and help their residents survive; and

• Ensure that investment in infrastructure takes climate change and the health of the community into account prior to approval being granted. Facilities that do not benefit the community should not be funded.

Given the majority of Australia’s population lives in an urban environment, it is troubling that Australia lacks a clearly articulated strategy to improve the health of its urban populations. Planning, by its very nature, is proactive, identifying problems early and then planning to meet those problems in a timely manner.

Without considered preventative planning, the Australian health and urban systems will deal with climate change in a reactive, expensive, ad hoc, crisis management manner.
List of publications included as part of the thesis


*Global Health Action* is an international peer reviewed journal that aims to fuel a more concrete, hands-on approach to global health challenges by publishing research that addresses a global agenda and includes a strong implementation or policy component.


*Urban Climate* is an international peer reviewed journals that serves the scientific and decision making communities with the publication of research on theory, science and applications relevant to understanding urban climatic change.


*Urban Policy and Research* is an international peer reviewed journal that publishes articles in the field of urban studies and urban policy. It seeks to develop better links between theoretical and empirical research, and practice.


*Public Health Research and Practice*, is an online-only, peer-reviewed quarterly journal that publishes innovative, high-quality papers that inform public health
policy and practice, paying particular attention to innovations, data and perspectives from policy and practice

A statement that summarises and clearly identifies the nature and extent of the intellectual input by the candidate and any co-authors for each of these papers can be found in Appendix A.
Additional Publications

Additional publications and conference presentations that have relevance to this thesis but are not included in it are listed alphabetically and chronologically.


2. Burton AJ. *Climate change and health in the urban environment: Adaptation opportunities in Australian Cities*. NCCARF Conference, Cairns 2011.

3. Burton AJ. *Climate change, health and thermal stress in the urban environment: Adaptation opportunities in Australian Cities*. Research Futures Conference, University of Western Sydney, 2011.

4. Burton, AJ. A study of the understanding of the potential health impacts of climate change amongst urban and health planners in Australia. CSIRO CAF Project 4 collaborators' meeting Planning for climate change, Sydney 2011.


13. Olson R, Burton A. Byron P. Turnbull M. *Markers’ experiences of providing formative assessment feedback in hardcopy, desktop and tablet,* 17th International First Year in Higher Education Conference 2014
1. Introduction and overview

"We ought to plan the ideal of our city with an eye to four considerations. The first, as being the most indispensable, is health"
Aristotle, Politics (English Translation) (ca 350 BC)

1.1 Climate change, human health and the nexus between health and urban planning

Climate change is likely to be one of the greatest challenges that humans will face in the 21st century. There is broad scientific consensus on the anthropomorphnic causes of climate change and the risks that it poses to Earth, its ecosystems and the people who rely on them. Climate change will bring increases in extreme weather events, droughts, heatwaves, sea-level rise and species extinction on an unprecedented scale and speed.

In Australia, climate change is expected to have an impact across the environmental, economic, political, physical and social wellbeing of the community. Climate change will affect different groups of people in different locations at different times. While these changes are expected to disrupt natural systems climate change will also have significant impacts on people, their social situations and their health.

The majority of Australians agree that climate change is happening and that adverse impacts are likely to result. However, few people comprehend that climate change will have a significant impact on human health. There is a growing body of evidence showing and suggesting the negative health impacts of climate change and in particular its impacts on the most vulnerable populations. How large these effects will be depends upon the influence of a range of factors, such as local environmental conditions, socioeconomic circumstances, underlying individual vulnerabilities, chronic disease prevalence and age profile. Vulnerable population sub-groups include the socioeconomically disadvantaged, elderly, the very young, those who have migrated from other countries and those suffering from chronic disease.
The health impacts of climate change will occur via both direct and indirect means. Direct health impacts, such as mortality directly related to heatwaves, are reasonably well understood and are easily measurable.\textsuperscript{31-35} The extreme weather events experienced in Australia between 2009-11 - the heatwaves and bushfires in Victoria and floods and cyclones in Queensland - are examples of the potential direct effects of climate change. These and similar events serve to reinforce to the community the power of the climate and its potential to affect human health and the wellbeing of the community. Indirect health impacts are diverse and less well understood.\textsuperscript{10, 11} Indirect impacts might include disturbances in natural ecological systems that lead to an extension (in range) of vector borne diseases,\textsuperscript{36-38} or poor health outcomes and increased disadvantage as a result of failures in urban and health system planning, amplifying vulnerability to climate change.

Climate change is seen as a slow and unfolding problem with combined causes from multiple sources that are driven by human influences.\textsuperscript{39} While national governments work towards global agreements to limit the impact of climate change, at a national and local level there are a number of “policy levers\textsuperscript{1}” that governments can use to help protect the community from the impacts of climate change. These include mitigation tools such as carbon pollution reduction schemes, and adaptation measures such as drought protection or the development of integrated regional vulnerability assessments.\textsuperscript{40} The Australian Government has undertaken significant work in implementing policies aimed at mitigation, particularly through the Direct Action Plan aimed at paying polluters to reduce their climate footprint. However, there is less evidence of adaptation\textsuperscript{2} policies that aim to reduce the impact of climate change, and less still of adaptation plans that look specifically at human health. In this context adaptation is defined as “adjustments in individual groups and institutional behavior (sic) in order to reduce society’s vulnerability to

\begin{flushleft}
\textsuperscript{1} A “policy lever” is a policy tool that changes the behaviour of an individual, group or business to achieve a desired outcome\textsuperscript{2} Adaptation is the adjustment of a system to “climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.”\textsuperscript{29}
\end{flushleft}
climate.” By increasing adaptive capacity communities will be better able to cope with climate change. There are inherent, lengthy delays in the climate system and therefore, despite any concerted global effort to mitigate greenhouse gas emissions, some amount of climate change will continue for at least the remainder of the century. Therefore adaptation will be key to minimising the harms to human health from climate change.

Governments must plan to increase adaptive capacity within the community to reduce the expected adverse effects of climate change. How this is done will be a major determinant of how severe those effects will be. When determining how best to increase adaptive capacity to cope with the health impacts of climate change it is important to ensure that the needs of the community now and in the future are met and that services and facilities provide value for money. This “community needs” approach has been used in urban and infrastructure planning and, within the health sector, has led to health service planning being an accepted and widely used tool. A failure to adequately invest in and plan for adaptation will leave communities poorly prepared and will increase the probability of severe adverse consequences. For appropriate and timely adaptation to meet the needs of a community at a local level, a broad, integrated system-wide approach to planning for the health impacts of climate change is needed, that includes both urban planners and health service planners in its thinking.

In Australia climate change is occurring against a backdrop of rapid environmental and social change, with urbanisation, population growth and land use change all occurring on scales that are unprecedented. Each of these changes - urbanisation, population and land use change - will in and of themselves affect human health, so it is reasonable to assume that climate change will act to magnify the health impacts of these changes. The failure to plan for and adapt to climate change is a missed opportunity to proactively tackle the impacts that it will have on human health.

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3 Adaptive capacity is the “thresholds and ‘coping ranges’, defined by the conditions that a system can deal with, accommodate, adapt to, and recover from.”

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Burton – Urban and health services planning in climate change adaptation
2. Hypothesis

*That the capacity to adapt to the health impacts of climate change in Australia is dependent upon urban planners and health service planners understanding the health impacts of climate change, and being able to enact this understanding in their planning activities.*

This thesis explores climate change adaptation at a local scale, by reviewing the problem of how to increase capacity to adapt to the health impacts of climate change within Australia through urban planning and health service planning. It investigates the understanding of the health impacts of climate change within these two professions, looks at the shortcomings in their respective systems and examines strengths that could be built upon to enable climate change adaptation.

While seemingly disparate, the two professional groups recruited for this research, urban planners and health service planners, are directly involved in planning activities that affect and impact upon the health of the community. As the problem of climate change worsens it will be incumbent upon planners as well as policy makers to be attentive to the changing demands that climate change will place on the community, their cities and the services.¹⁷

2.1 Urban Planning and its connection to population health

*Urban planning* is the act of designing the communities in which people live, work and play, by balancing the built and natural environment, community needs, cultural significance, and economic sustainability.⁴⁶ The aim of urban planning is to improve the quality of life for the residents of those communities and to create vibrant liveable communities. An “urban planner” is a term used to describe a professional person who undertakes such work.⁴⁶

The concept of the planned city is not new. A planned city can be witnessed in the ordered layout of ancient Greek, Roman, Etruscan, Italic, and Hellenistic cities.⁴⁷ Aristotle identified health as a major driver of planned cities as long ago as c.350 BC. The linkages between human health and urban planning were lost in western
societies during the process of industrialisation and have only recently been re-incorporated within current urban planning philosophy.  

Physician reformers in the 19th century identified the association between urban form and public health (Duffy, cited in Frank et al.\textsuperscript{48}). Following the first epidemiological study of the impact of the urban environment on the disease, these physician reformers observed that the combination of poor urban design, poor sanitation and poor living conditions in the most densely populated regions of the city led to serious public health issues.\textsuperscript{48} These reformers heavily influenced early modern planners and this is particularly evident in the Garden City and Healthy City Movement first developed by Howard.\textsuperscript{48, 49} This new form of planning aimed to improve people’s lives by separating them from the harms of the industrial revolution.\textsuperscript{48} By separating housing from industry (through zoning laws) and mandating light, airflow, sanitation, clean water and open space, the population health of the community was significantly improved through reductions in diseases like typhus, cholera yellow fever and even smallpox.\textsuperscript{13, 50}

However, over time the segregation of work and home, coupled with the availability of the motor car, pro-car policies and unprecedented rates of government spending on highways and roads infrastructure (such as the spending authorised under the \textit{Federal-Aid Highway Act of 1956} (USA)), has allowed cities to rapidly expand into surrounding rural areas, leading to the dispersed sprawling cities of today.\textsuperscript{50, 52} The result is that while cities no longer have the health issues identified in the mid 19\textsuperscript{th} century, they now have different public health problems, the most important being the growing crisis of obesity, which is driving a chronic disease epidemic.\textsuperscript{53, 54} In response, planning authorities, health departments and non-government organisations (especially peak planning and health groups) are working to redress some of the health problems brought about by 20\textsuperscript{th} century urban planning\textsuperscript{55} with the recognition that there needs to be a shift towards more efficient and healthy forms of urbanisation.\textsuperscript{56}

The Planning Institute of Australia (PIA), Australia’s peak body for urban and regional planners, in collaboration with the Australian Local Governments Association and
The Heart Foundation, developed the *Healthy Space and Place* document and website directed at planning professionals with the view to education of professionals and positively influencing their planning decisions to plan for healthier more compact communities. Although this website is being discontinued, further reports such as *Does Density Matter? The role of density in creating walkable neighbourhoods*[^57], the *Blueprint for Active Australia*[^58] and web sites such as [www.healthyactivebydesign.com.au](http://www.healthyactivebydesign.com.au) further highlight the role that urban planning plays in community and population health.

When the impact of climate change is considered, appropriate, proactive urban planning is required to cope with the direct physical impacts, such as urban heat islands, sea-level changes, severe droughts and floods[^60]. The impacts of sea-level rise on coastal settlements are well-documented[^61, 62] and some Australian local governments are well underway with planning for sea-level rise[^63]. The need for this level of planning has been recognised by professional bodies and some universities. The Planning Institute of Australia, in collaboration with the Chifley Business School[^4], have developed a series of professional development modules for the profession[^64].

However despite the long relationship of health and urban planning and research identifying that urban planning plays a role in mitigating health impacts of climate change[^8, 17, 65, 66], these sessions focus only on planning for the physical impacts of climate change[^64]. This seems to be a significant oversight.

Urban planners are primarily involved in health prevention. Their role is to plan cities for people while ensuring the health and wellbeing of the population in those cities is catered for. The planning profession is in a unique position to assist the community in understanding adaptive capacity and planning for adaptation to the expected consequences of climate change.

Urban planning can increase adaptive capacity through both direct and indirect means. Examples of direct mitigation and adaptation measures include:

[^4]: The Chifley Business School is a business and management education provider based at Torrens University in Australia
• The control of vector-borne diseases, through appropriate controls in the use of water tanks or the protection of wetlands from development;
• Mitigating the extremes of heatwaves and the urban heat island effect by planning for cool spaces, urban greening and even light-coloured roofs; and
• Planning for increased housing density, in compact mixed-use developments to increase walkability and facilitate social capital.

Indirect adaptation measures are harder to measure but also have significant co-benefits. For example high obesity rates (due to a sedentary lifestyle and poor diet) are contributing factors to the current high levels of type 2 diabetes occurring in westernised urban populations. These rates are now increasing in east Asian countries as a result of westernisation. Type 2 diabetes is a preventable lifestyle disease. Making cities more walkable and bicycle friendly has multiple benefits including improved individual fitness and weight loss, reduced local air pollution and associated respiratory illness, and reduced greenhouse gas emissions. These improvements in the health of the population strengthen urban and social systems, increase cooperation and connectedness, and lead to increased resilience, adaptive capacity and an improved ability to cope with the potential health impacts of climate change.

Socially isolated individuals are at greater risk of dying from extreme heat. Good urban planning can increase social capital and reduce social isolation within the community by increasing active travel, increasing green spaces (including tree planting) and improving liveability and amenity. Such improvements can also have the co-benefit of improved retail business outcomes with active transport users producing much higher levels of retail spend than car-borne shoppers. It is already known that social capital can play an important role in coping with, and recovering from, extreme weather events. Therefore planning to reduce social isolation,

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5 Social capital is defined as the “networks between people that lead to cooperation and beneficial outcomes.”

6 Community resilience is a function of “economic development, information and communication, and community competence, ... the degree to which individuals experience strong social support and have robust social connections, the state of the physical and psychological health of the population, and the integration and collaboration of government and nongovernment entities.”
utilising and building upon the existing urban form, may be an important component in increasing adaptive capacity within the community and planning for climate change.

A review undertaken by the Productivity Commission in 2012 shows that while data and “some predicted climate change impacts are being considered” planning for climate change “is not occurring in a particularly systematic or coordinated way across Australia.” So while there is a shift in urban planning towards more efficient and healthy forms of urbanisation this is not being done with an eye towards climate change.

The built environment plays a significant role in the health and wellbeing of the community. Good urban design leads to increased levels of physical activity, improved social capital and reduced impacts of the urban heat island effect. That urban design affects and influences human behaviour and therefore human health is well understood. By improving the health of the community at a population level through good urban design the resilience of the community will be increased, adaptive capacity improved and some of the negative impacts of climate change will be mitigated ultimately leading to a reduction in demand for health services. However, if climate change is not considered and poor urban planning and design is allowed the detrimental health impacts of climate change will be exacerbated, leading to worse outcomes and a greater impost on the health system, particularly in vulnerable populations. If urban planners are aware of climate change but largely unaware of its potential impact on population health then their ability to make planning decisions to mitigate these impacts is minimal. Good urban planning would aim to reduce chronic diseases, increase community resilience, improve adaptive capacity and ultimately reduce the demand for health services.

While it is clear that urban planning can and must increase community adaptive capacity problems can’t be solved through urban planning alone. To address these issues at a community level coordinated, multi-disciplinary and multi-sectoral approaches that incorporate socio-economic, spatial and environmental policies throughout the urban system are required. Urban planning can work to encourage
good health and minimise the impact of disease, but it is only one facet of adapting to climate change. How well we are able to treat people affected by climate change within out health systems is the other.

2.2 Health Service Planning

*Health service planning* involves identifying the future health needs of a population by planning for new services and aligning existing services to meet this need, while aiming to make the most effective use of available resources. Health service planners are responsible for planning the health system, and for determining the specific needs of the community in terms of the amount and types of services required. The process of health service planning includes responding to policy, and identifying issues that may arise now and into the future, by developing a series of planned steps to implement the options that have been identified. A health service planner typically has access to tools that allow: cross border activity analysis, emergency department demand forecasting, inpatient demand forecasting, mental health services and alcohol and other drug services demand forecasting. Planned services may be directed to an individual’s needs (i.e. the number of generalists, specialists, hospital beds or allied health professionals or services required in a given region) or at a population level through the development of health promotion guidelines or campaigns such as “Quit” or “Take 30”.

Health service planning has a longer-term outlook but service plans themselves often cover a relatively short three to five year timeframe. A health service planner will often will have extensive experience in the health system, potentially coming from a clinical or allied health professional background, but this is not a prerequisite. While relatively few in number, health service planners in Australia are responsible for recommending hundreds of millions of dollars worth of decisions on health investment annually.

The health system is the safety net that provides the primary, community and tertiary health services to the society. The way that the health system operates

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7 “Quit” and “Take 30” are Australian public health campaigns aimed at improving the health of the population by encouraging people to stop smoking and increase their levels of daily exercise respectively.
plays a significant role in patient outcomes, where a poorly planned, resourced and uncoordinated health system will perform worse than a well planned, resourced and coordinated one.\textsuperscript{44} With this in mind the detrimental health impacts of climate change will be exacerbated and adaptive capacity reduced if the health system is not proactive in planning for and coordinating resources to minimise the health impacts of climate change.\textsuperscript{81} Action must therefore be taken on building and recognising the links between climate change and adverse health and appropriate preventative, primary community and tertiary health systems should be put into place to deal with the adverse outcomes.\textsuperscript{78} Early health service planning for climate change is a prudent approach to manage and minimise the future health impacts and care costs that are likely to occur.

Health services are large, expensive bureaucracies that require long term planning. They are effective at treating people leading to good health outcomes,\textsuperscript{82} but on the whole they are not flexible and require time to adjust or react to new or changing situations. The broad and near universal impacts of climate change in Australia, coupled with the significant costs of the health system, means that the health effects of climate change will need to be dealt with within the context of the existing system, utilising existing facilities and modified services.\textsuperscript{10}

Within Australia, health service planners face general challenges including equity of access, the increasing poor health of the population (due to effects such as physical inactivity overweight and obesity), efficient health care delivery, role of market forces and increasing concern from government and private investment about the return on investment in health.\textsuperscript{44} The additional overlay of climate change and its impact on human health is now a factor that health services planners must incorporate into their plans.\textsuperscript{81}
2.3 Why look at both ends of the health spectrum?

“(I)t is critical that we find pathways to connect planning and health.”

In an ideal world, all professions work together for the health and wellbeing of the community, aligning priorities to ensure that the health of the entire community is met and that exposure to hazards are minimised. This would be done through appropriate and timely planning and by continuously monitoring, evaluating and improving outcomes. However, this thesis provides evidence that the professionals involved in this research find it difficult to work across disciplinary boundaries and towards common health goals.

In order to make informed decisions, policy-makers and planners need timely and useful information, not only about the challenges of urbanisation and an ageing population but also about the health impacts of climate change and all of the foreseeable consequences. Adequate joint planning for climate change, both at an urban design level and a service design level would seem to be an appropriate way to increase adaptive capacity at a population level.

2.4 The health impacts of climate change

Health outcomes at a population and at an individual level are multi-causal. There are many factors affecting health outcomes, such as age, socio-demographics, ethnicity, age distribution, economic status, rural/urban settlement behaviour, and individual behaviour and circumstance. It is therefore not possible to plan for the health impacts of climate change without considering the effects of these other factors. To further complicate matters, various non-climate health issues, such as chronic disease will also influence the scale of health impacts over time.

At a national level, as identified in the Garnaut Review - Final Report the health impacts of climate change in Australia are likely to be diverse, severe, and largely negative, varying by health outcome - the impact healthcare activities have on a person - and geographic region. The highly urbanised nature of Australia means that, at a population level, the health impacts of climate change will be
The potential health impacts of climate change include increased incidence of thermal stress, a decrease in air quality leading to aggravated chronic respiratory and cardiovascular diseases amongst others, an increase in enteric pathogens, an increase in vector borne disease and an increase in adverse mental health outcomes.

2.4.1 Thermal stress

Hot days and extended heatwaves are predicted to increase in both severity and frequency leading to warmer summers and greater numbers of extreme heat events but also milder winters. This pattern is expected to be the case for Europe, North America and Australia. While studies internationally indicate an increase in temperatures may lead to a slight decrease in cold-related mortality, at a population level, this will be outweighed by increased death rates due to thermal stress. Heatwaves and associated thermal stress are a major cause of mortality not only in Australia but globally. This was evidenced by the significant spike in deaths rates as a result of major heatwaves that gripped Europe in 2003, Victoria in 2009, India in 2015 and Pakistan in 2015. Groups particularly susceptible to heat-related mortality include the elderly, the very young, city-dwellers, those with less education, people on medications such as diuretics, the socially isolated, the mentally ill, those lacking access to air conditioning, and outdoor labourers.

Within Australia climate change will lead to an increase in prolonged and intense heatwaves as well as more hot days where temperatures rise over 35°C during the daytime and remain above 20°C over night. As a result, the incidence of thermal stress will increase. Heat-related mortality will increase with an ageing population and methods to reduce this impact will depend on the effective implementation of a range of adaptation options, including heatwave early warning systems, urban design to reduce heat loads, and enhanced social services during heatwaves.

At an individual level heat-related illnesses and deaths are largely preventable through behavioural adaptations, including the use of air conditioning and increased fluid intake.
2.4.2 Air quality

Climate change will decrease air quality, which is sensitive to weather patterns, particularly in the urban environment.\(^{107}\) Summertime surface level ozone in polluted regions is expected to rise, as will particulate matter concentrations, fuelled in part by climate driven bushfires.\(^{107}\) This increased exposure to noxious gases and particulate matter can aggravate chronic respiratory diseases such as asthma, exacerbate cardiovascular disease, reduce immunity, damage lung tissue, reduce outdoor work capacity, and possibly contribute to cancer.\(^{19}\) Decreased air quality will inevitably lead to increased health service usage, particularly emergency departments, during severe events such as large scale bushfires.\(^{108}\) Ultimately increased exposure to air pollution will, at a population level, lead to premature deaths.\(^{109-111}\)

2.4.3 Enteric infections

There are correlations between peak ambient temperature and the peak in reported clinical cases of salmonellosis\(^{100}\) (noting that the incidence of salmonellosis and other enteric diseases are significantly underreported).\(^{112}\) With a rise in temperature the incidence of infection with enteric pathogens, such as salmonellosis, will increase within the urban environment.\(^{18}\)

Climate variability will mean more intense storm events that will lead to the identification of deficiencies in watershed protection\(^{8}\), infrastructure, and storm drainage systems, leading to an increase in the risk of contamination events\(^{113}\) through waterborne pathogens in drinking water and contaminated food.\(^{113,114}\) The transmission of these pathogens is strongly affected by changes to urban and rural environments and hence need appropriate urban infrastructure planning.

\(^{8}\) Watershed protection refers to the managements of catchment areas reduce water pollution and protect the environment and human life.
2.4.4 Vector borne disease and zoonoses

Across the globe, climate change will lead to changes in the distribution, range and season of vectors and, as a result, an increase in the transmission of vector borne diseases. Many countries have seen an increase in vector borne diseases including West Nile Virus, malaria and chikungunya virus with increased vulnerability in poorer countries that are less able to adapt. However, OECD countries are also likely to be impacted. Cases of chikungunya virus have been identified in Germany and Italy and zoonotic diseases such as Lyme disease and Hendra virus are becoming more prevalent across the temperate world, including Canada and Australia respectively. As patterns of climate change alter the geographic ranges of hosts and vectors and urban environments expand into habitat the potential for people to increase their exposure to diseases such as Hendra Virus increases.

Within Australia the transmission of dengue virus is of particular concern as its vector, Aedes aegypti, is an urban dwelling mosquito known to be moving south. The re-emergence of domestic rainwater tanks in Australia may contribute to the spread of this vector. Japanese Encephalitis may once more become endemic in Australia, as may malaria, with the potential range of vectors expanding into populations centres and growth corridors of south-eastern Queensland. Both urban and health service planning will have a role to play in the restriction of the spread of vector borne diseases as well as their treatment.

2.4.5 Mental health

It is hypothesised that there will be a rise in mental health disorders as a result of increased urbanisation and exacerbated climate change. Climate change will affect mental health through both direct and indirect pathways leading to serious mental health problems and increased risk of suicide. Disruptions in networks of families and friends through extreme weather events (including prolonged drought),

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9 Zoonoses is “Any disease or infection that is naturally transmissible from vertebrate animals to humans and vice-versa is classified as a zoonosis.” Zoonoses may be bacterial, viral, or parasitic, or may involve unconventional agents, an Australian example being Hendra Virus.

10 OECD is the Organisation for Economic Co-operation and Development comprising 34 nations. It is a forum for governments to work together, share experiences and seek solutions to problems common to its member nations.
the exacerbation of chronic illnesses, increasing exposure to daily challenges, increasing traumatic events, and damage to the environment and the economy are all stresses on ability to cope with life.\textsuperscript{127,128} Prolonged drought significantly affects the mental health of the community, and this is particularly noticeable within younger people.\textsuperscript{92,129} In addition there is a correlation between increased thermal stress due to heatwaves and increased numbers of reported assaults\textsuperscript{33} putting further strain on the community.

2.5 Other factors influencing health that will be affected by climate change

2.5.1 Needs of vulnerable populations

Climate change will disproportionately affect those from vulnerable population groups including the very young, the elderly, some Aboriginal and Torres Strait Islander peoples, those with existing or emerging chronic disease issues and those from lower socioeconomic backgrounds.\textsuperscript{130-133} These groups are also more likely to suffer from significant non-communicable diseases, such as cardiovascular disease and mental illness and climate change will only serve to heighten the risks associated with these conditions. These groups, given their vulnerable status, will also have less adaptive capacity.

2.5.2 Food availability

Climate change will impact human health through reduced food security and undernutrition (particularly in lesser developed countries) affecting crop yields, forestry, livestock, fisheries, aquaculture, and water systems.\textsuperscript{78} The world “could now be facing a perfect storm of challenges (with regard to food security), including climate change and increasingly severe droughts and floods, soaring food prices”.\textsuperscript{134}

Within Australia drought and severe weather events will lead to a decrease in agricultural production capacity reducing the availability of affordable fresh fruit and vegetables.\textsuperscript{135} This, coupled with worsening climatic conditions, obesogenic urban environments and the availability of energy dense highly processed foods, will
increase obesity and exacerbate chronic disease, leading to an increase in the population of those who are vulnerable to the health impacts of climate change.136,137

2.5.3 Aged care services demand

The population of Australia is ageing,138 and with that comes an increase in a particularly vulnerable population. Older people are more vulnerable to the effects of extreme heat,133, 139, 140 isolation, infectious diseases,141, 142 poor nutrition, food and water borne illness,143 exacerbation of respiratory diseases due to reduced air quality,144 and mental health issues.92, 126, 127, 145 There will need to be careful implementation of strategies that aim to reduce the risks of mortality and morbidity in this population group as a result of climate change.139

While not a result of climate change, the growth in this cohort will see an increase in, and changes to, the types and nature of services and infrastructure required for older people. For example aged care services will become a significant delivery arm of health care services into the future. Currently approximately 74% of people who are aged over 70 make use of some form of aged care service and by 2050 this is expected to be 3.5 million Australians.146 It is likely that most of these services will be delivered in the home rather than in specific aged care facilities. How these services will run, and the nature and types of housing, urban and social support infrastructure needed for them to be effectively delivered will be affected by climate change.

2.5.4 Severe weather events (other than heat events)

Climate change will see an increase in severe weather events including increased frequency and severity of bushfires, droughts, storms and sea surges.

Fire danger weather, characterised by increasing temperatures, high winds and lower humidity, is expected increase,147 with existing observations indicating a 10-40% increase in fire danger weather recorded in south-eastern Australia in the period between 2001-2007 when compared to the period between 1980 and 2000.148 Apart from the direct physical impacts of fires, this increase in the number
of fire danger weather periods will lead to an increase in mental health issues\textsuperscript{149} and respiratory illness.\textsuperscript{144, 108}

The destructiveness of cyclones correlates with increased sea surface temperature.\textsuperscript{150-152} As the climate changes and the waters around Australia continue to warm, tropical cyclones are likely to become more intense\textsuperscript{153} and move further south, largely affecting the highly populated coast of Queensland, the Northern Territory and (less populated) coast of Western Australia. These events will have direct physical impacts on infrastructure and people, as well as indirect impacts such as mental health issues, poor sanitation and the spread of vector borne disease.

Climate change is likely to lead to less rainfall and an increase in the frequency and severity of droughts across much of Australia. There will be less runoff into rivers and dams,\textsuperscript{154} affecting wildlife, food production\textsuperscript{155} and the economic viability of smaller rural farming communities.\textsuperscript{156} The probability of drought-related health impacts depends upon a range of factors including drought severity, underlying population vulnerability, and existing health services.\textsuperscript{157} As a result of drought in Australia it is likely that there will be significant impacts on the mental health of the community and a reduction in the availability of cheap fresh food.

These events are already leading to changes in the built environment - the way our cites are being planned,\textsuperscript{63} buildings are being built\textsuperscript{158} and services for residents are being offered. While protecting infrastructure is important, increasing adaptive capacity within the population should not be overlooked.

\textit{2.5.5 Health services demand}

Climate change, coupled with an increasingly vulnerable population, will undoubtedly increase the demand for health services, from General Practitioner visits and services offered in a home or community setting, to acute services offered in a hospital setting. While higher temperatures expected as a result of climate change may see a decrease in some cardiovascular-related mortality\textsuperscript{33} there will be significantly higher hospital admissions for several chronic disease categories including renal admissions and ischaemic heart disease\textsuperscript{33} increasing the strain on
health services.\textsuperscript{159} Emergency department presentations will increase\textsuperscript{160} as will total hospital admissions. Further, drought and heatwaves will exacerbate mental health conditions with one study showing an observed increase in admissions by \textsuperscript{33}.

Better modelling of the association between climate change and health service use coupled with a “comprehensive assessment of current and future climate-related burdens of disease (is) needed”\textsuperscript{78} to better plan for the health services needed under a changing climate. Planning for this will require recognition of the health impacts of climate change within the health sector, modelling of impacts,\textsuperscript{78} early warning systems, investment in better public health\textsuperscript{106} and implementation of appropriate adaptation and mitigation strategies across the community.

2.6 Justification

Recent extreme weather events, the frequency and intensity of which are likely to change under climate change scenarios,\textsuperscript{161} highlight the cost of failing to adequately plan and prepare for changing climate. When complicating factors including an ageing population and increased urbanisation are included the consequences of failing to adequately plan for climate change could be expensive at best and ineffectual at worst. Extreme weather events such as the heatwaves and bushfires in Victoria in 2009 are an example of how an extreme weather event can have a significant impact upon the health of the community. During the 2009 heatwave in Victoria, Melbourne recorded a new temperature maximum record of 46.4°C and the state recoded a new maximum temperature of 48.8°C.\textsuperscript{162} Transport infrastructure failed and the power supply was interrupted, causing millions of people to lose electrical power.\textsuperscript{163} As a consequence, the Victorian Department of Human Services reported an additional 374 deaths as a result of heat stress, more deaths than those who were killed directly as a result of the associated bushfires.\textsuperscript{35} The confluence of the bushfires and the heatwave placed considerable strain on Victoria’s health systems.\textsuperscript{35, 86}

\begin{quote}
\textit{The rich won’t be immune to climate change}
\end{quote}

\textit{(Participant quote)}
While this event can not be directly linked to climate change it can, perhaps, give an insight into the types of events that may happen more frequently in the future.

A major challenge to be faced, however, is that of bridging the divide between the scientific knowledge that exists and the planners and policy makers who shape policy and our physical and social environments. This study aims to bring together areas of applied research into the impacts of climate change on human health and thus bridge the gap between research and the professions of urban and health service planning. It will aim to reconcile differences and create synergies between researchers and decision makers at both a local and national scale.

2.7 Research Objectives

This research had four primary research objectives, and a paper has been published, accepted or submitted on each:

1. Document the extent of awareness of the health impacts of climate change among health service planners and urban planners:

2. Identify the shortcomings and strengths of Australian urban planning system.
   Burton AJ, Bambrick H and Friel S. *Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system*. Accepted, pending revisions, under review.
3. Identify the shortcomings and strengths of Australian health service planning system.

Burton AJ, Bambrick H and Friel S. Climate change: Are Australian health systems ready? 2nd revision, under review.

4. Investigate and make recommendations about how the professions of urban planning and health service planning can reduce their shortcomings and work with their strengths, over the short to medium term, to increase the adaptive capacity of the Australian community and mitigate the health impacts of climate change.
3.0 Methods

3.1 Qualitative research and the interpretivist approach

This research was undertaken using qualitative research methods. Qualitative research is defined as research that focuses on the unique complex relationships between personal and social meanings, individual and cultural practices and the material environment and context in which the participants exist. A qualitative research is a strong tool that is able to ask the questions that are central to the disciplines of planning, that is, how people make sense of the world and address the objective dimensions of human action and interaction, in effect how to plan cities and services for people in a changing climate. The qualitative research method has provided the ability to:

• explore the understanding of the professionals from their own perspective;
• produce dependable results, as interviews were replicated across the entire study population;
• produce confirmable information, as the data collected reflected the understanding of the study groups; and
• make the study transferable, as it was used between the study populations thus allowing for generalisability across the different professional groups.

While there are different interview methods used to collect qualitative data (including positivist and feminist approaches) an interpretivist approach was used to undertake the research described in this thesis. The decision to take this approach was based upon the nature of the participants in this study, the experience of the candidate, and the research objectives. A similar interpretivist approach was used in a study that aimed to understand the perceptions of nurses about climate and environmental issues in Sweden in 2013.

An interpretivist approach assumes that reality is subjective and seen from many different perspectives depending upon the individual. An interpretivist approach seeks to derive meanings from the perceptions, experiences and social contexts of the individual using semi-structured open-ended questions enabling the participants
to express their thoughts. An interpretivist approach seeks to discover and understand the circumstances of human behaviour.\textsuperscript{165}

Interpretivism firmly embeds the researchers' values through all phases of the process, allowing the findings of the project to emerge through dialogue which leads to a more informed and sophisticated understanding of the participants’ responses.\textsuperscript{167} The participants are active partners in the data collection and are able respond to the semi-structured nature of the questions naturally. The researcher is able to ask additional questions to further explore answers and the context around those answers. Participants are able to engage in the research process and may gain a deeper understanding of the own behaviours and perspective of the research topic. The key components of the interpretivist approach relate to the subjective perceptions/understandings that the participants have that arise from their experience; objective actions and behaviours that they undertake as a result; and the context, in this instance their workplace, under which this occurs. Essentially the participants’ understanding of the world is based upon their experiences and that “who we are and how we understand the world is a central part of how we understand ourselves, others and the world”.\textsuperscript{167}

3.2 Using the Interpretivist approach in this study

This study is an in-depth investigation of participants’ knowledge of climate change, its health impacts, and the role that participating organisations and professions can play in promoting adaptation to climate change. It looks at what the implications of this knowledge and understanding are. In this study the participants, as professional planners working in the area, are seen as the experts in their respective fields, unable to separate themselves from their communities, experiences and understanding.\textsuperscript{168} That is, the professionals interviewed in this study are influenced and conditioned by their membership of communities, and therefore, competing priorities influence their understanding and make what may appear to be simple decisions complex and difficult.\textsuperscript{165} As a result, the way that these planners think and act is influenced by their professional as well as their personal connections and beliefs.
3.3 Determining the Interview population

The interview populations comprised urban planners and health service planners. Professional populations of urban planners and health service planners were chosen because they are integral in planning for and adapting cities and services to the impacts of climate change in their everyday work.

Urban planners were recruited from the public service, private sector and non-government organisations, focussing mainly on planners who work at the local and regional levels, rather than at national-level planning. This reflects the structure of the Australian urban planning system, which is mainly administered at the local level, but influenced by state/territory and federal governments through direct and indirect funding. There was a small component of the sample responsible for national level planning projects.

The health service planners recruited for this study were generally planning for health services at a local/regional level. This is reflective of the structure of the Australian health system which is funded at both a state and national level but where services are administered by the state and territory governments.

3.4 Region of Study

The study was limited to Australian-based planners working in either the health services planning field or urban planning field. The region of study was restricted to Australia due to restrictions in time and the nature of the funding for the research being Australian based. Planners may have studied or worked overseas but at the time of the interview were working within Australia.

Within the urban planning cluster of the study there was no limit the size of the urban area, but all were planning for urban settlements in excess of 30,000 people.

3.5 Recruitment

Recruitment was targeted at the two professional clusters interviewed as part of this study: urban planners and health service planners. The same recruitment method was used for both clusters.
“Snowball sampling” is a qualitative research recruitment technique that uses professional and social networks that exist between members of the population in order to build a sample.\textsuperscript{165, 169} It is an effective tool for reaching the target population but can introduce both sample and response bias which may impact upon that data collection.\textsuperscript{170} This bias is an identified limitation of the study.

### 3.5.1 Recruitment of urban planners

The Planning Institute of Australia (PIA) assisted in recruitment by providing a brief statement about this research to their members. The Planning Institute of Australia is a national membership based organisation representing 4,700 planning professionals that, through education, communication and professional development, aim to create better communities by advocating on behalf of their members.\textsuperscript{171} The dissemination of this information was handled by each state and territory.

A virtual meeting and exchange room for Australia and New Zealand urban planning educators, researchers and policymakers known as RePlan\textsuperscript{11} was also used to recruit interview subjects. The same brief statement about this research was provided to RePlan and sent to all members of the forum. Participants recruited through the Planning Institute of Australia and RePlan were invited to make direct contact through e-mail.

Existing professional connections were also used to obtain some of the initial seed sample. This involved directly contacting a potential participant known to the candidate through e-mail, providing them with background information about the research, and asking if they would be prepared to participate or if they were able to provide the names and contact details of potential participants.

Two weeks after this initial contact, a follow up e-mail was sent. If no contact was heard after this second contact, a third e-mail was sent four to six weeks after the

\textsuperscript{11} RePlan is a virtual meeting and exchange room for Australia and New Zealand urban planning educators, researchers and policymakers that is open to all professionals working or studying in the urban planning field. It is an e-mail list server, administered by Dr Paul Maginn from the University of Western Australia, that allows for moderated discussion of all manner of issues related to urban and regional planning practice, research and teaching.
initial contact. A final fourth e-mail was sent 10 weeks after the initial contact. If the potential participant did not respond at this point they were considered to have refused to participate in this study.

A total of 101 urban planners were contacted and invited to participate in this research.

3.5.2 Recruitment of health service planners

Professional connections to the candidate were used to obtain an initial seed sample for this study. This recruitment method was used due to the small number of professionals working in this profession (less than 200 nationally). Further participants were then identified using snowball sampling, because as a result of the small number of health service planners in Australia many planners know each other. The use of snowball sampling alone was considered adequate to access a representative sample.

As previously described, potential recruits were contacted directly through e-mail. Two weeks after the initial contact, a follow up e-mail was sent. If no contact was heard after this second contact, a third e-mail was sent four to six weeks after the initial contact. A final e-mail was sent 10 weeks after the initial contact. If the potential participant did not respond at this point they were considered to have refused to participate in this study.

A total of 48 health service planners were contacted and invited to participate in this research.

3.6 Background information provided prior to interview

Once participants agreed to participate in this study they were provided with a background information paper about climate change and the impacts that are expected to result (Appendix A). This paper focussed on the projected health impacts of climate change, and included a referenced reading list and a copy of all of the prescribed questions (the survey instrument) that would to be asked during this research. The paper was provided to each participant as they joined the study.
Participants were encouraged but not required to read the background paper prior to interview.

At this time, participants were informed of the candidate’s background as a professional who had worked in both urban and health service planning.

Participants were made aware prior to the interview that the research was undertaken with a view to understanding their awareness and knowledge of the health impacts of climate change.

3.7 The survey instrument

The Environmental Health Committee\(^{172}\) (enHealth) developed the questions in the survey instrument used in this study. As a subcommittee of the Australian Health Protection Committee (AHPC), enHealth was founded to coordinate nationally agreed environmental health policies and provide policy advice to the Australian Health Ministers’ Advisory Council (AHMAC). enHealth informs and provides expert advice to AHPC and AHMAC on environmental policy with significant health implications, engages with the community on significant health policies matters and coordinates research, shares information, and develops practical environmental health resources.\(^{173}\) The survey instrument was originally designed to be an interactive web-based tool that comprised an introductory page, five optional background information pages, and four pages of questions. Its purpose was to collect information from participants about their needs, capacity and activity regarding adaptation to climate change for health.\(^{104}\)

The survey instrument was developed as part of enHealth’s development of a national climate change adaptation action plan for Australia as a web-based tool designed for health professionals and hospital administrators. The national climate change adaptation action plan for Australia has either never been completed or has not been made a public document. The United Nations Framework on the Conventions on Climate Change supports lesser-developed countries to develop National Adaptation Plans of Action to “identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change”. To
date over 50 lesser developed counties have provided these plans to the United Nations.\textsuperscript{174}

The questions associated with the survey instrument were publically available while enHealth were undertaking their survey but have since been removed from the website. The questions from the survey were used with the permission of the Secretary to enHealth. As part of the study the candidate requested permission to access the document and the use the raw data from enHealth but these queries (telephone and e-mail) were left unanswered and the candidate was unable to obtain permissions to access either.

In the context of this study, the survey instrument was used as the basis for qualitative interviews that were designed to collect extended qualitative data from participants about their understanding of climate change and human health as well as the activity and capacity of their organisation to respond to the impacts of climate change.

3.8 Interviews

3.8.1 Timing of interviews

Interviews with health service planners were conducted between 8th September 2011 and 21st February 2012. Interviews with urban planners were undertaken between 10th August 2011 and 22nd February 2012.

3.8.2 Interview technique

The interpretivist approach used in this study relies on naturalistic interviewing techniques\textsuperscript{167} where questions are asked in a conversational manner. All questions were asked in a consistent order and using consistent wording across all interviews. The candidate undertook all interviews and attempted to thoroughly investigate the participants’ understanding of the question and explore their responses. These methods were used to ensure an adequate dialogue between the researcher and the participants so as to collaboratively construct a meaningful reality.\textsuperscript{167} The interviews were semi-structured and conducted in a conversational interview style with a core of open-ended questions that allowed further exploration of particular
issues as they arose. This may have introduced additional bias into the results as not all participants were as forthcoming with additional information (see ‘Bias’ below).

3.8.3 Interview Process

Phone interviews were the predominant method of interview, preferable for several reasons: to reduce bias, cost, travel time and greenhouse gas emissions. All interviews were undertaken in this manner unless the participant specifically requested a face-to-face interview. There were a total of seven face-to-face interviews in the study (five urban planners and two health services planners).

If during the interview participants asked their own question, the candidate answered these at that time, similar to a general conversation. If the question required follow-up the candidate researched the answer and communicated the findings to the participant for both confirmation and feedback.

3.8.4 Questions

Participants were asked to reflect on the information provided and respond verbally to the questions found the background paper. Participants were asked to address all questions. The participants themselves determined how they would respond to each question and how much information they would provide. The candidate drew further information from the participants by asking additional questions about their answers. Participants were not asked to prioritise or nominate the degree of impact but participants were asked to identify if there was any impact, what that impact may be or whether or not they believed that there would be that particular impact.

The questions identified the health impacts of climate change as being either medium (five years) to long (30 years) term. There were no questions about current or immediate impacts.

3.8.5 Benefits of using this survey tool

One benefit of using this survey instrument is that these questions are adaptable in that they can be used as a simple web-based tool but can also be used in an in depth interview tool. While outside of the scope of this study the tool could be used across
a range of professions, allowing future research opportunities across other professions. These professions could include, but not be limited to, private and public sector employees engaged in risk management, medical practitioners, allied health professionals and treasury officials. This additional research would increase the understanding of the potential impacts of climate change and the preparedness of organisations and jurisdictions for these eventualities.

3.9 Sources of bias

Within this study there were several potential sources of bias, particularly in the areas of recruitment, information provided to the participants prior to interview, and interviewer technique.

3.9.1 Participation bias

As participation in this study was entirely voluntary, it is possible that the sample of participants was skewed, in that the number of participants who were already aware of and interested in the impacts of climate change were over-represented.

3.9.2 Recruitment techniques

The use of snowball sampling is a good tool for accessing hard-to-reach populations. In this study the candidate used personal professional networks as the seed for some of the recruits. The candidate had previously met, or worked with, ten of the urban planning professionals and four of the health service planning professionals. It is possible that these relationships may have influenced the way participants answered questions, with participants likely to be more verbose with their answers.

There may have been differential recruitment of interviewees, with a bias towards people with an increased length of time working in the sector. Interviewees with more experience in the field may have had larger peer networks and thus would have been more likely to have recommended additional interviewees. In addition, interviewees may be more likely to suggest peers with similar traits, thus leading to interviews with participants with similar traits. This bias may have led to overestimation of the level of awareness of the health impacts of climate change.
3.9.3 Sample size

Professional urban planners participating in this study were from New South Wales, the Australian Capital Territory, Victoria, Queensland and Western Australia and were all either public servants, senior representatives from private planning companies or planning experts from the non-government sector. Experience ranged from first year graduate level through to senior planners at both chief executive and elected official level.

Professional health service planners participating in this study were from New South Wales, the Australian Capital Territory, Victoria, Tasmania and Western Australia.

The group of urban planners participating in this study was reasonably large (n=43). Urban planners who worked for federal, state/territory or local governments were identified as “Public” (n = 24). Those who worked for privately owned planning firms were identified as “Private” (n = 15). Those who worked for non-government organisations were identified as “NGO” (n = 4). While the total number of urban planning participants was reasonably large the sample size of the health service planning participants was considerably smaller (n=16). However, this sample of health service planners was considered a good representation and cross section of senior Australian health service planners responsible for approval of plans which require the expenditure of millions of capital and recurrent dollars. 176,177

3.9.4 Candidate’s professional experience

Provision of the background paper and information about the candidate’s professional experience may have influenced the participant responses. The candidate has worked in a professional capacity across both urban and health service planning. All participants were made aware of this experience prior to the interview and this may have influenced their answers to the questions asked.

3.9.5 Interview Processes – Bias

The candidate was aware of Whyte’s directiveness scale, 178 which identifies how interviewers can inadvertently influence the responses of interviewees. These are outlined below, along with the techniques used to mitigate these possible effects:
• **By making encouraging noises.** During the interview process the candidate did make encouraging noises, and when interviewing participants face to face did use physical gestures (such as nodding). The candidate attempted to keep these actions to a minimum but did use these techniques to try to elicit further information. Nonetheless, these noises and gestures may have influenced the participant in their answers by encouraging them, for example, to further explore areas that, without these subtle cues they may not have expanded upon.

• **By reflecting on remarks made by the interviewee.** During the interview process the candidate reflected upon remarks made by the participant. This technique was used for two reasons: to draw further comment about a subject, and to ensure that the candidate understood and correctly recorded the information being provided. This reflection was also used to reduce bias by ensuring that the participants’ thoughts were accurately recorded and interpreted.

• **Probing on the last remark by the informant.** In a similar vein, the candidate probed the participant to fully explain comments, to ensure that the participant was able to express their understanding and that the candidate fully understood the point that the participant was trying to make.

• **Probing an idea preceding the last remark by the informant.** From time to time the candidate would go back to comments made previously by the participant. This was undertaken to gain further insight into a point raised previously and ensure that the participants was able to fully express their point of view and understanding of the question.

• **Introducing a new topic.** The candidate did not introduce new topics. However, when asked, the candidate did identify examples of answers to questions that other participants had provided. These examples were brief and limited, and related only to issues raised by other participants.

### 3.9.6 Additional Biases

The provision of the background paper to participants prior to interview may have changed their perceptions of the study topic. Indeed they may have never thought
about the area previously and it may have been their first introduction to it. By providing them with information on the current research thinking, this may have moulded and influenced their opinions on the questions asked as part of this research but if so this would likely be in the direction of participants identifying more, rather than less, health impacts as being of concern to planners.10

The candidate had previously worked with or met professionally in some capacity ten of the urban planning participants (24%) and four of the health planning participants (25%). This knowledge may have influenced the answers provided by the participants. All other participants were unknown to the interviewer.

3.10 Sample Size

The total sample size (n=59) for this study was only limited by availability of willing participants able to undertake the study within a reasonable timeframe. Additional participants were available and would have increased the robustness of the data collected but time constraints meant that additional interviews were not possible.

3.11 De-identification

Each interview was assigned a unique identifying number. Information was recorded about the participant’s home state or territory, level of experience in the profession, and their employment (i.e. government, non-government organisation, or private). Participants were informed that survey responses would be de-identified before analysis to ensure that privacy could be maintained, and to encourage candour in participant responses.

3.12 Ethics

This study was approved by University of Western Sydney Human Research Ethics Committee (approval number H9266) in August of 2011, prior to the commencement of participant recruitment.

3.13 Recording and playback

Each interview was digitally recorded using an Apple IOS device and generic voice memo software. Playback of information was through generic iTunes software.
These devices and software were used because they were readily available, effective and portable. Playback could be controlled to the second and the volume of voices enhanced if needed.

3.14 Transcription

During the interviews the candidate took detailed handwritten notes. These notes were expanded upon as the candidate listened to recordings of the interviews. The notes formed the basis for transcribing the key components of the answers provided. Conversational sections of the interviews were not transcribed word for word but informed the context in which the key words and concepts from these sections were identified. An example of how a written section of an interview was recorded with key points is below:

**Barriers**
- sustainable future workshops came up with a whole list of barriers
- they don’t relate to the workforce
- the biggest barrier was a inertia in the system
- getting the run-around
- NIMBY-ism
- there are people in the organisation who don’t believe that climate change is an issue

Some sections were transcribed verbatim using the voice recognition software Dragon Dictate for Mac 3.0.2. Specific quotes relating directly to the question, interesting quotes, and contextual wording were transcribed verbatim from the digital audio recordings. An example of this is below.

**Gaps**
- may have the responsibility but also having the backup to follow that through
  - there are still caveats which means I have do take things back up the line
  - business procedures and opening some of those things up
  - it’s being risk averse and not empowering the planners to make decisions
  - there were these centralising things, a blame culture
- business procedures
- actually understanding how decisions are made
- the organisational chart is different from how decisions are made
- risk averse

---

12 NIMBY is an acronym for “Not In My Back Yard” and is a colloquial term for a person who fights change of development within their locality
how can I get this information, how can I communicate easily

"It’s not a transparent system. It's difficult for people in the bureaucracy to understand, it's difficult for people trying to deal with the bureaucracy to understand. That makes it very difficult to know where to go and get information." (35.44)

3.15 Analysis

Each interview was listened to a minimum of three times with reference to the original handwritten notes. These notes were expanded, and themes based on the answers provided were developed. As more interviews were analysed, key issues emerged. Content analysis was used to generate a matrix of dot points from these key issues, which were then grouped into themes.

All responses to “Question 1” of the interview were recorded as being of potential impact, no impact would occur, or did not respond to the potential health impact at all. These questions also allowed for discussion of each of the potential health impacts and this information was collected within the matrix of comments and thematically analysed to identify specific themes such as the use of urban design to reduce the urban heat island effect.

Questions 5 through 11 were open-ended questions, also thematically analysed by hand. The length and information provided by participants was used as a gauge of the engagement in the topic as well as their awareness of the potential issue.

Questions 2,3 and 4 were reviewed but the results were not considered relevant for this study.

3.16 Limitations of the Study

This study has several limitations. The sample size and sampling method of the participants may limit the generalisability of the findings, particularly among the health service planners. However, with regard to that cluster, participants were all senior planners from a diversity of Australian states and territories, knowledgeable about policy and practice in their state, and well-informed about planning activities within their sector.
The provision of the background paper to participants before interview, listing the health concerns identified in the National Climate Change Adaptation Plan for Human Health may have influenced responses from participants, but if so this would likely be in the direction of participants identifying more, rather than less, health impacts as being of concern to planners.\textsuperscript{10}

Not all states and territories were represented in the study group, with a general bias towards Victoria and NSW/ACT and this may limit the generalisability of the findings to the whole of Australia.\textsuperscript{11}

The use of snowball sampling, a non-random sampling technique, limits the generalisations that can be drawn from the papers about Australian planners.
4. Results and discussion

4.1 Summary of results

Results identified in this section are summarised from the four papers that form the basis for this thesis. They are expanded further and discussed in the Key Findings section.

4.1.1 Summary of results – Burton AJ, et al. Is enough attention given to climate change in health service planning? An Australian perspective

Interviews with health service planners showed that there was limited understanding of the health impacts of climate change. Results published in Burton AJ, Bambrick H and Friel S. *Is enough attention given to climate change in health service planning? An Australian perspective*¹⁰ identified that the “majority of participants (n=12) were aware of climate change *per se* but did not identify climate change as a factor in past trends and further climate change was not included as a factor in future modelling of health service demand.”¹⁰

Participants’ attitudes regarding the likely impacts of climate change were categorised into three broad groups:¹⁰

1. Those who were either sceptical or did not believe that climate change would have any impact upon their work (n=2):

   …from what I’ve seen at this stage nobody’s identifying climate change as being a reason for any sort of increase in activity.

   *(Participant Quote)*
2. Those who, until being interviewed, were unaware or had not thought about the health impacts of climate change in the context of their work (n=12):

   I suppose that it could be an issue but had never thought of it as such prior to reading the background paper, reading the questions and participating in this research.

   (Participant Quote)

3. Those who were well informed and proactive in planning for the health impacts of climate change (n=2):

   ... people can’t help but notice that something is happening and something has to be done. That’s a big step forward.

   (Participant Quote)

The results previously published from this study are shown in Figure 1 below, which summarises participants’ responses when asked whether or not the identified health impacts of climate change were of concern and would require planning (“agreed”); would not require planning (“disagreed”); and shows where participants did not identify that potential health impact during the interview (“not identified”). Impacts were ordered from left to right according to the number of planners who agreed that the impact was of concern and would require planning.
Figure 1: Potential health impacts of climate change as identified by Australian health service planners.
4.1.2 Summary of results – Burton AJ, et al. Climate change - Are Australian health systems ready

Results from Burton AJ et al. Climate change - Are Australian health systems ready⁸⁴ identified the strengths, shortcomings and barriers recognised by health service planners that would affect how their organisations would be able to plan for the health impacts of climate change.

The strengths identified by the health service planners were categorised into five broad themes:

1. Investment in infrastructure and technologies
2. Responsiveness of existing systems and programs

...the health plans are revisited every five years ... as need increases due to climate change, then that cycle of planning will pick that up ...

(Participant Quote)

3. Well trained, skilled staff
4. Awareness of health impacts of climate change
5. Trust

Fifteen of the 16 participants were able to identify at least one shortcoming in their system. These shortcomings were categorised into four broad themes:

1. A ‘health department’ problem

It’s about people...everything that anyone does has an influence on people’s health ... we as the health sector should be (working) in collaboration with every other sector.

(Participant Quote)
2. Organisational culture:

I don’t think there is ... political commitment at a state level (or) at a district level to investigate the impacts of climate change ... They are confronting so many other issues that they see as a higher priority that it’s fairly low down on the list, if on the list at all.

(Participant Quote)

3. System Issues

... the gaps are already immense, ... when you have already got gaps that need to be met to fix the current situation then the impact of things like climate change are just going to exacerbate that.

(Participant Quote)

4. Planning

There isn’t the more basic element of including the potential for global climate change into the actual planning process for either services ... or for the construction of the facilities themselves.

(Participant Quote)
Barriers identified by health service planning participants fell into six broad themes:

1. Demographics
2. Scepticism

Until we acknowledge that climate change is actually occurring we’re not going to be able to say that we are putting in place adaptation measures to respond to it.

(Participant Quote)

3. Scale and Complexity

4. Politics

Recently there has been a change in support from the new state government and minister. They are not supportive of climate change issues and this seems to be an ideological approach rather than a fact based approach. There remains support at both officer level and senior level within the state government, but the political support (and consequent funding) is no longer there

(Participant quote)

5. Systems
6. Knowledge and Culture

4.1.3 Summary of results – Burton AJ, et al. If you don’t know how can you plan? Considering the health impacts of climate change in urban planning in Australia

With regard to urban planning, results published in Burton AJ, et al. If you don’t know how can you plan? Considering the health impacts of climate change in urban planning in Australia\textsuperscript{11} identified that the attitudes of urban planners to planning for the health impacts of climate change ranged from being “sceptical about climate
change” to being proactive educators highlighting the need for proactive adaptive planning.11

Four domains were identified to describe these attitudes, as shown by Figure 211 and described below:

Domain 1 comprised the “interpreters and followers”, those participants “who showed little or no interest the subject, wished only to follow the planning rules and regulations and only to undertake work their clients were paying for.”

Domain 2 comprised the “conservative but confident”, those participants “who were sceptical of climate change or its potential to have an impact on their work or on their organisation.”

Domain 3 comprised the “unaware but open to ideas and information”, those participants “who were interested in and identified that climate change would have an impact on their work.”

Domain 4 comprised the “proactive change merchants and leaders”, an extension of Domain 3 but where “participants were well informed and were playing an active role in educating and influencing others and their organisation.”
<table>
<thead>
<tr>
<th>Domain 1:</th>
<th>Domain 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The interpreters and followers:</strong></td>
<td><strong>The conservative but confident:</strong></td>
</tr>
<tr>
<td><em>We are sitting back trying to meet the rules, whatever the rules are, and that means that we, I guess, on the face of it, don’t care what the rules are. We just want them clear and simple so that we can comply with them and get on with life.</em></td>
<td><em>I don’t see any climate change specific impacts that are going to be such a magnitude that they are going to be outside the spectrum that we can ordinarily deal with.</em></td>
</tr>
<tr>
<td>0 Public</td>
<td>4 Public</td>
</tr>
<tr>
<td>5 Private</td>
<td>1 Private</td>
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<td>0 NGO</td>
<td>0 NGO</td>
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<table>
<thead>
<tr>
<th>Domain 3:</th>
<th>Domain 4:</th>
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<tbody>
<tr>
<td><strong>The unaware but open to ideas and information:</strong></td>
<td><strong>Proactive change merchants and leaders:</strong></td>
</tr>
<tr>
<td><em>Heat Stress is something that we are aware of but the extent of its potential impact on the community is not something that I was aware of.</em></td>
<td><em>Adaptation is a fundamental principle of most planning systems, because what it means is that you understand the environment ... you are sensitive to things that will compromise the health of future communities.</em></td>
</tr>
<tr>
<td>14 Public</td>
<td>5 Public</td>
</tr>
<tr>
<td>9 Private</td>
<td>0 Private</td>
</tr>
<tr>
<td>2 NGO</td>
<td>2 NGO</td>
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Figure 2: The attitudes that urban planning participants presented during their interviews, clustered into four domains. Note that elected officials were not included in this figure. 11

*Burton – Urban and health services planning in climate change adaptation*
Similar to Figure 1, Figure 3 presents a summary of the participant responses to questions concerning the health impacts of climate change. It shows that urban planners are aware of direct impacts of climate change such as heat stress and severe weather events but are largely unaware of the indirect impacts such as increased air pollution.11
Figure 3: Shows participants’ perceptions about whether the health impacts of climate change need to be incorporated by their organisation into urban planning. 

Burton – Urban and health services planning in climate change adaptation
4.1.4 Summary of results – Burton AJ, et al. Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system

Results from Burton AJ, et al. *Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system* identified strengths, shortcomings and barriers recognised by urban planners in their respective systems that affect how they would be able to plan for the health impacts of climate change. Strengths were categorised into six themes:85

1. Multidisciplinary teams;
2. Governance
3. Continued learning;
4. The existing urban form;
5. Acceptance of climate change; and
6. Communication.

The shortcomings were also categorised into six themes:

1. Implementation;
2. Communication;
3. Politicisation of the planning regime;
4. Lack of research in the area.

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At the moment we respond to trends ...(we) almost need to be a body of evidence, which said 'This is what's going to happen and this is going to make things different to what you are seeing' for there to be ... a climate change response

*(Participant quote)*

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5. Objective Driven; and
6. Bureaucracy;

While I could develop an adaptation action plan ... it wouldn’t be adopted as policy and it wouldn’t be considered to be approved because it has not gone through the ...(proper processes).

(Participant quote)

The barriers were can be categorised into five themes:

1. Time and affordability
2. Politics and leadership,

So I think ... there’s no political will. And it also goes back to there being a lot of on going debate in the public sphere that’s led by ... politicians

(Participant quote)

3. Roles and responsibilities,
4. Knowledge and communication; and

(I) Don’t know (about climate change), we have enough problems as it is

(Participant Quote)

5. The system.
4.2 Discussion of key findings

Within the two interview clusters participants identified that there are a litany of compounding shortcomings. A lack of planning or not identifying climate change as an issue is a major shortcoming. Added to this are knowledge gaps, devolution of responsibility, poor organisational culture, political influence, bureaucracy, systems issues, demographics and the sheer scale and complexity of the problems that climate change brings. These shortcomings will be discussed in further detail but have resulted in a widespread failure to incorporate climate change and its health impacts into either health service planning or urban planning.84,85 There are however several strengths within the respective systems upon which an adaptive response to climate change can be built. Governance, investment, existing knowledge and the multidisciplinary nature of planning are all strengths within both professional clusters that contribute to adaptation to climate change.

4.2.1 Barriers

Through this research four broad barriers to proactive planning were identified. The first is the scale of the problem. Climate change is seen as being too large, too daunting and too complex to fix or to even know where to start. When coupled with structural externalities such as the changing demographics the problem is seen as something that the individual within the system can’t fix. The second is structural, system-based barriers where there is a lack of support, lack of recognition of the problem179 and lack of leadership. While there may be plans in place the organisational culture and leadership prevent or discourage change, with the politicisation of health service and urban planning actively discouraging it. The final two barriers are a lack clear identification and acceptance of roles and responsibilities, and significant knowledge gaps within the professions.

4.2.1.2 Number of participants not planning for climate change

Within the urban planning cluster ten out of the 43 participants were either unconcerned or confident that climate change would not impact upon their work. A further 25 identified that they were concerned about climate change but that they were largely unaware of its potential impacts on human health.11 This means that
35 (81%) of the professionals interviewed in this cluster were either unaware and/or unconcerned about the potential health impacts of climate change.

Within the health service planning cluster two participants were “either sceptical or did not believe that climate change would have any impact on their work”\(^{10}\) and a further twelve “were unaware or had not thought about the health impacts of climate change in the context of their work”\(^{10}\). This means that within the group 88% of participants were not considering climate change within the context of their work.

*(A barrier is) (a)cceptance first that there is a problem (with the health impacts of climate change), because if there is not then there is no use worrying about it*

*(Participant Quote)*

These findings show that the professionals who are tasked with planning our cities and health systems are not aware of climate change as an issue that needs to be planned for. By implication, that means that Australia is not planning for the health impacts of climate change in either a proactive health prevention approach through urban planning or a treatment approach through health service planning. This lack of preparedness will mean more negative affects of climate change, leading to expensive and ad hoc solutions as the problems associated with climate change continue to unfold in the coming decades.

**4.2.1.3 Scale and Complexity**

Clearly, climate change is a complex problem and the sheer scale of the challenge to mitigate climate change, reduce its impacts and build adaptive capacity within the community should be recognised. While governments are working towards mitigation strategies to reduce the impact of climate change the scale of the problem will remain large for the foreseeable future. Both urban and health systems are inherently complex. With the added layer of an unpredictable climate, where the timing, nature, location and intensity of the effects are unknown\(^{78}\) and which for
many planners is outside of the scope of their normal practice, many planners feel
daunted by a problem that is large, complex and out of their control. As one
participant from the health service planning cluster put it:

You can see with things that are real and pressing, (like) the
ageing of the population, if we are having difficult coming
to terms with those, coming to terms with things like
climate change ... is beyond our comprehension

(Participant Quote)

Within urban planning for example there is often conflict between population health
and other planning considerations such as vehicle mobility and land yield. The
result is that planners often assign health a lower priority over other areas where
they have experience, understanding and expertise. The additional layer of
complexity that is the health impacts of climate change, which are further outside
their scope of traditional practice, will only make urban planning more challenging.

Tools that are available to reduce the impact of this barrier include an existing health
impact assessment tool which provides a systematic approach to identifying,
evaluating and managing health impacts of climate change. But a further,
more basic approach is improved communication of the science of climate change.
By providing clear, timely and relevant information on the problems associated with
climate change, innovative solutions from practitioners will be encouraged, allowing
organisations to set clearer goals and more effective policies. Strong
leadership that recognises that the problems associated with climate change are
complex is required to foster innovation and implement policy change. This
leadership can come from all levels of an organisation but must recognise
relationships, break down professional silos and encourage creative and innovative
ways to increase adaptive capacity between and within organisations.
4.2.1.4 System Issues

Participants consistently identified a series of systems issues as potential barriers to adaptation. Pressure to complete tasks faster with fewer resources was a common thread, particularly within government employees. Government planners also identified that working within a bureaucracy led to a feeling of disempowerment and that limited system flexibility meant that there was little capacity for innovation. As a result they identified that it would be more difficult to manage large and complex issues such as climate change.

To improve the resilience, responsiveness and adaptive capacity of the system, there needs to be recognition across all levels of the system of the health impacts of climate change as an issue. Again, there needs to be appropriate education and ready access to contemporary information sources on the health impacts of climate change similar to those that were provided by the Climate Council prior to their funding being terminated by the current Australian Government. As previously discussed a strong organisational culture that includes strong leadership and a commitment to forward planning, based on the best possible empirical data, will help to increase adaptive capacity both within organisations and within the community.

4.2.1.5 Planning

Apart from some broader plans, most notably in Western Australia most states and territories have no strategy for dealing with the health impacts of climate change and therefore there is no consistent approach to including it in either urban or health service planning. To highlight this, one government health service planning participant identified that of the eleven priority areas across their department climate change did not fit into any of them.

It’s hard to say positive things about planning

(Participant quote)
Within the systems, there is a distinct lack of planning. A key role of planning is to envisage the future need of the community, with a view to putting in place appropriate resources to meet that need. Planning needs to focus on the primary prevention of problems and early intervention before focusing on short-term solutions to problems or providing tertiary care. Ideally these decisions are supported by robust evidence, with modelling tools used as an aid in decision making, and decision making also supported through the collection and interpretation of epidemiological and patient data. Including disease specificity into climate-health research methods is necessary to identify climate-sensitive diseases and highlight the burden of climate-sensitive disease in the community.

Incorporating climate data into models used to inform planning decisions would also provide additional information to assist in planning for the health impacts of climate change.

4.2.1.6 Bureaucracy

There is significant bureaucracy set in and around planning across Australia. Bureaucracy, by its very nature, is resistant to change and can lead to the formation of institutional silos and a lack of coordination both across and within governments. A top-down bureaucratic approach assumes that “policies set explicit aims and objectives that are directly translated into action on the ground.” Therefore poor policy implemented by a bureaucracy is difficult and slow to change. Both clusters identified that they have entrenched bureaucracy.

Urban planning cluster participants identified that each state, territory and local government have their own planning schemes. That means there is often duplication and limited coordination. Within government there are different and competing priorities between agencies; treasury, health, environment, planning and transport were identified by participants as playing some role in the planning of cities and health services, and all of these agencies have competing priorities. Further, even within planning departments the very nature of planning itself means that there is sometimes a conflict between strategic and statutory planning, with one looking to the future and the other writing and interpreting rules for today.
Within the health system there are entrenched medical and administrative bureaucracies. This results in a challenging environment where cohesive planning across departments, let alone between hospitals, districts and across jurisdictions is difficult.

One of the barriers that was not identified by the participants but that has become apparent is that of a lack of transparency within planning for health services. The planning of the health system is difficult to understand and the methodology used is not readily available. This perhaps is as a result of the culture within health departments and the political interference identified by participants. This lack of transparency has the potential to lead to politicisation and duplication of planning work across jurisdictions resulting in a lack of efficiency across the entire system, and a lack of learning being passed on between organisations. The specialised nature of health service planning and the relatively small number of professionals in the field also makes succession planning difficult, which also leads to these problems.

Many bureaucracies are objective driven. Participants identified how climate change was seen as an environmental issue and therefore not a primary objective of their organisation (this is discussed in ‘Roles and responsibilities’ below). Participants identified that their bureaucracies had a view that to manage climate change they had to plan for mitigation and reducing greenhouse gas emissions. There was limited or no view towards adaptation, nor consideration of how these decisions would affect people. Hence, to reduce the health impacts of climate change there is a need to refocus the response around climate change from that of an environmental one towards one that incorporates adaptation measures to reduce the impacts on the communities serviced by these organisations.

Bureaucracy can lead to issues of poor implementation where the best plans can be eroded, meaning that minimum benchmarks often become the ceiling. Further, inertia in a bureaucratic system means that there are often lead times through the development of policies and plans and lag times post development that can be beyond five years. Bureaucracy must fundamentally change to allow for innovation and adaptability, developing policy that builds on flexibility and facilitating policy
systems that encourage, rather than inhibit, robust adaptive planning.\textsuperscript{186} For this to occur there needs to be that change in organisational culture with leadership from the very highest level.\textsuperscript{184}

4.2.1.7 Roles and responsibilities - A ‘health department’ problem

Participants identified that the broad determinants of health are not recognised outside of health departments. This has led not only to failures in the urban planning, transport and education system but across government and the private sector, to address the basic underlying health issues of the community. Participants from the health cluster identified that others believed that the health department was there to pick up the pieces.

\begin{quote}
...everything that anyone does has an influence on people’s health ... we as the health sector should be (working) in collaboration with every other sector.
\end{quote}

\textit{(Participant quote)}
Participants recognised that there were failures within the health sector to actively engage with and educate these other sectors. In order to fix these shortcomings, practitioners and departments must proactively engage with the broader community, including those engaged in urban planning, to educate and work with them in spreading the message of the broader determinants of health and getting these organisations involved with improving health outcomes. The development of broad “comprehensive coordinating policies” including a health in all policies approach that incorporates intersectoral long-term climate and health strategy may assist in redressing this issue.

No use doing things in isolation, things have to be cross government, cross sector, cross state boarders and I guess that’s the thing we will apply … to respond to climate change

(Participant quote)

4.2.1.8 Knowledge Gaps

All participants who were interviewed were aware of climate change, but significantly fewer were cognisant of the potential health impacts of climate change prior to being involved in this study. Where participants were aware of a potential health impact, their awareness was much more likely to be the result of lived experience (heat stress or severe weather events). Indirect impacts of climate change such as air pollution were much less likely to be identified or even linked by participants.

Absolutely, we look at who is generating the (air) pollution, … but that’s not caused by climate change.

(Participant quote)
This was consistent in the responses of both clusters as highlighted in Figures 1 and 3 in that they were less able to identify indirect or less obvious effects of climate change. This might indicate a failure to engage with and understand the risks and science of climate change by planning professionals in general.

While there is much credible information available, there is little incentive to find or be driven to find that information in the day-to-day activities of professional planners. This may be in part due climate scientists finding it difficult to communicate effectively to non-specialist audiences, a lack of organisational or political will, or the perception (or reality) of a lack of time. Further, much of the available peer reviewed scientific literature is unavailable to the public, being behind pay walls, or difficult for a layperson to access or interpret. This may lead people to find other sources of information such as mainstream media, which may include conflicting or incorrect information and limited locale-specific information, leading to uncertainty and mistrust of the science. The lack of awareness of readily available credible sources and lack of clarity about issues and/or information that conflicts with the personal values or experiences of the professional meant that evidence of the need to plan is often being ignored.

While in some cases legislation may indirectly impose climate change requirements upon the planning community, building an appropriate information strategy that sets climate change into an appropriate context thereby engaging and increasing the knowledge, awareness and emotional response amongst planners is needed for real change to occur. Therefore, a key learning is the need to proactively communicate and educate the key policy makers, practitioners and planners on all of the adverse health impacts of climate change, and support them to become champions for action and to utilise the contemporary tools which are available to minimise the harmful health impacts.

4.2.1.9 Organisational culture

The organisational culture of many of the participants’ workplaces was seen as a shortcoming. Participants saw that there was a lack of leadership, often coupled
with low staff morale. This, they felt, meant that it was difficult to change the
direction of their respective organisations.

Leadership that stimulates creativity and innovation through “strategy, structure,
support mechanisms, behaviour that encourages and open communication” is key to
a successful organisation. Further it is strong leaders who help to overcome
resistance and instil best practices. Leadership that stimulates creativity and innovation through “strategy, structure, support mechanisms, behaviour that encourages and open communication” is key to a successful organisation. Further it is strong leaders who help to overcome resistance and instil best practices. 

The culture of an organisation is an important part of its health and key to quality improvement within and across an administration. Cultural shift to change and improve an organisation to allow for planning for climate change needs a shared mission and vision. This shared understanding must be led by the leadership team and include elements that reflect mutual respect, continued learning, and shared values, beliefs and behaviours, while meeting the needs of employees and key stakeholders. Organisational culture is perhaps a more difficult thing to change but with organisational leadership and appropriate levels of education and personal leadership and external pressure, change can happen.

4.2.1.10 Politicisation of the planning regime

“Information is worthless without political will or institutional capacity”

Both clusters identified that politics plays a significant role in shaping planning decisions. There is the appearance of vested interests and that leadership within their organisations potentially fear risk due to the potential for negative publicity and recriminations from the political decisions makers as a result. Further, both clusters identified that short political cycles pushed the need for immediate rewards often with unrealistic timeframes. Participants felt that due to politicisation, their departments or companies take the easiest path, meaning that the planners are either not willing to or are unable to push the envelope of design or new ways of delivering services, and therefore, that this limited the capacity for innovation.

The need for action to plan to minimize the potential impacts of climate change on human health was identified by the Australian Government in 2007.
time the Council of Australian Governments had developed a framework that
directed the Australian Health Ministers’ Conference to write a national action plan
on the health impacts of climate change. This plan was to identify the capacity of
health system to plan for and respond to vulnerabilities.9,195

However, Australia’s commitment since the election of the Abbott Government has
waned considerably. The defunding of federal agencies including the Australian
Preventative Health Agency and the Climate Commission are two examples of key
bodies that were closed as a direct result of the changing of the federal government.

… there is a lack of focus and people, a lot of people in the
powerful situation still don’t give it (climate change) a high
priority.

(Participant quote)

Participants identified that in the current environment responses were often
dependent upon political motives. If there was no political commitment to climate
change then it was not seen as a priority.

I don’t think there is a commitment, a political commitment
at a state level (or) at a district level to investigate the
impacts of climate change … They are confronting so many
other issues that they see as a higher priority that its fairly
low down on the list, if on the list at all.

(Participant quote)

Potential solutions to this barrier might include the preparation of an overarching
enforceable Government plan endorsed by the Council of Australian Government.
This plan would need to be able to be tailored for individual jurisdictions and could
make use of and coordinate existing jurisdictional plans. In addition, education of
the community and the professionals involved could put pressure on politicians “to
create and enforce laws designed to ensure the conditions for people to be healthy.”196

4.2.1.11 Demographics

Alongside the developing crisis of climate change, Australia faces a significant ageing of its population, with over 25% of the population expected to be over 65 by 2044-45 and an increasing proportion of the ‘oldest old’. It is these groups who will be among the most vulnerable to climate change.138 This fundamental change in the Australian population, from one of relative youth to one dominated by older age groups will require specific planning and adds a further layer of complexity to planning for climate change.
4.2.2 Overcoming barriers

To successfully adapt an organisation requires a level of competence in long term decision making under conditions of inherent uncertainty. Many organisations and individuals find this challenging even if long term planning is at the core of their operations.\textsuperscript{179} Additionally organisations may be unable to overcome structural barriers to adaptation particularly if those barriers are external to the organisation. Further, some organisations do not recognise the need to adapt; or they recognise the need but lack crucial tools, knowledge and expertise to do so.\textsuperscript{179}

4.2.3 Strengths upon which to build adaptive capacity

In addition to the opportunities identified for change above, participants noted significant areas of strength upon which climate adaptation measures can be built. System wide governance, the existing services and urban form, multi-disciplinary teams with diverse skill sets and a willingness of governments to invest in infrastructure are all opportunities for adaptation.

4.2.3.1 Governance

Participants consistently identified that the governance surrounding planning was strong. Governance within the planning system provided a functional institutional framework that was applied, economically sustainable and a strong strategic base within which government and the private sector could willingly invest and work. At an urban level information is readily available prior to investment, there are strong procedures in place that ensure the decision making processes are clear and there is an opportunity for policy incrementalism allowing for systems and policy to change overtime. While some may argue that incrementalism will not achieve the necessary changes for climate adaptation,\textsuperscript{197} given the organisational culture and pervading politics it may be the only viable policy approach.

Within the urban planning cluster there is an organised “hierarchy, incorporating state planning Acts and regulation, strategic regional and metropolitan plans, and local government planning schemes”\textsuperscript{77} which supports ordered development of the urban area.
Similarly strong governance is in evidence within the health sector, with entrenched systems of hierarchy incorporating community consumer representation aimed at ensuring that patient outcomes are high. These governance systems are also bolstered with high levels of community trust, a key to the functioning health system.

Participants identified that in their experience the public trusted their respective professions, particularly within the health sector. “People value health systems not only for the care they themselves receive in times of sickness but also for the contribution the systems make to the broader well-being of society”.

This trust can be used as a tool, not only to plan for climate change but also the broader health and well-being of the community.

4.2.3.2 Investment in infrastructure

Participants identified that there is strength in the existing urban form that will encourage and allow for adaptive capacity within the community. Cities and their supporting infrastructure are inherently expensive and resource intensive and require significant public expenditure to build. It is probably not feasible or realistic to build entirely new infrastructure that will allow adaptation to climate change.

Rather, participants identified that there was significant potential to build upon and adapt within the existing urban form to create healthy, vibrant mixed-use walkable communities which lead to improved physical health, decreased vulnerability and increased adaptive capacity.

Similarly there is also strength within the health sector’s built form, with already significant investment in bricks and mortar health care centres. These specialist facilities too can be adapted to meet the changing demands of the health system in adapting to climate change. However, new facilities should be planned and constructed with climate change adaption in mind.

Continued planned investment in appropriate targeted infrastructure aimed at mitigating the impacts of climate change, improving community resilience and adaptive capacity is a key strategic approach in the adaptation of Australia to the health impacts of climate change.
4.2.3.3 Existing knowledge base amongst health and urban planners

Planners are knowledgeable and trained to take information from a variety of sources into account. By building upon their knowledge base, providing and promoting professional development opportunities, coupling this with appropriate and timely information, backed up with rigorous locational specific data, their understanding of the issues can be enhanced leading to increased awareness of and strategies to increase adaptive capacity. There is a wealth of data collected within the urban and health systems and planners should be encouraged to use this data to better inform and improve decision making processes. Further, collaboration between government and researchers should be actively encouraged and data made available to better understand the system and ultimately improve the health and well being of the community.

A study of public health experts in South East Queensland identified that there was substantial knowledge on the potential health impacts of climate change in South East Queensland, particularly the potential increase of vector borne disease. However within the health cluster participants in this research did not perceive climate change to be a health threat, with one senior planning executive responding to this study with the following

```
I have read the information you have provided and I have realised that my area within Queensland Health is not the appropriate area for you

(Participant quote)
```
And other planners identified that there is limited awareness that climate change and health are intricately linked.\(^{201}\)

\[
\text{The human element and the consequential (health) impacts (of climate change) are not widely accepted (amongst urban planners) yet}
\]

\(\text{(Participant quote)}\)

\[
\text{You can correct me if I’m wrong, we will see (climate change) coming as a trend ... it’s not something that’s going to (just happen) ... I’m thinking it’s not going to be the AIDS of the 80’s.}
\]

\(\text{(Participant quote)}\)

### 4.2.3.4 Multidisciplinary teams

Building on the knowledge base of planners, the multidisciplinary nature of the planning teams is a distinct strength. With experience from diverse professional backgrounds the planning profession offers diverse views on and potential novel approaches to problem solving.\(^{184}\) Participants are well trained and responsive to existing systems and programs. They identified that their strong professional networks have allowed them to break down traditional silos and work across divisions and agencies.

\[
\text{(Champions are OK but) the more important thing is that cross sector/cross division...ownership}
\]

\(\text{(Participant quote)}\)
4.4 Key adaptation strategies and the nexus between health service planning and urban planning

This research demonstrates that there is significant scope for climate change adaptation within both the health service and urban planning systems. Continued data collection coupled with ongoing research is key to developing evidenced based policy. Research in the area should be practical and encourage real world applications, incorporating case studies to allow for easy wide scale implementation at all levels of government and the private sector. Such research will also support policy incrementalism, allowing for the most up to date research, data and information to inform and change policy, thereby reducing some of the issues associated with policy lag. This use of contemporary data to develop and justify policy decisions\textsuperscript{196} will lead to increased understanding and better policy and planning outcomes. Using expert researchers should be part of this approach.

Key characteristics of planning for climate change are that systems need to be flexible, strategically allocated, and robust.\textsuperscript{202} Looking at the clusters separately recommendations from this and other studies\textsuperscript{203} include that contemporary health service planning must take a broader approach than traditional service planning has, and should incorporate the following:

Strategic, long-term service planning: The need for long-term strategic service planning has been discussed at some length. Planners need to look beyond the standard service planning time frames and project for future use over tens of years \textsuperscript{81}. Further they need to incorporate a systems thinking approach looking at the whole of the system, rather than its individual parts (i.e. services).\textsuperscript{81, 204}

Health Promotion: Closer ties with health promotion are required, alongside of recognition of the role that prevention plays in decreasing demand for health services and increasing community resilience.\textsuperscript{205}

Data and climate projections: The generation and interpretation of reliable, relevant, and up-to-date data and information will be essential for health services to plan for and respond to the negative health effects of climate change.\textsuperscript{78} Future analyses should focus on identifying issues such as climate-sensitive diseases to pinpoint
medical conditions that are likely to be most affected and to highlight the burden of climate-sensitive disease in the community.\textsuperscript{132 206}

**Health protection:** Health protection will play a major role in decreasing the impact of climate change through the control of enteric and vector borne disease. Appropriate planning and resourcing of these services will lead to a reduction in the impact of climate change within the community.

**Disaster preparedness:** The increase in severe weather events is one of the most visually obvious and identifiable impacts of climate change. Increasing preparedness can be achieved by planning based upon past experience, and using activity projections that are based upon the most up to date data and modelling. This will be crucial in planning for appropriate climate change responses.

**Workforce development:** Education, increasing diversity and building upon skills will lead to a more responsive workforce.

**Healthcare financing:** A review of spending, based upon appropriate planning and data should inform the appropriate financing of services and facilities, to meet the needs of the community now and into the future.

Similar to health service planning urban planning too must take a broader approach than traditionally seen and incorporate the following:

**Strategic planning:** Strategic planning must recognise that the health of the community, the built environment and climate change are inextricably linked. This will lead to better informed planning decisions. The use of tools like Health Impact Assessment to identify and ameliorate potential health outcomes of urban policies and development\textsuperscript{207} coupled with appropriate strategic planning will not only mitigate climate change by reducing an urban area’s carbon footprint but also increase physical activity levels, improve walkability and reduced private motor vehicle usage. This, if implemented well, will lead to an increase in adaptive capacity and community resilience and decrease in the impact of climate change on human health.
**Health promotion:** Urban planning must recognise its role in health promotion and work with groups like health departments, the university sector and non-government organisations such as the Heart Foundation to promote the benefits of active living. This has the co-benefit of mitigating climate change and increasing adaptive capacity and community resilience.

**Disaster preparedness:** It is crucial that urban environments are developed that are able to both cope with disasters and help their residents survive. Lessons learned from previous disasters and the incorporation of disaster risk reduction into plans and planning must be considered. Further, as learned from cities like Christchurch, involving the community is a key tool to improving recovery outcomes. A health in all policies approach may also help with preparedness and recovery.

**Workforce development:** As identified earlier, building the workforce, and educating the workforce will lead to increased innovation and a more responsive and engaged workforce.

**Urban financing:** Investment in infrastructure, be it public or private, should take climate change and the health of the community into account prior to approval being granted. Those facilities that do not benefit the community should not be funded.

**Data and climate projections:** As per the health sector, the generation and interpretation of reliable, relevant, and up-to-date data and information will be essential for urban systems to plan for the minimisation of the negative health effects of climate change. Planners need to use tools like Health Impact Assessment to identify and ameliorate potential health outcomes of urban policies and development.

The use of independent subject matter experts who are able to speak with authority on the impacts of climate change is a key to educating the professionals involved in planning our health systems and our cities. They should be assisted by communications experts who can “assess the (professionals) beliefs and values,
propose evidence-based designs for communication content and processes, and evaluate their performance.\textsuperscript{180}

There is much evidence regarding the existing impacts of climate change. Planning for these most recognisable impacts, such as planning for extreme heat, is a simple, no regrets approach that has the additional co-benefits. Further, by planning for these impacts now, policy systems can be put in place to deal with the more challenging aspects of climate change as they appear. Concentrating on planning for services already associated with the highly visible, direct, and readily observable impacts of climate change are all opportunities to begin the process of planning for climate change.\textsuperscript{10}

The promotion of healthy physical activity facilitated through urban design that places greater emphasis on the health and wellbeing of the community is a no regrets approach to building community resilience and adaptive capacity.\textsuperscript{11, 18, 196} For example, investment in walkable, mixed use neighbourhoods that are well serviced by public transport will see transit users achieving significantly more physical activity than car drivers just by walking to and from public transport.\textsuperscript{211, 212} By facilitating physical activity through urban design, at a population level, chronic disease is reduced, adaptive capacity is increased and demand for health services minimised.

Planning for vulnerable populations within the community by changing the priorities towards healthier “forms of urbanisation, more efficient and renewable energy sources, and a sustainable and fairer food system”\textsuperscript{56} will increase resilience within the community, leading to more appropriate and equitable use of resources.

There is a need for inter-service planning and to incorporate a health in all policies approach. A ‘health in all policies’ approach is a collaborative way of “improving the health of all people by incorporating health considerations into decision-making across sectors and policy areas.”\textsuperscript{213} By taking this approach policy makers and legislators ensure that the health and well being of the community must be taken into account when new or amended policy or legislation is developed. ‘Health in all policies’ could be achieved through either legislative or regulatory modes and could be supported by employing multidisciplinary teams and/or situating active planning
and health officers within departments other than urban planning or health departments.

Australia lacks a clearly articulated strategy to improve the health of its urban populations. Failure to explicitly adapt, via urban planning and health service planning, to the health impacts of climate change within Australian cities means key public health opportunities are being overlooked.11

Leading by example 196 within flagship jurisdictions like Western Australia and the ACT, planning for the health impacts of climate change and the obesity epidemic respectively will show other jurisdictions that change is possible. The ACT is moving to incorporate active living principles, designed to fight the obesity epidemic, into its statutory planning documents. This is the first time that such an approach has been attempted and, if successful will lead to other jurisdictions following suit.

Planning, by its very nature, is proactive, identifying problems early and then planning to meet those problems in a timely manner. Being involved early will help to minimise the impacts of climate change196 on human health.

4.5 Future directions for further study

Clearly there remains the need for further research and to provide specific information to these professions, to help inform strategic planning, and local and domestic level planning. Research into the health impacts of climate change and potential solutions that planners can implement are key to future adaptation. Good urban design can minimise both greenhouse gas emissions and the urban heat island effect56 by inclusion of shade-trees and green space, appropriate orientation of buildings and appropriate transport mix. The albedo of building materials and number of local heat sources all impact upon the ability of an urban area to minimise the impacts of heat.56 These are all good examples of implementable research directions. Further understanding of the nexus between climate change, the planning professions and the role that risk management professionals, medical practitioners, allied health professionals and treasury officials can play in planning would be of significant interest. This further research would increase the
understanding of the potential impacts of climate change and the preparedness of organisations and jurisdictions for these eventualities.

5. Conclusions

This study offers an in-depth insight into how two groups of professionals who are currently engaged in planning make sense of adapting to the health impacts of climate change. It confirms that the link between climate change, health service planning, urban planning, and human health, is, in the main, yet to be made by these professionals.\(^8, \, 64, \, 84, \, 85, \, 214\) The majority of participants demonstrated a limited understanding of the potential health impacts of climate change despite being provided with information about the health impacts of climate change prior to interview.\(^10, \, 11\) This limited understanding meant that participants did not or could not recognise a role for urban or health service planning in mitigating the health impacts of climate change, by increasing adaptive capacity or reducing the burden of disease.\(^13\)

Climate change will undoubtedly have health impacts upon the community. From direct impacts such as heatwaves and storms, to indirect impacts including increased air pollution and the spread of vector borne disease, climate change will impact on all levels of the community, but will be particularly evident among the most vulnerable within society.

The environments in which people live and the services that are available within those environments will largely determine the scale and impact of these health impacts. Urban environments can be planned to minimise extreme heat, for example, and health services can be prioritised to meet the needs of those least able to cope. However, because there is currently a very limited understanding of the health impacts of climate change amongst professional planners, they are unable to identify the climate impacts that could potentially impact them or their organisation. This finding was observed in both the health service and urban planning clusters.\(^10, \, 11\) Consequently, planners are not currently planning for the health impacts of climate change and “do not fully understand the health consequences of environmental factors (like climate change)”\(^215\) in their day to day work.\(^10, \, 11\)
There are clear benefits in and a need for health professionals and urban planners to work together collaboratively in the long-term to develop an adaptive response to climate change.\textsuperscript{202} Some are realising that working together to combat other serious issues such as lifestyle related health problems is time and cost effective.

However, without considered preventative planning, the Australian health and urban systems will deal with climate change in a reactive, expensive, ad hoc, crisis management manner. The very real challenge for decision-makers, when including climate change in their plans, is that it is only one of many factors that influence human health therefore cannot be considered in isolation\textsuperscript{30}. While it has been argued that “scientific uncertainties preclude policymakers from taking action today in anticipation of climate change”\textsuperscript{30}, the reality is that planners make decisions every day, with an abundance of uncertainties, and that aside, the scientific community do not consider climate change to be an uncertainty. The existing wealth of knowledge about climate change and its possible effects can be included in decision-making processes now.\textsuperscript{30}

\begin{quote}
Planning and the development of cities and the construction of buildings has one of the greatest potentials not only to …
mitigate the effects of climate change but also … (to facilitate climate) adaptation
\end{quote}

\textit{(Participant quote)}

With climate change becoming a major threat to the future health of the population it seems only sensible that planners, particularly for urban and health services, take it into account in the long term.

The implementation of considered, planned strategies is likely to be the most effective and efficient means of reducing climate change and its impacts.\textsuperscript{17, 46, 51, 216} By planning for adaptive capacity and increasing resilience the avoidable, serious, costly and complex risks of climate change may be able to be reduced\textsuperscript{179}. To meet this challenge Australia will need robust and thorough planning regimes that takes
both a prevention based approach through urban and land use planning, and a
treatment based approach through evidenced based health service planning.

Planners are in the unique position of being at the forefront of designing
environments and systems in which people live and work. They are professionals
who need to be aware of climate change and its health impacts, so that they can use
this information in planning decisions. This study has demonstrated that the
capacity to adapt to the health impacts of climate change in Australia is currently
compromised, because urban planners and health service planners have a limited
understanding of the health impacts of climate change, and are therefore not able to
enact this understanding in their planning activities.

Australia is currently failing to use planning as a climate change adaptation tool.
While this is a missed opportunity to proactively address the health impacts of
climate change there is significant potential to overcome the systematic barriers
and build on the strengths of both health service planning and urban planning to
increase adaptive capacity and deliver better health outcomes for the Australian
community.
6. Published papers

Is enough attention given to climate change in health service planning? An Australian perspective

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Background: Within an Australian context, the medium- to long-term health impacts of climate change are likely to be wide, varied and amplify many existing disorders and health inequities. How the health system responds to these challenges will be best considered in the context of existing health facilities and services. This paper provides a snapshot of the understanding that Australian health planners have of the potential health impacts of climate change.

Methods: The first author interviewed (n = 16) health service planners from five Australian states and territories using an interpretivist paradigm. All interviews were digitally recorded, key components transcribed and thematically analysed.

Results: Results indicate that the majority of participants were aware of climate change but not of its potential health impacts. Despite this, most planners were of the opinion that they would need to plan for the health impacts of climate change on the community.

Conclusion: With the best available evidence pointing towards there being significant health impacts as a result of climate change, now is the time to undertake proactive service planning that address market failures within the health system. If considered planning is not undertaken then Australian health system can only deal with climate change in an expensive ad hoc, crisis management manner. Without meeting the challenges of climate change to the health system head on, Australia will remain unprepared for the health impacts of climate change with negative consequences for the health of the Australian population.

Keywords: climate change; health service planning

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will become evident well before others. Some impacts will occur via direct and easily measurable pathways (17), while others will occur via indirect pathways entailing disturbances in natural ecological systems (6), failures of the urban planning system (23–26), or through changes in economic circumstances such as disruption to livelihoods and communities (27).

The likely medium- to long-term impacts of climate change on Australian populations will lead to an increased strain on aged care services, community-based services, primary health services, and ultimately an increase in demand for tertiary health-based services.

The structure of the current Australian health system is that it is largely funded at both state level and national level according to the Australian Health Care Agreements which are aimed at preventing illness and meeting the needs of the population and ensuring equity (28). Health service planning, however, occurs at state level with administration by the state governments and a small amount of planning at municipal level. Planning is the act of identifying the future health needs of a population and plans for new and aligns existing services that reflect this need while aiming to make the most effective use of available resources (29, 30).

Australian government policy on climate change has been categorised as inconsistent (31). However, current Australian government policy identifies that departments should embed climate change adaptation within their existing institutional frameworks (32). They further identify that it is important to improve awareness and understanding and to increase the capacity of decision makers to plan for the impacts of climate change (32, 33). Therefore, to ensure that the health system is proactive with regards to climate change, those tasked with planning the future of the health system need to be aware and informed on the potential health issues that will arise as a result of climate change (34).

Within Australia, there are examples of inter-sectoral actions that target medium- to long-term climate impacts (35, 36); however, these examples are sporadic and have not been universally adopted within an Australian context. This response is perhaps reflective of Australian attitudes to climate change, which indicates that there is a belief that it is happening but that most people do not ‘consider it to be a threat to them personally’ (37). Thus, within the politicised nature of the health system, planning for climate change may not be seen as a high priority.

The authors present a case study exploring attitudes towards climate change among Australian health service planners, in particular their awareness of the potential health impacts of climate change and their perceived need to incorporate climate change into their health service plans.

Methods

This research was undertaken using a qualitative research method employing a series of independent interviews under an interpretivist paradigm where the participants are seen as the experts in their field (38).

Prior to the interview, each participant was provided with a background paper prepared by the first author summarising current literature on health and climate change. Participants were encouraged to read the paper prior to interview but this was not compulsory. The background paper included the questions that formed the basis for the study and was provided so that all participants had a baseline knowledge of the subject and were able to prepare for the interview. Participants were asked to reflect on the background paper and respond to the question: ‘What do you see as the medium to long-term health impacts of climate change that your organisation will have to respond to?’ ‘Organisation’ here refers to the state or territory health services or private sector services that the participants were employed by.

The background paper included a list of likely health impacts identified by the Australia’s Environmental Health Committee (9). These were:

1. Mental health
2. Heat stress
3. Severe weather events (other than heat events), for example, bushfire, storm, sea surge
4. Health services demand
5. Needs of vulnerable populations
6. Vector-borne disease and/or zoonoses
7. Aged care services demand
8. Food quality and safety
9. Water quality and/or safety
10. Air pollution and aeroallergens
11. Food availability

Interviews were conducted by the first author who was aware of and utilised the Whyte directiveness scale in an effort to reduce introduced bias during interviews (39).

Participants were from New South Wales, the Australian Capital Territory, Victoria, Tasmania, and Western Australia and were all either senior civil servants or senior representatives from private planning companies. Participants’ job titles included Senior Health Service Planner, Senior Planning Manager, and Executive Director of service planning units amongst others. Their specific job titles have not been included in this paper to ensure that their contributions remain anonymous. While relatively small in number (n = 16), the interview sample represents a cross-section of senior Australian health service planners who are responsible for approval of plans which require the expenditure of millions of capital and recurrent dollars (40–42).
Participants were identified through snowball sampling (38) with a focus on health planners at a state and territory level who were generally planning for health service at a local/regional level. This reflects the structure of the Australian health system which is funded at both a state and national level but where services are administered by the state governments.

Forty-eight Australian health service planners were invited to participate and 16 accepted. Thirteen interviews were conducted by telephone and three were conducted face-to-face. The interviews were semi-structured using a conversational style with open-ended questions that allowed further exploration of particular issues that arose. Interview summaries and transcripts were de-identified so that participants could be candid with their answers and that privacy was maintained.

Interviews with Australian health service planners were conducted between September 2011 and February 2012. All interviews were digitally recorded and key components of the answers were transcribed by the first author. Other components were recorded and summarised but not transcribed verbatim. A matrix of key impacts was developed identifying keywords and thematically analysed by the first author.

This study was approved by the University of Western Sydney Human Research Ethics Committee (approval number H9266).

Results

Sixteen senior health planners were interviewed from five Australian states and territories.

From the information given by participants in interviews, attitudes to the role of health planners in responding to the likely impacts of climate change were categorised into three broad groups:

1. Those who were either sceptical or did not believe that climate change would have any impact on their work (n = 2):

   ... from what I’ve seen at this stage nobody’s identifying climate change as being a reason for any sort of increase in activity.

2. Those who, until being interviewed, were unaware or had not thought about the health impacts of climate change in the context of their work (n = 12):

   I suppose that it could be an issue but had never thought of it as such prior to reading the background paper, reading the questions and participating in this research.

3. Those who were well-informed and proactive in planning for the health impacts of climate change (n = 2):

   ... people can’t help but notice that something is happening and something has to be done. That’s a big step forward.

In addition to those who actively participated in the research, a fourth group (made up of planners who were invited but chose not participate) could also be identified through responses obtained as part of the recruitment process:

4. Those who identified that climate change was outside of the scope and relevance of their current planning.

my area within (the de-identified health department) is not the appropriate area for [questions about climate change and health]

Table 1 presents a summary of participants’ responses to questions concerning the health impacts of climate change. The stacked bars show the total number of participants who either agreed that this is a likely impact that requires planning, disagreed that this is a likely impact that requires planning or did not identify the potential health impact during the interview.

Discussion

These results demonstrate that despite climate change being described as the biggest global health treat of the 21st century (43), there appears to be a poor understanding of the potential impacts of climate change on health systems. The majority of participants (n = 12) was aware of climate change per se but did not identify climate change as a factor in past trends and further climate change was not included as a factor in future modelling of health service demand. Even when participants agreed to the potential for climate change to affect a named set of health outcomes, these outcomes were not widely considered relevant to health service planning despite the evidence that they will have an impact on the health of the population in coming years and decades (10, 25, 27, 44–55), and despite the recognition of the problem by governments in Australia for over 25 years (32, 46, 56).

Highly visible and reported impacts of climate change, in particular heat stress and severe weather events, were identified by the majority of participants; there was little understanding of the potentially more subtle impacts of climate change such as aeroallergens and the impact of climate change on older Australians. Of particular note was that 12 participants identified the impact of climate change on mental health. This is perhaps reflective of the growing recognition and training among health care professionals on mental health issues and the prevalence of mental health problems in the community (57) and the impact that additional strains, like climate change may have.
Table 1. Participants’ perceptions about whether climate change impacts need to incorporated into their health service plans

<table>
<thead>
<tr>
<th>Comment (themed, not transcribed)</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental health</td>
<td></td>
</tr>
<tr>
<td>Climate change will increase the numbers and complexity of mental health client within the community and will require a planned response from health services.</td>
<td>12</td>
</tr>
<tr>
<td>Mental health</td>
<td></td>
</tr>
<tr>
<td>Climate change may impact upon the mental health of the community but will not require a planned response from health services.</td>
<td>4</td>
</tr>
<tr>
<td>Heat stress</td>
<td></td>
</tr>
<tr>
<td>Australia is likely to experience more hot days and extended heat waves. This experience will require a specific planned response from health services.</td>
<td>11</td>
</tr>
<tr>
<td>Heat stress</td>
<td></td>
</tr>
<tr>
<td>Australia has always had hot days and heat waves and health services do not require a specific planned response to deal with the potential for additional heat waves.</td>
<td>4</td>
</tr>
<tr>
<td>Heat stress</td>
<td></td>
</tr>
<tr>
<td>Additional stress seen in health services is due to bed block and reduced summer services rather than heat stress. Climate change is not likely to affect that.</td>
<td>1</td>
</tr>
<tr>
<td>Severe weather events</td>
<td></td>
</tr>
<tr>
<td>Climate change will lead to an increase in the number, frequency and severity of severe weather events. Health services will need to specifically plan for these and the resultant increase in health service demand.</td>
<td>11</td>
</tr>
<tr>
<td>Severe weather events</td>
<td></td>
</tr>
<tr>
<td>Past severe weather events have not required a change to health planning and future events are therefore not likely to require this.</td>
<td>3</td>
</tr>
<tr>
<td>Health service demand</td>
<td></td>
</tr>
<tr>
<td>As a result of climate change there will be an increase in health service demand that will require a planned response.</td>
<td>9</td>
</tr>
<tr>
<td>Health service demand</td>
<td></td>
</tr>
<tr>
<td>Climate change will lead to a shift from health care provided primarily as primary and community based care towards tertiary (hospital) level care, thus increasing both the cost of health care and the need to plan for and provide additional or modified services.</td>
<td>1</td>
</tr>
<tr>
<td>Health service demand</td>
<td></td>
</tr>
<tr>
<td>Health service demand will continue to increase but climate change will not be a key factor or driver in that change. Other factors including the ageing population will be principal in driving change.</td>
<td>2</td>
</tr>
<tr>
<td>Vector-borne disease and zoonoses</td>
<td></td>
</tr>
<tr>
<td>Climate change will see an increase in the number and range of potential vectors and a commensurate increase in vector-borne disease and zoonoses as a result. This will therefore require a planned response from health services.</td>
<td>8</td>
</tr>
<tr>
<td>Vector-borne disease and zoonoses</td>
<td></td>
</tr>
<tr>
<td>Vector-borne disease and zoonoses is a small problem that can be treated on a case-by-case basis. Even if climate change were to increase the numbers of vectors and their range it would not require a planned response.</td>
<td>6</td>
</tr>
<tr>
<td>Aged care</td>
<td></td>
</tr>
<tr>
<td>Australia’s ageing population will be significantly impacted by climate change therefore health services will need to plan specifically for the health impacts of climate change for this age group.</td>
<td>7</td>
</tr>
<tr>
<td>Aged care</td>
<td></td>
</tr>
<tr>
<td>Aged care and the ageing population have nothing to do with climate change.</td>
<td>4</td>
</tr>
<tr>
<td>Food-borne illness</td>
<td></td>
</tr>
<tr>
<td>Climate change is likely to see an increase in food-borne illness and health services will need to plan for this.</td>
<td>6</td>
</tr>
<tr>
<td>Food-borne illness</td>
<td></td>
</tr>
<tr>
<td>Climate change is likely to see an increase in food-borne illness and the health department will need to respond to this but the planning of these services is outside of the scope of current practice.</td>
<td>2</td>
</tr>
<tr>
<td>Food-borne illness</td>
<td></td>
</tr>
<tr>
<td>There is no need to plan health services for any potential increase in food-borne illnesses.</td>
<td>4</td>
</tr>
<tr>
<td>Water-borne disease</td>
<td></td>
</tr>
<tr>
<td>Climate change is likely to see an increase in water-borne illness and health services will need to plan for this.</td>
<td>6</td>
</tr>
<tr>
<td>Water-borne disease</td>
<td></td>
</tr>
<tr>
<td>Climate change is likely to see an increase in water-borne illness and the health department will need to respond to this but the planning of these services is outside of the scope of current practice.</td>
<td>2</td>
</tr>
<tr>
<td>Water-borne disease</td>
<td></td>
</tr>
<tr>
<td>There is no need to plan health services for any potential increase in water-borne disease.</td>
<td>4</td>
</tr>
<tr>
<td>Air pollution and aeroallergens</td>
<td></td>
</tr>
<tr>
<td>Presentations to health services as a result of an increase in air pollution and aeroallergens will require a planned response from health services.</td>
<td>6</td>
</tr>
<tr>
<td>Air pollution and aeroallergens</td>
<td></td>
</tr>
<tr>
<td>Air pollution and aeroallergens exist now and it is unlikely that, as a result of climate change health services will need specific planning.</td>
<td>5</td>
</tr>
</tbody>
</table>
Health service planners have yet to incorporate the impacts of climate change into their computer modelling and therefore their planning. This, in part, is as a result of the perceived lack of data about the health impacts of climate change.

(The ageing population is) there in front of us, we can see it, we can feel it, we have got the data for it ... but what we haven’t been able to … or nobody has told us, is the impact of climate change on health service provision.

Due to the lack of data, participants were uncertain about how much of an impact climate change would have on the services for which they were planning; while they believed they should plan for things they considered certain, such as the ageing population, they considered that there was too much uncertainty about climate change impacts and it therefore could not be incorporated into service planning.

Although lack of precision in estimating the exact impacts and their magnitude remains a limitation of impacts modelling, the likelihood of some level of impact is well accepted by researchers and could be factored into service modelling. Other health sectors have developed climate change plans (58), but the majority of health service planners were not aware of the likely climate change-associated impacts on population health, and were therefore unable to incorporate the evidence into their service plans.

This lack of awareness persists despite the Australian government policy that identifies ‘(t)he process of embedding climate change in new policy reform will involve explicitly identifying climate change risks and ensuring appropriate account of their implications is taken in policy development and program delivery’ (32). It seems that information is either not reaching those tasked with health service planning or is not being acknowledged by planners, or is recognised but not yet able to be used by the planners as broader decisions and policy are made elsewhere.

Clearly there are significant risks to health service effectiveness if a proactive planning strategy is not put in place for the health impacts of climate change. As Lawrence puts it ‘(t)he direct and indirect effects of climate change on public health are more complex and pervasive than any other issue confronted by public health professionals (59)’. A failure to plan for climate change risks increasing future climate vulnerability (60).

With the best available evidence pointing towards there being significant health impacts as a result of climate change, now is the time to undertake proactive service planning that addresses market failures within the health system (29) such as the health impacts of climate change (61). When combined with supportive government policy and following the lead in tackling climate change for other sectors, like urban, transport and energy planning, a planned approach by the health system is clearly a ‘no regrets’ path that will ultimately reduce the impact of climate change on the health system (55).

Health service planning is reliant on empirical testing of hypotheses and requires time for monitoring potential impacts. This traditional approach to health service planning does not allow for the early implementation of adaptive strategies, which may be necessary to provide the best response to climate change (10, 62).

Planning for the health impacts of climate change is clearly a complex problem and it is possible that it is seen as too complex and is therefore too difficult for planners to know where to begin. Such a lack of ordered and advanced planning means that the impacts of climate change may instead risk being confronted in an ad hoc, crisis management manner. Without meeting the challenge of climate change to the health system head on, Australia will remain unprepared for the health impacts of climate change.

One approach to initiate necessary changes in planning practices towards one that considers the changing climate
might be to concentrate on services already associated with the highly visible, direct, and readily observable impacts such as heat, flooding, bushfire, and storms. Extreme heat has the potential to have a massive impact on the community (1, 4, 49, 63–66). Several Australian states are in the process of developing and testing heat wave action plans. Health services planning would benefit from consideration of these and inclusion of specific service responses into their health plans, such as strategies for assisting chronic-disease patients during heat waves who may not be directly under the care of a service provider, that is, they are living at home (67, 68).

The impact of climate change on the mental health of the community was the only area that was identified by all participants and as such could be an appropriate issue with which to commence health service planning for climate change.

Raising awareness about findings from health impacts modelling research may increase a willingness to consider climate change in health planning, as lack of access to information was noted by participants as a reason for not incorporating these likely impacts into their plans. Providing data in a workable format for health planners so that it could readily be incorporated into health services modelling may be required.

Eagar et al. identified that planning is an on-going process of learning and adapting to change and its protagonists are often as much activists as they are problem solvers (29). Thus, unless the planner has a specific interest in and/or knowledge of the subject, in this case climate change, the planner is unlikely to either investigate or incorporate this into his or her plans. Educating, identifying, nurturing, and supporting health service planners who have a particular interest in the field may also be a catalyst for change.

The small number of planners interviewed for this study limits the generalisability of the findings; however, participants were all senior planners from a number of Australian states and were all knowledgeable about policy and practice in their state, and well-informed about planning activities within their sector. Each participant, in other words, plays a leading role in health service planning in Australia.

The provision of the background paper to participants before interview listing the health concerns identified in the National Climate Change Adaptation Plan for Human Health (9) may have influenced responses from participants, but if so this would likely be in the direction of participants identifying more, rather than less, health impacts as being of concern to planners.

Conclusions

Climate change poses considerable challenges and addressing its health consequences requires careful incorporation into health services planning (56). This study highlights the gaps in understanding of health service planners about the health impacts of climate change and suggests ways in which planning for these impacts may start to be addressed.

Nurturing leaders in climate and health planning, incorporating climate data into health service models, and concentrating on planning for services already associated with the highly visible, direct, and readily observable impacts of climate change are all opportunities to begin the process of planning for climate change.

If considered planning is not undertaken, then the Australian health system will only be able to deal with climate change in an expensive ad hoc, crisis management manner. Without meeting the challenge of climate change to the health system head on, Australia will remain unprepared for the health impacts of climate change and this will ultimately have negative consequences for the health of the Australian population.

Conflict of interest and funding

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References

If you don’t know how can you plan? Considering the health impacts of climate change in urban planning in Australia

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Abstract
Climate change is likely to adversely affect population health through its impacts on diseases already of concern. How cities respond will largely determine its impact on the community.

Results of 42 interviews with urban planners in Australia show that while they are aware of climate change as a general concern, they are not aware of the various ways in which it may impact on human health. Planning for climate change tends to focus on impacts on infrastructure (i.e. sea level rise) with little or no planning aimed at human health adaptation for city residents. Australia risks overlooking key public health opportunities that would address both contemporary health concerns and future health risks from climate change.

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1. Introduction

Virtually from the very beginnings of settlement planning, the health of the population has been a central theme. This concept is underlined in the introduction to the book ‘Health and Community Design’ with a quote from Aristotle circa 350 B.C. “We ought to plan the ideal of our city with an eye to four considerations. The first, as being the most indispensable, is health.” (Frank et al., 2003). Further,
public health reforms of the late 19th century Europe and North America are behind urban planning reforms such as segregated zoning\(^1\) that continue to underpin many of the existing land use practices seen in modern cities (Ferriman, 2007; Bankoff, 2001; Thompson, 2007; McCue and Thompson, 2012). However, from these land-use practices have sprung unintended consequences, what may be described as public health or planning maladaptations. The segregation of workplaces from housing, when incorporated with the increasing affordability of motor vehicles and the prioritisation by planners of mobility over accessibility has led to an over reliance on the private motor vehicle. This example of planning maladaptation has contributed to climate change and reduced walkability and daily physical activity while increasing the susceptibility of urban dwellers to the impacts of climate change (Haines, 2008; British Medical Association, 2012; Saelens et al., 2003; Owen et al., 2007).

While there is evidence that suggests those involved with health recognise the “crucial part played by urban planners and engineers in health improvement” through “the sanitary revolution” (Ferriman, 2007; Rao et al., 2007) there appears now to be a significant disconnect between urban planning and health (Corburn, 2004; Barton and Grant, 2006). This disconnect is not new and continues to manifest itself in Australia, where cities are often planned around the dominant priorities of transport (private automobiles) and the economics of new suburban growth (Newman, 1992) rather than the health and well being of people who live in them. Thus active transport infrastructure like footpaths and cycle paths are not seen as essential for transport or health and well being of the community but rather a cost on development. However the recent development of the “Healthy Spaces and Places” guideline and associated professional training package [a reference tool for planners that assists them to incorporate healthy and active living design principals] is a step towards the profession reengaging the health and well being of the community through planning (Planning Institute of Australia, 2009).

This reengagement with public health is perhaps now more important than ever when climate change, described as a public health threat on a scale with tobacco smoke (Nilsson et al., 2012) is introduced. In this context, it is the way that cities respond to and adapt to climate change that will have a major influence on how the health of their populations will be affected (Bambrick et al., 2011). But is urban planning up to the task? What do urban planners understand about the health impacts of climate change? How will our cities adapt to climate change and, more importantly how will they, the cities, help their residents cope with climate change?

Climate change is unlikely to cause new health problems for city populations, rather it will exacerbate existing urban health problems (Bambrick et al., 2008; Friel et al., 2011). The health impacts of climate change will be influenced by a range of factors such as environment, socioeconomic circumstances (at country, regional and personal level), infrastructural and institutional resources, underlying physical vulnerabilities and local preventive (adaptive) strategies.

This will be particularly significant in Australia which already experiences climate extremes in temperature and rainfall that are projected to become even more extreme (Climate Commission, 2011; Bureau of Meteorology, 2012; CSIRO, 2007; Climate Commission, 2013) and which is one of the most highly urbanised countries in the world with over 89% of the population living in cities (Commonwealth of Australia, 2010). With the Australian population projected to grow 40% to 35 million by around mid-century (Commonwealth of Australia 2010.) the way Australian cities perform environmentally, socially, economically and physically will determine the magnitude of the health impacts from climate change. While the health system will have its role to play in planning services to mitigate these health impacts (Burton et al., 2014; Ebi et al., 2006), it will be those who are tasked with planning our cities, working in collaboration with public health officials, who may yet have the greatest role in mitigating the health impacts of climate change (Capon, 2010; Frumkin, 2002). Bambrick et al. (2011) identified that cities “provide adaptation opportunities to improve on today’s public health and not simply reduce negative health consequences [of climate change].” (Bambrick et al., 2011).

We present a study detailing awareness of and attitudes towards climate change among Australian urban planners, in particular their awareness of the potential health impacts of climate change, and their willingness and capacity to incorporate climate change into their plans. This study identifies a

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1. An example of segregated zoning is the separation of polluting industrial development from residential dwellings.
number of knowledge gaps among planners that could reduce Australia’s capacity for urban adaptation. Findings from this study will assist in the development of tools for increasing the preparedness of planners to consider and therefore manage the health impacts of climate change in their work, as good urban planning is a key facilitator of climate adaptation for health.

2. Materials and methods

In-depth interviews with urban planners were undertaken using an ‘interpretivist paradigm’, which views the participants as the experts in their field and focuses “on objectively verifiable facts [as well as] the many subjective meanings that people attach to them” (Unlin et al., 2005). The key components of this paradigm relate to the subjective perceptions/understandings that the participants have that arise from their experience; objective actions and behaviours that they undertake as a result; and the context, in this instance their workplace, under which this occurs (Unlin et al., 2005). This allowed the authors to obtain the views of the participants on the potential health impacts that they believe, through their professional and personal experience, for which their workplaces will need to plan.

Interviews were undertaken between 10 August 2011 and 22 February 2012. Potential participants were identified through snowball sampling (Unlin et al., 2005) with a focus on planners who were working at the local or regional level. This reflects the structure of the Australian planning system, which is mainly administered at local levels but is influenced by state/territory and federal governments. The Planning Institute of Australia assisted in recruitment through their state and territory offices by incorporating a brief advertisement about the research in their monthly member e-newsletter. RePlan, a virtual meeting/exchange room for Australia and New Zealand urban planning educators, researchers and policymakers, was also used to recruit interview subjects online. One hundred and one planners were contacted in the recruitment process.

Forty-two planners agreed to participate in the study, a response rate of 43%; 38 interviews were conducted by telephone and the remaining four face-to-face. The interviews were semi-structured and conversational in style with open-ended questions that allowed further exploration of particular issues that arose. Interview responses were de-identified prior to analysis to ensure that participants could be candid with their answers and that privacy was maintained. Those categorised as “Public” include those civil servants who work directly for Federal, State/Territory or Local Governments; “Private” work for privately owned planning firms; and “NGO” work for Non-Government Organisations.

Each participant was provided with a background paper [Supplementary material] upon agreement to the interview. They were asked to reflect on the information provided and, for this section of the research, to respond to the question: ‘What do you see as the medium to long-term health impacts of climate change that your organization will have to respond to?’ The background paper consisted of a summary of current published thinking about the potential health impacts of climate change. It included a list of potential health impacts of climate change that was developed by the Australian Government as part of their research for the development of a National Climate Change Adaptation Plan for Human Health. This list included the following potential impacts:

- Vector-borne disease and/or zoonoses.
- Heat stress.
- Air pollution and aeroallergens.
- Needs of vulnerable populations.
- Food availability.
- Mental health.
- Aged care services demand.
- Food quality and safety.
- Water quality and/or safety.
- Severe weather events (other than heat events) e.g. bushfire, storm, sea surge.
- Health services demand.
The interviews were semi-structured using a conversational style with open ended questions that allowed further exploration of particular issues that arose (Burton et al., 2014). All interviews were digitally recorded and key components of the answers were transcribed. Other components were recorded and summarised but not transcribed verbatim. A matrix of key impacts was developed and thematically analysed.

Participants’ responses attitudes to the role of urban planners in responding to the likely impacts of climate change were categorised into four domains.

Domains were determined using a tally of participant answers as either positive or negative, where ‘not identified’ was recorded as a negative. Further categorisation used more subjective determinants such as the general tenor of the interview, the inclusion of positive and negative words, the length of answers provided to the questions and a demonstrated understanding of the public health implications of the potential health impacts. Participants who provided generally negative, short answers and did not show a broader understanding of the public health issues were categorised in Domain 1. Participants who provided more negative, short answers and who were sceptical of the public health implications and limited understanding of their role in addressing them were categorised in Domain 2. Participants who provided generally positive, longer answers and showed some understanding of the public health issues and their role in addressing them were categorised in Domain 3. Participants who provided generally positive answers, included longer answers and showed extensive understanding of the public health issues and the role that urban planners had to play were categorised in Domain 4.

This study was approved by the University of Western Sydney Human Research Ethics Committee [approval number H9266].

3. Results

At the time of interview participants were from five of the eight Australian States and Territories with 57% working in NSW/ACT, 33% currently working in Victoria, 7% from Queensland and 3% from Western Australia and included planners who were civil servants \( n = 23 \) or 54.8%, from private companies \( n = 15 \) or 35.7% and non-government organisations \( n = 4 \) or 9.5%. Nineteen participants were women and twenty-four were men. Participants’ career experience ranged from first year graduates to professionals with over 35 years of experience and included elected officials, senior executives within government planning departments and senior partners and planners within both large and small planning firms. Participants included strategic planners [79.5%], social planners [12.6%), transport planners [4.5%] and other planners [3.4%].

Dom 1 – The interpreters and followers: Participants who showed little or no interest the subject, wished only to follow the planning rules and regulations and only to undertake work their clients were paying for.

Domain 2 – The conservative but confident: Participants who were sceptical of climate change or its potential to have an impact on their work or on their organisation.

Domain 3 – The unaware but open to ideas and information: Participants who were interested in and identified that climate change would have an impact on their work.

Domain 4 – Proactive change merchants and leaders: is an extension of Domain 3 where participants were well informed and were playing an active role in educating and influencing others and their organisation.
Fig. 1. The attitudes that participants presented during their interviews, clustered into four domains. These ranged from sceptical to proactive.

<table>
<thead>
<tr>
<th>Domain 1:</th>
<th>Domain 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The interpreters and followers:</strong></td>
<td><strong>The conservative but confident:</strong></td>
</tr>
<tr>
<td><em>We are sitting back trying to meet the rules, whatever the rules are, and that means that we, I guess, on the face of it, don’t care what the rules are. We just want them clear and simple so that we can comply with them and get on with life.</em></td>
<td><em>I don’t see any climate change specific impacts that are going to be such a magnitude that they are going to be outside the spectrum that we can ordinarily deal with.</em></td>
</tr>
<tr>
<td>0 Public 5 Private 0 NGO</td>
<td>4 Public 1 Private 0 NGO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain 3:</th>
<th>Domain 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The unaware but open to ideas and information:</strong></td>
<td><strong>Proactive change merchants and leaders:</strong></td>
</tr>
<tr>
<td><em>Heat Stress is something that we are aware of but the extent of its potential impact on the community is not something that I was aware of.</em></td>
<td><em>Adaptation is a fundamental principle of most planning systems, because what it means is that you understand the environment ... you are sensitive to things that will compromise the health of future communities.</em></td>
</tr>
<tr>
<td>14 Public 9 Private 2 NGO</td>
<td>5 Public 0 Private 2 NGO</td>
</tr>
</tbody>
</table>

Fig. 2. Shows participants perceptions about whether the health impacts of climate change need to incorporated by their organisation into urban planning.
Fig. 2 presents a summary of the participant responses to questions concerning the health impacts of climate change. The number of participants is shown on the y-axis and the potential health impacts on the x-axis. The stacked bars show the total number of participants who either agreed that this is a likely impact that requires planning, disagreed that this is a likely impact that requires planning or did not identify the potential health impact during the interview. Impacts were ordered from left to right according to the number of planners who agreed that the impact as one of concern.

3.1. Heat stress

The majority \([n = 37 \text{ or } 88.1\%]\) of participants agreed that heat stress as a result of climate change would require a planned response from their organisation, but specific responses ranged from heat being a key issue and more pronounced as a result of climate change, to it being seen as a small ‘third order’ issue, to it being insignificant and not something that would not require specific planning to address. While aware that heat waves occur, many participants were not, however, aware of the extent of their potential health impacts.

Participants identified the ‘urban heat island’ effect (Landsberg, 1981; Oke, 1984, 1982) and many recognised that good urban design can help to reduce the impact of heat stress. They identified a number of simple design solutions that can be incorporated at a master plan, landscape plan or individual building plan levels. Some raised concerns over existing building stock that they perceived as largely poorly designed and constructed and would therefore not cope with the extremes of climate change. This group identified the importance of appropriate building design that maintained land yield but that moved away from apartments that were ‘constructed . . . like hot or cold boxes’ and away from eaveless buildings with low albedo black roofs to solar passive designs that instead incorporate natural ventilation, and have large eaves and/or verandas. Others identified using landscape design, trees and green roofs that incorporate biomass as a tool to reduce the potential impact of heat within the urban environment.

Other participants, notably those from private firms \([n = 3 \text{ or } 7.1\%]\), identified that heat was not regularly discussed and that they were not planning for heat because its consideration was not being mandated by planning authorities or included in their clients’ briefs. One identified that heat was a factor when it came to the economics of planning but that health impacts of heat and climate change would be a ‘third order’ type consideration. That is, that in their role they felt that climate change was unimportant when compared to complying with regulations required for planning approval, what the clients want or the economics of the project.

A small number of participants noted that the impacts of excess heat would be mitigated through the use of air conditioners and that therefore there would not be ‘any sort of massive change to current practices’. However, others pointed out that there is an over reliance on air conditioners and that during power outages this could prove to be a significant problem.

3.2. Severe weather events

The majority of participants \([n = 32 \text{ or } 76\%]\) agreed that, as a result of climate change, severe weather events [drought, bush fire, cyclones, storm surges, flooding] would require a planned response from their organisation.

Two participants suggested that a particularly severe single weather event, specifically a fire or prolonged drought, could significantly change models that inform their planning work. Examples provided by participants included the prolonged drought in Australia at the start of this century bringing forward dam construction and which virtually mandated water tanks under BASIX\(^3\) and modified building standards that were a direct result of the 2009 Victorian [Australia] Bushfires. Participants felt that such changes were clear evidence that organisations do and will need to respond to severe weather events. However, one participant identified that without appropriate data capture that allowed for an

\(^3\) The Building Sustainability Index (BASIX) is an online planning tool used in NSW that aims to deliver equitable, effective water and greenhouse gas reductions in residential buildings and is part of the states development application process. It does this by checking a proposed design against sustainability targets.
understanding of events, there cannot be an appropriate adaptation strategy and therefore the responses of organisations to severe weather events may be flawed.

Participants identified that severe weather events had altered the prevailing thinking and indeed such events currently “dominate” their thinking. Some participants identified that as a result of severe weather events such as bush fires, droughts and slow moving floods they were now taking into consideration things as diverse as food availability, the delivery of education for isolated communities and increased building standards. One participant said that they felt the community would end up with over engineered buildings and facilities for present day conditions but that ultimately the community would enjoy better quality and more efficient infrastructure.

Some participants noted that severe weather events had the potential to provide huge social shocks in to form of reduced social capital, reduced physical activity and increases in antisocial behaviour. One participant suggested that reduced physical activity as a result of extremes in climate could have impacts on a whole range of diseases, particularly cancer, diabetes and heart disease. Another participant, in contrast, suggested that while being important, severe events were things that were easy for the media to sell and that at the moment they were very topical, but that they did not believe that planning for severe weather events would be a high priority for either them or their organisation.

3.3. Food availability

Thirty-five participants identified food availability as an issue, with 27 [64.3%] agreeing their organisation would need to plan for it. Eight indicated that it was not an issue or that it was the responsibility of others outside the urban planning sector.

Participants identified that protecting agricultural zones around cities, in order to access fresh produce and maintain urban agriculture are tools to protect food availability. According to one participant, ‘in the 70s we were far more aware of the agricultural quality of land than we are now’. This participant felt that the economic imperative of city growth had taken priority over agricultural production. Some participants felt there remained an overt disregard for farming in general, and for food in particular, in planning and resource management. Others felt that this imbalance was being addressed and that the profession was now planning to ensure protection of land for food production such as broad acre, market garden or factory farming.

Other participants linked food availability with the needs of vulnerable populations. They identified that they needed to plan for people on lower incomes and that these groups were often located on the fringes of cities where access to good quality, locally grown produce was difficult and would become more so with climate change. Urban agriculture (i.e. growing fruit, vegetables and small livestock such as poultry) and community gardens were identified as potential supplementary food sources but were not seen as a viable alternative to industrial agriculture supplying large supermarkets.

One participant felt that, as a wealthy nation, Australia would be able to afford to import food or develop technological fixes that would provide for its future food needs and that therefore food availability was not an issue of concern. Some suggested that food availability could be guaranteed by providing large grocery shops close to new housing areas. Some of those interviewed identified that climate change was not related to food availability, and they questioned whether it was an urban planning problem at all.

3.4. Mental health

Twenty [47.6%] participants agreed that climate change would have an impact on the mental health of the community and that therefore their organisation would need to respond to this. Some identified the issue of mental health within the community as a whole was already a ‘massive’ problem and, when combined with the complication of climate change it was their biggest concern.

One participant said that within the profession they believed that there was an undercurrent of recognition of the effect that planning, in particular, and climate change may have on mental health but that that awareness was limited.
Participants identified a range of interventions they believed would be beneficial to the mental health of the community while allowing for climate change adaptation. Many of these involved encouraging active travel and building in opportunities for exercise, recreation and contact with natural or parkland spaces into daily living. It was noted by participants that an increased number of hot days – and hot days that would be hotter – had the potential to reduce people’s willingness and ability to exercise and that therefore planners needed to take this into account when designing for active transport and recreation.

Issues around mental health were noted to be not limited to one area of the city but rather that it was potentially a problem across the whole urban area. Participants identified that mental health issues appeared particularly prevalent among vulnerable populations and that climate change was likely to exacerbate these problems. They noted that problems appeared to be exacerbated if there is limited access to appropriate facilities and services.

Participants noted that extreme weather events, drought and extended periods of heat were likely to increase stress levels in the community. They identified that such events had the potential to impact upon a ‘city’s emotional wellbeing’. They noted that their experience of drought in recent years had informed them that ‘green cities improve morale’ within the community and that additional engineering solutions were needed to help keep cities green.

One participant suggested that people underestimate the costs of living and any increase leads them to having a decreased financial capacity as a result. This in turn decreases the capacity for people to adapt [both physically and financially]. They felt that climate change could result in additional pressures that may tip them towards depression or other mental health issues, because of increased financial pressures.

Ten of those interviewed identified that climate change impacts on mental health did ‘not leap out’ at them and that “This is an issue that exists despite climate change.” The view was expressed by some that planners do not consider mental health needs in their work currently and are more focused planning for people’s physical health outcomes.

3.5. Aged care

Twenty-seven participants identified aged care and the ageing population during their interviews, with 20 [47.6%] agreeing that their organisation would need to respond to these issues in relation to climate change.

Many of those interviewed noted that they were very aware of the need to plan for demographic change itself but identified that aged care was a third order issue and that the ageing population had nothing to do with climate change:

[The] ageing population … are [a] vulnerable population but I don’t think you can say that that’s because of climate change.

Others however felt that climate change was going to exacerbate health problems associated with ageing. They identified that the largest issue affecting this group would be the impacts that heat stress could have on this demographic. They also noted that the surge in the ageing population would need appropriate planning for physical facilities that were more adaptable to future needs of the community and climatic events.

3.6. Water quality and safety

Twenty [47.6%] participants agreed that water quality and safety was an issue that their organisation would need to respond to and plan for with some noting that their organisations were already doing this. Participants identified that they were changing urban design to increase water security, improve water efficiency, to better cope with heavy rains and storms, improve cleanliness of water runoff, and return to more ‘natural’ flows through the urban environment.

One participant identified the potential for the changes in water management practices could lead to a spread of vector borne disease. Less than five identified the issue of rainwater tanks as a potential risk by providing breeding habitat for vectors.
However, six of those interviewed identified that water quality and safety was not an issue to be considered, and, while it obviously affects their work it was an area for which others outside the planning sector, had responsibility.

3.7. Vulnerable populations

That climate change may especially affect vulnerable populations was identified by 24 of the participants with 20 [47.6%] of those agreeing there would be a significant impact on these groups and that therefore this would need to elicit a planned response from their organisation. It should be noted that some participants [n = 7 or 16.6%] identified the ageing community, a potentially vulnerable group to climate change but did not specifically identify vulnerable populations in their interview. Conversely, six participants identified vulnerable populations but not ageing and aged care needs.

Participants identified that an aim of urban planning was to increase community resilience and that this should help individuals and communities to mitigate some of the impacts of climate change. They reported that they use tools such as vulnerability assessment to help with this.

Those who agreed this was an issue noted a number of vulnerable populations including young children, the elderly, those from low socioeconomic groups and Aboriginal and Torres Strait Islander Peoples. They identified that, particularly for the elderly, their homes were less likely to be adequately equipped to deal with the extremes of climate change, especially increased heat. They also noted that although vulnerable populations were dispersed throughout cities, there were specific locales, for example within the suburban fringes of cities, where there was a greater density of potentially more vulnerable populations.

Participants said that socioeconomic stresses could lead to increased isolation and that those on lower incomes were often located in suburbs that were less likely to be well serviced by public transport and other facilities and tended to be heavily car dependent. They noted that the locales where people live influences their behaviour and that those from lower socioeconomic backgrounds are likely to be less physically active or capable and therefore they might be personally poorly equipped to deal with the extremes brought by climate change.

3.8. Vector borne disease and zoonoses

Vector borne disease and zoonoses was identified as an issue to consider by 27 participants, with 10 [23.8%] of those interviewed agreeing that an increase in vector borne disease was something for which planning was required. They identified that within the urban environment diseases such as dengue could thrive in cities as far south as Brisbane.

Others, however, noted that any increase in these diseases would be just another situation that needs to be dealt with and that:

As an urban planner the direct impact on my work on those sorts of diseases is hard to see.

3.9. Air pollution

Eighteen participants identified the issue of air pollution, but only 12 [28.5%] of those agreed that it was an issue that their organisation would need to respond to and plan for as a result of climate change.

The response of one participant perhaps typified the feeling of the majority when they spoke about air pollution;

Absolutely, we look at who is generating the pollution, . . . but that's not caused by climate change.

This participant identified that air pollution came from point source emitters and that, while there are negative health impacts associated with air pollution, they were unaware of any link between it and climate change. Other participants noted that aeroallergens could be a problem but this was not something they were investigating at the moment.
However, one participant noted that they look currently at air pollution and aeroallergens and that if climate change were likely to increase the levels of these then they would certainly have to look at associated planning needs.

3.10. Health service demand

That climate change would have an impact on health service demand was identified by 17 of the participants, with 12 [28.5%] of those agreeing that there would be an increase in health service demand that they would need to respond to as planners. They identified issues such as preventative health, community health and acute healthcare as areas for concern.

Participants relayed concerns over the potential impact upon vulnerable populations and the ability of health services to cope with these groups. They identified that, as a profession, they needed to ensure that there were adequate facilities to allow people to be more resilient [i.e. infrastructure that allows for active transport or appropriate recreation facilities], prepare before events happen and allow them to adapt to changes, in order to avoid or ameliorate increased demand on health services due to climate change.

3.11. Food quality and safety

The impact of climate change on food quality and safety was identified as an issue by 14 participants, with eight [19.1%] agreeing that this would be an issue that their organisation would need to respond to and plan for. No more detail was forthcoming about how urban planning might contribute to food safety and quality under climate change.

3.12. Other issues

During the interview process there was a significant concern expressed by some planners about the perceived uncertainty surrounding climate change and this has, perhaps, been used as an excuse for inaction within urban planning as well as other sectors. While uncertainty can never be entirely removed from the equation, one participant suggested that there was a need to capture data that would allow for an appropriate understanding of past and potential events. Their response indicated that they felt unable to develop an appropriate strategy without such data and that therefore any responses that organisations are undertaking, particularly to severe weather events, may be flawed.

There was concern amongst some of those interviewed that the extreme weather events seen over the past number of years are the new norms and they recognise therefore that they need to be planning for even more extreme extremes as the climate changes.

4. Discussion

Based on responses from a broad sample of urban planners in Australia, findings from this study provide a snapshot of the types of health outcomes of climate change that are under consideration by urban planners in their work. These findings will assist the fostering of partnerships between urban planners and public health professionals, as well as the development of tools and training to improve awareness and understandings of climate change related health issues and improve urban design and implementation serves to reduce the negative impacts of climate change and enhance public health under future climate.

Participants were largely of the opinion that the health impacts of climate change were going to affect their work and that they were going to have to consider climate change in their planning [n = 37 or 88.1%], but that currently little or nothing is being done specifically to address this. While the majority of planners interviewed were aware of climate change per se, they were not aware of the likely associated health impacts or unconvinced of its potential health impacts [n = 36 or 85.7%].

If the attitude of planners in Domain 1 is examined, their responses suggest without appropriate rules or regulations there is potentially little scope for tackling climate change within elements of
the private sector. Their responsibility is first and foremost to their clients and or the company they work for. Thirty-three per cent of private industry planners interviewed fell into this category. The study involved only a small but representative sample of a large group of professionals and does not necessarily indicate that private enterprise is not proactive or innovative or that a significant minority of private enterprise is like this, rather only that this is the response of this group of participants. It is interesting however to note that no public or NGO sector participants were categorised as falling within this domain.

(There) is the desire of clients of mine to actually do a good job ... So they will sometimes attempt to have rules changed or ... interpreted in a way that allows them to achieve what they might see as a better ... environmental outcome. But their main incentive is ... work that is profitable. Sometimes those two things coincide.

An evaluation of Domain 2 shows the participants classed in this domain were certainly aware of climate change but were sceptical about its impacts, particularly health impacts. The typical response provided by this group was that there is nothing that can’t be dealt with within the context of the current system. Solutions such as additional air conditioning, modified building standards and engineered solutions to cope with severe weather events were all identified by participants in this domain.

Even without climate change we still would have had our drought, we still would have had our bush fires and all of that would have happened anyway. So those macro changes, we have to respond to all the time anyway.

However, some of these apparent solutions, such as air conditioning, have the potential to be mal-adaptive, increase social inequities and contribute to climate change (Farbotko and Waitt, 2011). Such hasty or single focus responses to the complex problems of urban adaptation can lead the maladaptive responses that were perhaps first described by Hardin (Hardin, 1968), as the ‘tragedy of the commons’ where the individual acts outside the community well being. In this instance by cooling their own environment with the use of air conditioning they not only add to climate change, but also increase the risks of black out and the resultant increase in costs as energy companies upgrade infrastructure as a result (Farbotko and Waitt, 2011; Haughton and Hunter, 1994). Reliance on technological fix strategies was described by one participant as a very high-risk solution to a very complex set of problems.

It has been argued that those in wealthier societies believe that they can effectively buy their way out of problems and to take steps to avoid or ameliorate disasters (Bankoff, 2001). However, events such as Hurricane Katrina in the United States of America, the European heatwaves of 2003, the Queensland floods of 2011 and 2013 and the record breaking heatwaves in south eastern Australia of 2014 (Hannam, 2014) show that even wealthy countries are vulnerable to the new extremes in weather (Jackson and Shields, 2008; Medew, 2014; ABC Online, 2014). Further, buying ‘simple’ solutions to problems may itself prove maladaptive, for example, building more roads to ease traffic congestion leads to more cars being on the road (Downs, 1962; Naess et al., 2001). Thus simply importing food or providing large grocery shops close to new housing areas will not ensure food security. Without an integrated and diverse strategy aimed at increasing resilience and reducing inequity buying solutions may ultimately simply be wasting money better invested elsewhere. This approach is identified as Domain 2.

Domain 3 is the largest group of the quartet with 25 participants. Responses from this domain suggest that they are concerned about climate change but were largely unaware of the breadth of its potential health impacts prior to participating in this research. Members of this group were able to identify highly visible impacts, such as severe weather events and heat waves, but were less likely to identify less direct or more hidden issues such as air pollution and vector borne disease.

The human element and the consequential (health) impacts (of climate change) are not widely accepted (amongst urban planners) yet.

That participants recognised types of events that they had themselves experienced or seen through the mass media, which is known to increase awareness (Sampei and Aoyagi-Usui, 2009), but that they did not recognise less obvious effects is understandable. If the 11 potential impacts of climate change
on the urban system are looked at in more detail, there is a clear diversity of understanding and awareness between the highly visible impacts such as severe weather events and more subtle potential impacts such as vector, food or water borne disease. Distinctions between these were particularly highlighted by the amount of information and discussion provided by participants on each of the 11 potential impacts. There are thus many potential health impacts of climate change that are less visible, which potentially have a similar impact, but because they are cumulative over time rather than an abrupt and obvious event they are not reported by media. Thus they are relatively invisible and are therefore not included adequately in planning.

The lack of recognition of the less visible impacts, such as vector borne disease, is interesting but perhaps not surprising. Vector borne disease for example is clearly associated with climate which sets the parameters under which disease may be transmitted, and patterns of infection will change as the climate changes. But urban conditions and regulations (planning and building codes, for example) play a significant role in promoting or hindering disease transmission, contributing to disease distribution and infection patterns (Reiter, 2001). Recent water restrictions, incentives and regulations have ensured that rainwater tanks, for example, have once again become very popular in Australia, but with poor maintenance these become potential breading grounds for *Aedes aegypti*, the primary vector for the dengue virus (Beebe et al., 2009). While both public health regulations and Australian Standards require that rainwater tanks are insect proof (ARID, 2008; Queensland Health, 2011), responsibility for ensuring they remain so is with the owner and with the local government (Queensland Health, 2011). Thus urban planning policies aimed at reducing consumption of potable town water through installation of backyard tanks may be a maladaptive response to the health impacts of climate change.

Planners grouped into Domain 4 were a combination of non-government organisations, private and civil servant planners. Their response suggests that they were aware of virtually all the potential health issues that have been identified as important for Australia. Further, they reported personal efforts to educate their peers, employers and clients of the need to plan for climate change.

The location of those interviewed and their background (i.e. where they have lived or grew up) may have influenced their understanding of the potential impact that these diseases can have on a community. The majority of participants were based in either Victoria or ACT/NSW at the time of their interview yet only 15% of these participants identified vector borne disease as an issue. While two of the participants who identified vector borne disease disclosed that they had lived in areas that are endemic with vector borne diseases such as dengue and malaria. This perhaps is somewhat of a concern as vector borne diseases such as Ross River virus and Murray Valley encephalitis can occur within both NSW and Victoria and the range of these diseases may increase with climate change (Woodruff and Bambrick, 2008).

It is possible that the health impacts of climate change is seen as too complex and all encompassing that it is difficult for planners to know how to begin to address it. As such, the health impacts of climate change may continue to be dealt with in an *ad hoc* crisis management manner rather than under long term planning. Therefore, without a change in attitude and planning requirements, Australia’s urban systems will remain unprepared and poorly adapted to the health impacts of climate change.

Concentrating efforts on topics that the majority of planners identified may be the best starting point for planning for climate change. Severe weather events, heat and food availability are the areas that most planners identified in their interviews and are likely to be ones that can gain traction among less convinced peers.

Planning is an on-going process of learning and adapting to change and its protagonists are often as much activists as they are problem solvers (Eagar et al., 2001). Thus, unless the planner has a specific interest in and or knowledge of the subject, in this case climate change, they are unlikely to either investigate or incorporate this into their plans. Therefore educating, identifying, nurturing and on-going professional development for planners are perhaps additional initial courses of action. The Planning Institute of Australia currently run professional development on climate change for planners through the Certified Practicing Planner program, a professional development program for practitioners within planning related field. At the time of writing this course is, however, focused upon the physical aspects of planning and mitigation, i.e. planning on reducing greenhouse gases, manage risk, developing more resilient urban systems and dealing with sea level rise (Planning Institute of Australia, 2013). A change in focus and a link with their Healthy Spaces and Places program could deli-
ver many co-benefits to the environment and the health impacts of climate change. Building capacity within the sector, particularly within those planners who have a particular interest in the field may be a catalyst for change.

Further, the strengthening of links between planners and public health professionals will also increase the awareness and understanding of the role of urban planning in public health. The role that organisations such as the Heart Foundation (Australia) and the fostering of programs such as Active Living and publications such as “The Blue Print for an Active Australia” (National Heart Foundation of Australia, 2014) while not specifically climate change related, are integral to this process.

There is perhaps a greater role for the inclusion of additional regulations to ensure that private enterprise plays their role in not only mitigating the impacts of climate change but in helping cities and their citizens in adapting to it. However, regulation can have unintended negative consequences such as increasing red tape, reducing (initial) housing affordability and increasing the complexity of development. Therefore, if there is additional regulation put in place it must not be so prescriptive that it does not allow for private sector innovation.

A potentially beneficial approach would be a ‘no regrets’ attitude to planning that builds upon things that are already well understood, like incorporating mixed-use development, active transport and the greening of cities. This may, however, limit the potential health benefits that could be gained by taking a more explicit, climate change adaptive approach.

Clearly there is also a need for further research and to provide specific information to this profession, to help inform strategic planning, and local and domestic level planning. Research into the health impacts of climate change and potential solutions that planners – and through them the urban environment – has to offer. For example it is clear that good urban design can minimise both greenhouse gas emissions and the urban heat island effect. The inclusion of shade-trees and green space, the orientation of buildings, an appropriate transport mix, the albedo of building materials and number of local heat sources all impact upon the ability of an urban area to minimise the impacts of heat (Friel et al., 2008). What other innovative solutions can these professionals come up with when aware of the problems that face the community?

It’s perhaps also relevant to note that despite the concept that modern urban planning grew out of the public health movement some of those interviewed did not consider health to be a key factor of urban planning. This response seems to confirm that, at least among some participants there remains disconnect between planning and public health (Corburn, 2004).

Not all states and territories were represented in the study group, with a bias towards Victoria and NSW/ACT and this may limit the generalisability of the findings. However all participants were active in the field and knowledgeable about policy and practice in their state or territory.

The provision of the background paper to participants before interview listing the health concerns identified in the National Climate Change Adaptation Plan for Human Health (Commonwealth of Australia, 2010) may have influenced responses from participants, but if so this would likely be in the direction of participants identifying more, rather than fewer, health impacts as being of concern to planners. (Burton et al., 2014).

5. Conclusion

This study illustrates the extent to which planners are aware of climate change and the somewhat limited understanding of the potential impacts that climate change will have on human health. It shows that because of this limited understanding the health impacts of climate change are not specifically being planned for within the Australian cities. It further highlights that there is often a conflict between health considerations and other planning decisions with the result that planners assign health a lower priority in relation to other areas, such as vehicle mobility and land yield. This conflict between priorities means that we are not proactively planning for climate change in our settlements and this represents a missed opportunity for delivering ‘no regrets’ co-benefits to health.

Therefore a proactive approach that refocuses urban planning to place a greater emphasis on the health and wellbeing of the community through urban design is a no regrets approach that will build resilience in the population and ultimately reduce the adverse health impacts of climate change (Bambrick et al., 2011).
While there are examples of incorporating both health and climate change in urban planning at the moment, particularly through active transport, Australia lacks a clearly articulated strategy to improve the health of its urban populations. Failure to explicitly adapt, via urban planning, to the health impacts of climate change within Australian cities means key public health opportunities are being overlooked.

Acknowledgment

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.uclim.2015.01.003.

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Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system.

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**Abstract:**

Climate change poses a significant threat to the community and urban planners need to place climate change at the forefront of their decision-making. Increasingly scientists are identifying that climate change will have a significant affect on human health and how cities respond and adapt will have a major influence on the magnitude of the anticipated health impacts on their populations.

Results of 42 interviews with urban planners in Australia identified strengths in the planning system including strong governance models and the multidisciplinary nature of modern day planning. However, shortcomings such as increased politicization, bureaucracy and a lack of leadership reduce the systems ability to adapt.

Climate change is not a short-term problem but rather an inter-generational one and therefore must be tackled by planning cities today in ways that build community resilience and allows and encourages future adaptation and mitigation. Such an approach is a no regrets strategy in adapting to the inevitable health impacts of climate change.
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Keywords

Climate change
Urban Planning
Human health
Introduction
There is consensus amongst the scientific community that climate change represents the single most significant problem facing global governments into the future (Allen et al., 2014). It will promote an increase in the severity of weather events (The Climate Commission, 2011), extended droughts (The Climate Commission, 2013) and a rise in sea levels (Church et al., 2013), as well as most likely contribute to many as yet unknown outcomes. With over 89% of the population living in cities (Commonwealth of Australia, 2010), Australian urban planners will need to place climate change at the forefront of their decision-making (Bambrick et al., 2011, Burton et al., 2014a). Climate change will affect the urban infrastructure upon which our cities depend (Freeman and Warner, 2001, Stewart et al., 2011), for example sea level rise will damage major ports, airports and residential properties worth estimates $63 billion AUD (2008 value) (Australian Government, 2009). However the impact that climate change poses to the health of the population is potentially more far reaching with increasing “human morbidity and mortality, and consequences for mental health and human well-being” (Allen et al., 2014) being most notable within areas of higher population such as cities. Further climate change is likely to have a disproportionate impact on the most vulnerable in the community, amplifying existing health conditions and exacerbating health inequities (Friel et al., 2011).

How cities respond and adapt to climate change will have a major influence on the magnitude of the anticipated health impacts on their populations (Bambrick et al., 2011). Those responses that are deemed appropriate
responses should be designed to have significant co-benefits, in that they will improve on existing population health and “not simply reduce negative health consequences [of climate change]” (Bambrick et al., 2011). To take full advantage of these opportunities planners need to be aware of, and plan for, the impacts of climate change, not only on the city infrastructure but also on the people who reside in the city and use that infrastructure.

Our previous study (Burton et al., 2014a) identified that most urban planners were unaware of the health impacts of climate change. With climate change set to impact all Australian cities clear planning policies are needed to ensure that we are able to meet the diverse changes that will occur. In this paper, through a health and climate change lens, we detail the strengths, short comings and barriers within the Australian urban planning systems and their capacity to incorporate climate change into their plans.

Methods
As described previously (Burton et al., 2014a, Burton et al., 2014b) using an interpretivist paradigm (Unlin et al., 2005), the first author undertook in-depth interviews with current urban planners in Australia about the strengths and weaknesses of the planning system’s ability to deal with the health impacts of climate change.

Potential participants were identified through snowball sampling (Unlin et al., 2005) with a focus on planners who were working at the local or regional level. This reflects the structure of the Australian planning system, which is mainly administered at local levels but is influenced by state/territory and federal governments. In total 101 participants were approached, and were in all
states and territories however the study was unable to garner participants from the remaining three states and territories.

Interviews were undertaken with representatives from the public sector (N = 23) private sector (N = 15) and non government sector (N = 4) in five of the eight Australian states and territories. Interviews were undertaken between 10 August 2011 and 22 February 2012. The interviews were semi-structured and conversational in style with open-ended questions that allowed further exploration of particular issues that arose. Interview responses were de-identified prior to analysis to ensure that participants could be candid with their answers and that privacy was maintained.

Each participant was provided with a background paper prepared by the first author that summarised existing literature on health and climate change and included a list of likely health impacts identified by Australia’s Environmental Health Committee (Commonwealth of Australia - Environmental Health Committee (Enhealth)). The background paper included a list of potential health impacts on three time scales:

1. Already apparent: risks amplified by climate change including an uptrend in the average annual number of hot days and an increase in the number and severity of bushfires and the associated injury, death, respiratory hazard, and mental health consequences.

2. Current probable impacts: but not yet clearly identified including a rise in foodborne diarrhoeal disease; altered air quality: ozone formation, aeroallergens; Mental health impacts, becoming more
apparent in urban areas; and Vector-borne infections: dengue, Ross River virus.

3. Predicted future health impacts: Extreme weather events: injuries, deaths, infectious disease, depression; and water shortages: impacts on food yields, hygiene, recreation.

Participants were asked to reflect on the information provided and to respond to the questions:

• What are the strengths of your current systems and arrangements for responding to the expected health impacts of climate change?
• What are the gaps that would need to be resolved in order to meet the expected health impacts of climate change?
• What barriers to implementation of climate change adaptation measures do you experience, or anticipate?

All interviews were digitally recorded and key components of the answers, i.e. specific quotes relating directly to the question, were transcribed. Other components were recorded but not transcribed verbatim. A matrix of key concepts based on the answers was developed and, thematically analysed by the first author.

For this study the authors used the following definitions.

*Strength* is something that participants identified that their organisation had or was doing that would allow them to respond to the potential health impacts of climate change.
A shortcoming (gap) is a response or area that participants identified that their organisation was missing. It is a problem of omission, of a response not being possible to the health impacts of climate change because something was not being or able to be done.

A barrier is something that participants identified as a more present and real impediment that is acting against appropriate action and preventing their organisation from dealing with the health impacts of climate change.

This study was approved by the University of Western Sydney Human Research Ethics Committee [approval number H9266].

Results

Forty-two planners agreed to participate in the study, a response rate of 43%; 38 interviews were conducted by telephone and the remaining five face-to-face.

The study participants identified that Australian urban planning systems had a number of existing strengths that would enable adaptation to climate pressures. However, they also identified significant shortcomings (identified as gaps and barriers) within their systems that had the potential to impede or reduce the efficacy of a planned response to climate change.

Strengths in the current Australian urban planning systems

When asked “What are the strengths of your current systems and arrangements for responding to the expected health impacts of climate change?” all participants were able to identify at least one strength.

The strengths were categorised into six broad themes:
1. Governance

Participants identified that there is strong governance within Australian planning systems. This governance provides a strong strategic context with upfront planning rules and regulations that are coupled with clear decision-making processes. This allows for a functional, proactive planning framework that is applied, participatory, economically sustainable and allows for design flexibility within an orderly planning process. One participant identified that this would make it relatively easy to modify and tighten the existing rules and regulations to allow for adaptation to climate change.

2. Multidisciplinary teams

Participants identified that the nature of the urban planning profession attracted people from diverse professional backgrounds. They identified that this allowed for problems to be tackled and solutions identified in diverse and novel ways. Where traditionally problems may have viewed isolation, participants identified that multidisciplinary teams allowed them to make greater use of systems thinking, allowing them to look at problems in a broader context to find non-maladaptive solutions. Participants identified that the multidisciplinary approach was not necessarily a formal policy adopted by
their organisations but rather the outcome of the backgrounds of people working within the profession.

3. Communication

Participants identified that their organisations were able to communicate planning strategies to industry and the broader community well. This allowed their organisation to reinforce information and provide a consistent message. Participants also identified that successful communications worked in multiple ways and that it was important to adapt and change policies and decisions based upon community, industry and scientific feedback.

4. Continued learning

Participants recognized that extreme weather events were likely to increase, that they had learned much from specific incidents (such as the Black Saturday bushfires in Victoria, Australia, in 2009) and understood the role that planning would need to play in adapting to extreme weather events fueled by climate change. This continued learning is evidenced by the changes to the building standards, subdivision layouts, and emergency access and egress that were made as a direct result of these fires.

4. Existing urban form

Participants identified that within cities there is significant scope for working within the existing urban footprint and that environmentally and culturally specific designs could be used to help build community resilience. Areas with the capacity for urban infill, with existing green space, with links or potential links to public transport were all key advantages to the existing urban form.
5. Awareness and acceptance of climate change

Participants identified that within the profession there was an acceptance of climate change and its health impacts. This had allowed them to form proactive partnerships with universities that would help garner data and evidence to help with planning for climate change. Acceptance is, however, different from knowledge of the impacts of climate change. It should be noted that the same group of participants showed a limited understanding of the potential health impacts of climate change (Burton *et al.*, 2014a).

Shortcoming in the current Australian urban planning system

When asked, “What are the gaps that would need to be resolved in order to meet the expected health impacts of climate change?” all but one participant identified at least one shortcoming in either their system, the profession in general, or their organisation. The shortcomings identified by participants can be categorised into six broad themes:

1. Bureaucracy;
2. Objective Driven;
3. Implementation;
4. Communication;
5. Politicisation of the planning regime; and
6. Lack of research in the area.

1. Bureaucracy

Participants identified that the nature bureaucracy led to there being gaps and a reduction of the profession’s ability to plan for the health impacts of climate change. Participants identified that each state or territory had their own planning schemes and that there were few (if any) strategic links across
governments. Furthermore, bureaucracy tended to reinforce institutional silos, reducing coordination both across and within government. Participants identified that this led to a lack of inter-agency coordination and collaboration, because different agencies had differing priorities. These competing priorities were seen either to result in a lack of coordination across government, or that the views of one agency would tend to dominate the views of others. In addition, participants identified that because bureaucracies tended to be large and unwieldy, they found the complexity of the system they were working in difficult to understand.

It's not a transparent system. It's difficult for people in the bureaucracy to understand, it's difficult for people trying to deal with the bureaucracy to understand. That makes it very difficult to know where to go and get information.

Participants identified that the bureaucracy was often risk adverse. This led to a lack of empowerment, which meant that planners were either constrained with their decisions or in extreme cases not able to make decisions at all.

2. Objective Driven

Participants identified that the planning system was more focused on planning for objectives rather then the people they were planning for. Some participants identified that climate change was seen only as an environmental issue and the objective was focused on mitigation and reducing greenhouse gas emissions that needed to be managed from an infrastructure perspective, rather than on adapting cities to cope with climate change. These participants felt that the profession was not looking at it from an adaptation perspective or as an issue that would affect the health and well-being of people. An example
provided by one participant was an organisation’s willingness to plan for physical impacts of climate change, such as sea-level rise, on infrastructure, but a limited understanding and therefore planning for the impact this might have on people.

3. Implementation
Participants identified that within planning there were many competing priorities. They identified that poor implementation meant that even the best plans could be eroded. As a result they identified that the vision of tree-lined streets were all too often replaced with places to drive or park motor vehicles.

Planners may try and minimize this through benchmarking, however when a minimum benchmark was created one private sector participant identified that it could then become a de-facto ceiling through which innovation was stifled, resulting in a disincentive to ‘go beyond’ the minimum standards.

4. Communication
Participants felt that it was too easy to greenwash the community and the profession with the sheer volume and variety of information they were ‘bombarded with’ and that this had the potential to lead to confusion. One participant identified that the scientific community needed to sell the concepts of the health impacts of climate change because people did not understand that health was part of the conversation.

Participants identified that as professionals they needed to engage with a very diverse community, including business, academic and the greater public within limited timeframes. As a consequence they had been unable to effectively engage with all the target groups effectively.
5. Politicisation
Participants identified that there was a significant politicisation of both planning and of climate change. One participant described the political gap as being a lack of leadership and noted that without the government imprimatur the profession could not be leaders in the field. Another identified that there was not the commitment to plan for climate change at the very highest level.

6. Research
A number of participants identified that there was a lack of evidence and data and that without the available evidence there was no imperative to plan for the health impacts of climate change. Participants suggested that research could be collaborative, working more closely with them, leading to more applied planning and strategic thinking. Participants identified that representative case studies were appropriate tools for improved planning outcomes.

7. No Gaps
While not identified as a theme, it is of note one private sector participant from ACT/NSW said that they did not see any gaps and did not believe that there would need to be a dramatic shift in order meet the challenges (if any) of climate change.

One participant from the private sector noted that issues ‘come and go’ and that climate change was almost a ‘fashion’.

Barriers in the current Australian urban planning system
When they were asked, “What barriers to implementation of climate change adaptation measures do you experience, or anticipate?” all participants were
able to identify at least one barrier in their system, the profession or their organisation.

The barriers identified by participants can be categorised into five themes:

1. Politics and leadership,
2. Knowledge and communication
3. Cost and affordability
4. Roles and responsibilities, and
5. The system.

1. Politics and leadership

Participants identified politics as the major barrier to adaptation. They reported that there were significant vested interests that wished to maintain the status quo and that there was a general fear of risk and of change. As a result planners were either unwilling or unable to push the boundaries of planning. They identified that their departments or companies tended to take the easiest path, which was more often than not a business as usual approach.

Participants identified that Australian politics had done much to undermine confidence in climate science and polarize the debate on how and when to act on climate change. As a result participants identified that both they, and the community, had been left confused and that the state of political discourse meant that it gave people a license to ignore the problem.

2. Knowledge and communication

Participants identified that they felt there was a drop in awareness of the impacts of climate change, as well as significant misunderstandings about the
impacts of climate change within their organisations, and that some planners didn’t believe that climate change was ‘a new and present danger’ that needed to be planned for.

One reason for the lack of knowledge and awareness identified by participants was the lack of professional education about climate change provided to them. Those who chose to participate in educational sessions tended to self-select. That is, participants who were aware of the impacts of climate change tended to seek out professional education about climate change, while those who were not aware of the impacts did not, as climate change is not a compulsory aspect of planning education or professional development.

3. Cost and affordability

Participants identified that if, as a result of climate change, there was a need to move away from traditional post war suburban development, and that as a result there would be additional costs. They identified that these costs would not be able to be absorbed and therefore would need to be borne by the users and government alike. As a result there would be significant pushback from the development and construction industry wishing for a reduction in costs and ‘red and green tape’. Significant lobbying from industry has already seen a significant amount of jurisdictional and political resistance to increased change and regulation at local, state and federal levels.

4. Roles and responsibilities
Participants identified that the health of the population was not seen as their responsibility; rather, the health of the population is the responsibility of the health department.

_Obviously we have less of an impact (on people’s health) than health people (Doctors, nurses, allied health professionals etc.) themselves._

In addition, the very nature of planning means that there is sometimes a conflict between strategic and statutory planning, with one looking to the future with the other writing and interpreting rules for today. This confusion can lead to a tension and a lack of concrete action or poor implementation.

5. System

Participants identified that the planning systems were large and imperfect and that their bureaucratic nature did not encourage adaptation or innovation. As a result participants identified that adaptation measures were often compromised from the outset and that concise and consistent planning was difficult to achieve.

Participants identified that there was limited coordination between agencies and conflicting priorities. Government participants consistently identified their treasury department as a barrier to implementing plans. Treasury tended to favour the most immediately cost-effective measures rather than a planning solution that delivered a whole suite of benefits that sit outside of the traditional planning remit and the three to four year Australian electoral cycles. These measures might initially cost more, but have longer-term benefits including longer-term economic savings.
The size and complexity of the systems the participants were working within also meant that there were lag times of up to five years or more between policy and implementation, meaning that what is considered best practice today may not be implemented for many years. Furthermore with such a lag infrastructure development built under one planning policy is likely to take generations to change. They also identified that it was difficult to coordinate, collect and share information between departments.

Furthermore, participants identified that there often was no clear hierarchy of policies that informed each other. They identified that overarching national and state based climate change plans should inform a state or territory wide spatial plan. This should in turn inform infrastructure, transport and jurisdictional based plans. Such an approach, they felt, would provide certainty to local governments in particular. The development of a state-wide policy would serve to protect local governments from litigation from the development industry and provide them with back up and information to help with their decisions.

Discussion

Within Australia there has been a significant disconnect between planning and public health which needs to be addressed to build resilience at a population level and ultimately reduce the adverse health impacts of climate change (Bambrick et al., 2011, Burton et al., 2014a).

To achieve this, however, it is clear that those planners working in the systems need to overcome the shortcomings that have the potential to inhibit and reduce a jurisdictions ability to adapt climate change. Bureaucracy,
politicization, a fear of risk, poor communication and a lack of partnerships between agencies, researchers and policy makers about the impacts of climate change are all identified shortcomings that pose significant threats to appropriate and nimble responses to climate change adaptation. These shortcomings mirror the findings by Eliasson, where they identified barriers to planning for climate change to include communication problems, conflicting interests, economy (cost), lack of knowledge, low priority, a changed or unclear policy and time (Eliasson, 2000). Today, when coupled with a somewhat limited understanding of its potential health impacts (Burton et al., 2014a), appropriate responses to climate change may be difficult to achieve.

However, a coordinated approach that builds on the identified strengths within the planning system can potentially overcome these shortcomings and provide a platform for not only for climate change adaptation but more broadly for improving the health and well being of the community (Giles-Corti et al., 2014).

The modern day predominant sub-urban form within Australia is similar to that seen in other new world countries such as the United States of America and Canada (Troy, 2004). Large dormitory suburbs driven by the notions that Australia had ‘space aplenty’ and ‘that all residents could enjoy high standards of amenity’ has become norm (Troy, 2004). Serviced in part by public transport but in the main by the private automobile form of development is almost designed for physical inactivity. It is more and more being criticised for its wasteful use of space, high environmental cost and impact upon the waistlines of the population (Frumkin, 2002). Indeed it is estimated that 10 to 15% of Australia’s disease burden could be prevented through interventions
to reduce environmental health risks (Prüss-Üstün and Corvalán, 2006, World Health Organization, 2008) that are exacerbated through poor urban design. In an environment where people who are unwell, over weight or obese are likely to be adversely impacted upon (reference) it is unrealistic to continue to develop Australian cities in their current form.

There are clear co-benefits to planning cities for health which need to be a key considered in the ongoing management of cities (Capon, 2007) and good urban planning that delivers health benefits through urban design is a no regrets approach that will lead to better cities for people (Corburn, 2004). There are significant co-benefits in the development of partnerships between urban planners and public health professionals as well as improved education between both sectors (Capon and Blakely, 2007). The existing urban form can be transformed to improve environmental and health outcomes by encouraging active transport, and increasing density in key locations and along transit routes, thereby improving the health and well being of the community, reducing the impact of chronic disease, reducing risk factors for asthma through air pollution (Environmental Protection Agency, 2001) and greenhouse gas emissions (Bambrick et al., 2011, Saelens et al., 2003, Udell et al., 2014).

The strong levels of governance that the participants identified means that, if decisions to act are made, urban planning is well placed to lead climate adaptation measures by providing localized solutions to identified and emerging problems. Planning regulations that are evidenced based, forthright, clear and logical, encourage private sector investment and innovation and
have the potential to both drive and encourage adaptation solutions (Corburn, 2009).

Multidisciplinary teams that encourage partnerships across agencies and between planning and public health professionals are key to appropriate, cost effective and well informed adaptation measures (Burton et al., 2014a, Frumkin et al., 2008).

Collaborations such as the whole of government approach taken by the Australian Capital Territory government in fighting obesity through it's “Healthy Weight Action Plan” (ACT Government, 2013) are leading the way in intra-government collaboration, showing how government agencies can work towards a single public health goal. While this plan does not specifically mention climate change there are obvious adaptation co-benefits in improving the health and resilience of the community, and by improving professional relationships and increasing the cross pollination of ideas and an increase in awareness of public health issues between departments.

It is clear that there is a limited understanding within the broader community and within the planning profession of the need to plan for the health impacts of climate change on the population (Burton et al., 2014a). To address this short coming, communication between professions and education of planning professionals and the population is needed. While there are current examples of professional development opportunities to increase understanding of climate change, the climate change module offered by the Planning Institute of Australia does not address public health. This lack of professional capacity building is a clear shortcoming but is perhaps relatively easy to overcome.
At a national level within Australia there is a distinct lack of leadership with regard to climate change. Politicians are perhaps motivated to avoid blame for actions, particularly when sections of the media deem a concept to be unpopular (Weaver, 1986), in this instance working towards combatting climate change. As a result, in Australia planning for climate mitigation and adaptation has actively been dismantled or wound back to such a degree that implementation is not possible. For Australia to respond positively to the challenges of climate change conviction beyond partisan short term politics is needed. This leadership will be needed to develop a bipartisan overarching plan that is endorsed by the Council of Australian Governments (COAG) which is both binding and enforceable. This plan will need to feed in to and draw upon local and state adaptation strategies.

Clearly these adaptation plans need to be regularly updated and advised by ongoing research. As such the continued funding of agencies like the CSIRO Climate Flagship (under which this study was funded) and partnerships between university, government and the private sector will be needed. This research needs to be backed up with data and the continued monitoring and its interpretation.

Conclusion
The Australian urban planning system is robust with obvious strengths and with opportunities to plan for climate change. However, the system does need to incorporate a focus the people that cities serve, their citizens. The inflexible bureaucracy coupled with a fear of risk and a dearth of leadership are short comings that must be overcome to adapt to the health impacts of climate change. Further without appropriate professional development, a
refocusing of planning towards people rather than infrastructure and long term bi-partisan political leadership the population with in Australian cities will suffer from, and struggle to adapt to, the health impacts of climate change.

There are no ideal urban environments (Capon and Blakely, 2007), but a failure of Australian urban planners to plan for climate change within cities today represents a missed opportunity to proactively tackle the problem and its associated health impacts. Climate change is not a short-term problem but rather an inter-generational one and therefore must be tackled by planning cities today in ways that build community resilience and allows and encourages future adaptation and mitigation. Such an approach is a no regrets strategy in adapting to the inevitable health impacts of climate change.

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plan? Considering the health impacts of climate change in urban planning in Australia. *Forthcoming.*


# Climate change: Are Australian health systems ready?

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Climate change: Are Australian health systems ready?

Authors’ names

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Key Points

Climate Change will place the Australian health system under pressure.

Barriers to climate adaptation include a lack of knowledge about the potential health impacts, bureaucratic inertia and lack of political commitment.

Potential adaptation measures include expanding the planning horizon beyond five years allowing for longer term planning, educating planners about the health impacts of climate change and a national strategy for responding to the health impacts of climate change.
Abstract

Climate change is likely to widen health inequities and exacerbate morbidity and mortality from existing health disorders. Adaptive responses will need to be taken by the health system to reduce these health impacts.

This paper analyses the perceived strengths and shortcomings of the Australian health system with a view to proactive and responsive service planning in response to climate change.

In this study interviews with senior Australian health service planners (n=16) indicate that the Australian health system is staffed by well-trained professionals and serviced by contemporary medical technology. However, the system is under pressure and struggles to cope with rapid change. Perceived barriers to climate change adaptation are reported to include a lack of knowledge about the potential health impacts of climate change, bureaucratic inertia and a lack of political commitment.

These barriers will limit the ability of administrators to manage the health impacts of climate change. Potential solutions include expanding the planning horizon beyond the traditional five-year view to allow for longer term planning, as well as educating planners about the health impacts of climate change. A national strategy for responding to the health impacts of climate change is also needed.
Background:

The impacts of climate change are anticipated to be wide-ranging, causing significant harms to population health. Increased severe weather events, rising sea levels and reduced agricultural yields will impact communities world-wide exacerbating existing health conditions and inequities via direct and indirect pathways.

There is a growing understanding of the health impacts of climate change within business and public sectors. However there is little evidence that the health system is planning for the health impacts of climate change despite the evidence that adaptation is needed.

The scale of the likely impacts of climate change coupled with the cost of developing new facilities and services means that much of the adaptation within the health sector will need to be undertaken in the context of existing facilities and with modified services. To ensure that the needs of the population are met the core principals of health service planning - equity, accessibility, efficiency, quality and effectiveness - must be at the heart of any adaptation activities. A planned approach that incorporates all levels and types of health service, from primary through to tertiary care, will be required for the health system to respond appropriately. If the Australian health system fails to incorporate climate change into its planning it will miss an opportunity to proactively tackle its health impacts.
This paper explores the strengths and weaknesses of the Australian health system to adapt to climate change as perceived by those who are tasked with planning it.

Methods

The methods used here are summarised in Burton, Bambrick and Friel (2014). The first author undertook in-depth interviews with senior Australian state and territory health service planners from five states and territories (New South Wales, the Australian Capital Territory, Victoria, Tasmania and Western Australia) who were generally planning for health services at a local/regional level. This reflects the structure of the Australian health system which is funded at both national and state/territory levels but where services are administered by state/territory governments. These states and territories have a combined population of 16.4 million people or 71.5% of the Australian population. Specific job titles have not been included in this paper to ensure that contributions remain anonymous. The interview sample (n=16) represents a cross section of senior Australian health service planners. Interviews were semi-structured, using open-ended questions that allowed further exploration of particular issues that arose. Participants knew that their responses were being de-identified ensuring privacy. Each participant was provided with a background paper (available in supplementary material) that summarised existing literature on health and
climate change, including a list of likely health impacts. Participants were asked to reflect on the information provided respond to the questions:

- What are the strengths of your current systems and arrangements for responding to the expected health impacts of climate change?
- What are the gaps that would need to be resolved in order to meet the expected health impacts of climate change?
- What barriers to implementation of climate change adaptation measures do you experience, or anticipate?

All interviews were digitally recorded and the first author transcribed key components of the answers. A matrix of key concepts identifying significant words and themes based on the answers was developed and, using applied analysis, thematically analysed by the first author.

The following definitions were used:

A **strength** is something that participants identified that their organisation had or was doing that would allow them to respond to the potential health impacts of climate change.

A **shortcoming** (referred to in the interview question as a gap) is a response or area that participants identified that their organisation was missing. It is a
problem of omission, of a response not being possible to the health impacts of climate change because something was not being or able to be done.

A barrier is something that participants identified as a more present and real impediment that is acting against appropriate action and preventing their organisation from dealing with the health impacts of climate change.

This study was approved by the University of Western Sydney Human Research Ethics Committee [approval number H9266].

Results:

Strengths in the current Australian health system

Fourteen of the 16 senior health planners agreed that meeting the health challenges of climate change would require specific planning but that the Australian health system has a number of existing strengths that would enable adaptation to climate pressures.

The strengths identified by the health planners were categorised into five broad themes:

1. Investment in infrastructure and technologies

Participants identified that their jurisdictions were willing to invest in the tertiary health industry through infrastructure and proven technologies, and were willing to investigate and invest in new technologies. They observed that this meant that the Australian health system was well placed to address the health impacts of climate change.

2. Responsiveness of existing systems and programs
Participants noted that the Australian health system was well resourced and resilient. They identified that a shift away from acute and hospital-based care to a model centred around preventative, community and primary care was a particular strength.

Participants identified that the program of regular planning cycles and evaluation of health services was a strength that would allow for incremental adaptation to problems such as climate change.

...the health plans are revisited every five years ... as need increases due to climate change, then that cycle of planning will pick that up ...

Participants noted that this strong culture of planning was supported by high-level data capture, analysis and inpatient models based upon collected patient data, epidemiological data, validation testing and the continual feedback of clinicians. Two participants identified that these models should be able to pick up trends and determine if climate change is having an impact upon health services. However another participant commented that the data were weak and fragmented, and that the models had the potential to suppress comorbidities. Further, some participants suggested that trends observed might not be linked to climate change but rather to other trends such as the ageing of the population.

Participants identified that disaster planning was seen to be an important tool in dealing with the health impacts of climate change, noting communication had improved significantly as a result of lessons learned from major disasters.
Partnerships between clinicians, other experts and ‘back of house teams’ were becoming more pronounced, producing better patient results and improving patient flow through the health system. This, when coupled with expanded roles for enrolled nurses and assistants in nursing was seen to be relieving pressure from the more highly trained practitioners, providing more resilience in the system.

One participant identified that there were very strong mental health programs and that this would be an advantage given the likely increase in mental health related disorders stemming from climate change.

3. Well trained, skilled staff

Participants identified that the health system was serviced by a well-trained, highly skilled and well resourced workforce with expertise both ‘at the coal face’ and academically.

4. Awareness of health impacts of climate change

Some participants identified that there was a growing awareness of the health impacts of climate change. One participant identified a greater awareness within their government and this was an enabler of proactive planning for climate change. This, however, may be unique to one state as it was at odds with the views of other participants.

5. Trust

One participant identified that health professionals had the trust of the general population.
Identified shortcomings in the health system

Fifteen of the 16 participants were able to identify at least one shortcoming. The shortcomings identified by participants can be split into four broad themes:

1. A 'health department' problem

Participants identified that, outside of the health department, the broad determinants of health\footnote{\textsuperscript{15}} were not recognised. As a result there were failures in the urban planning, transport and education sectors to address the underlying health issues of the community. Participants recognised that this may be due to the health sector not actively educating and engaging with these sectors.

*It’s about people…everything that anyone does has an influence on people’s health … we as the health sector should be [working] in collaboration with every other sector.*

2. Organisational culture:

Participants identified that while organisational culture could be an enabler, currently it was a weakness. They identified that leadership was key to organisational culture but that there was currently little political commitment to addressing climate change and so it was not a seen as a priority within their organisations.

*I don’t think there is … political commitment at a State level (or) at a district level to investigate the impacts of climate change ... They are*
confronting so many other issues that they see as a higher priority that it’s fairly low down on the list, if on the list at all.

Participants identified that there remained considerable uncertainty about climate change within their professional environment. This led to a belief that there was no need to plan for the health impacts of climate change.

3. System Issues

Participants identified that, as a system under enormous pressure, there is little capacity to deal with shocks such as climate change. They noted that climate change would only serve to exacerbate the existing shortcomings within health services and expose further system weaknesses.

... the gaps are already immense, ... when you have already got gaps that need to be met to fix the current situation then the impact of things like climate change are just going to exacerbate that.

One participant said that there was a lack of coordination between agencies noting that while emergency services were well equipped to deal with emergencies the health department was often unaware of resources and procedures.

While several participants identified knowledge of climate change as a strength, one participant identified that the lack of awareness was the single largest weakness.

The number one gap is ignorance ... people not thinking about it [climate change], building it into their plans.
One participant identified that there was a generational gap between those who accepted the science and believed it was time to act versus those who wished to take a more conservative view.

4. Planning

Participants highlighted that, apart from some broader plans, most notably in Western Australia, there was no strategy dealing with the health impacts of climate change and therefore no consistent approach to planning. To highlight this, one participant identified that of the 11 priority areas across their department, climate change did not fit into any of them.

There isn’t the more basic element of including the potential for global climate change into the actual planning process for either services … or for the construction of the facilities themselves.

Participants acknowledged there were potential significant shortcomings in the data used to inform service planning computer models which had the potential to mask trends.

Barriers to climate adaptation

Participants gave responses that fell into six broad themes:

1. Demographics

Participants noted that the impact of the ageing population would far outweigh any impact of climate change. As a result, they anticipated that more time and resources would be put into tackling these issues rather than climate change.
2. Scepticism

Participants identified considerable scepticism and debate over the health impacts of climate change. They identified that evidence and data that described clinical trends and clearly identified the implications of climate change were not available. However one participant noted that the data were available but they couldn’t convince people of the need to look at it.

*Until we acknowledge that climate change is actually occurring we’re not going to be able to say that we are putting in place adaptation measures to respond to it.*

Two participants identified that they were sceptical about the impacts but identified that, through the use of appropriate data to inform planning, the health system would be able to gradually adapt to anything, be it climate change or the ageing population.

3. Scale and Complexity

One participant said the problem of climate change was so large and complex in scale and uncertainties that it was impossible for government to do it all. They identified the need to work across the community to effectively tackle the problems but that the existing barriers between government and non-government sector needed to be broken down first.

One participant identified initial costs and fear of liability as a potential barrier (e.g. smoking and asbestos) but noted while up front costs may be high if governments were slow to act the burdens of disease may become astronomical.
4. Politics

Participants identified the politicisation of the health system and the impact that short election cycles had on the resultant planning of the health system. They identified the influence of conservative media on climate change policy. As a result, much of the planning was reactive, done for political expediency, reactive and focused on short term political agendas rather than long term strategic goals. One participant said that logical progressive planning ‘gets thrown out the window with the next government.’

They felt that both major political parties showed a lack of leadership and neither had the health impacts of climate change on their political agenda. Therefore there were no resources within departments allocated to it.

5. Systems

Participants identified that there were many system wide barriers. These included: a lack of whole of government strategies; ‘bureaucratic inertia’; vested interests; the misapplication and over reliance on technology; a lack of knowledge; and the loss of legibility and lack of clarity across the system.

Two participants identified a lack of fiscal resources aimed towards climate change adaptation, while two others identified the measurement of health service performance as particular barriers, with treasury departments only interested in ‘bed days saved’ this year.

One participant noted that working in a bureaucracy had its own specific, challenges identifying that decisions made were those of consensus, achieved over a long time, rather than being evidenced based.
One participant identified that the design of Australian cities meant that active lifestyles were being planned out of them. Whilst this factor is external to the health system, it reduced the effectiveness of preventative health approaches.

6. Knowledge and Culture:

Participants identified that the potential problems that climate change could bring were being ignored. This was coupled with medical conservatism, an entrenched medical bureaucracy and therefore a resistance to change. They felt that much of the health system was ‘captured by the medical agenda’ aimed at treatment rather than prevention.

One participant noted that there was a specific knowledge and communication barrier about climate change, noting that current communication and education approaches only reached those interested in the subject.

Two participants identified the lack of data and scenario modelling to be a particular barrier.

One participant indicated that they did not anticipate there would be any barriers in adapting to climate change.

Discussion:

The Australian health system appears to be well placed to respond to the health impacts of climate change because it has many features that lead to high quality patient outcomes. There is a willingness by governments and the private sector to invest in new technology, tertiary infrastructure personnel, service coordination and health outcome evaluation. It compares well with other OECD countries both in terms of outcomes and costs and
provides high levels of universal health care to all citizens. Its potential to deal with climate change is enhanced through a program of regular planning and evaluation that is supported by high-level data capture and analysis. Further, and a well-trained, highly skilled and resourced workforce. The system is further strengthened by the shift in focus from acute models of care to those of prevention, increasing resilience and reducing preventable diseases. However, participants identified that, at least when it comes to dealing with the health impacts of climate change, there are many challenges within the Australian health system which might lead the health system to respond to climate change in an expensive, ad hoc, crisis management manner. This is in part due to a lack of appreciation of the broad determinants of health (external to health services). When coupled with poor organisational culture and systemic issues, the ability to plan appropriately for adaptation to the challenges of climate change is made difficult. Added to this, the politicisation of the Australian health system has meant that political ideology has been favoured above evidenced based policy as evidenced by closure of the Australian National Preventive Health Agency and the termination of the National Partnership Agreement on Preventive Health. Such an approach raises significant questions about Australia’s ability to identify, plan and ultimately meet the impacts of climate change as well as its preventable disease burden.
The short-term nature of health service planning is the principal shortcoming in the current system. The inability to look beyond a typical five year planning cycle means that the health system is not yet engaging in climate change planning. Health service planners should look, ideally, at future needs over the longer term, in decades rather than years. Extending the planning horizon beyond the standard five-year timeframe will allow for long-term strategic refocusing of the health system, thereby reducing risks associated with climate change.

Health service planners use a range of tools and evidence to inform their plans. Computer models based on past patient data inform service planners about the future health needs of communities. While there are studies linking increased hospital admissions in Australia to climatic conditions such as hot days, none of the existing models incorporate climatic data thus potentially limiting their usefulness in planning for climate change. To help support decision making the incorporation of a broader range of parameters, including climatic data into these computer models, will lead to improved longer term planning. In concert, a comprehensive education campaign about the risks posed by climate change to the health system, delivered across the health sector to planners, clinicians and administrators, is needed.

A final tool that could support decision makers is a clearly articulated national strategy that is backed by the Council of Australian Governments (COAG) and successive governments. Such a strategy would identify how the Australian health system, as a whole, will respond to the health impacts of climate change. The priorities articulated in such a strategy would be used by health service planners to inform their plans.
Conclusion:

When compared on a global scale Australia’s health system is likely to be well placed in terms of adapting to climate change. However, a lack of understanding and awareness of the issues climate change will bring combined with the identified shortcomings will, without appropriate planning, hinder Australia’s ability to adapt to the health impacts of climate change.

*We need to identify this (the health impacts of climate change) very strongly as a risk. We need to address risks, we can’t just continue on assuming all will be right and it will all sort itself out.*

While there is potential for the health system to adapt through incremental change there are significant and expensive risks in not planning for known issues. Further, there are lost opportunities and commensurate co-benefits for health if the health sector does not take a leadership role in planning for climate change.¹²

In order to overcome these shortcomings and build on its strengths there are several potential approaches that warrant further exploration. Educating planners about the health impacts of climate change, stretching the planning horizon beyond five years and coupling these with a clearly articulated national strategy that identifies how the Australian health system, as a whole, will respond to the health impacts of climate change are three instruments that should be implemented to start the process of climate adaptation within the health system.
While planning is a key tool in adapting to the impacts of climate change the a politicisation of the health system and a lack of awareness means that no plans are in place. The longer that Australia delays, the greater the cost and negative effects on its citizens.

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7. References

REFERENCES

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8. Appendices

Appendix A

Co-Authors Statement
Request for co-author approval:

Confirmation of contributions made by Mr Anthony Burton to publications relating to work published as part of his Doctor of Philosophy, Urban and health service planning to reduce the health impacts of climate change in Australia: Where are we with using planning as an adaptation tool

I, Professor Hilary Bambrick, confirm that the information summarised in Table 1 below represents a reasonable and accurate description of the contributions made by the doctoral candidate (Mr Anthony Burton) to the paper(s) in which I was involved as a co-author.

Signed: ________________________

Date: _____19 August 2015_________________

Table 1. Contribution of doctoral candidate (Mr Anthony Burton) to the key components of each publication included as discrete chapter in thesis

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| Is enough attention given to climate change in health service planning? An Australian perspective | Global Health Action      | Published | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
| If you don’t know how can you plan? Considering the health impacts of climate change in urban planning in Australia. | Urban Climate             | Published | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
| Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system. | Urban Policy and Research | Accepted pending revisions | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
|---|---|---|---|---|
| Climate change - Are Australian health systems ready. | Public Health Research & Practice | Under review | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
Request for co-author approval:

Confirmation of contributions made by Mr Anthony Burton to publications relating to work published as part of his Doctor of Philosophy: Urban and health service planning to reduce the health impacts of climate change in Australia: Where are we with using planning as an adaptation tool

I, Professor Sharon Friel, confirm that the information summarised in Table 1 below represents a reasonable and accurate description of the contributions made by the doctoral candidate (Mr Anthony Burton) to the paper(s) in which I was involved as a co-author.

Signed: [Signature]

Date: 17/8/15

Table 1. Contribution of doctoral candidate (Mr Anthony Burton) to the key components of each publication included as discrete chapter in thesis

<table>
<thead>
<tr>
<th>Title of paper</th>
<th>Publication (journal/text)</th>
<th>Status</th>
<th>Authors (in order)</th>
<th>Candidate’s contribution</th>
</tr>
</thead>
</table>
| Is enough attention given to climate change in health service planning? An Australian perspective | Global Health Action       | Published | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
| If you don’t know how can you plan? Considering the health impacts of climate change in urban planning in Australia. | Urban Climate              | Published | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
| Can our urban planning systems plan for the health impacts of climate change? Strengths and shortcomings of the Australian system. | Urban Policy and Research | Accepted pending revisions | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
| --- | --- | --- | --- | --- |
| Climate change - Are Australian health systems ready. | Public Health Research & Practice | Under review | Burton AJ, Bambrick H and Friel S. | - Developed and designed the paper  
- Compiled data  
- Was primary author of the paper |
Climate Change is the greatest challenge that humans will face in the 21st century. In Australia, climate change is expected to have an impact across the environmental, economic, political, physical and social health of the community. Furthermore, the impacts of climate change will not occur all at once and nor in a predictable order, rather some of these impacts will become evident well before others. Some impacts will occur via quite direct and easily measurable pathways (e.g. heatwaves and death\(^1\)); others will occur via indirect pathways entailing disturbances in natural ecological systems (e.g. mosquito population range and activity\(^2\)), failures of the urban planning system (e.g. inadequate public transport, employment, education or recreation opportunities\(^3\)) or through changes in economic circumstances such as disruption to livelihoods and communities (e.g. mental health consequences of prolonged droughts and regional drying trends and changed economic capacity as a result of climatic changes\(^4\)).

The types and intensity of impacts will vary according to region and unevenly affect population sub-groups, reflecting the influence of environment, socioeconomic circumstances, infrastructural and institutional resources, underlying physical vulnerabilities such as age and chronic disease, and local preventive (adaptive) strategies. Population sub-groups from the most vulnerable parts of the communities will be those most affected by the threats associated with climate change.

Rather than heralding new diseases, climate change is likely to amplify many existing disorders and health inequities; and health system responses will need to be considered mostly in the context of existing health services\(^5\).
Already apparent: risks amplified by climate change
- Uptrend in the average annual number of heat days and deaths, hospitalizations; and
- Increase in the number and severity of bushfires and associated injury, death, respiratory hazard, and mental health consequences.

Current probable impacts: but not yet clearly identified
- Rise in foodborne diarrhoeal disease;
- Altered air quality: ozone formation, aeroallergens;
- Mental health impacts, particularly noticeable in some rural regions but becoming more apparent in urban areas; and
- Vector-borne infections: dengue, Ross River virus, Japanese encephalitis, and chikungunya.

Predicted future health impacts
- Extreme weather events: injuries, deaths, infectious disease, depression;
- Water shortages: impacts on food yields, hygiene, recreation;
- Thermal stress in outdoor workers: injuries, organ damage; and
- Physical/behavioural health impacts in rural and potentially urban communities.

Principles of health system responses to climate change

Flexibility
- Location of services;
- Scale of response; and
- Type of services and by whom they are delivered.

Strategic allocation of resources
- Builds on existing services;
- Targets vulnerable regions and populations; and
- Equitable and just access.

Robustness
- Resilient infrastructure;
- Consistent services; and
- Sustainable workforce.
References


7. enHealth. Assessment of vulnerability for Australia's health system, 2010
Questionnaire questions

• What do you see as the medium to long term health impacts of climate change that your organisation will have to respond to?
  o Vector-borne disease and/or zoonoses
  o Heat stress
  o Air pollution and aeroallergens
  o Needs of particular vulnerable populations
  o Food availability
  o Mental health
  o Aged care services demand
  o Food quality and safety
  o Water quality and/or safety
  o Severe weather event e.g. bushfire, storm, sea surge (other than heat events)
  o Health services demand

• What population groups do you expect to be affected by these impacts?
  o Vulnerable new arrivals and refugees
  o People with limited education or literacy
  o People living in rural communities or disadvantaged communities
  o Children, particularly those at risk of long-term disadvantage
  o Women
  o Aboriginal and Torres Strait Islander peoples
  o Older Australians
  o People with limited social networks
  o People employed outdoors
  o Tourists
  o Jobless families, people who are unemployed and low skilled adults who are at greater risk of unemployment
  o People with pre-existing medical conditions, including mental illness or disability
  o Homeless people
  o Other (please specify)

• What are the workforce implications (health care or other) for the adaptation activities in your area of interest?
  o For example, is the workforce large enough?
  o Will new skills and training be required?
  o Are there any related industrial or occupational health and safety concerns such as heat or disease exposure?

• Are you developing, or do you currently have, any adaptation action plans or interventions related to climate change and human health? If yes please provide details of the adaptation action plans or interventions related to climate change and human health that you are developing or using. This may include one or more strategies such as heat action plans or general climate change adaptation plans of which human health is one component. Please provide the names of strategies/plans, their scope and any collaborators in addition to any other information you are willing to provide.
• If you have commenced implementing a plan, what lessons of relevance to the health or ageing sectors have you already learned that might be valuable to share with others?
• What are the strengths of your current systems and arrangements for responding to the expected health impacts of climate change?
• What are the gaps that would need to be resolved in order to meet the expected health impacts of climate change?
• What barriers to implementation of climate change adaptation measures do you experience, or anticipate?
• What collaborative or administrative arrangements do you have in place for working with other sectors on adaptation to address the health impacts of climate change?
Planning for Climate Change: a study of the understanding of the potential health impacts of climate change amongst urban and health planners in Australia.

Background Information and Questionnaire

Climate Change is the greatest challenge that humans will face in the 21st century. In Australia, climate change is expected to have an impact across the environmental, economic, political, physical and social health of the community. Furthermore, the impacts of climate change will not occur all at once and nor in a predictable order, rather some of these impacts will become evident well before others. Some impacts will occur via quite direct and easily measurable pathways (e.g. heatwaves and death\textsuperscript{236}); others will occur via indirect pathways entailing disturbances in natural ecological systems (e.g. mosquito population range and activity\textsuperscript{36}), failures of the urban planning system (e.g. inadequate public transport, employment, education or recreation opportunities\textsuperscript{217}) or through changes in economic circumstances such as disruption to livelihoods and communities (e.g. mental health consequences of prolonged droughts and regional drying trends and changed economic capacity as a result of climatic changes\textsuperscript{217}).

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• Resilient infrastructure;
• Consistent services; and
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Appendix C

Professional experience
The candidate has worked in a professional capacity within both urban planning and health service planning. He has worked for the ACT Government as an urban planner and as a health service planner before working in private practice. He has since worked with the Heart Foundation as a key urban planning advisor and advocate. His experience within these fields, in part, shaped the nature of the project, the hypothesis and research objectives.