Health Impact Assessment

Greater Christchurch Urban Development Strategy Options

2006

Canterbury DHB
District Health Board
Te Poari Hauora o Waitaha

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Foreword

![PHAC - Public Health Advisory Committee - Te Rōpū Tohutohu i te Hauora Tūmatanui. A sub-committee of the National Health Committee](logo)

March 2006

In 2004, the Public Health Advisory Committee (PHAC) published guidance to policy makers1 on how to assess policies for their potential impacts on health and wellbeing - health impact assessment (HIA). As Chair of PHAC, it is my pleasure to write the foreword for this report on a pioneering HIA project that puts this guidance into practice for the improvement of the health and well-being of the Greater Christchurch community.

This report also plays an important part in building capacity and knowledge of HIA in New Zealand. I hope it will become influential not only through its relevance to the Greater Christchurch Urban Development Strategy, but also through demonstrating how HIA can inform policy development so as to achieve better health outcomes for all communities in New Zealand.

The HIA, on two options put forward by the Greater Christchurch Urban Development Strategy, is the first in New Zealand that assesses the links between urban design, health determinants, and health outcomes at this level of policy. It shows why one of the options offers the likelihood of better health outcomes than the other. But of even more importance, the report identifies some of the key factors that will affect the health of citizens whichever option is chosen. Its usefulness corroborates a growing body of international evidence on the significance of undertaking HIA for local and central government bodies.

Intersectoral collaboration is a key theme in a number of government policies. It is of great importance to public health and for HIA in particular. HIA makes clear the connections between health and the social and economic influences on health, as well as identifying the consequent key stakeholders who need to participate in the policy process to improve health outcomes. The involvement of a wide range of stakeholders in this HIA process is one key to its success.

Throughout this report it is evident that those who participated gained immensely from the process. Not only did they find it enjoyable to broaden their perspective on the role of urban design in achieving good health for the community, but they were also inspired by the opportunities presented through the necessary collaboration between a range of sectors and stakeholders.

The examples contained in this report, and the impacts on health detailed, can be seen to be both broad and complex. However, the recommendations provided are not only essential and sustainable; they are achievable.

Geoff Fougere

(Chair, Public Health Advisory Committee)

March 2006

On behalf of the Greater Christchurch Urban Development Strategy (UDS) Forum, I warmly welcome the Health Impact Assessment for its ability to weigh up the potential health and social effects of policy on people.

Of concern in this report is the potential impact of future Greater Christchurch UDS decisions on the Greater Christchurch's most vulnerable communities. I therefore thank the authors of this report for their groundbreaking work to help inform future decisions made as part of the development of the Strategy.

This Health Impact Assessment will help develop those working on the development and implementation of the Strategy to better understand their role in improving health outcomes for all the people of Greater Christchurch. It will be central to ensuring that improving the health of the community stays firmly on the radar of the UDS, and will be influential in developing better working relationships across a whole range of disciplines - many of whom may never have worked together had it not been for this Health Impact Assessment.

The Health Impact Assessment for the Greater Christchurch Urban Development Strategy was received by the Greater Christchurch UDS Forum at its meeting of 5 December, 2005.

Kind regards

Bob Parker
Chair of the Greater Christchurch Urban Development Strategy

Executive Summary

A health impact assessment was undertaken on the Greater Christchurch Urban Development Strategy by the Canterbury District Health Board and the results were presented to the Greater Christchurch Urban Development Strategy Forum (The Forum) at its December 2005 meeting. This report formally documents the rationale behind performing a health impact assessment on the strategy, the process involved and the conclusions reached.

A health impact assessment is a formal process that aims to predict the potential effects of policies on the health and wellbeing of the affected populations. A rapid health impact assessment incorporates input from readily available sources including relevant literature, key informants and the community – primary research was not undertaken as for a comprehensive assessment. The Greater Christchurch Urban Development Strategy (UDS) is a collaborative project involving four district councils and Transit NZ. The purpose of the strategy is to ensure that population growth in the region is planned for and managed to ensure that the necessary changes improve the overall quality of life rather than detract from it.

This health impact assessment (HIA) had two workstreams. The first workstream assessed the potential effect on health outcomes of the UDS Concentration option (A/B) against the Business as Usual option. Concentration was the preferred option by the majority of respondents from the community consultation. Implicit in the Public Health Advisory Committee (PHAC) HIA process is the practical incorporation of Treaty of Waitangi principles into everyday life. A key output of this HIA is the development of an ongoing project around engaging with local Māori, the second workstream.

The following recommendations were made:

AIR QUALITY

- Develop cross-sectoral collaborative project based working groups. These projects should aim to:
    - Improve the capacity to monitor the links between air quality and relevant health outcomes;
    - Sponsor energy efficient housing;
    - Sponsor public and active transport;
    - Advocate to upgrade the building code; and
    - Reduce the reliance on solid fuel burners while ensuring availability of affordable & healthy alternative heating options.

WATER QUALITY

- Protect aquifer catchment zones;
- Integrate water management with urban planning;
- Water resource planning and management should be supported by a steering group including Ngai Tahu, public and private sectors, with a mutually agreed process;
- Adhere to sustainable development models for water management including monitoring and accounting for predicted climate changes; and
- Improve monitoring and reporting of water quality and quantity in the greater Christchurch area.

SOCIAL CONNECTEDNESS

- Facilitate the development of community spirit *within* neighbourhoods e.g. by thoughtful location of schools;
- Ensure an efficient public transport system that connects people of all incomes to their neighbourhoods and the wider city;
- Design for a 'sense of place' using elements of local identity and belonging e.g. indigenous planting and public art;
- Incorporate universal design principles when planning and designing public spaces to allow access for all people;
- Plan a range of housing types (size and price) that reflect and promote community diversity; and
- Involve residents in the design of new communities.

HOUSING

- Profile and utilise current New Zealand housing research to inform planning;
- Ensure affordable housing options for all;
- Strengthen building codes locally to build quality housing stock that is highly energy efficient; and
- Introduce universal design principles into all new buildings to reduce inequities in access.

TRANSPORT

- Actively promote active transport – particularly by cycle and on foot;
- Promote use of public transport;
- Reduce reliance on private cars – particularly in the centre of Christchurch and towns;
- Incorporate, road, footpath and cycleway design strategies that maximise road safety;
- Minimise adverse effects on communities when constructing and developing arterial roads;
- Incorporate planning for Peak Oil into transport policy and planning; and
- Monitor impacts of transport on health outcomes (e.g. emissions, injury rates).

ENGAGEMENT WITH MĀORI

- Incorporate findings from Māori research on low impact Māori urban design in the UDS.

Conclusions

Urban design has a strong influence on health outcomes. Quantitative evidence to support the link between the design of an urban area and a particular health outcome can be difficult to identify. This reflects the complexity of the relationship between urban design and people, and the relatively recent development of urban design issues as an area of research[*].

Health inequalities are strongly linked to socio-economic inequalities. In New Zealand, inequalities have been widening over the last twenty years. Informed urban design can assist in the reduction of socio-economic inequalities, however, the possibility of urban regeneration increasing social inequality is real. "The challenge for urban developments is to achieve improvement for the whole society, while enhancing the position of the poorest"[2].

The built environment is a complex eco-system. No problem exists in isolation and neither does its solution. For optimal health outcomes the Urban Development Strategy must identify and consider the range of health determinants in relation to the whole urban environment.

This HIA confirms that 'Concentration' is more likely than 'Business as Usual' to result in good health outcomes. Implementation of the recommendations in this HIA is more achievable and sustainable under the concentration option.

This HIA was a learning process for all parties. Overwhelming feedback from those who participated in this HIA was that it was an educational, enjoyable and valuable process that broadened their perspective on the role of urban design in achieving good health for the community.

* Public Health Advisory Committee A guide to health impact assessment: a policy tool for New Zealand. Wellington. New Zealand Government, 2004.
www.nhc.govt.nz/PHAC/publications/guidetohia.pdf

The HIA working party recommends to the Greater Christchurch Urban Development Strategy Forum that:

1. Cross-sectoral working parties are established for selected health determinants to provide advice to the development and preparation of the strategy.

2. Health impact assessments for selected health determinants should be carried out with adequate resourcing.

3. All staff participating in the Greater Christchurch Urban Development Strategy should be trained in the principles of health impact assessment.

4. Health impact assessment should be incorporated into the development and analysis of policy for the UDS.

This Health Impact Assessment recommends that 'Concentration' is more likely than 'Business as Usual' to result in better health outcomes.

What is a Health Impact Assessment?

Health Impact Assessment or HIA is a formal process that aims to predict the potential effects of policies on health and wellbeing. Project level HIA is often undertaken in New Zealand within the context of the Resource Management Act. Policy level HIA is a relatively new field and is rooted in the idea that health at a population level is often impacted on by policy decisions made in sectors outside of the 'health' portfolio, such as those relating to transport or the economy. The focus of policy level HIA is on how a particular policy affects actual health outcomes for people and the determinants of those health outcomes.

The HIA methodology is explicitly based on a value system in which redressing health inequalities is seen as fundamental. A primary objective of performing an HIA is to minimise health inequalities and to create equal opportunities for improving and maintaining good health. In New Zealand, the PHAC HIA guide has a specific focus on ensuring that the principles of the Treaty of Waitangi (Partnership, Participation and Protection) are addressed in the policy process.

An HIA does not attempt to make the necessary policy decisions, but highlights areas of particular policy which may impact on the health of a population. It is recognised that sometimes policy makers may choose to make decisions which are not ideal in terms of health, though they meet the interests of other community or corporate goals. The HIA process is based upon ensuring that where a trade-off is involved, the decisions should be transparent and the impacts on health readily understood by everyone affected by the decisions.

The four key stages in the process of HIA are screening, scoping, appraisal and reporting and finally, evaluation. There are four main inputs into the appraisal stage these are results from community consultation, relevant literature reviews, input from selected key informants and stakeholders, and recognition of pertinent constraints on the policy e.g. there may be legislative or environmental boundaries on what is possible.

An HIA was carried out on a strategy to manage urban development for Greater Christchurch.

What is the Greater Christchurch Urban Development Strategy?

The Greater Christchurch Urban Development Strategy (UDS) is a community based project to prepare a strategic plan to manage the impact of population growth and change within the Greater Christchurch area. It is a collaborative project involving the district councils of Selwyn and Waimakariri, Christchurch City Council (CCC) (including the former Banks Peninsula Council), the Regional Council known as Environment Canterbury, (ECan) and Transit New Zealand. Representatives of these groups meet regularly with a cross section of local leaders from business, the community and government as the "Greater Christchurch Urban Development Strategy Forum". The Forum is guiding the process of developing the Strategy.

The need for an Urban Development Strategy is based on a number of premises, some of which are:

- By 2041 approximately **120,000 more people** will have moved to the greater Christchurch area bringing the total population within the vicinity of 500,000;
- This population will be **ageing**. By 2021 20% of the population will be aged 65 and over;
- **Water use may increase**. Currently the greatest residential use of water is for activities such as watering gardens and washing cars;
- People will be **reliant on cars** for transport. By 2021 traffic growth will increase by 40-50%; and
- The population increase will generate **demand for more infrastructure** with its associated costs.

The purpose of the UDS is to ensure that the projected population increase is planned for and managed so changes to the community improve overall quality of life rather than detract from it.

More about Health Determinants

There is clear evidence that the health of our community is primarily determined by social, cultural, economic and environmental influences, not by health sector services or individual behaviours [3]. The effects of some health determinants on health outcomes may not be immediately obvious because they appear to be quite distantly related.

An example of how a health determinant may affect health is shown in the figure below. There is an explicit link made between a change in policy (introducing market rents to state housing) and direct health outcomes.

Figure 1 Possible causal pathways between a housing policy change and adverse health outcomes
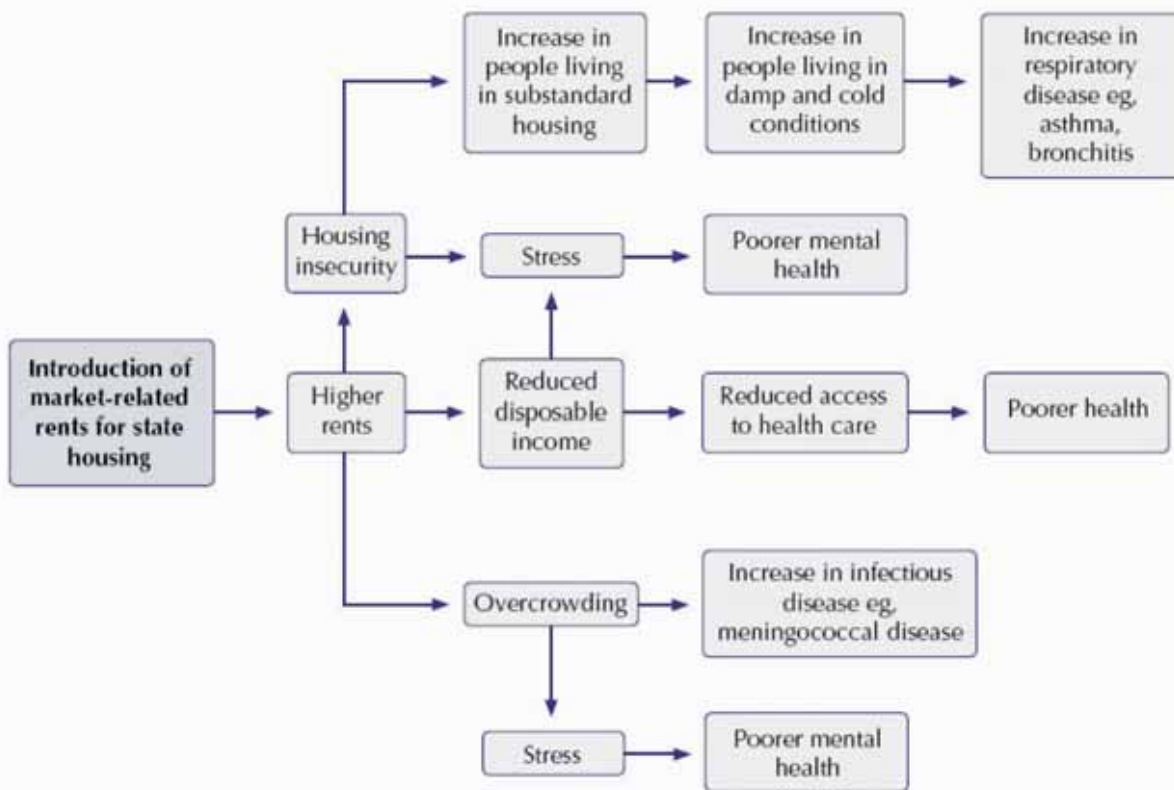
(from PHAC HIA guide [4])

In general we are familiar with the concept of causes of death; for example: 'My father died of lung cancer'. The 'Looking Upstream' report [5] asks the question: 'what was the cause of the lung cancer? We know the vast majority of lung cancers are caused by tobacco use and the evidence available suggests that in New Zealand tobacco use caused 5000 deaths in 1997.

Martin Tobias, the author of 'Looking Upstream', was able to make estimates of the number of deaths attributable to particular risk factors in New Zealand in 1997. Two examples given in the report are:
  • 8500 deaths were attributed to poor diet. A subset of this was the 1600 deaths attributed to inadequate vegetable and fruit consumption.
  • 2600 deaths were attributable to inadequate physical activity.

Estimating the deaths attributable to risk factors is very complex. The assumptions made in the 'Looking Upstream' report tend to suggest that the numbers of deaths attributed to specific risk factors are likely to be under estimated.

The top ten causes of death by risk factor in NZ in 1997 were diet, tobacco, deprivation, cholesterol, blood pressure, Body Mass Index, insufficient physical activity, (pre) diabetes, infection and inadequate vegetables and fruit. Most of these risk factors are modified by the environment we live in. For example, if our environment encouraged physical activity in ten minute bursts three times a day, it is likely that body mass indexes would drop, leading to decreased cholesterol and blood pressure and less pre diabetes with associated reductions in illness and death [5].

The Looking Upstream report included only risk factors (or 'health determinants') that met the following criteria:
- high impact;
- potential to be modified;
- well-established link to (one or more) important health conditions; and
- necessary data available to estimate attributable mortality.

Health conditions (disease and injury outcomes) were included based on the following criteria;
- high associated fatality;
- well-established link to (one or more) important risk factors; and
- necessary data available to relate outcome to exposure.

Details on the methodology used are clearly laid out in the report. Table 1 below is a modified version of Table three in 'Looking Upstream' and shows selected risk factors which are strongly linked to specific health conditions.

Table 1 Risk Factor – Health Condition pairs (modified from Table 3, 'looking Upstream' report)

Risk factor group	Risk factor (Health determinant)	Health conditions causing death
Biological	Cholesterol (total)	Ischaemic Heart Disease (IHD), ischaemic stroke
	Blood pressure (systolic)	IHD, stroke
	Body Mass Index	IHD, stroke, diabetes, cancers
	(Pre)diabetes	Diabetes, IHD, stroke, renal failure
Behavioural	Diet (total) Inadequate vegetable and fruit intake	IHD, stroke, diabetes, cancers IHD, stroke, cancers All causes
	Insufficient physical activity	
	Tobacco	IHD, stroke, Chronic Obstructive Pulmonary Disease (COPD)lung cancer, other cancers
	Violence	Suicide (including undetermined intent), homicide (assault and abuse)
	Radiation (UV)	Melanotic and non-melanotic skin cancer
	Air pollution	All causes (mainly IHD, COPD, asthma)
	Occupational illness or injury	Occupational diseases, work-related diseases, injuries at workplace, injuries in traffic at work, commuting injuries
Socio-cultural	Deprivation	All causes

Urban Design / Urban Form

> In countries across the world, it is the socially disadvantaged groups who experience poorer health, greater exposure to health risks and poorer access to health services. Inequalities in the distribution of, and access to, material resources including income, education, employment and housing are accepted as the key causes of health inequalities. (paraphrase)
>
> Ministry of Health (2002)[9]

Urban design as a health determinant was first formally identified in western society by Chadwick in his 1842 report: 'On the sanitary condition of the labouring population of Great Britain' [6]. This report led to the Public Health Act of 1848 and from there to urban planning related initiatives such as sewerage systems and waste collection [7].

With the development of scientific knowledge in the areas of infectious disease and technological 'fixes', such as vaccinations, the focus of health specialists moved away from community engineering and urban design to a model based on medical principles. While considerable progress has been made to control communicable diseases the major threats to health in the developed world are now in the areas of non-communicable disease (e.g. lifestyle diseases such as obesity related illnesses) and illness caused by environmental degradation.

Once again governments and public health authorities are considering the critical role that urban design plays in determining population health. The year 2005 was the 'Year of the Built Environment'. The NZ Ministry for the Environment released several documents on urban design during the year. In a 'summary of the value of urban design' [8] Marion Hobbs, Minister for the Environment, states that 'urban design matters because it has the potential to help New Zealanders live more sustainably, happily and healthily.'

"urban design matters because it has the potential to help New Zealanders live more sustainably, happily and healthily."

More about Health Inequalities

One of the central aims of the HIA is the reduction of health inequalities. Specifically, HIA seeks to reduce health inequalities by "…ensuring that policies do not exacerbate or continue existing inequalities" [4]. While acknowledging that the possibility of completely eliminating health inequalities is still debated, Woodward and Kawachi [10] find evidence that they can at least be reduced. They offer the following four arguments for why health inequalities should be reduced:

- Inequalities in health are unfair, or unjust;
- Conditions that lead to marked health disparities are detrimental to all members of society;
- Disparities in health are avoidable to the extent that they stem from identifiable policy options exercised by governments; and
- Public health programmes that reduce health inequalities can also be cost effective.

Patterns of inequality are well recognised within Canterbury and across New Zealand [11], with patterns in health status affected by socio-economic status, ethnicity, gender and geographical residence [9].

Ethnic identity forms a particularly important dimension of health inequalities [9]. Māori and Pacific Islands' children are more likely to live in highly deprived areas in comparison to children of other ethnicities [12]. On average, Māori have the poorest health status of any group in New Zealand. Forty-four per cent of all Māori in the South Island live in Canterbury. About 30% of Māori in Canterbury have levels of deprivation of NZDep2001** of 8, 9 or 10 (15% for Pakeha) [12]. In addition, there are proportionately more Pacific Islands' people living in the more deprived areas of the South Island than non-Pacific Islands' people. Pacific Islands' people are also more likely than non-Pacific Islands' people to be admitted to hospital for diseases of the respiratory system, skin and subcutaneous tissue and conditions related to pregnancy.

** Deprivation is measured in New Zealand using nine indicators They are: lack of a telephone, dependence on a means tested benefit, unemployment, income below a certain level, lack of a car, single parent families, rented rather than owned homes, lack of educational qualifications, and higher numbers of occupants per bedroom. The country has been divided into 36,800 areas and graded from 1 to 10 where 10 refers to the poorest areas.

Nineteen per cent of the population in Canterbury live in areas with the most deprived NZDep01 scores, though Canterbury has relatively few areas of deprivation in comparison to other District Health Boards [12]. For the Canterbury region, people who are socio-economically deprived are hospitalised at twice the rate of less deprived people. Many of the causes of hospitalisation are preventable through primary care [12]. In addition, the percentage of people who live in deprived circumstances is higher in Christchurch than in the surrounding rural areas [12].

Within Christchurch there are clear geographic patterns of deprivation. Areas of high deprivation run in a band from west to east through the centre of the city. These areas include people on low incomes, with low levels of educational attainment, high concentrations of Māori and Pacific peoples, sole parent families, refugees and recent migrants. These areas also have high levels of unemployment, low home ownership and high numbers of rental properties, particularly Housing New Zealand homes [13]. The four area units with the highest levels of deprivation include Aranui, Linwood, Phillipstown and Waltham [13].

Many of the determinants of health examined in this HIA have varying impacts upon different groups within the community. A recent study concludes that people aged 15-34 are more likely to be exposed to particulate pollution than other age groups and that those who live in the more deprived areas of Christchurch experience higher mean annual levels of air pollution and more days that exceed the recommended 24 hour pollution thresholds. Importantly, "The unequal exposure to air pollution between advantaged and disadvantaged groups provides a direct causal explanation for the socioeconomic gradient in ill health, particularly for those diseases related to air pollution such as asthma and lung cancer" [14].

It is also suggested that higher levels of relative disadvantage, poorer provision of medical care, sub-standard housing, reduced access to facilities and adverse psycho-social conditions make disadvantaged populations more susceptible to the effects of air pollution upon health. Finally, socio-economic differences mean that disadvantaged communities have a higher susceptibility to predisposing health conditions such as diabetes and asthma, which renders them more sensitive to the effects of air pollution" [14]. In a particular example, Māori tend to have higher rates of respiratory health problems than non-Māori and are a younger population. Māori are disproportionately represented in lower socio-economic groups. These three factors mean that Māori as a population group are more likely to be adversely affected by poor air quality than non-Māori.

The migrant community, people without vehicles, older people, people on low incomes and people with disabilities can be particularly vulnerable to social isolation.

With respect to housing, differences in housing quality have been linked to variations in health and well-being. As one study suggests, newly built housing is most likely to be owner occupied while older, uninsulated, less well maintained housing is more likely to be rented to people of lower socio-economic status. The impact of inadequate housing on health is likely to be even more marked for those on lower incomes.

Importantly, those who are economically or socially deprived are more likely to be Māori and Pacific Islands' people. "Māori live on average 10 years fewer than non-Māori as a consequence of greater socio-economic deprivation; Pacific peoples live on average eight years less than Non- Pacific and non-Māori. Poor housing, along with other socio-economic factors, may be part of the explanation for this critical disparity in our society" [15].

For the purposes of this HIA, the existence of health inequalities within Greater Christchurch, are critical areas for study. As argued by McCarthy "The challenge for urban development…is to achieve improvement for the whole society, while enhancing the position of the poorest" [2].

"The challenge for urban development…is to achieve improvement for the whole society, while enhancing the position of the poorest" [2].

Why do a HIA on the UDS?

Health Impact Assessment at the Policy level is a relatively new tool. In 1998, amongst other recommendations the National Health Committee (NHC) recommended that the Minister of Health:

- Require the Ministry of Health to review its current opportunities for input into the policies of other sectors and obtain Ministerial approval for prioritising this work, collecting evidence and producing high quality advice from a health perspective;

- Require the Ministry of Health to examine the effect of changes in the funding and provision of basic utilities such as water, sewerage and electricity on the health of the population, especially lower socioeconomic groups, and continue to monitor further changes;

- Ensure that health considerations influence central government policy on the funding and provision of these basic utilities;

- Urge local authorities to consider explicitly the health impact of changes to the provision of recreational and environmental services, especially the effect on low-income groups; and

- Require the Health Funding Authority to examine further opportunities for effective collaboration with local authorities within programmes such as Healthy Cities and Healthy Communities [3].

The New Zealand Health Strategy was released in 2000. Its first Goal is 'A healthy social environment' and the first objective of this goal is that public policies should be assessed for their impact on health and health inequalities [16]. In 2004, the first edition of 'A Guide to Health Impact Assessment: A Policy Tool for New Zealand' was released by the Public Health Advisory Committee (PHAC) [4].

"HIA is a practical aid to help facilitate better policy-making that is based on evidence, focused on outcomes and encourages collaboration between a range of sectors and stakeholders"

PHAC believes that "the main purpose of HIA is to enhance the policy making process. It is a practical aid to help facilitate better policy-making that is based on evidence, focused on outcomes and encourages collaboration between a range of sectors and stakeholders. The use of HIA is part of wider moves towards sustainable development, cross-sectoral collaboration and a 'whole of government approach" [4].

Five key reasons for doing a Health Impact Assessment (HIA) are:

- To improve health and reduce health inequalities;

- To help policy makers use a sustainable development approach. (This is linked to the Local Government Act of 2002 which requires local bodies to use a sustainable development approach and to consider the well being of their communities);

- To help policy makers incorporate evidence into policy-making;

- To promote cross-sectoral working; and

- To promote a participatory, consultative approach to policy-making.

Despite clear government level support for policy level HIA very few have been undertaken in New Zealand. The Canterbury District Health Board identified the Greater Christchurch UDS as an opportunity to contribute a HIA to a significant policy planning process which will impact on many important health determinants. The final form of the UDS will have a major influence on the health and wellbeing of the people living in Greater Christchurch.

How we did this HIA

A HIA can be conducted 'comprehensively' or 'rapidly'. A comprehensive HIA may involve collecting new research information over a period of years. A rapid HIA uses readily available information from practitioners and literature reviews.

This HIA was conducted as a rapid HIA

This HIA was conducted as a rapid HIA. A HIA at this level of policy making had never been conducted before in New Zealand and provided a learning opportunity regarding the practical application of the HIA process locally. As part of the development of the HIA, a process evaluation was undertaken throughout (See Appendix A) and an impact evaluation is planned.

Screening and scoping the HIA

A rapid screening to determine whether the UDS was suitable for an HIA was carried out by a small group from Community and Public Health (CPH) the public health branch of the Canterbury District Health Board and Christchurch City Council (CCC) including the former UDS Project Leader. It was agreed that the UDS was an ideal policy for an HIA and planning for an HIA was begun.

A screening/scoping workshop was carried out on 29 June 2005 with over 30 council and public health staff attending. (A full report is available from the authors). The UDS will influence other health determinants beyond those chosen for this 'first round' HIA, but given the limited time and resources available only six key determinants were selected to undergo the HIA process. The six determinants of health chosen were:

1. Water quality
2. Air quality
3. Waste management
4. Social connectedness
5. Housing
6. Transport

A steering group, comprising representatives of CPH, CCC and UDS team, was set up to oversee the HIA. This group, in collaboration with the participants of the initial screening and scoping workshops, developed overall goals for the HIA:

GOAL
- To assist the UDS team by providing information on how to improve the health and well being of the community and to reduce inequalities in health throughout the greater Christchurch Region.

AIMS
- To provide evidence for decision-making about the link between urban development and health; and
- recommendations to increase positive and decrease negative inputs.

OBJECTIVES
- To strengthen partnerships working between sectors;
- To ensure appropriate participation of the community including those that are vulnerable;
- To involve Māori in all levels of the HIA process; and
- To build capacity and knowledge of HIAs.

Since Māori have the poorest health status of any group in New Zealand, engagement with Māori was identified as an essential component of this work. The steering group agreed that an attempt to establish a robust and replicable Māori consultation process should be made as part of the HIA. This was seen as a key outcome and was planned as a separate piece of work. The timelines for this project and for the HIA itself were not concurrent. The development of a local Māori consultation process incorporating Tangata Whenua and manuhiri will be ongoing.

In summary two strands of work were developed for the HIA:

1. HIA on the six selected determinants of health, and

2. Engagement with Māori.

Appraisal and workshops

Consultation with the community is a vital part of a policy level HIA. Time and budgetary constraints meant that we were unable to do consultation specifically relevant to the HIA but pertinent sections of other consultation processes, namely the UDS consultation, the various local government community outcomes consultations and Environment Canterbury's 50 year Community Visioning Report were referred to. The results are discussed below.

Four workshops were held with key stakeholders on the first four health determinants as listed above. Workshop participants were mostly from the councils and CPH, although Environmental and Scientific Research (ESR), Ngai Tahu, Landcare Research, Healthy Christchurch and other local organisations both public and private were represented. (A list of participants is in Appendix B). Most participants were from the health sector or from the community side of councils, and not usually involved in the planning issues addressed in this HIA.

An information technologist carried out a highly selective literature search and a rapid literature review was conducted on all of the selected health determinants. Time did not allow for workshops on Housing and Transport, so the reports on these determinants are based on literature review only.

Timelines were very tight and resources (staff time, funding, and training) were stretched, particularly during May-August 2005 due to the Christchurch Legionnaires outbreak (19 notifications including 3 fatalities) This outbreak diverted significant resources from the HIA project. The most significant impact of the outbreak on this project was that the report on waste management could not be completed in the time available.

> *"The most significant impact of the outbreak on this project was that the report on waste management could not be completed in the time available."*

Evaluation

A process evaluation was undertaken beginning at the initial scoping meeting on 29 June. The results of this are reported in Appendix A. A fuller report is available on request.

The two policy options compared

For the HIA an attempt was made to compare two of the four policy options given in the UDS options document. 'Business as Usual' was compared with the 'Concentration' option (a mix of Option A and B), the two most popular options in the consultation process.

Business as Usual

Business as usual continues current trends of development spreading out around the Greater Christchurch area in new subdivisions with some housing in urban renewal developments. Councils would continue to pursue independent growth strategies. This would result in around 4920 hectares, equivalent to 26 Hagley Parks of farmland and open space, being used for new housing. Walking, cycling and public transport would be a poor alternative to driving, with congestion expected to increase by 320%. Business as usual would result in an increase in water demand and infrastructure costs would be higher than for other options. New developments outside Christchurch and the large towns will have little in the way of community facilities when first developed as residents have to travel further to community facilities such as schools, recreation centres and libraries. While well-planned development can breathe life into neighbourhoods and attract new residents much of the current development of existing suburbs is uncoordinated. This unplanned development changes the character for communities as villas and townhouses sit uncomfortably side by side, transitional changes. Open space within the city and towns is increasingly used up for housing.

Options A and B

Urban development focuses on central Christchurch and inner suburbs and also Rangiora, Kaiapoi and Rolleston. Farmland / open space required for new housing is somewhere between 2110 and 2041 hectares or 11 to 12 Hagley Parks. Commuting would be expected to take 45 % longer than currently, and walking and cycling along with public transport would be improved. Under Option B a large proportion of residential areas would remain unchanged. Locating development at existing urban centres should strengthen community identity rather than change it. With growth restricted to areas around existing towns and within the city boundary, open spaces and regional parks could be developed as green zones between Christchurch and neighbouring towns. These will provide for recreational opportunities as well as natural environments.

How will this HIA fit into the UDS?

The HIA is one of a number of significant pieces of work to be integrated into the UDS as it is developed. Recommendations that arise out of the HIA process are expected to influence the direction taken by the UDS particularly in those areas relating to housing, transport and urban form. The HIA will provide a valuable information base to develop criteria for assessing the UDS.

Summary

There are strong links between urban design and health outcomes. A rapid Health Impact Assessment (HIA) was undertaken on the Greater Christchurch Urban Development Strategy (UDS). The goal of the HIA was to improve the health and well being of the community and to reduce inequalities in health (which are derived from government policy) throughout the Greater Christchurch region.

The first workstream assessed the potential effect on health outcomes of UDS Concentration option (A/B) the preferred (by the majority of respondents in the community consultation) against the Business as Usual option using readily available evidence sources. No primary research was undertaken. The results of these assessments on six key health determinants are summarised in the following chapters.

Implicit in the HIA process is the practical incorporation of Treaty of Waitangi principles into everyday life. A key output of this HIA is the development of the second workstream around engaging with local Māori.

How the following chapters are structured:

Section Two consists of the results of the community consultations undertaken by various local bodies and the Urban Development Forum which are pertinent to this HIA. Section Three summarises the results of the various inputs to the appraisal process of each health determinant. A boxed section at the start of each chapter includes a brief summary of relevant information and the recommendations that arose from the particular workshops and literature reviews associated with each health determinant. The rest of the chapter provides more information relevant to the topic. Section Four summarises progress so far on developing an engagement process with local Māori.

Reporting Back on Community Consultation

Community Consultation on Options

In April 2005, the UDS Forum released a consultation booklet outlining four options for managing future growth in the Greater Christchurch area. People were invited to select their preferred option. The booklet provided a brief summary of the key issues faced and the consequences for continuing on a Business as Usual (BAU) path. It presented three options for managing growth, as well as the BAU option, and comparisons between them. A feedback form was provided so people could respond to a series of issues, and space was also provided for additional comments.

Community response to options
Of the more than 3250 feedback forms received, 62% chose Option A, to concentrate development within Christchurch City and other larger towns in surrounding districts. Another 22% wanted Option B, which balances future urban growth between existing built areas with some expansion into adjacent areas. Few wanted Option C (2%), which allows for more dispersed development or Business as Usual (3%) which means each authority continues to independently plan for growth. About 12% did not answer or liked none of the above options, however, the vast majority of these preferred Option A or a mixture of A/B, many wanted something more sustainable than A. This means near to 95% chose concentration as the preferred option.

What was very noticeable from the consultation process was that people shared the same concerns no matter where they lived. Most people recognised the need to protect the water supply, valuable soils, community character, open spaces and to provide well planned communities linked by good transport systems.

"Most people recognised the need to protect the water supply, valuable soils, community character, open spaces and to provide well planned communities linked by good transport systems."

While the purpose of the UDS is to ensure an excellent quality of life in the area, health was not referred to directly, although there were many references to well being and quality of life. The issues raised, however, that can influence health beyond the identified constraints of water, noise and hazards were:

- Developing the concept of urban centres with community facilities, including shopping and working within walking or cycling distance of where people live;
- Improving the ability to walk or cycle to work, school or around the neighbourhood;
- Reducing car usage to improve air quality and increase physical activity;
- Ensuring that transport planning is socially responsible in the long term;

- Ensuring there is a stronger sense of community;

- Improving the quality of all housing stock (new and upgraded) to provide warm well built homes;

- Offering a range of house styles;

- Mix of housing to create neighbourhoods;

- Providing medium density and mixed use around activity centres;

- Providing affordable social housing particularly for low income, single or older people;

- Protecting water quality and improving air quality;

- Providing more open space and improved recreational opportunities;

- Considering a more ecological approach to the management of stormwater that could also contribute to open space;

- Ensuring that infrastructure such as schools, libraries, and community facilities are planned early in a development.

A number of constraints have been discussed and agreed by the UDS Forum. Most of these were identified early within the UDS process and have been outlined through the consultation of options process discussed below and include:

- Unconfined aquifer recharge zone for water supply;

- Airport noise zone contours;

- Waimakariri River flooding risk; and

- Preservation of the Port Hills.

Christchurch City Community Outcomes 2006-2009

One of the most important indicators of the aspirations of people in Canterbury are the Community Outcomes for 2006-2009. These describe key goals for each of the Districts, Christchurch City and Environment Canterbury and provide strategic guidance to local and central government, community organisations and individuals regarding future directions for the district or city.

To identify their community outcomes, the Local Government Act 2002 requires local authorities to consult with their communities every six years to identify residents' aspirations for their district or city. Consultation occurred with a range of groups and organisations, such as community organisations, the business sector, Pacific Islands' communities, people with disabilities, environmental groups and the public at community meetings.

Each local authority has received a mandate to prioritise the health of their community. These can be identified in their community outcome statements that relate to health, listed in the table below:

Table 2 Community Outcome Statements related to Health

Christchurch City	Waimakariri	ECan	Selwyn
A Healthy City: We live long, happy and healthy lives.	*The Community's needs for Health and Social services are met.*	*Living the Good Life in Canterbury* (DRAFT)	
In particular, *We all have access to affordable health services that meet our needs.* *More people in Christchurch city live healthy lifestyles.* *Our city environment supports the health of the community.*	In particular, *Our people are supported by a wide range of health services that are available in our District.* *Participation in community-based support services is acknowledged and encouraged.*	In particular, *Good healthcare for all.*	

The Community 50 Year Canterbury Visioning Report

The Community 50 Year Canterbury Visioning Report was commissioned by Environment Canterbury to generate a picture of what people in Canterbury think their region should look like in 50 years time. A total of 1900 residents were asked to participate in the research. Four hundred participants were drawn from Christchurch City, 150 from the former Banks Peninsula, 150 from Waimakariri and 150 from Selwyn.

Respondents were asked to rank the importance of a number of statements on a scale of 1 to 10 (one being 'not at all important', and ten being 'extremely important'). They were also asked to rate how well they thought these statements were currently being achieved. A sample of the results relating most directly to health outcomes can be seen in the table below. For all factors, study participants placed a high priority upon each factor for the region in fifty years time. The factors that participants indicated as needing the greatest level of improvement on current performance included: the availability of good health care for all; people to feel safe at all times; having healthy ground water systems; for the air to be in a healthy condition; and for everyone to have access to an acceptable standard of housing.

> *"The factors that participants indicated as needing the greatest level of improvement on current performance included: the availability of good health care for all; people to feel safe at all times; having healthy ground water systems; for the air to be in a healthy condition; and for everyone to have access to an acceptable standard of housing."*

Table 3 The Community 50 Year Canterbury Visioning Report – Results relating to health outcomes

UDS area rankings	CCC		SDC		BPDC		WDC	
	Current	50yrs	Current	50yrs	Current	50yrs	Current	50yrs
Good health care for all	6.38	9.63	6.48	9.71	6.32	9.70	6.30	9.63
People feel safe at all times	6.13	9.56	6.48	9.65	6.49	9.71	6.29	9.69
Ground water systems in a healthy condition	7.26	9.54	6.90	9.56	6.54	9.60	6.81	9.46
Air to be in a healthy condition	5.46	9.43	6.31	9.43	5.77	9.57	5.82	9.48
Everyone to have access to an acceptable standard of housing	6.36	9.25	6.68	9.25	6.54	9.23	6.51	9.29
Opportunity to participate in sport/recreation	7.96	8.90	8.07	8.87	7.93	9.01	8.03	8.83
Plenty of public parks and reserves	7.86	8.80	7.75	8.83	7.81	9.12	7.55	8.66

Data source: Opinions Market Research Ltd survey November 2003

Section Three:
Reporting Back on Selected Health Determinants

Air Quality

Background

Air pollutants include fine particulate PM^{10} (particulate matter up to 10 *micrometres* in size) and gaseous emissions from the burning of fossil fuels. These particles are so small they can evade our bodies defence mechanisms and become lodged in our lungs. Many of the gas pollutants are directly poisonous. When air pollution is high people with heart and lung problems can be severely affected leading to days off work, hospital admissions, and at worst, death. People who are exposed to moderate levels of carbon monoxide from traffic (pedestrians, commuters, people who live near busy roads) can experience headaches, weakness and nausea. Even low-grade air pollution has been linked to poor health in babies and young children by stopping their lungs from properly developing. While external air quality is often the focus it should be remembered that internal air quality is equally important.

Recommendations

- Develop cross-sectoral collaborative project based working groups; which include
    - Environment Canterbury;
    - City and District Councils;
    - Canterbury District Health Board;
    - GeoHealth University of Canterbury;
    - Transit NZ;
    - Land Transport;
    - Energy Efficiency and Conservation Authority;
    - Ministry of Environment;
    - Ministry of Health;
    - Private building companies;
    - Master Builders Association; and
    - Suppliers of energy efficient housing products.

Projects should aim to:

- Improve the capacity to monitor the links between air quality and relevant health outcomes;
- Sponsor energy efficient housing;
- Sponsor public and active transport;
- Advocate to upgrade the building code; and
- Reduce the reliance on solid fuel burners while ensuring availability of affordable & healthy alternative heating options.

Review of available information

The recent pilot study of HAPiNZ (Health and Air Pollution in NZ) [17] was based in Christchurch and funded through a joint initiative between the Health Research Council, Ministry for the Environment, Ministry of Transport and Environment Canterbury. A large collaborative group, including over 20 of New Zealand's leading researchers in air pollution, epidemiology, toxicology, environmental management, economics and public health policy, worked on this project which is available online at http://www.hapinz.org.nz Clearly this study is directly relevant. A very brief summary follows.

Air pollution in Christchurch is primarily derived from three main sources; industrial, domestic solid fuel home heating and vehicular emissions. These emissions fall into two categories:

1. fine particulates (PM$_{10}$- particulate matter up to 10 micrometers in size) from combustion sources; and

2. gaseous emissions such as carbon monoxide, nitrogen dioxide, sulphur dioxide and benzene.

In Christchurch, it is estimated that domestic sources account for 76% of the emissions, industrial sources for 13% and vehicle sources 11%.

The geography of Christchurch and some surrounding towns and climate means that inversion layers trapping air pollutants are not uncommon, particularly in winter [18].
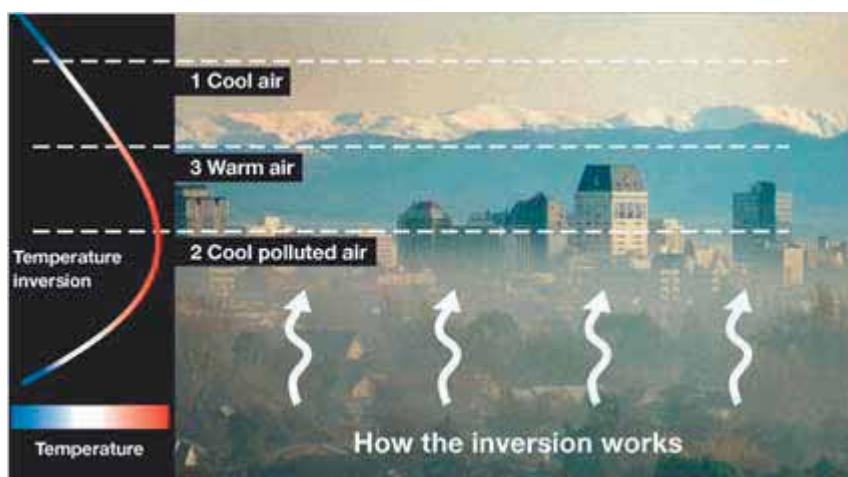
Picture from Environment Canterbury website.[19]

Christchurch experiences on average 30 days each year when the 24 hour average PM$_{10}$ concentrations exceed the air quality standard of 50 microgram (µgm). Peak 24 hour levels on those days are above 200 µgm, 32 high pollution nights were recorded for winter 2005. Between May and August, 90% of ambient PM is derived from wood burning home heating, while during the rest of the year motor vehicles and industry are the source of almost all the air pollution[17].

Table 4 below shows the direct measurable health effects of air pollution in Christchurch and the economic cost to the community of these health effects. The economic cost to the community of the 158 deaths per year attributed to air pollution totals $118.5 million. $93 million of that total is incurred by domestic air polluters, (primarily solid fuel burners). Restricted activity days cost the community a further $43 million.

Table 4 Health Effects and estimated costs of air pollution in Christchurch

Health Effect	Yearly cases attributed to air pollution	Cost per case	Annual cost (millions)			
			Domestic	*Industrial*	*Vehicle*	*Total*
Mortality	158	$750,000	$93.0	$13.5	$12.0	$118.5
Cancer	1.6	$750,000	$0.8	$0.2	$0.2	$1.2
Chronic bronchitis	52	$75,000	$2.7	$0.7	$0.6	$4.0
Acute cardiac admissions	53	$3,675	$0.1	$0.05	$0.05	$0.2
Acute respiratory admissions	194	$2,700	$0.4	$0.1	$0.1	$0.6
Doctors visits, medicines	Not assessed	Not assessed	-	-	-	-
Minor direct hospital costs	-	-	$0.15	$0.03	$0.02	$0.2
Restricted activity days	285,000 days	$150	$30	$7.0	$6.0	$43.0

This table is a combination of Tables 1,2,3,and 4 in the HAPiNZ study[17]

The HAPiNZ study states that the costs associated with the health effects are likely to be underestimates as they do not include possible additional costs due to unidentified effects of pollutants other than PM^{10}, and do not include costs associated with extra doctors' visits due to air pollution. Neither do they include costs associated with indoor air pollution, or costs of effects due to workplace or in-vehicle exposures, which are beyond the scope of the study [17].

> 'Currently available impact assessment studies clearly suggest that public health largely benefits from better air quality. These studies are rather selective underestimates as they are strongly driven by mortality but do not fully include quantification of the impact on morbidity, and their consequences on quality of life among the diseased and the caregivers." Kunzli [20]

Environment Canterbury's Natural Resources Regional Plan – Chapter 3: Air Quality (NRRP-Air Quality) has already resulted in a small but significant improvement in air quality. As the Clean Heat Project takes full effect the rate of improvement will increase but whether this is sufficient to achieve national air quality targets set for 2013 is not certain. While home heating emissions are decreasing, carbon dioxide emissions from land transport are increasing and have already reached the target set for 2011 six years early [21].

Although air pollution affects all the population to some extent, those most at risk are people aged over 65 years, infants under one year, asthmatics and people with chronic bronchitis and with chronic disease such as cardiac disease.

Greenhouse gases, produced by burning fossil fuels also impact on climate change. Estimates from 2001 indicate that Christchurch emitted 1.4 million tones of carbon dioxide a year (approximately 5.1% of New Zealand's total), half from vehicles and approximately 17% from wood and coal-fired home heating [22].

A particular concern of the HIA workshop was to establish the effects of air pollution on children's health. Children are especially susceptible to air pollution because of their immature lung growth and development, incomplete metabolic systems, less efficient detoxification systems and higher rates of respiratory infection. In 2005 the World

Health Organization published a review of available evidence on the 'Effects of air pollution on children's health and development' [23]. The major issues raised in this review were:

- Exposure of the developing lung to air pollution reduces the maximal functional capacity developed as children enter adulthood. This reduced lung function could lead to greater susceptibility during adulthood to the effects of ageing, infection and other pollutants, such as tobacco smoke and occupational exposures;

- Children exposed to indoor pollutants (e.g. tobacco smoke) are at greater risk of being affected by outdoor pollutants;

- There is sufficient evidence to identify a link between particulate air pollution and respiratory deaths in the post-neonatal period;

- Evidence suggests a link between birth weight and air pollution;

- There is sufficient evidence to assume a link between air pollution exposure and aggravation of asthma, cough and bronchitis;

- Evidence suggests a link between the prevalence/incidence of asthma symptoms in people living in close proximity to traffic;

- Evidence suggests a direct link between exposure to ambient air pollution and increased incidence of upper and lower respiratory symptoms; and

- **There is direct evidence that reducing exposures to air pollution will improve children's health.**

> "While recognizing the need for further research, current knowledge on the health effects of air pollution is sufficient for it to be strongly recommended that children's current exposure to air pollutants be reduced."
>
> WHO (p6[23])

Issues raised in the workshop

Workshop participants discussed the direct and indirect health effects from air pollution. Poor air quality on high pollution days may dissuade people from going outside and exercising.

Concerns were raised about unflued domestic gas heating which is more likely to be used by low income groups and people living in rented accommodation. While indoor, unflued gas heating creates no additional outdoor air pollution, there is a need to assess the overall benefits given its negative effect upon indoor air quality .

Given that solid fuel home heating contributes to approximately 80% of air pollution in winter months, the workshop participants felt air quality would be similar under 'Business as usual' or Option A/B if Environment Canterbury's NRRP-Air Quality is successful. The elimination of solid fuel heating pollution will then mean transport, particularly individual car use will be the biggest contributor to poor air quality.

> The improvements in exhaust technology will, in the long term, neither improve air quality nor protect the health of the public if the growth rates in car selling and driving remain an unquestioned paradigm of 'progress'. Sustainable air pollution abatement must be more comprehensive and include for example, urban planning with enforced public transport systems and rigorous promotion of low or no emissions cars… the inclusion of external costs into polluting processes.' Kunzli [20]

Greater density in the Christchurch central city will support developing a more viable public transport system. Concentration also means more people could be exposed to poor air quality in the central city. As population density increases it becomes even more important to ensure air quality is closely monitored and exposure to polluted air is minimized.

As population density increases it becomes even more important to ensure air quality is closely monitored and exposure to polluted air is minimized.

The NRRP-Air Quality still allows for solid fuel heating so it is possible that Christchurch's air quality will not meet the national standards if the community does not undertake voluntary initiatives to improve their home heating methods.

Treaty of Waitangi considerations

Māori tend to have higher rates of respiratory health problems than non-Māori[3]. They have a younger population and are disproportionately represented in lower socio-economic deciles [12]. These three factors mean that Māori as a population group are more likely to be adversely affected by poor air quality than non-Māori.

Are other groups likely to be more affected?

People in low socio-economic groups are more affected by poorer air quality because they are more likely to live near roads and transport corridors exposing them to higher concentrations of vehicle emissions. They are more likely to live in rental accommodation or older style housing, which tends to be uninsulated. This has been confirmed by a recent study showing people aged 15-34 are more likely to be exposed to particulate pollution than other age groups. People living in more deprived areas of Christchurch are subject to higher mean annual levels of air pollution and to a higher average of days exceeding the recommended 24 hour thresholds [24].

> "The unequal exposure to air pollution between advantaged and disadvantaged groups provides a direct causal explanation for the socioeconomic gradient in ill health, particularly for those diseases related to air pollution such as asthma and lung cancer. Second, as well as suffering greater levels of exposure, disadvantaged populations are likely to be more susceptible to the effects of air pollution upon health. This inequity arises because disadvantaged communities experience higher levels of relative disadvantage, poorer provision of medical care, housing and access to facilities such as grocery stores, and adverse psychosocial conditions. Third, disadvantaged communities have a higher susceptibility to predisposing health conditions such as diabetes and asthma, due to socioeconomic differences including occupation, social support and medical care, which renders them more sensitive to the effects of air pollution" [25]

In a recent paper Pearce and Kingham referred to the concept of environmental injustice, i.e. 'those who have the greatest exposure to pollution are not the largest producers of pollution'. As an example, in Christchurch the areas that have the lowest levels of car ownership are those with the highest exposure to vehicle pollution [24].

The preferred option

Workshop participants believed that air quality had more potential to improve if well planned concentration of urban development occurred, in conjunction with active implementation of air quality standards and close monitoring of air quality indicators, than if the 'Business as Usual' path was followed.

Participants stated that air quality could be improved whatever option was chosen if Environment Canterbury's NRRP-Air Quality plan is fully implemented.

Conclusions

Issues to do with air quality cannot be addressed in isolation. This will involve coordination between various planning bodies and the community. Air quality will improve if people are able to travel shorter distances to their workplaces and schools, if they are able to access public transport, if building codes are improved such that homes are well insulated and heated appropriately and if there are appropriate incentives to business to reduce or eliminate industrial air pollution. The workshop participants agreed that there is a need to:

- Advocate to upgrade the building code. Measures to promote energy efficient (hot and cold weather) and sustainable housing stock should be explored and implemented;

- Ensure that alternative heating options to solid fuel burners do not adversely affect health by worsening indoor air quality (e.g. unflued gas heaters) or by increasing costs;

- Explore and implement a wider range of possible measures to reduce city traffic congestion (e.g. congestion taxes, company buses for workers, promotion of work and school travel plans, implementation of 'polluter pays' principles); and

- Improve monitoring of health outcomes in addition to standard air quality measures. GIS information could be used to relate hospital admissions to those patients who work or live where air quality is poor.

The conclusions and recommendations made in this section of the report are supported by a range of local and national policy initiatives. Some examples are:

Environment Canterbury's NRRP-Air Quality plan and **Clean Heat Project** have been discussed. The **Ministry for the Environments Warmer Homes Project** aims to investigate how families can be encouraged to make their homes more energy efficient and to install cleaner heating. See this section at the end of the Housing chapter for other initiatives that aim to reduce domestic sources of air pollution. The **New Zealand Transport Strategy 2002** aims to reduce vehicle emissions.

RENTABIKE RUNAWAY SUCCESS IN LYON

12 August 2005 - The French are not short of groundbreaking cheap and efficient public transport. But now the Paris Metro and the high-speed TGV have a more humble, although no less hi-tech, equal - the Lyon rent-a-bike. Less than three months after its launch, the city's Vélo'v scheme, reportedly the largest of its kind in the world, is a runaway success. "Very quickly, we've moved from being a curiosity to a genuine new urban transport mode," said Gilles Vesco of the city council.

Some 15,000 Lyonnais are now registered users, and the 24-hour scheme's 1,500 sturdy silver-and-red bikes - which have three gears, a handlebar basket and a lock - are detached from their 100-odd computerised racks on average 6.5 times each a day. And this is just the beginning: by 2007, there should be 4,000 cycles and up to 400 racks in the city - which is one roughly every 300 metres.

Collective bike schemes started in the 1960s with the free "white bikes" of Amsterdam and Copenhagen, schemes which laboured under the hippy-era illusion that most users would be public-spirited enough to return bikes after use. They were not.

The Lyon scheme adopts a system pioneered, on a much smaller scale, in Vienna and incorporates strong incentives not to abscond. Users must register in advance so that their personal details are on record, and they are then issued with a security code and a prepaid card, which they can top up at each rack's computer terminal. "Our success reflects a cultural shift that you could call collective individualism," Mr Vesco told the daily Libération. "Everyone chooses their own destination, route and timetable, but they use a collective means of transport."

Vélo'v is, apparently, a simple system to use, and is also cheap. With the prepaid card, which costs one euro for a week and five euros for a year, rental costs one euro an hour, with the first half-hour free.

In practice, that means borrowing a bike is as good as free, since 90% of all Vélo'v journeys last less than 30 minutes. It is funded by JC Decaux, the billboard multinational, which agreed to launch and operate the bike scheme in part-exchange for the right to sell advertising space on the city's bus and tram shelters.

Each time a bike is returned to a rack the brakes, tyre pressure, gears and lights are digitally checked and the results sent to the control centre; any malfunction means the bike is not offered for rent.

There have been a few teething problems. Some racks are used far more than others, leading to shortages in the most popular spots, despite a computerised warning system that alerts the control centre. But users can consult every Vélo'v terminal to find out which nearby rack has bikes, and soon bigger racks will be built where needed.

[The Guardian Online]

Water quality

Background

Water is essential for life. Water quality affects health and has been described as the single greatest factor affecting life expectancy in the 19th century [26]. People get sick if drinking-water is polluted by:

- Infectious agents;
- Toxic chemicals and
- Radiological hazards[27-29].

Polluted rivers, streams and oceans can also affect health if people swim in them, or eat fish or seafood from polluted waters. Water also has intrinsic values for health that are aesthetic, spiritual and cultural.

Recommendations

- Protect aquifer catchment zones;

- Integrate water management with urban planning;

- Water resource planning and management should be supported by a steering group including Ngai Tahu, public and private sectors with a mutually agreed process;

- Adhere to sustainable development models for water management including monitoring and accounting for predicted climate changes;

- Improve monitoring and reporting of water quality and quantity in the greater Christchurch area.

Review of available information

Background

Participants at the HIA Water Workshop agreed to consider water in its broadest sense – as drinking water, its quality, and recreational, cultural and spiritual values while focusing most on water quality as the aspect most closely connected to health.

Over 90% of the drinking water in Canterbury comes from ground water. Christchurch's reticulated water supply originates from the unconfined aquifer system to the north of the city. Much of this water is of very high quality and is not treated. It is, however, vulnerable to contamination from land use and discharges upstream of the water supply [30].

Environment Canterbury's Natural Resources Regional Plan (NRRP) [30] is an important plan for groundwater management. This plan establishes objectives, policies and methods for sustainably managing the region's water resources. These include:
- setting flow regimes and limits on aquifers;
- principles for allocating water; and
- protection of communities' drinking water sources.

The NRRP incorporates key elements of the Ngai Tahu Freshwater Policy. For Ngai Tahu, the use of water bodies for certain types of activities impacts on their spiritual and cultural values. For example, the discharge of effluent to water, especially human waste, is considered an offensive activity, which defiles the spiritual and cultural values of the water [30].

This section of the HIA attempts to describe the impacts of different urban development options on water quality and quantity. It seeks to systematically draw on knowledge from scientific literature and Christchurch technical water experts to enable policy development.

Water and Greater Christchurch in 2005

More than any other region in New Zealand, Canterbury relies on groundwater for its drinking water for both private and community supplies. In New Zealand most supplies are from surface catchments and require treatment to control quality parameters like colour/sediment, odour and taste and to provide protection from bacteria/protozoa.

Many catchment areas associated with groundwater sources have moved away from activities such as isolated dwellings with low stock rates to more intensive farming, lifestyle blocks with onsite disposal of effluent/storm water, increased irrigation and more point source waste discharges to land.

Catchment protection for surface water has always been recognised and is reflected in the strict catchment controls that are in place in some supplies that rely on surface water such as Dunedin and Wellington. Catchment protection for groundwater has not been given the same priority or risk ranking as for surface water catchments. The Christchurch Groundwater Protection Zone is a proposal to protect the catchment of groundwater for water supply. Other documents include the Proposed National Environmental Standard for Human Drinking Water Sources and the Drinking Water Standards for New Zealand 2005 (Ministry for the Environment).

Intensifying land use over the aquifer presents a considerable risk to the drinking water quality. Observed nitrate concentrations have already increased in certain areas (e.g. Ashburton-Rakaia plain and Waimakariri District) and bacterial contamination is occurring, especially in the shallow aquifers [31,32].

Groundwater levels are being recorded at record lows. Low groundwater levels pose a public health issue, as the need for water for stock, industry, tourism activities and agriculture compete with drinking water needs [33].

Many lifestyle blocks dispose of their effluent and stormwater on-site. Most also rely on shallow wells for drinking water. No ongoing monitoring for indicators of health concern is undertaken of these private wells to ensure the supplies are free from contamination.

Environment Canterbury carries out monitoring of groundwater that provides a good indication of the *overall* quality of Canterbury groundwater. This programme may not identify the full impacts of localised issues and may need reviewing to assess the impact of future development.

The way forward to protect public health will include a range of strategies that could include:

- Improved catchment management - for example, measures to manage land use activities in the proposed Christchurch Groundwater Recharge Zone;

- Promotion of coordination between the various responsible agencies and local water researchers (ECan, District Councils, ESR and CPH, NIWA, Landcare and Ngai Tahu) to achieve land use control to protect against ground water pollution;

- Review the location of the current monitoring wells and the health water indicators with other interested parties such as District Councils, ESR, CPH;

- Adoption of policies by the Regional and District Councils that improve the overall efficiency of the use of water such as water charging;

- Move away from the increasing reliance on drinking water treatment to providing barriers against contamination of the aquifers; and

- Consolidation of unserviced communities to well managed reticulated systems.

Issues raised in the workshop

Strategic land-use planning

> Water quality management agencies traditionally address existing water quality problems rather than preventing them
>
> Wang 2001[35]

It is rare to find co-ordinated planning of land use and water quality management [36]. The NRRP may go some way to resolve this. The UDS provides an ideal opportunity to integrate land use and water management. Most of Canterbury's water is of a very high quality and the NRRP is trying to protect it. There are, however, localised problems that need to be rectified such as the nitrates issue.

Land uses can influence water quality in many ways. These include:
- Changes to land cover, e.g. removing vegetation cover;
- Water extraction activities;
- Construction/ modification of waterways;
- Application of fertilisers, herbicides, pesticides and other chemicals;
- Livestock density and disposal of animal effluent to land;
- Road construction, maintenance and use;
- Forms of recreation;
- Urban or rural residential development – with particular attention to effluent disposal;
- Sanitation, landfill and waste disposal; and
- Other potentially polluting human activities, such as industry and military sites.

All of these are relevant in the Greater Christchurch context and many were mentioned during the HIA Water Workshop.

Urban and rural residential development reduces ground water quality

- Areas downstream of high human activity have demonstrably lower surface water quality [35];
- Ground water quality is lower in catchment areas with urban and industrial activity [36];
- Inappropriate use of septic systems can contaminate ground water in low-density; suburban and rural residential developments [37].

Disposal of sewage is the obvious human impact on water quality. Despite reticulated sewerage (and septic tanks in rural areas) diffuse sewage pollution still occurs [30]. Surface excavations, such as gravel pits or removal of soil can remove the protection provided by overlying sediments, increasing the risk of contaminants entering confined and unconfined aquifers [30].

A sampling programme to assess groundwater quality is undertaken annually by Environment Canterbury. Key trends are:

- Groundwater quality is being degraded by human induced contamination such as intensification of farming activities particularly microbes and nitrate-nitrogen. These are particularly linked to the effluent leaching related to the increase in dairy farming in Canterbury;
- Organic compounds such as chlorinated solvents are being detected in low concentrations in some areas of the shallow aquifers in Christchurch. This is an illustration of how vulnerable our aquifers are to inappropriate development;
- Currently, deeper aquifers in general, provide higher water quality; and
- Localised seawater contamination has occurred in the Woolston/Heathcote industrial areas due to pressure reversal caused by inappropriate levels of water abstraction [30].

There is support for the mitigating actions described in documents such as the NRRP, local district plans, the national environmental standards for human and drinking water sources and the drinking water standards for New Zealand.

Treaty of Waitangi considerations

> Rivers, lakes trees, rocks like men and women, all have a mauri (life force)…Damage to a resource not only creates physical impairment but also causes spiritual damage and in the process impinges on the mauri of other objects, including people.
>
> Durie1998[38]

"Six hapu are directly affected. Food gathering is really important. There are identity issues and spiritual/ mental health issues for local Māori."
Workshop participant

Article Two of the Treaty of Waitangi guarantees Māori tino rangatiratanga or self-determination over fisheries, forests and other taonga (treasures). Water clearly falls into the category of a taonga, with a deep intrinsic and spiritual value for Māori. The Resource Management Act 1991 provides a 'bare minimum' framework for inclusion of te ao Māori (Māori perspectives) and for effective co-management of resources [39].

Land-use and water resource planning in Canterbury could better reflect Māori values. New frameworks and partnerships need to be developed for meaningful ongoing resource management.

Are other groups likely to be more affected?

Most urban areas of the UDS receive a high quality reticulated water supply. Inequalities are more apparent when observing access to water for aesthetic and intrinsic values. Rural populations in Canterbury and New Zealand have

poorer water supplies. This tends to be because water supplies in these areas are smaller, harder to maintain and monitor [40].

Business as Usual is likely to continue the trend of physically separating deprived and advantaged communities. It is also likely to lead to more people in rural areas with individual or small and therefore less safe water supplies.

The preferred option

Water quality is extremely important to the Greater Christchurch residents who submitted on the Greater Christchurch UDS Options feedback.

Over 96% of respondents considered protecting water quality in Greater Christchurch as very important no matter what option was chosen.

General consensus between the Water Workshop participants and scientific literature suggests that the Business As Usual option is more likely to degrade water quality. This is due to a number of factors:

- Increased total land area used for residential housing;
- Increased water extraction due to irrigation / greater lawn areas;
- Septic tanks in lifestyle blocks leading to contamination of ground water (particularly if sited over the aquifers to the north and west of the city);
- Urban expansion leads to loss of buffering capacity of rural land surrounding the city;
- Increased hard sealed urban areas leads to more rapid storm water pulses; and
- Harmonising water management and social needs are a necessary condition for sustainable development [36].

Options A and A/B with intensification of urban development provide more opportunity to protect water catchments and to conserve water (Water workshop).

> The volume of storm water that washes off a one-acre parking lot is about 16 times greater than the volume that runs off a comparable-sized meadow. This increased runoff causes increased erosion and stream siltation and may affect water treatment plants.
>
> Centre for Disease Control[37]

In urbanised areas rainfall, that once filtered slowly downhill, becomes surface runoff flowing rapidly across surfaces such as concrete, roading and rooftops into storm water drains and then into waterways [37]. Discussion around this impact of urbanisation focused on the increased risk of surface and waterway flooding that has been noted in Christchurch in the rate of rise of the Avon River and recurring flooding of the Heathcote River over decades.

While this could be a risk with concentration options, this risk can be mitigated. Methods of mitigation include use of semi-permeable surfaces such as light gravel footpaths, sensitive construction and maintenance of parks / green spaces, (particularly bordering waterways) and planting of trees beside waterways to reduce erosion and increase buffering capacity of changes in water level (Water Workshop).

> Sustainable development can be defined as management, which meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
>
> Melloul and Collin[36]

Water is a limited resource. Climate forecasts for the East Coast of the South Island predict lower rainfall for the next 30 years. This has significant implications for urban development and the water needs of the population of Christchurch [41]. Reduced rainfall combined with increased water use, particularly by dairy farms, necessitates sustainability in water resource management in this region [30,41].

In summary, a review of the health impacts of different urban development strategies on water suggests that concentration (Option A or Options A/B) will have less adverse health impact on water quality than Business As Usual. Concentration options are more likely to ensure protection of catchments and use less water.

> "Regardless of government structures and sector responsibilities, it is important that health authorities liaise and collaborate with sectors managing the water resource and regulating land use in the catchment. Establishing close collaboration between the public health authority, water supplier and resource management agency assists recognition of the health hazards potentially occurring in the system…Depending on the setting, this may include involvement of further sectors, such as agriculture, traffic, tourism or urban development.
> World Health Organization [42]

Conclusions

To ensure a healthy population the Greater Christchurch Urban Development Strategy should:

- Protect the aquifers and rural water supplies;
- Integrate water management with urban planning;
- Be supported by a cross sectoral steering group, including Ngai Tahu, to plan water management with a mutually agreed process;
- Long-term trend monitoring of Christchurch and Canterbury water quality and quantity at appropriate sites; We support the implementation of the NZDWS 2005 to require more stringent source monitoring to ensure protection against microbiological contamination such as protozoa;
- Adopt sustainable development models for water management;
- Mitigate threats to groundwater quality, including regulating land use, urban/rural buffer-zones, riparian planting, and green areas for filtering of rural water supplies; and
- Improve storm water management.

The conclusions and recommendations made in this section of the report are supported by a range of local and national policy initiatives; Some examples are:

The **Water Programme of Action**, which falls under the **Sustainable Development Programme of Action**. The Programme is coordinated by the Ministry for the Environment and the Ministry of Agriculture and Forestry. The programme initially consists of a number of projects within three separate strands covering: water allocation and use; water quality; and water bodies of national importance.

The **Resource Management Act 1991** provides for national environmental standards on aspects of resource use. The intention of the **Proposed National Environmental Standard for Human Drinking-water Sources (Ministry for the Environment (September 2005)** is to ensure that local authorities give adequate consideration to protecting drinking-water sources i.e. both surface and groundwater sources (as affected by other activities) when drawing up their Regional/District plans under RMA and when they consider resource consents which may affect drinking-water sources. It is recognised that the better the quality of the source water, the lower the risks and simpler the treatment that is required for the final drinking water. The **NZ Drinking Water Standards 2005** have been discussed, as has **Environment Canterbury's Proposed Natural Resources Regional Plan** (NRRP).
Comments from workshop participants

"We can treat the water – this may be the tradeoff we're prepared to make to allow further development" Workshop participant

Social Connectedness

Background

Social connectedness has been used in this report to describe *that state whereby people feel part of society; family and personal relationships are strong; differences among people are respected; and people feel safe and supported by others*. This report describes the link between:

1. Social connectedness and health; and
2. The link between urban design and social connectedness.

Three workshops were held on this health determinant and the views of workshop participants have strongly shaped the recommendations made in the report.

Recommendations

- Facilitate the development of community spirit *within* neighbourhoods e.g. by thoughtful location of schools
- Ensure an efficient public transport system that connects people of all incomes to their neighbourhoods and the wider city
- Design for a 'sense of place' using elements of local identity and belonging e.g. indigenous planting and public art
- Incorporate universal design principles when planning and designing public spaces to allow access for all people
- Plan a range of housing types (size and price) that reflect and promote community diversity and

- Involve residents in the design of new communities.

Review of available information

What do we mean by Social Connectedness?

The literature that describes social connectedness, shared values and the sense of community belonging, often discusses the concepts of social cohesion and social capital. In a local example, the Christchurch City Social Trends Report [13] defines social cohesion as: "…the relationships people have with others and the benefits those relationships bring to the individual and society at large. It includes informal relationships with family, friends, colleagues and neighbours, as well as relationships people make through participating in community activities, such as sport, leisure activities or paid work, voluntary work or community services."

Statistics New Zealand describes the characteristics of social cohesion as when people feel part of society; family and personal relationships are strong; differences among people are respected; and people feel safe and supported by others [43].

Discussions of social cohesion and its relationship with health often make reference to social capital, "the series of relationships, networks and norms that facilitate collective action" [44].

For the purposes of this HIA, the term "social connectedness" has been used in this report to describe *that state whereby people feel part of society; family and personal relationships are strong; differences among people are respected; and people feel safe and supported by others*.

The workshop discussions focussed upon developing an understanding of the ways in which:
- a sense of community and connectedness (and thereby low levels of isolation/exclusion) affects health outcomes; and how
- urban design can be used to promote the development of community and connectedness (and thereby low levels of isolation/exclusion) for people within Greater Christchurch.

What is the link to health outcomes?

The link between social capital and health is often discussed in academic research, even though how social connectedness actually affects health is not well understood. According to Kawachi *et al*., social capital may affect health through different pathways depending on the geographic scale at which it is measured. At the neighbourhood level, for example, three pathways are identified by:
- influencing health related behaviours;
- influencing access to services and amenities; and
- by affecting psychosocial processes by providing social support, esteem and mutual respect [45].

At the state level, Kawachi *et al.*, [45] argue that more cohesive states produce more equal patterns of political participation that result in policies that ensure the security of all members, rather than just the wealthy minority.

What do we know about Social Connectedness in Greater Christchurch?

Overall, levels of social connectedness in Christchurch city are relatively high***. In 2002 the Christchurch Community Mapping Project [46] indicated that a high proportion of Christchurch residents:
- Have some connection within their communities and positive contact with their neighbours;
- Have someone to turn to in times of stress or in times of need;
- Are happy with Christchurch as a place to live, work and spend their spare time; and
- Participate in community-based activities and one or more unpaid/voluntary activities.

For some people there were a number of significant barriers preventing them from fully participating in their communities. Specifically, increasing ethnic diversity, social inequalities, and social exclusion and isolation were seen as particular

*** *These findings are from the Christchurch City Council Annual Survey of Residents (2002) and relate to a sample population of Christchurch city. A total of 780 people participated in the survey with a response rate of 65%. The population for the survey is defined as people aged older than 18 years who had lived in Christchurch for at least the 12 months prior to the survey and who lived in private households in permanent dwellings. Participants were randomly selected from within the total sample population.*

challenges. Local government planning can influence the following factors which were found to have a negative effect on a sense of community belonging:

- Local community facilities and public space receiving inadequate maintenance and care to encourage a sense of community identity and pride
- Reduced physical mobility resulting from physical disabilities
- Levels of communication and understanding between ethnic groups, different generations, and members of different communities
- Poor communication skills including English language, literacy and numeracy
- Discrimination based on age, ethnicity or mental health, and
- Emotional health problems of pressure and stress.

Issues raised in the workshop

Social Connectedness and Health

> "The neighbourhoods in which people live may influence health…through such mechanisms as: the availability and accessibility of health services; infrastructure deprivation (lack of parks, stores selling healthy foods at affordable prices etc); the prevalence of prevailing attitudes towards health and health related behaviours; and stress and a lack of social support"[47]

Acceptance of a significant relationship between "social connectedness" and health outcomes was found both in the literature and in the workshop discussions though the actual nature of the link is complex and much debated.

Among workshop participants there was strong consensus that a sense of community, belonging and participation was critically important to well-being. In particular, social connectedness was considered important to mental health and well-being; levels of physical activity; and individual knowledge of and ability to access health and support services.

This is both theoretically and empirically supported in the literature, which most commonly discusses the links between social cohesion, social capital and health. High levels of social connectedness have been linked to lower suicide rates [48]; lower rates of dementia and Alzheimer's disease; lower rates of child abuse and higher levels of self reported happiness [49]. Berkman and Syme found that people with few social ties were two to three times more likely to die of all causes than were those with more extensive contacts [50]. Kawachi et al., have also demonstrated that lower levels of social connectedness are associated with higher rates of most major causes of death including coronary heart disease, malignant cancers, strokes, unintentional injury and infant mortality [45].

The Institute of Public Health in Ireland argues that certain indicators of social capital have "…significant independent effects on perceived health" [51]. These indicators include for example, the views about problems and services in the local area; social contacts and support networks; the levels of trust people have for their neighbours and the level of civic engagement. Kawachi and Kennedy (2001) found that the probability of self-reported poor health increased significantly from high to low 'social capital' areas (cited in [52]). In another study, stronger social ties have been linked to lower levels of mortality, and higher participation in social activities has been associated with better mental and physical health [52].

Features of the built environment can contribute to providing a setting for social interaction and the development of community. A Joseph Rowntree Foundation report [53] states that the quality of the physical environment is important to levels of community morale and social interaction. Other researchers have found an increased frequency of casual social interaction in areas with better accessibility to facilities**** as the social ties that develop from casual social interaction in relation to these amenities often become a stepping stone to more formal interaction [54].

Both the literature and workshop participants highlighted the significance of *local* centres to levels of social connectedness. The provision of services and facilities in a single location provides the possibility of building community within a region through the continuous use of, interaction around, and identification with, those amenities. One workshop

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*****More intense forms of interaction were found to be dependent upon other influences such as attitudes towards 'neighbouring' and demographics.*

participant supported this by saying "It doesn't matter where the community is, so long as it has a heart". In addition, the Joseph Rowntree Foundation report [53] has argued that a lack of sufficient community facilities such as shops, cafes, youth clubs, sports and social facilities, hinders the process of building social bridges between groups within neighbourhoods. As observed by Duhl and Sanchez:

"The coffee shop, the local grocery store and other informal gathering sites have been zoned out of residential areas. An…arguably dangerous amount of attention has been paid to the individual and family unit, resulting in aesthetically well designed individual homes but no sense of community". [7]

Consequently, ensuring that neighbourhoods are well connected to, or close to, amenities is a key way the built environment can be used to generate a 'community conducive' setting.

Symbols of community provide focal points for identity in some areas. That is, certain elements within a geographic space can contribute to the development of a sense of place for people within an area. Communities might feel connected around churches, artworks, monuments, schools and community centres. This may include residents living close to, or their ability to access, opportunities for employment, services, recreation education and community facilities.

Workshop participants focussed upon the important role of schools as community connectors. Schools often form focal points for community development as parents and children make contact and interact around common issues and interests. Schools were described by some participants as a "signifiers of identity", and as community facilities where communities of interest might develop. Consequently, it was considered beneficial to community development if schools could be centrally located within communities, to enable children and parents to walk to and from, and regularly meet at, school based activities. Schools also become the physical centre of the community by providing spaces for community functions.

These responses are supported in the literature. Witten *et al.* suggest that "…beyond their educational function, schools can serve as catalysts for community participation, social cohesion and the vitality of neighbourhoods" [55]. It is argued that schools contribute to the broader health of the community by providing quasi-public spaces where people make contact with one another and nurture social relations. Participation in and around schooling is often an important part of everyday life particularly for the parents of young children. Consequently, Witten *et al.* argue that schools provide a point of opportunity for planners and policy makers to strengthen neighbourhood cohesion, particularly in areas populated by parents of young children [56].

> "Successful places are ones that people enjoy and are proud of. They have a real public realm available… without charge, for everyone to see, use and enjoy 24-hours a day, including streets, squares and parks." [57]
>
> The United Kingdom Parliament (2003)

Some elements of a city, in contrast, can segregate communities. Particular examples cited by workshop participants included large, busy roads and cemeteries. Similarly, many participants were adamant that malls should not be considered a point for community interaction and development. One of the key concerns was for people to have access to places where they could go and feel they belonged. In the experience of participants, malls are private spaces and are intended for a specific sector of the community (in particular, excluding many young people and people on lower incomes). They are not primarily intended to promote interaction and the development of relationships.

Treaty of Waitangi considerations

Many commentators believe that the process of urbanisation has contributed to the fragmentation of ties within Māori whanau and tribes. Apart from isolated examples such as urban Marae, there is little in our current urban design in the Greater Christchurch region that clearly identifies Māori as the original tangata whenua of the region.

In Christchurch 30% of Māori in Canterbury (versus 15% of Pakeha) have levels of deprivation of 8, 9 or 10 [12] and thus are disproportionately represented living in areas where social connectedness is particularly problematic.

Are other groups likely to be more affected?

The importance of ensuring that low income individuals and families within Greater Christchurch are not marginalised or *further* marginalised as development occurs was often raised in the workshops. Many comments relating to the importance of promoting a sense of community, and the design tactics for doing so, emerged from experiences gained working with low income groups and areas within Christchurch City. Duhl and Sanchez [7] have also suggested that where communities become fragmented, the deterioration of social ties in poor neighbourhoods is particularly acute. Key recommendations for ensuring the well being of some of our most vulnerable residents included:

- Involving affected communities in development rather than imposing development on them;
- Ensuring the availability of low cost accommodation close to amenities and employment sources, and similarly;
- Ensuring that communities are well connected to the city and the wider region by good transport services and links.

The quality and nature of transport was often mentioned as being critical to people's ability to participate, their level of social isolation and their access to services. This was considered to be especially important for low income areas where transport links are not always well provided. Environments that promoted walking and cycling were also considered desirable for their contribution to physical fitness, and decreased reliance upon motor vehicles, and also for allowing interaction between travellers. Elsewhere, suburban sprawl that is poorly served by public transport has been found to disconnect places from the towns and cities upon which residents depend [57]. Similarly, Talen [58] found a strong relationship between vehicle dependence and weaker social ties; while Cropper (2001) [54] found that in some cases, intensification lead to an increase in neighbouring [†].

The preferred option

Two workshops were held on social connectedness and in neither did participants strongly favour one particular option. Participants strongly affirmed the link between urban design and social connectedness with downstream health benefits. There was clear support for the concept of urban centres which was also a strong theme in the UDS consultation feedback. Implicit in this is a rejection of the 'Business as Usual' option with its lack of integrated urban planning.

Conclusions

In summary, both the workshop discussions and the literature affirm the importance of social connectedness to the health and well-being of groups and individuals. A range of ways the built environment can be used to promote social connectedness are identified. The recommendations are grouped into three distinct themes: Designing for Accessibility; Designing for Interaction and Identity; and Designing for Diversity.

Design for Accessibility:

- Ensure an efficient transport system that connects people of all incomes to their neighbourhoods and the wider city and minimises time spent travelling to work, school, shops and recreation - this is especially important for *existing*, low income areas;
- Design transport networks that at least allow, and at best promote the use of alternatives to private motor vehicles such as walking and cycling;
- Plan local centres that are close to living zones, to facilitate the development of community *within* an area. For example, ensure new subdivisions are close to employment; community services and facilities; opportunities for recreation; schools; and churches; and
- Incorporate universal design principles when planning and designing public spaces [º].

[†] However, this did not always translate into a strong sense of community. For this to occur, it is suggested that other factors may have to be present including homogeneity of residents in terms of socio economic status.

[º] Universal Design is an approach to the design of all products and environments to be as usable as possible by as many people as possible regardless of age, ability or situation.

Design for Interaction and Identity:

- Create local centres and public spaces that promote incidental interaction, walkability and gathering; and

- Design for a 'sense of place' using symbols of identity and belonging, including schools, churches, and community centres, cafes and public houses, and also monuments and artworks that signify the identity of the community.

Design for Diversity:

- Prioritise affordability, particularly access to quality (highly energy efficient and sustainable), low cost housing for the region's lowest income residents;

- Plan a range of housing types (size and price) that reflect and promote community diversity; and

- Involve residents in the design of new communities, particularly when an existing community is likely to be significantly affected as the result of development in an area.

Housing – a rapid literature review

Background

Housing can impact on health outcomes in a number of ways. Inadequate housing tends to be cold and damp, have poor internal air quality, offers little protection from excessive noise and has design features which increase the risk of injury causing falls. There is clear evidence that improving the energy efficiency of houses (e.g. having good insulation) improves the general health and well-being of occupants and reduces respiratory illness. Any improvement in housing is consistently followed by improvements in mental health. High accommodation costs can adversely affect health by reducing ability to pay for everyday items such as nutritious food.

In general people in rented accommodation have higher death rates than owner-occupiers. This is particularly true for Māori and Pacific Islands' peoples.

Recommendations

- Profile and utilise current New Zealand housing research to inform planning;

- Ensure affordable housing options for all;

- Strengthen building codes locally to build quality housing stock that is highly energy efficient; and

- Introduce universal design principles into all new buildings to reduce inequities in access.

Review of available information

The New Zealand Government's vision for housing is that *All New Zealanders have access to affordable, sustainable, good quality housing appropriate to their needs [59].* The New Zealand Housing Strategy acknowledges that this is not the current situation.

Quantifying particular health hazards associated with housing has not proved to be simple, despite a significant amount of literature linking inadequate housing with poor health. This is because housing is inextricably linked with its inhabitant's socio-economic status and with the general housing standards in the local community.

"housing is inextricably linked with its inhabitant's socio-economic status and with the general housing standards in the local community"

The next table represents the results of a comprehensive literature review carried out in 2001 [60] on the specific health impacts of housing.

The main housing factors that have been associated with health variation are:
- Poor internal air quality
- Poor hygrothermal conditions (excessive heat, cold and/or humidity)
- Slips, trips and falls
- Noise
- House dust mites
- Ambient tobacco smoke
- Fires [61]

There is a lack of intervention studies with solid data on how to improve health outcomes through improvements to housing [62]. The Wellington School of Medicine is currently carrying out three intervention studies investigating the relationship between: health and housing and heating; housing and insulation (see box); and housing and crowding. Some of these studies are being carried out in Christchurch City. Final results are expected to be available in 2006/07. In New Zealand, specific data linking overcrowding to higher risks of contagious diseases such as Meningitis and the link between overcrowding and infectious diseases such as Tuberculosis and Rheumatic fever is well established [63] [64].

The most recent review of the evidence provides an overall assessment of the health effects of housing improvement. The review concludes that:
- It is unclear whether reducing specific housing hazards leads to health improvements;
- The small number of evaluative studies of housing improvements makes it difficult to know which types of housing improvements are most likely to improve health;
- General housing improvements may result in small improvements in physical health and general well-being;
- Improvements in mental health are consistently reported following housing improvements. The degree of mental health improvement may be linked to the extent of the housing improvement;
- Improved energy efficiency may alleviate respiratory symptoms; and
- Housing improvements may also result in adverse health impacts; e.g. if the rent increased, poorer diets, and increased mortality rates have been reported [61].

It is difficult to make specific recommendations on the strength of the evidence available. But we know that improving the energy efficiency of houses will benefit people with respiratory illness. It will reduce spending on heating thus freeing up household income to spend on other necessities. Further, housing improvements are consistently linked to improved mental health, although the mechanism of this is not clear.

Table 5 Evidence from controlled and uncontrolled intervention studies of specific health impacts of housing

Impact on outcomes measured	General Health or wellbeing	Symptoms/illness and health service use	Respiratory	Mental health	Mortality	Social
Rehousing/refurbishment plus relocation from slum area or community regeneration						
	◀▶ Unclear impact on measures of general health +	◀▶ Unclear impact on symptoms or illness episodes ++ ◀▶ Unclear effects on health service use +	◀▶ Conflicting findings from four studies	▲ Consistent improvements in mental health++	▼ Increased+	▲ Number of smokers reduced+ ▲ Increased community involvement, social support, sense of belonging and feeling of safety. Reduced fear of crime and sense of isolation+ ▲ Increased rents led to reduced income to buy adequate diet+
Medical Priority re-housing						
	▲ Improved objective measure and self reported health+	◀▶ Unclear impact on health service use+		▲ Improvement in objective measure and self-reported mental health++		
Energy Efficiency Measures						
	▲ Improved objective measure of health+	◀▶ Unclear impact on general symptoms	▲ Reduction in respiratory symptoms+	◀▶ No significant difference in emotion and mental health+		▲ Less school time lost due to asthma but not other symptoms+

Direction of effect: ▲ improvements to health or reductions in illness; ◀▶ no clear effect on health or illness indicators; ▼ reductions in health or increases in illness. Strength of evidence: +++ strong association: evidence from prospective controlled studies with good levels of follow up; ++ moderate association: evidence from at least one prospective controlled studies; + weak association: evidence from uncontrolled studies.

"Physical housing interventions may incorporate components that address other issues affecting health. For example, installing residential insulation in a cold, damp house may have the direct effect of improving the quality of the indoor environment, lessening the risk of chronic respiratory illness. Additionally, it may also reduce house heat loss, contribute to more efficient and healthy use of heating appliances, reduce fire risk, allow more money to be spent on items other than household heating, and improve mental health" [63].

Improvements in housing affect health along with other health determinants. Urban regeneration may indirectly and negatively affect health by the following mechanisms:

- Increased rents; These may result in people economising on other necessities such as heating costs and dietary needs;

- Effects on the social context and local area; Well planned improvements may generate increased community connectedness with positive health effects (see section on social connectedness in this report);

- Relocating to a new area; moving from a low socio economic area to a middle-income area has been linked to better employment and health improvements – but which comes first?

- Displacement; Regeneration of an area may simply shift the 'problem' elsewhere, and

- Social exclusion and community division; For those living on the margins of a regenerated area feelings of exclusion can exacerbate levels of stress and depression [61].

There is accumulating evidence within New Zealand that high accommodation costs (as a proportion of income) are leaving families with less disposable income to pay for items essential to good health such as nutritious food, education and access to health services [59,65]. There is a tendency, for example, for families to buy food high in calories and low in nutrition when they have little money.

Increased housing costs could also threaten levels of home ownership. If home ownership is good for individuals and for stable communities then there is an increasing concern that, for a number of reasons, New Zealanders are less able now to afford their own home [66] . There is a growing body of research linking home ownership with positive health, although it is recognised that not all groups within the community necessarily aspire to own their own home. Woodward [67] and Sundquist et al [68] have shown that people in rented accommodation have higher death rates than owner-occupiers, even after socio-economic variables have been considered. It is thought that home ownership may generate a degree of security and control within the life of the homeowner therefore contributing to positive mental and therefore physical health. This presumes, though, that home owners can afford mortgage payments [69].

Treaty of Waitangi considerations

In this field there is significant capacity amongst Māori to inform and engage the UDS team. The Centre for Housing Research in New Zealand, for example, has commissioned research titled "Māori Housing experiences, emerging trends and issues." This work is expected to be completed in May 2006. (http://www.hnzc.co.nz/chr/wip/project11.html). The centre has a number of prominent Māori researchers who have published extensively in the areas of sustainable housing and appropriate housing for Māori. Shad Rolleston (see section on Māori consultation) is completing a PhD on Māori perspectives on urban design. Ngai Tahu are currently researching housing best practice for Māori in the Canterbury area. The UDS should promote Māori participation and partner with manawhenua as much as is possible in the field of housing.

"Māori whanau generally prefer low density residential developments which allow good opportunities for outdoor living, communal gatherings, gardens and safe tamariki play space" …considerations of tapu and noa need to be built into Māori housing e.g. food facilities must be separate from bathrooms, toilets and laundries [70] .

Are other groups likely to be more affected?

Housing New Zealand's recent consultation process reveals that Māori and Pacific Islands' peoples still have strong aspirations towards home ownership but that "between 1991 and 2001 the rates of home ownership among Māori and Pacific Islands' people declined more quickly than for other people" [59].

People with mobility issues, such as wheelchair users and parents with young children in buggies, are often affected by access difficulties in the built environment. Elderly people in particular can be significantly affected by hazards in the home that lead to falls and subsequent injury. Implementation of universal design principles is likely to resolve all of these issues.

> "New housing is more likely to be owner-occupied; older, uninsulated housing in a poorer state of repair is more likely to be rented. Those who rent rather than own their own homes are more likely to be of lower socio-economic status, so the impact of inadequate housing on health is likely to be even more marked for those on lower incomes…Those who are economically or socially deprived are more likely to be Māori and Pacific peoples" [15]

The preferred option

For both 'Business and Usual' and 'Concentration' options there will be a mix of new housing, renovated older housing and unrenovated housing. In terms of actual housing each option has potential benefits and risks, though these can be managed by advance planning. No one option is clearly favoured.

The realities of an aging population need to be acknowledged with greater provision of smaller dwellings that require less maintenance (both indoor and outdoor) and are highly energy efficient. Concentration is likely to favour such dwellings.

For families with young children, safe and easy access to play areas is important. Some ethnic groups have larger families and require dwellings with greater numbers of bedrooms and bathrooms but that are still affordable to low income groups. The concentration option may allow for this but there must be consideration as to how such dwellings can be integrated with the need for easy access to green spaces and public transport.

It is likely that the concentration option will increase land costs in the urban centres thus driving up house prices. Proactive strategies will be needed to manage this risk.

All new housing centres should be designed to increase social connectedness and encourage perceptions of safety. The risks of urban regeneration, primarily that of 'moving the problem' rather than dealing with it, must be considered throughout.

In summary, while housing improvements such as increasing the energy efficiency of the home with good insulation will lead to overall health gains, greater improvements in health outcomes are more likely if other impacts upon health are simultaneously addressed. The risks of housing regeneration can be managed if they are considered early in the development process. Finally, housing interventions are more likely to be successful if programmes are based on partnership models with all relevant stakeholders including the residents of the affected houses [63].

Conclusions

Improved health outcomes are very likely if houses are built to the highest level of energy efficiency, although direct evidence from intervention studies is non-conclusive. Health improvements are more likely to follow specific housing improvements if other factors such as affordability, suitability, sustainability, cultural adequacy, location and availability of services are also considered. Provision of adequate housing cannot be dealt with in isolation from other health determinants. The HIA working party recommends that:
- Local by-laws are strengthened such that all new housing is planned utilising universal design principles and built to the highest possible standards of energy efficiency;

- New housing design and retrofitting of older housing should be undertaken in collaborative partnerships with all stakeholders including residents;

- Strong links be developed with housing researchers in New Zealand, particularly: 1) those involved in intervention studies such as the Wellington School of Medicine and: 2) Māori housing researchers, so that the results of this research can be utilized efficiently; and

- Plans are put in place to ensure there are affordable housing options for all – from the single elderly to the extended whanau.

The conclusions and recommendations made in this section of the report are supported by an extensive range of national and international policy initiatives.

New Zealand is a signatory to the **Universal declaration of Human Rights** and has been committed to respecting the rights detailed there since 1948. Article 25(1) refers to housing as a right. New Zealand ratified the **International Covenant on Economic, Social and Cultural Rights** in 1978, which provides the most significant legal source of the right to adequate **housing.** The Government's vision for housing as detailed in the **New Zealand Housing Strategy 2005** is that *all New Zealanders have access to affordable, sustainable, good quality housing appropriate to their needs*. The **Housing Innovation fund** and the **Local Government fund** aim to encourage community based organisations, Iwi and local government to expand their role as providers of sustainable, long term housing by offering loans and advisory support. **Community Housing Aotearoa Incorporated Nga Wharerau O Aotearoa** was established in October 2004 to connect, support and represent community-based organisations throughout New Zealand that provide housing to people on low incomes or with special needs. **Housing New Zealand Corporation** is developing a design and development initiative on low cost high quality housing. One of the requirements in achieving the purpose of the **Building Act 2004** is stated in section 2n: 'the *need to facilitate the efficient and sustainable use in buildings of materials (including materials that promote or support human health*)' Further the Act aims to improve control of, and encourage better practice in, design and construction of buildings the first time. The **Department of Building and Housing** aim to complete a **review of the building code** by November 2007 and are also working on a **review of the Housing improvement regulations 1947** and development of a **new baseline housing standard.** Research on housing and health in its widest sense is being carried out by the **Wellington School of Medicine, Massey University Real Estate Analysis Unit, Building Research Association of New Zealand** and the **Centre for Housing Research Aotearoa New Zealand**. Christchurch City Council is a signatory to the Ministry for the Environment's New Zealand **Urban Design Protocol March 2005** which amongst other things identifies the importance of linking well designed housing of all types to the wider context of the surrounding area. **The National Energy Efficiency and Conservation Strategy 2001** aims to improve the energy efficiency of housing nationwide through programmes such as the **Energy Efficiency Conservation Authorities Energy Wise Home Grants** and **Housing New Zealand's Corporations Energy Efficiency Retrofit programme.**

The Housing, Insulation and Health Study
Preliminary Results October 2003

What Was Done
Fourteen hundred households and almost five thousand people agreed to take part in a study, funded by eleven organisations, to test whether putting insulation into uninsulated houses had any impact on the occupants' health or the energy they used. The research was carried out by the Housing and Health Research Programme, at the Wellington School of Medicine, who work in partnership with seven locally-based organisations in Otara, Eastern Bay of Plenty, Nuhaka and Mahia, Taranaki, Porirua, Hokitika and Christchurch.

How It Was Done
Households were selected in 2001 and baseline interviews were carried out after the winter of 2001. Community researchers interviewed everyone in the households to record their health, wellbeing and power usage. The researchers then randomly assigned half the houses, in each community, to be insulated. Community retrofit teams insulated these 700 homes over the summer and then, after the winter of 2002, everyone was interviewed again. All the household information was then analysed. At the end of the study, the remaining 700 houses were also insulated.

Preliminary Results
  • Overall, there has been a small, but significant* drop in energy usage when houses are insulated.
  • Overall, once the houses were insulated, they were drier and slightly warmer.
  • People in the insulated houses reported that their houses were significantly warmer.
  • There was a significant improvement in the self-reported health of adults and children living in the houses that were insulated, compared to those whose houses were not insulated.
  • Adults and children in the insulated houses reported visiting the GP less. The decrease in the number of visits was significant for the adults.
  • Adults and children in the insulated houses reported that they were admitted to hospital less often for respiratory conditions.
  • Adults, in the workforce and living in insulated houses, were significantly less likely to report sick days off work, and children in these houses were less likely to have had days off school.
  • Samples of normal household dust were collected in three of the communities and examined for allergens and mould. All houses had mould, but the amount and species varied a lot. Insulating the houses did not seem to change the amount of mould, but householders in the insulated houses reported less visible mould.

These are the first results from the study.* Results described as significant are statistically significant.

This research was carried out by researchers in He Kainga Oranga working together with Te Pumanawa Hauora at Massey University, BRANZ, CRESA, Landcare Research, and Smartpower.

Transport - A rapid literature review

Background

Transport has a large impact on health. Road traffic safety, physical activity, air and noise pollution, community networks and climate change all influence health. Factors that contribute to road traffic safety include congestion, speed, seatbelt use and road and urban design.

Physical activity is key to health. Approximately 2600 premature deaths a year in New Zealand can be attributed to insufficient physical activity [5].. Air pollution produced by vehicles burning fossil fuels causes approximately 400 premature deaths annually [5].

Transport can enhance community networks by providing opportunities to meet, or disrupt them as a consequence of busy highways that segregate communities.

Recommendations

- Actively promote active transport – particularly by cycle and on foot
- Promote use of public transport
- Reduce reliance on private cars – particularly in the centre of Christchurch and towns
- Incorporate urban, road, footpath and cycleway design strategies that maximise road safety
- Minimise adverse effects on communities when constructing and developing arterial roads
- Incorporate planning for Peak Oil into transport policy and planning
- Monitor impacts of transport on health outcomes (e.g. emissions, injury rates)

The primary function of transport is in enabling access to people, goods and services. In so doing it also promotes health indirectly through the achievement and maintenance of social networks. Some forms of transport, such as cycling and walking, promote health directly by increasing physical activity and reduction of obesity. Lack of transport may damage health by denying access to people, goods, and services and by diverting resources from other necessities. Furthermore, transport may damage health directly, most notably by accidental injury and air pollution.

Acheson Report, 1998 [71]

Review of available information

> People living in counties with widely spread urban development are likely to walk less and weigh more, and have higher blood pressure than people living in less sprawling counties.
>
> Smart Growth America study [72]

A growing number of researchers and authors have described the links between urban design, health and transport options. There is an association between the type of place people live in and their activity levels, weight and health [72]. A study by Smart Growth America found that people living in counties with widely spread urban development are likely to walk less and weigh more than people living in less sprawling counties. In addition, people living in the more sprawling counties were more likely to suffer from high blood pressure. These results were consistent when controlled for aged, gender, ethnicity and education levels [72].

People with greater wealth are more likely to have access to cars and to be able to choose where they live, away from busy roads. The detrimental health effects of transport and urban design are therefore concentrated in more deprived communities [73] [74].

The impacts of transport on health have been well summarised [75] [73] [76]. A comprehensive and relevant review of New Zealand evidence for the health impacts of transport has been published by the NZ National Health Committee, and may be consulted for details [77].

The five key impacts of transport on health considered here are:
- Physical activity;
- Air and noise pollution;
- Community networks;
- Road traffic safety; and
- Climate change.

Current state of play – Greater Christchurch, urban design and transport

> The popularity of commuter cycling in Christchurch continues to remain high among commuters. Considerably more people commute by cycle each day than use the bus service (7.3% use cycles, 4.5% use buses, Census 2001). The investment made by the Council and Regional Council collectively towards providing for cycling is considerably less than that made for public transport. This shows that cycling is still a very popular and cost fective sustainable transport mode.
>
> Cycle Strategy for Christchurch City Council - Annual Report[78]

Christchurch is a city of approximately 325,000 people. Suburbs surround the city in a roughly radial fashion. Urban growth in Christchurch in the last 20 years has seen a trend for development of new subdivisions on the fringes of the city. The commuter belt now includes rural towns such as Lincoln, Rangiora, Rolleston and Spencerville. Development of the peripheries of the city onto private land has been driven largely by the initiative of property developers. 'Lifestyle block' development is an area of rapid growth. Many people commute from these new housing areas into the city.

The UDS expects traffic in 2021 will be 40 – 50 % more than it is today, most of which will primarily be on arterial roads, increasing congestion [79]. The Business As Usual (BAU) option predicts that by 2021 congestion would increase by 160% and commuting would take 26% longer. By 2041 congestion would rise by 320% from today's levels, and commuting take 55% longer [79]. Option A with concentrated development will have less congestion than BAU. Even so, under this option some roads would become more congested, with a 50% increase in congestion by 2021 and 190% by 2041. Travel times will be up to 45% longer by 2041[79].

Approximately 80% of New Zealanders now commute in a private motor vehicle, and most of the longer single-occupant car commutes originate in the outer suburbs [80,81]. Vehicle occupancy rates have dropped from 1.2 passengers in 1976 to 1.08 in 2001. Car commutes have become longer than most other weekday journeys accounting for 32% of the total distance travelled by car [81].

Commuters in Christchurch over the past decade (based in NZ Census data) travelled to work the following ways [80-82]:

Means of Travel	Christchurch 1991	Christchurch 1996	Christchurch 2001
Drove a Car / Truck / Van	59.3	60.9	60.6
Bicycle	8.9	6.7	5.7
Walked or Jogged	4.2	4.1	4.4
Public Bus	4.3	3.4	3.5
Passenger in Car / Truck / Van	4.9	4.0	3.4
Motor Bike or Power Cycle	2.4	1.3	0.8
Worked at Home	3.4	5.0	5.5
Did Not go to Work	10.6	10.8	12.4

When travelling for non-work reasons, 22% of Christchurch residents use the bus and 11% walk or jog. [83]

Christchurch has the third highest rate of commuter cycling in New Zealand, with approximately 7% of the population cycling on Census day in 2001. Palmerston North and Nelson have the highest levels nationally with 7.5% and 7.2% respectively.

There is evidence that the proportion of commuter cyclists, particularly school children, is decreasing. The percentage of commuters who cycled to work in Christchurch on Census day in 1981 was 10.7%, in 1996 it had dropped to 6.7% and in 2001 it was 5.7%.

An annual survey showed 96% of Christchurch residents are supportive of Council efforts to make Christchurch cycle friendly [82]. Christchurch City Council and Environment Canterbury have both developed cycling strategies to increase the amount of cycling, increase the enjoyment of cycling and reduce the number of cycle crashes in Christchurch city. These strategies include urban design measures to promote cycling, as well as the development of networks of cycle routes [84-86].

Physical activity

> Physical inactivity is the second (after tobacco smoking) most significant behavioural cause of ill-health in society….In the UK about 140 people are killed each year while riding a bike while around 20 000 others die prematurely from lack of any exercise.
>
> Chris Rissel 2003 [87]

There have been significant changes in the way New Zealanders move around in the past two decades, with an increasing reliance on the private motor vehicle and decreasing use of cycling and public transport [81].

Physical inactivity is a major cause of preventable deaths in New Zealand. At least 2600 people in New Zealand die prematurely each year due to physical inactivity. Sedentary people are more likely to be overweight, have non-insulin dependent diabetes and have high blood pressure which can lead to heart disease and strokes [5]. 45.2% of New Zealanders were described as overweight or obese in the New Zealand Health Survey in 2003. Overweight and obesity rates among Māori and Pacific Islands' people are even higher [88]. The same survey found only 52.1% of New Zealanders have regular physical activity. A 10% increase in physical activity could result in 600 fewer deaths per year [5]. The CDHB plan "Healthy Eating Active Living Action plan 2005 – 10" [89] provides greater detail on how inactivity leads to ill health, and solutions to increase physical activity.

A 10% increase in physical activity could result in 600 fewer deaths per year [5]

Cycling, walking and running are forms of active transport. Active transport will increase physical fitness, lower levels of obesity, increase well being and reduce road congestion.

Safety is a commonly perceived barrier to cycling. A British Medical Association report reviewing risk of injury and health benefits related to cycling concluded that the benefits clearly outweighed the risks [90]. A cohort study following 30 000 people in Denmark over 14 years, found that bicycling to work decreased the risk of death by 40% [91].

Methods to encourage walking and cycling, and to discourage use of cars, include charging for car parking or car use, traffic calming, road space reallocation, cycle paths, travel behaviour change programmes, public transport improvements and integrated urban transport strategies [92].

"Getting there –on foot, by cycle" provides a strategic framework to advance walking and cycling as part of the New Zealand Transport Strategy [93]. Policy-makers widely support opportunities to integrate public health and urban planning approaches to promote active community environments [87,90,94].

Urban design can substantially increase the opportunity for physical activity and active transport. The BAU Option is likely to increase the kilometres travelled, the number of vehicles required for daily commuting and reliance on the private motor vehicle with all the related adverse health impacts. The concentration option is most likely to increase opportunities for public and active transport, with the associated health benefits.

Air and noise pollution

> Interestingly, people riding a bike are exposed to two to three times less air pollution compared with people driving cars on the same road.
>
> Rissel 2003[87]

Transport is a major contributor to poor air quality. Vehicle emissions are estimated to be responsible for around 400 premature deaths per year in New Zealand [95].

Negative effects of traffic noise include interference with communication, sleep disturbance and vibration from passing traffic [77]. There is emerging evidence of a link between hypertension and ischaemic heart disease, and high levels of noise. Ambient noise levels continue to grow due to ever increasing volumes of traffic.

Urban design can significantly impact on the air and noise pollution associated with commuting and travel. Ministry of Transport research in Waitakere City, has mapped the effects of variations in urban form and activity to manage the environmental impacts of land transport. This includes air quality indices and greenhouse gas emissions and proposes integrating urban planning with environmental analysis [96].

Community networks

> In essence, roads in rural and provincial communities tend to connect people into communities, while roads in urban areas can divide communities due to traffic volumes, loss of land and dispersion of activity.
>
> Transport and Environment Committee 1998 [97]

"The influence of transport on social cohesion is complex. Transport provides an important means of contact between family members, friends and members of voluntary organisations and communities. At the same time, roadways and traffic act as a physical and psychological barrier to social contact. Whether the positive or negative social effects of transport predominate depends on the location and volumes of transport networks" [77].

In the context of urban planning, it is useful to note that in rural areas and satellite suburbs, reliance on a private motor vehicle is greater, and motorised transport is essential to access facilities and to maintain social contact. Social isolation may be increased by lack of car access, especially in areas with poor public transport [73,75].

Social severance is a term used to describe the negative effect that roads and traffic have on social interaction within a community. A busy roadway and heavy traffic flows can act as a barrier to community contact. International literature indicates that social severance has its greatest impact on those with limited mobility, such as children, the elderly and people with disabilities.

The figures below show twenty-five year old research demonstrating the effects of differing levels of traffic density on social networks and sense of community in San Francisco, USA. The diagrams make a compelling case for reducing traffic in residential areas. In New Zealand we need more information on transport–related social severance [77].

"I feel it's home. There are warm people on this street. I don't feel alone."

LIGHT TRAFFIC
2000 vehicles per day
200 vehicles per peak hour

3.0 friends per person

6.3 acquaintances

"Definitely a friendly street."

"Everybody knows each other."

"A friendly street. People chatting washing their cars, people on their way somewhere always drop in."

"Used to be nice. People were friendly."

"You see the neighbors, but they aren't close friends."

MODERATE TRAFFIC
8000 vehicles per day
550 vehicles per peak hour

1.3 friends per person

4.1 acquaintances

"A friendly street. Some families here a long time, many people related."

"Don't feel there is any community any more, but people say hello."

HEAVY TRAFFIC
16000 vehicles per day
19 00 vehicles per peak hour

0.9 friends per person

3.1 acquaintances

"It's not a friendly street, but it's not hostile."

"People are afraid to go into the street because of the traffic."

"It's not a friendly street -- no one offers help."

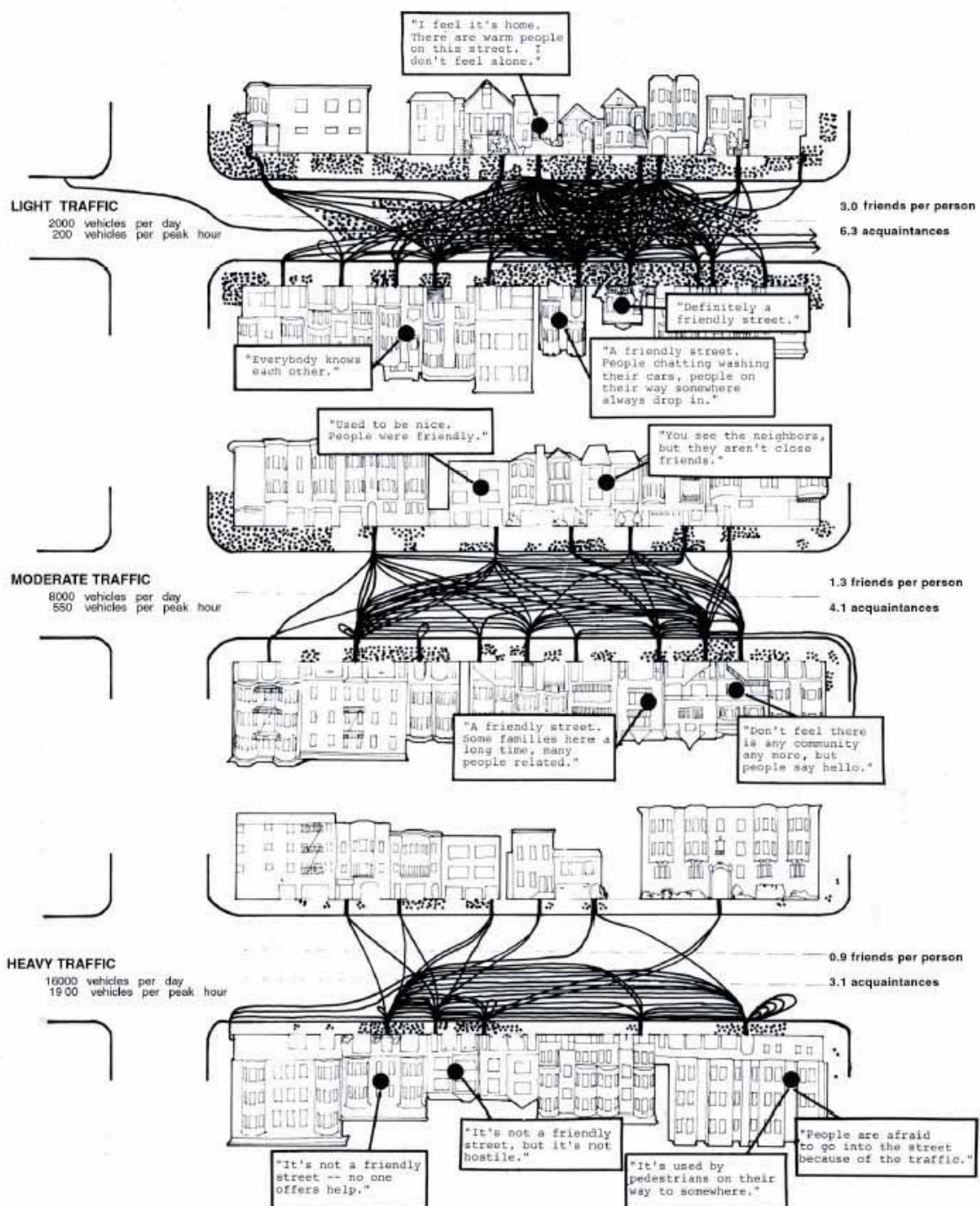"It's used by pedestrians on their way to somewhere."

Figure 1: This image shows how community ties can actually be knit together by a street that is livable and inviting — or torn apart when auto traffic noise, pollution, and threats dominate the street environment.

Source: Figure 3, page 21, **Livable Streets**, Donald Appleyard, University of California Press, 1981.
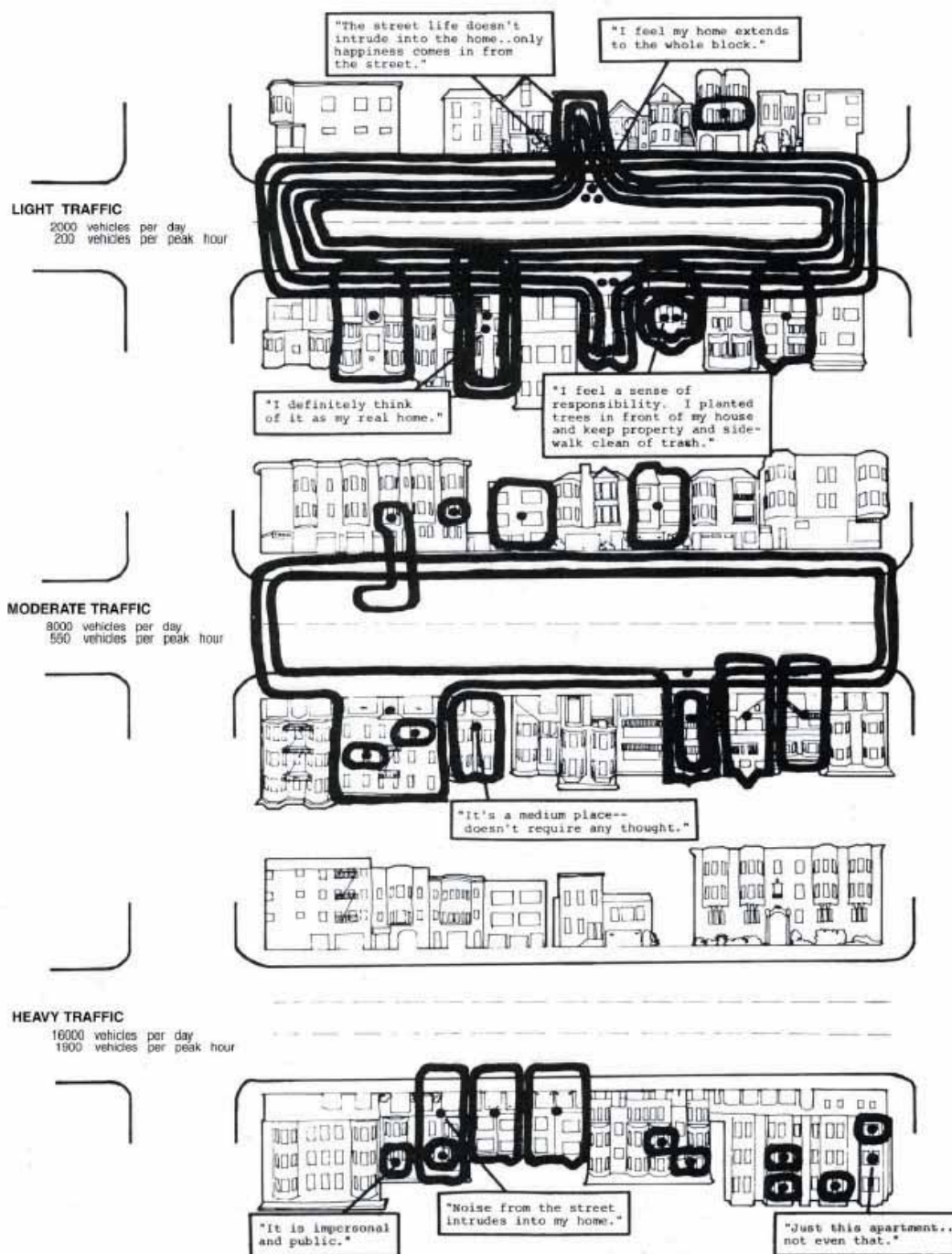
Figure 2: This illustration shows how a resident's sense of their home territories shrinks as traffic grows heavier and faster.

Source: Figure 4, page 23, **Livable Streets**, Donald Appleyard, University of California Press, 1981.

Road traffic safety

> In New Zealand, the trend over recent decades has been for a shift of passenger transport towards the private car for short and medium distances and towards air transport for longer distances.
>
> Statistics NZ, 2002 website

A significant proportion of hospitalisations and deaths in all countries are due to road traffic injuries [75]. In New Zealand, road traffic injuries ranked as the second highest cause of 'years of life lost' for men in 1996 [98].

Road traffic injuries are differentially distributed to adversely affect children, Māori and Pacific Islands' people, those with greater socio-economic deprivation, and pedestrians, cyclists and motorcyclists [75,99]. Drivers of Māori or Pacific ethnicity face a higher risk of injury per distance driven than Pakeha/ European drivers. The risk of being hospitalised as a result of a road crash is three times higher for Māori and almost three times higher for Pacific drivers [77].

Road traffic injury can be reduced by transport strategies and good urban design. For example, an Auckland study found that risk of injury at sites with highest traffic volumes was 13 times greater than those at least busy sites, and risk increased with increasing traffic volume. Risk of injury was also increased 8 times with high density curb parking and was more than doubled at sites with mean speeds over 40 km/h [100]. Ecological evidence supports these findings, for example, during the New Zealand governments restrictions on car use during the 1970's, there was a 46% reduction in child pedestrian mortality [100].

Climate change

> Most of the unsustainable commutes are located in the sprawling outer suburbs, which have between 20 and 800 households per square kilometre and where 75% of the population now reside. In these areas 80% of households own 2 or more cars; and they are responsible for 85% of the distance travelled by all commuters …. Many city dwellers are likely to suffer considerable hardship because 90% of their journeys to work are made by car, truck or motorcycle and there is no easy way of continuing to do that without cheap oil.
>
> Alan Parker [81]

Use of fossil fuels in vehicles produces carbon dioxide, a major greenhouse gas contributing to global warming. New Zealand is unique in OECD countries because methane, produced by sheep and cattle, contributes as much as two-thirds of our greenhouse gas emissions. Transport emissions contribute substantially to the remaining third. Carbon dioxide emissions in Christchurch have risen by 43% in the last 10 years [79].

Urban design can limit the adverse effects of high fossil fuel use for transport. There is evidence that most of the longer single-occupant car commutes originate in the outer suburbs [80,81].

The BAU Option is more likely to increase congestion, lengthen commuter travel times and increase total carbon dioxide production due to transport [79]. This option is also likely to prove unsustainable with the possibilities of peak oil in the coming decades. Alternatively, Concentration options are likely to limit the total distance to be travelled between home and employment/education facilities. Opportunities for use of public transport and active transport will be improved.

Treaty of Waitangi considerations

Māori are over represented in areas of highest deprivation in the community. Those in more deprived communities are more likely to live nearer to transport corridors that will expose them to higher concentrations of vehicle emissions. This is of particular relevance to Māori, where asthma rates are high in their preschool population.

Are other groups likely to be more affected?

Poorer people are more likely to live nearer to transport corridors that will expose them to higher concentrations of vehicle emissions, disrupt community networks and expose residents to higher risks of road traffic injury.

Disabled persons such as the frail elderly, children, parents of young children and those with a low income are differentially affected by transport policies. These groups are least likely to have access to private motor vehicles. Poor public transport can lead to social isolation as well as reduced opportunities for employment and education for these groups [101].

Street lighting, footpath quality, dropped kerbs and street signage impact on accessibility of streets for those with impaired mobility. Use of public transport is limited by the cost of fares, frequency of timeliness of public transport, physical accessibility of buses and the perceived safety of the waiting environment especially during the hours of darkness [101].

The preferred option

From a health perspective strategies that promote active transport are vital. These strategies can be pursued whichever option is chosen. An HIA by the London Health Commission on the London Mayoral draft transport strategy made the following recommendations to increase the potential for health improvement:

- Promote other modes of transport;
- Promote the use of public transport;
- Reduce the use of private cars; and
- Link transport, economic development and spatial development [102].

The review of literature around transport and health issues related to road safety, air and noise pollution, physical activity, community networks and climate change suggests that the potential for improved health outcomes is higher with the Concentration option than the Business as Usual option.

Conclusions

Urban design can facilitate active transport.

Urban design that promotes road traffic safety, active transport (foot and cycle), and use of public transport, sustainability and improved community networks is essential and attainable.

Indicators of healthy transport should be monitored including:
- Numbers of accidents e.g. children, cyclists and pedestrians;
- Air quality;
- Numbers of kilometres of cycle ways and walkways developed;
- Noise levels;
- Efficiency and use of public transport;
- Car ownership; and
- Cycling rates [103].

The Urban Development Strategy should:

- Recognise and utilise already existing National and Regional strategies such as "Getting there on Foot by Bike' and the 'Christchurch Active Living;

- Actively promote active transport – particularly cycle and foot. This should include segregation of cycle, foot and vehicle traffic, cycle way and footpath construction, opportunity for bicycle carriage on public transport, development of safe walking and cycling routes to schools and provision of secure cycle parking facilities;

- Promote use of public transport –including appropriate lighting of bus-stops, increased services to suburbs with lower car ownership, consultation with users about appropriate design e.g. parents of young children, bus route planning that reflects travel patterns;

- Monitor indicators of the health effects of transport;

- Aim to reduce the need for reliance on use of private cars;

- Construction and development of arterial roads should seek to minimize adverse effects on communities. Planning should consider potential adverse impacts on socio-economic inequalities; and

- Promote sustainable transport options and seek to manage effects of climate change related to vehicle emissions e.g. through development of carbon sink plantations.

The conclusions and recommendations made in this section of the report are supported by a range of local, national and international policy initiatives; Some examples are:

The **1999 World Health Organisation Charter on Transport, Environment and Health. The Land Transport Authority** released its *Getting there – on foot, by cycle: A strategy to advance walking and cycling in New Zealand Transport* in February 2005. It aims to ensure New Zealanders have supportive walking and cycling environments in communities, that safety is improved for pedestrians and cyclists and that people walk and cycle more as part of their day-to-day transport mix. The **New Zealand Transport Strategy** provides the policy framework for this strategy. New Zealand Christchurch City Council is a signatory to the **NZ Urban Design Protocol.** The Council has strategies for **Physical Recreation and Sport**, **Active Living** and has a **Regional Physical Activity Plan (draft). The Canterbury District Health Board** released the **Healthy Eating, Active Living plan** in 2005.

Section Four:
Engagement with Maori

Engagement with Māori

Background

> "The Treaty of Waitangi forms an important part of the New Zealand context for health impact assessment. It is the founding document of New Zealand and has a key place in both health legislation and the wider public policy environment. The Treaty has implications for both the Crown and Māori, and HIA is a potential means for helping ensure that policies address these implications".
>
> Public Health Advisory Committee, 2004

Within the health sector three principles are used in summation of the Treaty of Waitangi Articles. These include:

- **Partnership**: Working together with Iwi, hapu, whanau and other Māori groups to develop strategies for Māori health gain and appropriate health and disability services

- **Participation**: Involving Māori at all levels of the sector, in decision-making, planning, development and delivery of health and disability services; and

- **Protection**: Working to ensure Māori have at least the same level of health as non-Māori, and safeguarding Māori cultural concepts, values and practices [4].

As part of the HIA process, the development of the consultation framework with Māori embodied the principles of partnership and participation. The principle of protection has been addressed by virtue of the HIA's focus on inequalities.

Recommendations

- Incorporate Māori research findings on low impact Māori urban design in the UDS.

Background

The Health Impact Assessment Guide (HIA) (2004), acknowledges the importance of the Treaty of Waitangi. The Local Government Act (2002) recognises the responsibility of local authorities to maintain and improve opportunities for Māori to contribute to local government decision making processes. Ngai Tahu is a participating stakeholder in the Urban Development Forum (UDF).

The HIA on the Greater Christchurch Urban Development Strategy (UDS) provides another opportunity for Māori to participate in the decision-making process of the UDS. The HIA steering group agreed engagement with Māori was a priority.

The objective was to "develop a process of engaging Māori such that the outcome would reflect greater partnership and participation in the long term planning and implementation of the Greater Christchurch Urban Development Strategy".

To appreciate the challenge of engaging Māori in the HIA process, it is important to have some understanding of Māori in the Greater Christchurch region. Ngai Tahu are manawhenua or the tribe with historical and ancestral ties to all of Canterbury. In the regions of Banks Peninsula, Waimakariri, Selwyn and Christchurch City, there are six Runanga (Ngai Tahu is comprised of a total of 18 runanga):

- Te Runanga o Koukourarata
- Te Hapu o Ngati Wheke / Rapaki Runanga
- Te Runanga o Onuku
- Wairewa Runanga
- Te Taumutu Runanga
- Te Ngai Tuahuriri Runanga

Runanga have an appointed chairperson and are separate entities representing the people who historically were from a geographic area and are related to the community. Tuahuriri Runanga is a significant Runanga, and represents manawhenua over the majority of Christchurch City, along with Te Taumutu runanga and Te Hapu o Ngati Wheke.

Te Runanga o Ngai Tahu has a variety of roles and responsibilities. Under its development arm sits the environmental division, Kaupapa Taiao. Representation on the Urban Development Forum comes from this division, because of the potential environmental impacts of the UDS. Ngai Tahu Holdings Corporation Ltd has responsibility for Equities, Property, Seafood, Tourism and Tribal Services. As with other key stakeholders, Ngai Tahu Holdings, in particular Ngai Tahu Property, will need to consider the impact of the UDS on land usage for urban development.

Te Runaka ki Otautahi O Kai Tahu, is an entity established to represent the needs of Māori in Christchurch City. This is not a Runanga officially recognised by the Ngai Tahu Settlement Act 1998.

Nga Mataa Waka, is recognised as a Māori urban authority, representing Māori who are from other tribal affiliations. Although Nga Mataa Waka has been set up to represent urban Māori not affiliated with Ngai Tahu, this 'umbrella' is not universally accepted by all those from other tribal affiliations.

UDS Māori Consultation

Māori comprised only 1.5% of the 3,250 respondents to the UDS Options consultation document. A personal perspective from one Māori individual cannot represent all Māori in a geographical region, or a hapu or Iwi. Thorough consultation needs to be made within the formal frameworks accepted as representing a hapu or Iwi. Runanga provide this framework for manawhenua.

HIA Māori Consultation Process

Consultation with Māori for the HIA needed to be effective and appropriate. Identifying key people and establishing relationships with these people was vital.

For the HIA to fully consult with Māori the first obligation was to consult Ngai Tahu, who are manawhenua. To date, consultation with each of the six Runanga has not occurred. Time needs to be given to consulting with Te Runaka ki Otautahi o Kai Tahu, and with Nga Mataa Waaka.

A key outcome of this HIA is to embed the recommendations of the HIA within the framework of the UDS, therefore any consultation would not be a 'one off' but an ongoing process. A preliminary workshop was convened to begin 'seeding' the HIA process amongst Māori.

Preliminary Māori Workshop

An overview of the UDS HIA process was given to participants who included representatives from He Oranga Pounamu, Pegasus Health, Christchurch City Council, Landcare Research and Canterbury District Health Board.

Māori values and perspectives can influence urban settlement and design (Rolleston, 2005). Some of these values include:

Māori Values	*Western Understanding*
Kaitiakitanga	Guardianship and Stewardship
Kotahitanga	Collaboration
Mana	Authority and control
Mauri	Life Principles
Matauranga	Knowledge and Expertise
Tapu and Rahui	Sanctions and Restrictions
Rangatiratanga	Autonomy
Tikanga	Protocols and Regulations
Whakapapa	Genealogical Connections
Whanaungatanga	Relationships

The implementation of these values into urban settlement and design forms part of the work of Māori researchers. Two researchers, Craig Pauling (Ngai Tahu, Kati Mamoe, Waitaha, Ngati Mutunga) and Shad Rolleston (Ngai Terangi, Ngati Ranginui), contributed to the preliminary workshop. Rolleston presented aspects of his research, expressing that "*there is a need to integrate values back into the way we plan, back into the policies and strategies that will influence land utilization and development."* Pauling is to commence research, driven by the desire to explore ways in which traditional and contemporary Māori values and principles can contribute to improved urban settlement patterns particularly for, but not only, Māori.

Te Runanga o Ngai Tahu identified the development of housing around their Papatipu Marae as a goal within their Vision 2025 document. Development of housing influenced by Māori design is being pursued in rural, semi-rural, periurban and urban areas by Te Runanga o Ngai Tahu [104].

Section Five:
Summary and Conclusions

Summary and Conclusions

Urban design has a strong influence on health outcomes. Quantitative evidence to support the link between the design of an urban area and a particular health outcome can be difficult to identify. This reflects the complexity of the relationship between urban design and people, and the relatively recent development of urban design issues as an area of research [1].

In terms of clear health outcomes what is known?

The detrimental effect on human health that certain forms of the built environment can have is well known. Cities where vehicle use is high tend to have low levels of active transport use. In general, levels of physical activity and car use are inversely related to each other [105]. High levels of car use not only decreases physical activity but also contributes to air pollution causing asthma, other respiratory disease, and exacerbation of cardiovascular disease. Cars create noise pollution and generate morbidity and mortality from road traffic accidents. On a bigger scale car use contributes to global warming and climate change.

The spread of the built environment ('urban sprawl') consumes the natural environment. This reduces soil availability for growing food and increases surface runoff with increasing risk of water pollution and flooding. Certain forms of the built environment can contribute to poorer mental health by promoting social isolation, reducing available green spaces for recreation and reducing 'safe' places.

"No problem exists in isolation and neither does its solution"

Health inequalities are strongly linked to socio-economic inequalities. In New Zealand, inequalities have been widening over the last twenty years. Informed urban design can assist in the reduction of socio-economic inequalities, however the possibility of urban regeneration increasing social inequality is a real one. "The challenge for urban developments is to achieve improvement for the whole society, while enhancing the position of the poorest." [2].

The built environment is a complex eco-system – No problem exists in isolation and neither does its solution. For optimal health outcomes the urban development strategy must identify and consider the range of health determinants in relation to the whole urban environment.

This Health Impact Assessment confirms that 'Concentration' is more likely than 'Business as Usual' to result in good health outcomes. Implementation of the recommendations in this HIA is more achievable and sustainable under the concentration option.

It was a rapid assessment and was significantly constrained by resource and time limitations. However this HIA provides a framework for those working on the development of a strategy for Greater Christchurch to consider sustainability and health related issues within its identified workstreams.

This HIA was a learning process for all parties. Overwhelming feedback from those who participated in this HIA was that it was an educational, enjoyable and valuable process that broadened their perspective on the role of urban design in achieving good health for the community.

Recommendations

The HIA working party recommend that:

1. Cross-sectoral working parties are established for selected health determinants to provide advice to the development and preparation of the strategy.

2. Health impact assessments for selected health determinants should be carried out with adequate resourcing.

3. All staff participating in the Greater Christchurch Urban Development Strategy should be trained in the principles of health impact assessment.

4. Health impact assessment should be incorporated into the development and analysis of policy for the UDS.

References

1. McIndoe G, Chapman R, McDonald C, Holden G, Howden-Chapman P, Bray-Sharpin A, 2005. The Value of Urban design. The economic, environmental and social benefits of urban design: Ministry for the Environment.
2. McCarthy M, 2002. Urban development and health inequalities. Scandinavian Journal of Public Health. Supplement. 59: 59-62.
3. National Health Committee, 1998. The Social, Cultural and Economic Determinants of Health in New Zealand: Action to Improve Health. Wellington: National Advisory Committee on Health and Disability.
4. Public Health Advisory Committee, 2004. A Guide to Health Impact Assessment: A Policy Tool for New Zealand. Wellington: National Health Committee.
5. Ministry of Health, 2004. Looking Upstream. Causes of death cross-classified by risk and condition in New Zealand 1997. Wellington: Public Health Intelligence, Ministry of Health.
6. Chadwick E, 1842. Report on the sanitary condition of the labouring population of Great Britain. Edinburgh: Edinburgh University Press.
7. Duhl L, Sanchez A, 1999. Healthy cities and the city planning process - a background document on links between health and urban planning. Copenhagen, Denmark: World Health Organisation - Regional Office for Europe.
8. Ministry for the Environment, 2005. Summary of the Value of Urban Design. The economic, environmental and social benefits of urban design. NZ Urban Design Protocol. Wellington: Ministry for the Environment.
9. Ministry of Health, 2002. Reducing Inequalities in Health. Wellington: Ministry of Health.
10. Woodward A, Kawachi I, 2000. Why reduce health inequalities? Journal Epidemiology and Community Health 54: 923-29.
11. Crampton P, Salmond C, Kirkpatrick R, 2004. Degrees of Deprivation in New Zealand: An atlas of socioeconomic difference. Auckland: David Bateman Ltd.
12. Canterbury District Health Board, 2004. Canterbury Health Needs Assessment Summary 2004. Christchurch: Canterbury District Health Board.
13. Monitoring and research team, 2003. Christchurch City Social Trends Report. Christchurch: Christchurch City Council.
14. Pearce J, Kingham S, Zawar-Rewa P, 2006. Every breath you take? Environmental Justice and Air Pollution in Christchurch, New Zealand. In print - Environment and Planning.
15. Howden-Chapman P, Crane J, Baker M, Cunningham C, Matheson A, 2004. Reducing health inequality through improving housing: He Kainga Oranga/Housing and Health Programme. Howden-Chapman P, Carroll P, eds. Housing and Health. Research Policy and Innovation. Wellington: Steele Roberts.
16. Ministry of Health, 2000. New Zealand Health Strategy. Wellington: Ministry of Health.
17. Fisher G, Kjellstrom T, Woodward AJ, Hales S, Town I, Sturman A, Kingham S, O'Dea D, Wilton E, O'Fallon C, Scoggins A, Shrestha R, Zawar-Rewa P, Epton M, Pearce J, Sturman R, Spronken-Smith R, Wilson J, McLeod S, Dawson R, Tremblay L, Brown L, Trout K, Eason C, Donnelly P, 2005. Health and Air Pollution in New Zealand: Christchurch Pilot Study: Health Research Council, Ministry for the Environment, Ministry of Transport.
18. Ministry for the Environment, 2005. What makes air pollution increase?
19. Environment Canterbury, 2005. How the inversion works. Christchurch.
20. Kunzli N, 2002. The public health relevance of air pollution abatement.[see comment]. European Respiratory Journal 20: 198-209.
21. Environment Canterbury, 2004. Environment Canterbury Annual Report 2003/04. Christchurch: Environment Canterbury.
22. Fisher G, Peterson J, 2001. Implications of reducing wintertime air pollution in Christchurch on greenhouse gas emissions. AKO1152 Nr, ed. Christchurch: Environment Canterbury Report No.U01/84.
23. World Health Organisation, 2005. Effects of Air Pollution on Children's Health and Development. A review of the evidence: WHO, 185.

24. Pearce J, Kingham S, 2005. Do the poor breathe in the poorest air? Air pollution and poverty in Christchurch, New Zealand. 17th International Clean Air and Environment Conference - CASANZ. Hobart, Australia.

25. Pearce J, Kingham S, Zawar-Rewa P, 2006. Every breath you take? Environmental Justice and Air Pollution in Christchurch, New Zealand. In print - Environment and Planning.

26. Turshen M, 1989. The politics of public health. London: Zed Books.

27. Ministry of Health, 2005. Drinking-water Standards for New Zealand 2005. Wellington: Ministry of Health.

28. Ministry of Health, 2003. Annual Review of the Microbiological and Chemical Quality of Drinking-Water in New Zealand 2002. Wellington: Ministry of Health.

29. WHO, 2004. Guidelines for Water-quality Management. Third Edition. Geneva: WHO.

30. Environment Canterbury, 2001. Canterbury Natural Resources Regional Plan - Chapter 7 Water Quality. Christchurch: Environment Canterbury.

31. Abraham P, Hanson C, 2004. Nitrate contamination observed in Environment Canterbury's annual groundwater quality survey. Report No. U04/79. Christchurch: Environment Canterbury.

32. Hanson C, 2002. Nitrate concentrations in Canterbury groundwater - a review of existing data. Report No. R02/17. Christchurch: Environment Canterbury.

33. Aitchison-Earl P, Davey G, Horrell G, Martin A, Sanders R, Smith E, Scott D, Weeber J, State of the Canterbury Region Water Resource, October 2005 Report No. U05/89. Christchurch: Environment Canterbury.

34. Environment Canterbury, 2005. Groundwater Recharge Zones Amendment 27 May 2005. Christchurch: Environment Canterbury.

35. Wang X, 2001. Integrating water-quality management and land-use planning in a watershed context. Journal of Environmental Management 61: 25-36.

36. Melloul AJ, Collin ML, 2003. Harmonizing water management and social needs: A necessary condition for sustainable development. The case of Israel's coastal aquifer. Journal of Environmental Management 67: 385-394.

37. Centre for Disease Control, 2005. Designing and building healthy places: Water quality: CDC, Atlanta.

38. Durie M, 1998. Te Mana, Te Kawanatanga. The politics of Maori self-determination. Auckland: Oxford University Press.

39. Durie M, 1998. The application of the Treaty of Waitangi for Health. Durie M, ed. Whaiora: Maori health development. Auckland: Oxford University Press.

40. Ministry of Health, 2005. Drinking-water Standards for New Zealand. Wellington: Ministry of Health.

41. Norris J, 2005. NZ enters new climate cycle. The Press. Christchurch, 4.

42. World Health Organization, 2004. Guidelines for Water-quality management 3rd Edition. Geneva: World Health Organisation.

43. Statistics New Zealand, 2002. Monitoring Progress Towards a Sustainable New Zealand: An experimental report and analysis.: Statistics New Zealand.

44. Health Canada, 2003. Social capital as a Health Determinant: How is it Defined? Working paper 02-07: Health Canada.

45. Kawachi I, Berkman LF, 2000. Social Epidemiology. New York: Oxford University Press.

46. Child Youth and Family, Christchurch City Council, Department of Internal Affairs, He Oranga Pounamu, Strengthening Families Management Group, Safer Community Council, Healthy Christchurch, 2002. Christchurch Community Mapping Project. Christchurch: Christchurch City Council.

47. Pickett KE, Pearl M, 2001. Multilevel analyses of neighbourhood socio-economic context and health outcomes: a critical review. J Epidemiology Health: 111-122.

48. Durkheim E, 1897. 1951. Suicide: A study in sociology: Glen Coe, Ill. Free Press.

49. Organisation for Economic Co-Operation and Development, 2001. The wellbeing of nations the role of human and social capital. OECD, ed.

50. Kawachi I, 1997. Long Live Community. The American Prospect 8.

51.   The Institute of Public Health in Ireland, Inequalities in Perceived Health. A report on the all-Ireland Social Capital and Health Survey.

52.   Ziersch AM, Baum FE, Macdougall C, Putland C, 2005. Neighbourhood life and social capital: the implications for health. Social Science & Medicine 60: 71-86.

53.   Anonymous, 1999. Social Cohesion and Urban Inclusion for Disadvantaged Neighbourhoods- Ref 4109. Joseph Rowntree Foundation, ed. Foundations: Joseph Rowntree Foundation.

54.   Syme C, McGregor V, Mead D, February 2005. Social implications of housing intensification in the Auckland region: Analysis and review of media reports, surveys and literature. Unpublished report. Urban Form, Design and development: Auckland Sustainable Cities Programme. workstream: Urban Form, Design and Development.

55.   Witten K, McCreanor T, Kearns R, Ramasubramanian L, 2001. The impacts of a school closure on neighbourhood social cohesion: narratives from Invercargill, New Zealand. Health & Place 7: 307-17.

56.   Witten K, McCreanor T, Kearns R, 2003. The place of neighbourhood in social cohesion: Insights from Massey, West Auckland. Urban Policy and research 21: 321-338.

57.   The United Kingdom Parliament, 2003. Memorandum of the Urban Design Alliance.

58.   Talen E, 2001. Reconciling the link between New Urbanism and Community. National Planning Conference: American Planning Association.

59.   Housing New Zealand Corporation, 2005. Building the Future: The New Zealand Housing Strategy. Wellington: Housing New Zealand.

60.   Thomson H, Petticrew M, Morrison D, 2001. Health effects of housing improvement: systematic review of intervention studies. BMJ 323: 187-90.

61.   Health Evidence Network, 2005. Is Housing Improvement a potential health improvement strategy? World Health Organisation, 1-26.

62.   Thomson H, Petticrew M, Douglas M, 2003. Health Impact Assessment of housing improvements: incorporating research evidence. J Epidemiol Community Health 57: 11-16.

63.   Osborne R, Baker M, Howden-Chapman P, 2003. Healthy Housing: A concise review of the literature: He Kainga Oranga, Housing and Health Programme, Department of Public Health, Wellington School of Medicine and Health Sciences, University of Otago.

64.   Baker MG, McNicholas A, Garrett N, 2000. Household crowding a major risk factor for epidemic meningococcal disease in Auckland children. Paediatric Infectious Disease Journal 19: 983-90.

65.   Housing New Zealand, Building the Future. The NZ Housing Strategy: Housing New Zealand Corporation, 1-86.

66.   Smith L, Robinson B, 2005. From Housing to Homes. Unit TSAPaP, ed.

67.   Woodward. M, Shewry. M C, Smith MC, Tunstall-Pedoe H, 1992. Social Status and Coronary Heart Disease: Results from the Scottish Study. Preventative Medicine 21: 136-148.

68.   Sundquist J, Johansson S, 1997. Indicators of socio-economic position and there relation to mortality in Sweden. Social Science & Medicine 45: 1757-1766.

69.   Nettleton S, Burrows R, 1998. Mortgage debt, insecure ownership and health: an exploratory analysis. Sociology of Health & Illness 20: 731-53.

70.   Hoskins R, 2004. New perspectives on Maori Housing Solutions. Howden-Chapman P, Carroll P, eds. Housing and Health. Research Policy and Innovation. Wellington: Steele Roberts.

71.   Acheson, 1998. Inequalities in health. Edinburgh: The Stationary Office.

72.   McCann B, Ewing R, 2003. Measuring the health effects of sprawl. Washington DCq: Smart Growth America.

73.   Gorman D, Douglas M, Conway L, 2000. Health Impact Assessment: of the City of Edinburgh Council's Urban Transport Strategy. Edinburgh: Scottish Needs Assessment Programme, City of Edinburgh's Council.

74.   Berkman LF, Kawachi I, 2000. Social Epidemiology. New York: Oxford University Press.

75.   Public Health Advisory Committee, 2003. Intersections between transport and health: the impacts of transport on health. Wellington: National Health Committee.

76.   British Medical Association, 1997. Road transport and health. London: British Medical Association.
77.   Kjellstrom T, Hill S, 2002. New Zealand evidence for health impacts of transport - a background paper prepared for the Public Health Advisory Committee. Wellington: National Health Committee.
78.   Council CC, 2002. Cycle Strategy for Christchurch City. Christchurch: Christchurch City Council.
79.   Greater Christchurch Urban Development Forum, 2004. Greater Christchurch Urban Development Strategy - So many options which will you choose? 80.   Parker A, 2005. The end of suburbia: what happens when all the cheap oil is gone and what are the health implications? Health Promotion Journal of Australia 16: 61-8.
81.   Parker A, 2005. Unsustainable transport trends in Census Data for the journey to work: the oil conservation role of the bicycle in Australian and New Zealand cities. Melbourne: Bicycle Federation of Australia.
82.   Christchurch City Council, 2005. Cycling Monitor 2005. Christchurch: Christchurch City Council.
83.   Christchurch City Council, 2004. 2004 Christchurch Residents Survey. Christchurch: Christchurch City Council.
84.   Environment Canterbury, 2005. Cycling in Canterbury: strategy for the development of a regional network of cycle routes. Christchurch: Environment Canterbury.
85.   Environment Canterbury, 2005. Canterbury Regional Land Transport Strategy. Christchurch: Environment Canterbury.
86.   Christchurch City Council, 2004. Cycling Strategy. Christchurch: Christchurch City Council.
87.   Rissel c, 2003. Ride your bike: healthy policy for Australians. Health Promotion Journal of Australia 14: 151-2.
88.   Ministry of Health, 2004. A portrait of health: key results of the 2003 New Zealand Health Survey. Wellington: Public Health Intelligence, Ministry of Health.
89.   Canterbury District Health Board, 2004. Healthy Eating Active Living Action plan 2005 - 10. Christchurch: Canterbury District Health Board.
90.   British Medical Association, 1994. Cycling towards health and safety. Oxford (UK): Oxford University Press.
91.   Anderson L, Schnohr P, Schroll M, HO H, 2000. All-cause mortality associated with physical activity during leisure time, work, sports and cycling to work. Arch Intern Med 160: 1621-8.
92.   Ogilvie D, 2004. Promoting walking and cycling as an alternative to using cars: what works? A systematic review. Glasgow: Social and Public Health Sciences Unit, University of Glasgow.
93.   Ministry of Transport, 2005. Getting there - on foot, by cycle. Wellington: Ministry of Transport.
94.   Hoehner C, Brenna L, Brownson R, al e, 14. Opportunities for integrating public health and urban planning approaches to promote active community environments. American Journal of Health Promotion 18: 114-20.
95.   Fisher G, Rolfe K, Khellstron T, al e, 2002. Health effects due to motor vehicle air pollution in New Zealand. Wellington: Ministry of Transport.
96.   Irving P, Moncrieff I, 2004. Managing the environmental impacts of land transport: integrating environmental analysis with urban planning. Science of the Total Environment 334-5: 47-59.
97.   Transport and Environment Committee, 1998. Inquiry into the environmental effects of road transport: interim report. Wellington: New Zealand Parliament.
98.   Ministry of Health, 1999. Our Health Our Future: Hauora Pakari Koiora Roa - the Health of New Zealanders 1999. Wellington: Ministry of Health.
99.   Public Health Association of New Zealand, 2004. Transport and Health - Public Health Association of New Zealand position statement. Wellington: Public Health Association of New Zealand, 3.

100. Roberts I, Carlin J, Bennett C, Bergstrom E, Guyer B, Nolan T, Norton R, Pless IB, Rao R, Stevenson M, 1997. An international study of the exposure of children to traffic. Injury Prevention 3: 89-93.
101. London's Health Commission, 2001. A report of a health impact assessment of the Mayor's draft transport strategy by the London Health Commission. London: London Health Commission.
102. London Health Commission, 2000. A report of a health impact assessment of the Mayors draft transport strategy. London.
103. Racioppi F, Dora C, 1999. Transport, environment and health: the results of a Healthy Ciies survey in 54 European cities. Rome: WHO European Centre for Environment and Health.
104. Pauling C, 2005. "Tu Whare Ora Research Project Summary". Landcare Research. Unpublished.
105. Lindberg K, 2004. The built environment, urban design, and health: Counties Manakau DHB priorities: Funding and Planning, Counties Manakau District Health Board.
106. Taylor L, Gowman N, Quigley R, 2003. Evaluating health impact assessment. London: Health development agency.
107. London Health Commission, 2003. Evaluation of the Health Impact Assessments on the draft Mayoral strategies for London. London: London Health Commission.
108. Taylor L, Quigley R, 2002. Health impact assessment - A review of reviews. London: Health development agency.

Appendix A: Process Evaluation

Summary of Process Evaluation of the Health Impact Assessment of the Greater Christchurch Urban Development Strategy

Background
This process evaluation was performed to:

- assess whether this HIA achieved its objectives; and

- identify key strengths and weakness of the HIA process used in Canterbury.

A range of methods was used to evaluate the HIA process and impacts. These included talking to key people involved, questionnaires to workshop participants, group discussion, and observation of the process. It was based on frameworks in health impact assessment guides and examples[106-108]. Ideas were checked back with the project team and discussed. One person carried out this evaluation.

Evaluation of HIA process
An excellent process
There was an overwhelming strong positive support for the HIA from virtually all respondents. All interviewed members described the HIA process as enjoyable and felt it opened topics to a greater breadth and depth of evidence and understanding, and recommendations than would be possible otherwise. There was also strong support by workshop participants to be involved in future HIAs.

An important, groundbreaking initiative
Steering group members particularly described the novelty of HIA in New Zealand, and the size of this project as highly significant and important. Several group members felt that the newness of the process in New Zealand made it feel like pioneering new territory.

"We're out there in the bush – doing the first slashing, the first big HIA in the country. I'm not too worried about this not being perfect academically, its ground breaking stuff" - Steering group member

Resource limitations
All the steering group and project working group members described frustration with being unable to fulfil all aspects of a rapid Health Impact Assessment due to resource constraints. Several workshop participants also observed this as a limiting factor of the HIA. Both time and people power were felt to be too tight to do the HIA full justice. Linked to this, several group members mentioned *Legionella* outbreak in Christchurch, which diverted people away from working on the HIA.

Participation of Māori
Few Māori outside of Māori employees of CPH and the Christchurch City Council participated in the technical workshops. The project-working group had hoped for greater Māori participation in the wider HIA process, however, the bigger objective was to develop a relationship and future consultation process that was acceptable for ongoing participation of Māori in the Urban Development Strategy. This objective was met through the HIA Māori consultation process and *hui*.

Speaking different languages – learning the same language
The different 'vocabularies and jargon' of different disciplines and sectors can obscure communication and understanding. It was seen as enriching the HIA process, when workshop participants stopped to question each other and understand the others 'language' but was also felt at times to slow down discussions.

Elements of 'learning the same language' were observed during the introductory session where public health facilitators of the meeting talked of 'health inequalities' and 'health impact assessment'. These were new concepts for people working outside the health sector. Members from councils initially expressed concern that the HIA would add little to the "Social Impact" report in the Options for the Urban Development Strategy. By the end of the two-hour workshop, there was tangible shift to recognising the additional aspects and processes that a health impact assessment would offer.

Conversely, new understanding of the concept of 'sustainability' has been evident among employees at C& P H. Sustainability has not traditionally been considered a public health issue but during the HIA process a new vocabulary has developed in the public health workforce around urban design, peak oil and active transport.

"The public health people seemed to be coming at the issue from a very different direction or perspective or paradigm than what I, as a scientist, am used to thinking from. (...) For example, I think of the system as source/pathway/receptor, whereas other people were talking about the four aspects of health (physical/mental/social/family) that I don't deal with in my daily work." Water workshop participant

"A few months ago I hadn't heard of 'New Urbanism' or 'urban villages' – and now I talk about them all day long." Project working group member

Evaluation of Workshops/ Hui

Wide range of workshop participants.
Workshop participants were almost universally supportive of the diversity/ range of people invited. A few participants identified important individuals not represented at the workshops.

"It was great to see planners sitting there side-by-side with us health people. I think it helped them understand more about the big picture of public health and that they're part of it". Key informant interview – workshop participant

Intersectoral meetings provided new opportunities
Many workshop participants felt that the HIA process provided networking and education opportunities that were novel. Others felt that the discussion that occurred with workshop participants from a range of fields led to development of new concepts.

"At the waste workshop someone commented –'This is the first time all of us working in waste from councils and the private sector have actually all been in one room together to talk about waste.' It seemed amazing to me, and like… an important thing the HIA had achieved." Project working group member

"The greatest value of the HIA for me was my increased awareness of the public health sector and what you do – as a water scientist I have little exposure to these issues." Water workshop participant

Māori consultation process was important – a precedent
Dr Ramon Pink (Te Aopouri, Te Rarawa), Public Health Medicine Trainee who led the consultation process felt the relationship building aspect of the HIA was highly significant for ongoing involvement of Māori in the Urban Development Strategy. He felt that the HIA had also provided another doorway for relationship development between Ngai Tahu, CPH and Local Authorities. Comments from participants of the hui strongly supported the importance of this meeting.

"A challenge and invitation from the Health Impact Assessment process is to make Māori perspectives, values and traditions more central – and less peripheral. It is an opportunity to ensure Māori feel sure they are partners and full participants in all aspects of urban development and design, in a way that keeps te ao Māori central." Project working group member

The concept of strategic planning was described as a very Māori way of doing things:

"We support this 'cause we think (in) generations – this will impact on my grandchildren – I believe in this process. I was emphatic about how the Ngai Tahu work would be a valuable input into the UDS" Hui participant

Summary

This process evaluation found overwhelmingly strong support for the HIA process. The objectives of the HIA were fulfilled and exceeded.

Critical success factors identified were:

- Seizing the opportunity – this HIA was catalysed by an airport taxi discussion as well as formal invitations for collaboration to regional public health authorities from local authorities;
- Being prepared to learn on the job - the ability for key stakeholder organisations involved in the HIA to respond to opportunities, and to learn on the job made this an exciting and responsive project
- Good project leadership particularly by public health experts;
- Including experts and leaders – the presence of HIA experts at several workshops, and a Māori urban design researcher at the hui provided participants with evidence that this was an enterprise with strong evidence and an external support base; and
- An enjoyable and valuing process - workshops were commented on as enjoyable and learning environments – availability of simple food and drink assisted this. Participants valued being kept 'in the loop' with feedback from individual workshops, invitations to stay involved and a summary feedback workshop.

Key opportunities for improvement for future HIAs include:

- Allocate appropriate resources (human and financial) to the project right to the end. Allocate an appropriate budget in addition to project staff to support many aspects of an HIA including contractors, administrative support, catering and flights;
- Ensure project planning includes timelines that allow for consultation with all groups, including Māori, with timely invitations to workshops;
- Increased time and catering for workshops – four hours with lunch may be more suitable;
- Consider using a variety of mechanisms to keep workshop participants engaged with the discussion and questions of the HIA before and after workshops. In addition to transcripts of workshops, these might include email prompts to topic related groups, photo boards, colourful and interactive websites and circulating documents generated for comment to e-groups.

Dr Kaaren Mathias
Public Health Physician, CPH
CDHB

References

1.   Taylor L, Gowman N, Quigley R. Evaluating health impact assessment. London: Health development agency; 2003.
2.   London Health Commission. Evaluation of the Health Impact Assessments on the draft Mayoral strategies for London. London: London Health Commission; 2003.
3.   Taylor L, Quigley R. Health impact assessment - A review of reviews. London: Health development agency; 2002.
4.   Public Health Advisory Committee. A Guide to Health Impact Assessment: A Policy Tool for New Zealand. Wellington: National Health Committee; 2004.

Appendix B: Who was involved?

The project was coordinated by Dr Anna Stevenson. The steering group at different times comprised Jane Cartwright, Karen Banwell and Kathryn King from Christchurch City Council. Dr Daniel Williams, Dr Mel Brieseman, Dr Ramon Pink, Dr Anna Stevenson and Brian Prendergast represented Community and Public Health. Rob Quigley, HIA consultant, provided technical advice at the initial planning stages and facilitated the screening workshop and one social connectedness workshop.

The 'working party' consisted mainly of Dr Anna Stevenson, Dr Ramon Pink, Karen Banwell and Kathryn King. Alice Ann Wetzel assisted with editing.

The lead authors for each section were:

Dr Anna Stevenson	Sections One and Five, Air Quality, Housing
Dr Kaaren Mathias	Water and Transport
Dr Ramon Pink	Section Four
Kathryn King	Section Two and Social Connectedness

Many other people and organisations contributed significantly to the workshops and the report, they are:

Name	Organisation
Māori	
Ted Te Hae	Community and Public Health
Anahera Perrett	Community and Public Health
Rena Smith	Community and Public Health
Anna Stevenson	Community and Public Health
Fiona Pimm	He Oranga Pounamu
Wendy Dallas-Katoa	Pegasus Health
Craig Pauling	Ngai Tahu/Landcare Research
Braden Leonard	Community and Public Health
Shad Rolleston	Auckland University
Ramon Pink	Community and Public Health
Karen Banwell	Christchurch City Council
Air Quality	
Emily Wilton	Consultant
Anna Stevenson	Community and Public Health
Ann Currie	Community and Public Health
Angie Scott	Environment Canterbury
Jo Cavanagh	Landcare Research
Geoff O'Brien	Community and Public Health
Terry Moody	Christchurch City Council
Kathryn Cannan	Healthy Christchurch
Mel Brieseman	Community and Public Health
Daniel Williams	Community and Public Health
Water Quality	
Lynley Cook	Community and Public Health
Anna Stevenson	Community and Public Health
Geoff O'Brien	Community and Public Health
Mel Brieseman	Community and Public Health
Kaaren Mathias	Community and Public Health
Karen Banwell	Christchurch City Council
Ramon Pink	Community and Public Health
Howard Williams	Pattel Delamore and Partners

Malcolm Walker	Community and Public Health
Olivia Papuni	Community and Public Health
Leo Fietje	Environment Canterbury
Shirley Hayward	Environment Canterbury
Carl Hanson	Environment Canterbury
Kathryn King	Christchurch City Council
Judy Williamson	Community and Public Health
Jan Gregory	Environmental Science & Research
Kathryn Russell	Community and Public Health
Waste	
Cheryl Brunton	Community and Public Health
Anna Stevenson	Community and Public Health
Mel Brieseman	Community and Public Health
Margaret Leonard	Environmental Science & Research
Kathryn Cannan	Healthy Christchurch
Karen Banwell	Christchurch City Council
Ramon Pink	Community and Public Health
Judy Williamson	Community and Public Health
Gareth James	Canterbury Waste Services
Sarah Tammik	Environment Canterbury
Vincent Salomen	Environment Canterbury
Social Connectedness	
Ramon Pink, (Facilitator)	Community and Public Health
Anna Stevenson	Community and Public Health
Matthew Pratt,	Youth, Christchurch City Council
Robyn Steel	Metropolitan Housing and Safety CCC
Ruth Jones	Older Adults and Disability CCC
Jenni Marr	Multicultural CCC
Betty Freeman-Moir	Early Learning/Out of Schools Programmes CCC
Deirdre Ryan	Community Development CCC
Winifred Mahowa	Community Development– Wigram/Riccarton CCC
Kathryn King,	Christchurch City Council
Simon Tam	Problem Gambling Foundation
James Baines	Taylor Baines and Associates
Bridget Buckinham	Taylor Baines and Associates
Jackie Cooper	Aranui Project
Martin Ward	Public Health Advisory Committee
Rob Quigley	Quigley and Watts Ltd
Jude Ball	Quigley and Watts Ltd
Dave Morrell	Canterbury District Health Board
Fiona Pimm	He Oranga Pounamu
Sandy Hunt	Ngai Tahu
Kathryn Cannan	Healthy Christchurch
Brian Prendergast	Community and Public Health

## Appendix C Literature Search

Sources searched:
Medline, Embase, PsycInfo, Web of Science and BIOSIS.

Medline strategy

This strategy was adapted for the other databases using a combination of index terms and keywords – it was adjusted for the size and complexity of each source. Citation searching was performed in the Web of Science.

1   city planning/ or environment design/ or urban renewal/ (2075)
2   ([town$ or city or cities or urban or rural] adj3 [plan or plans or planning or design or designs or designing]).mp. (2212)
3   1 or 2 (3603)
4   air pollution/ or air pollution, indoor/ or smog/ or vehicle emissions/ (20313)
5   rural health/ or suburban health/ or urban health/ (22524)
6   public health/ (30536)
7   health status/ (26919)
8   *mental health/ (4736)
9   social support/ (24068)
10   water supply/ or water purification/ (19923)
11   Water Pollution/ (6672)
12   Waste Management/ (1420)
13   Refuse Disposal/ (5339)
14   (sewage or septic tank$).mp. (10444)
15   or/4-14 (159735)
16   15 and 3 (842)
17   limit 16 to (english language and yr="1985 - 2005") (574)
18   from 17 keep [SELECTED REFERENCES] (124)
19   built environment$.mp. (124)
20   19 not 17 (102)
21   limit 20 to (english language and yr="1985 - 2005") (96)
22   from 21 keep [SELECTED REFERENCES] (6)
23   (*public health/ or *health status/ or *mental health/) and (10 or 11 or 12 or 13 or 4) (745)
24   23 not (16 or 19) (733)
25   limit 27 to (english language and abstracts and yr="1985 - 2005") (257)
26   from [SELECTED REFERENCES] (32)
27   18 or 22 or 26 (162)
28   housing/ or housing for the elderly/ (9281)
29   exp transportation/ (32234)
30   28 or 29 (41341)
31   (6 or *public health/ or *mental health/ or *social support/) and 30 (753)
32   32 not (25 or 20) (671)
33   limit 32 to (english language and yr="1985-2005")
34   from 33 keep [SELECTED REFERENCES]
35   social capital.tw (305)
36   social cohesion.tw (118)
37   35 or 36 (408)
38   from 37 keep [SELECTED REFERENCES]
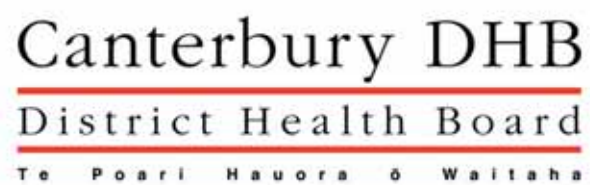
Health Impact Assessment
Greater Christchurch Urban Development Strategy Options
April 2006