UTLITARIAN CYCLING: INVESTIGATING LATENT DEMAND IN

CHRISTCHURCH, NEW ZEALAND

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by Katherine Jane Taylor

University of Canterbury

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Abstract

Christchurch, New Zealand, has relatively low rates of utilitarian cycle use. Six percent of commuters cycle so there is considerable potential for increasing utilitarian cycling, cycling for the purpose of getting to a destination day to day, rather than for recreation. Potential for utilitarian cycling in Christchurch is due to the predominantly flat urban area, wide transport corridors providing plenty of space for cycling, and a climate with few temperature extremes and low rainfall. Despite this favourable geography, Christchurch has followed the trend of many western cities with a declining mode share for cycling and increased motor vehicle use. This research investigated the motivations and barriers for cycling.

The focus was on the motivations and barriers perceived by people who do not cycle, or cycle regularly, for utility purposes. The research included an analysis of census data and questionnaires undertaken at workplaces along with recreational cyclists, to identify people interested in cycling. Focus groups were held with respondents who were identified as potential cyclists to discuss the motivations and barriers for cycling, with a focus on safety and infrastructure.

Findings demonstrated the potential for cycling in Christchurch with high proportions of people living within a reasonable cycling distance of their workplace. Major barriers for potential cyclists were safety and infrastructure, workplace showering and changing facilities and enjoyment of the journey. Infrastructure facilities were investigated to determine what level of service would attract new cyclists, found to be a segregated, comprehensive and consistent network of cycle facilities. There were also a number of minor barriers identified. Policies to improve utilitarian cycling need to include improving the overall urban environment so that it is safer and more enjoyable for cyclists. Education of cyclists and motorists along with policies to improve workplaces for cyclists should be implemented in conjunction with improvements in infrastructure.

Abbreviations

ASB – Advanced stop box

CBD – Central Business District

CCC – Christchurch City Council

CDHB – Canterbury District Health Board

CPH – Community and Public Health

PMH – Princess Margaret Hospital

LTNZ – Land Transport New Zealand (now part of the NZTA)

NHTS – National Household Travel Survey

NZTA – The New Zealand Transport Agency

SPARC – Sport and Recreation New Zealand

UC - University of Canterbury

Glossary of terms

Advanced Stop Box – an additional painted space on the road in front of the general traffic stop line at intersections for cyclists

Cycle lane – a lane marked on the road by cycle symbols, which is for sole use by cyclists

Commuter cycling – cycling for the journey to work only

Cycle path – an off-road route for cyclists

Cycleway – a term referring to any type of cycling infrastructure

Hook-Turn – a right hand turn manoeuvre by cyclists where they proceed straight through on the left of the road and wait in a designated space for the lights to change and then proceed with the side road traffic

Mid-Block – the portion of the road between intersection

Recreational cycling – cycling for enjoyment or exercise not for the purpose of going to a destination

Shared path – a cycle path shared by pedestrians and cyclists

Utilitarian cycling – cycle for transport to any destination

1.0   Chapter One – Introduction

Utilitarian cycling, the use of the bicycle for day to day travel (Land Transport NZ, 2005; Skinner and Rosen, 2007), has been declining in most western countries since the increase in motor vehicle use from the 1950s onwards (Pacione, 2001). In recent years, however, increased environmental awareness and concern about the physical and social health of urban communities has led academics and planners to reconsider motor vehicle dominance of transport. These concerns, in addition to rising fuel prices, have resulted in attempts to increase the use of sustainable modes of transport, primarily the bicycle, public transport and walking. Cycling is the focus in this research because it is active, environmentally friendly, relatively affordable, flexible and covers longer distances than walking (NSW Government, 2004). The policy challenge for transport planners is that the current urban environment in many western cities is currently motor vehicle-orientated and consequently there are many barriers that often outweigh the motivations of cycling as a mode of transport.

This research, therefore, aimed to investigate the motivations and barriers for utilitarian cycling and the possibility of accessing latent demand. Latent demand consists of suppressed trips that would be undertaken by cycle if there were better conditions in the built environment (Land Transport NZ, 2005). In general, this thesis uses the term cycling to refer to utilitarian cycling while commuter cycling, a subset of utilitarian cycling, and recreational cycling are referred to specifically, however, the adjective utilitarian is used, where necessary, to describe the type of cycling mentioned. In Chapter Two, the motivations and barriers for cycling are fully discussed, while this chapter gives a brief background of changing urban form and its connection to transport, especially focusing on the rise of motor vehicle use. Utilitarian cycling is described and a brief discussion of cycling as a transport mode is provided and further development of these themes is undertaken in the literature review. Finally, the aims and objectives of the research and the structure of the thesis are outlined.

1.1 Transport and urban form

Urban centres are spaces of centralised residential areas, with varying densities of population, and incorporate the associated activities of employment and social infrastructure as well as educational and recreational facilities. As the majority of the world's population live in urban centres, these are extremely important when working

towards sustainable urban development goals due to their size, population concentration and energy requirements, particularly in transport.

Transport is a very important factor in the sustainability of urban centres as it generally has high land and energy requirements (Stone, 2008). Urban form and transport have a very close relationship (Banister and Lichfield, 1995; Pacione, 2001) and advancements in transport technology and accessibility have affected land-use patterns over time (Docherty, 2003). Originally, urban centres were compact with different land uses in close proximity, partly due to the main methods of transport, walking or horse riding, restricting the movement of people and goods to a certain area (Pacione, 2001). Today, modern transport modes, such as the motor vehicle, have revolutionised how travel and communication are considered (Banister, 1994) and allowed urban centres to evolve into highly decentralised spaces, primarily through the development of residential subdivisions on the edge of cities.

Neither transport nor technology, however, causes decentralisation of urban areas; it simply makes living in decentralised locations possible. For decentralisation to occur people need to take up the opportunities provided by technological advancements to live at a distance from work, recreational or social locations (Gottmann, 1983). One of the reasons that many people in western cities have moved to decentralised areas is that the house in the suburbs became socially important as "the inspirational choice of residence" (Docherty, 2003: 4). Not only does the private motor vehicle provide the opportunity to live in the suburbs, it becomes a necessity of suburban life.

Motor vehicle numbers have increased dramatically over time. In New Zealand the number of people per motor vehicle has reduced from 1.9 in 1976 to 1.6 in 1996 (Saville-Smith, 2000) and 1.2[1] in 2006 (Land Transport NZ, 2007; Statistics New Zealand, 2008). When motor vehicle numbers increased from the 1950s onwards, urban planners focused on supplying sufficient transport infrastructure for the private motor vehicle (Pacione, 2001). Combined with decentralisation, the resulting motor vehicle-orientated society meant sustainable forms of transport suffered due to the relative ease of motorised transport (Badland and Schofield, 2006; Handy et al., 2002). In particular, dispersal of facilities results in longer journeys and travel by bicycle or walking is therefore less convenient (Banister, 1994). This decrease in sustainable transport was partly caused by an increase in the physical separation of different activities, to which people travelled, as well as

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[1] Calculated using 2006 census usually resident population and total vehicle registrations therefore may differ from Saville-Smith's method of calculation

increased risks of crossing roadways for pedestrians and cyclists (Noland and Kunreuther, 1995). In addition, suburban development often includes cul-de-sacs without connecting paths to other roads resulting in reduced physical links to other areas of the cities thus discouraging walking and cycling (Pucher and Dijkstra, 2003). The main cause of this trend is that many new developments fail to consider cycling in new road designs (Clarke, 2002), rather focusing on the motor vehicle and compounding the existing difficulties in encouraging walking and cycling. On the other hand, fully segregated networks of cycle facilities are only practical when planning new towns or suburbs (Land Transport NZ, 2005).

Cycling numbers first experienced a decline when motor vehicle numbers increased due to the relative speed, cost and convenience of motorised transport (Mathew, 1997). Ongoing declines in cycling have occurred as distances between urban activities increased following decentralisation of residential areas. Such decentralisation has created separated spaces of paid employment and residence despite attempts to create more integrated communities within urban areas (Saville-Smith, 2000). A result is longer and more complex trips to work (Banister and Lichfield, 1995; Pucher and Buehler, 2006) and that rather than facilities being more accessible, people are becoming more mobile to access those facilities (Holden, 2007; Tolley, 2003b). Consequently, sustainable modes become less viable due to the distances travelled and the ease of using the private motor vehicle. Public transport has also been affected by the dispersal of residential areas and activities as low density urban areas result in reduced demand, affecting the viability of services (Docherty, 2003).

Unconstrained transport growth, particularly in motor vehicle numbers, results in costs for society, urban centres and the environment (Banister and Lichfield, 1995). Negative effects of a motor vehicle-orientated urban centre, include air pollution, congestion, noise, road accidents, land requirements (Bergstrom and Magnusson, 2003), decreased safety, environmental quality, reduced social inclusion and community cohesion, as well as negative impacts on personal and public health (Tolley, 2003b). Health has also been negatively effected by the motorisation of transport and nearly fifty percent of New Zealand adults are not sufficiently active for a healthy lifestyle (Badland and Schofield, 2006). In addition, increasing congestion and unreliability of transport services has economic implications for the sustainability of communities (Docherty, 2003) as congestion affects the efficient movement of people and goods, the primary function of

transport (Pacione, 2001). Overall, these impacts of motorised transport contribute to an unsustainable urban environment.

Key factors in working towards a sustainable urban environment are motor vehicle numbers, distance travelled on trips (Monheim, 2003), reducing transport effects such as congestion, redesigning the urban environment to reduce travel and equity and social justice, allowing for the accessibility of disadvantaged populations (Plaut, 2005). The focus, therefore, is on how to effect change in transport mode choice and encourage a shift from the private motor vehicle to more sustainable and affordable modes such as public transport, cycling and walking.

One way to effect change is to consider the layout and design of urban centres. Theoretically, if activities are within walking and cycling distance then driving will decrease as people will opt for sustainable transport (Handy et al., 2002). Mixed-land use, as opposed to decentralised and separated residential and commercial areas, will create shorter distances and utilitarian cycling will increase (Komanoff and Pucher, 2003; McClintock, 2002a). It is difficult to affect where people opt to live in relation to their work, therefore, this research focuses on the motivations and barriers for cycling that are not affected by distance and could be influenced through policy.

1.2 Utilitarian travel

According to the literature urban residents travel for different purposes and these can be classified into work, recreation or shopping trips (Handy et al., 2002). Trips are a specific journey between two points initiated at generators, usually places of residence, and finishing at attractors such as educational facilities, workplaces and recreational facilities. Consequently, to encourage cycling, generators and attractors need to be linked by a comprehensive network of cycle facilities (Harrison, 2002). This network may include transport corridors that are attractive to cyclists for easy movement between two areas.

There are three types of trips undertaken as part of utilitarian travel; subsistence trips to work or education, maintenance trips for personal business or shopping, and discretionary trips for social, recreational or leisure reasons (O'Fallon and Sullivan, 2005). A more general term comprising subsistence and maintenance trips is utilitarian travel, day to day transport to local shops and other facilities, including work and education. Policy makers are currently struggling to reverse the decline in the use of the bicycle for utilitarian travel (Skinner and Rosen, 2007).

One of the principal trips an individual makes in any day is the trip to the workplace or place of education. A focus for transport planners trying to initiate a change in mode choice for utilitarian transport is, therefore, the commute as it makes up a significant proportion of weekly trips for the average worker. Consequently, changing commuters transport mode has high potential benefits (Stinson and Bhat, 2004).

In urban areas, a significant number of people commute at a similar time each day, causing congestion. One example is localised congestion around schools with motor vehicle use for journeys to school significantly contributing to rush hour traffic (Thull and Lausterer, 2003). Estimates in the United Kingdom (UK) suggest that one fifth of morning traffic is school based (Cleary, 2002) and O'Fallon (2007) suggests that anecdotal evidence from New Zealand shows that twenty to forty percent of morning traffic is due to school transport. A focus for reducing congestion, therefore, is on changing the dominance of the private motor vehicle in utilitarian transport, particularly for commuting, and encouraging sustainable modes such as public transport, cycling and walking.

Care must be taken, however, when transferring trips to sustainable modes, as the number of trips an individual makes in any one day remains stable, typically one to three. Consequently, modal change is usually at the expense of other modes, rather than trips (Tolley, 2003b). Sustainability arguments, therefore, state that it is important not to increase sustainable modes, such as public transport, walking and cycling, at the expense of other sustainable modes. Rather, motor vehicle drivers should be encouraged to use walking, cycling or public transport.

Active transport is given particular consideration in transport planning due to the lack of exercise in modern society being a major cause of obesity (McClintock, 2002b). Walking and cycling are encouraged for their benefits for the individual, but also the advantages for communities. Increased use of active transport modes has a flow on effect of reduced motor vehicle use and associated effects such as less air pollution and noise (Pucher and Dijkstra, 2003). Increasing walking and cycling also has a positive effect on social capital (Tolley, 2003b).

1.3 Cycling as a mode of transport

Cycling has several advantages over other modes; it can be faster than public transport or the private motor vehicle for short journeys in congested urban areas and can be used for trips outside walking range. In addition, the bicycle is a cheap and affordable mode of

transport suitable for short trips (McClintock, 2002b). Focusing on encouraging bicycle commuting is also a solution to traffic congestion and its associated effects such as energy dependence (Noland and Kunreuther, 1995). Other benefits of cycling include roadway cost savings, reduced traffic congestion, reduced parking problems and the cost of providing parking, greater and more equitable transport choice, a reduction in community severance due to reduced need for roadways, and increased social and community interaction (McClintock, 2002b; Tolley, 2003b). While there are many motivations for cycling, there are also barriers and it is important to understand both (Skinner and Rosen, 2007).

Historically, cycling first developed in the 1800s with both recreational and utility purposes and was mixed with other forms of transport for many years (Figure 1.1). During the inter-war years, at the same time as accessories such as bicycle luggage carriers became widely available, cycling became extremely popular (BMA, 1992; British Medical Association, 1992) and reached a peak in Britain in the 1950s with more distance covered by cycle than by motor vehicle (Mathew, 1997).

Figure 1.1 Bank Corner, Cathedral Square, Christchurch, New Zealand circa 1930

Source: (Christchurch City Libraries, 2009)

While the bicycle may have historically been a liberating mode of transport as it allowed for independent travel over a wider area, there has been a cultural shift to motor vehicle-dependence since the 1960s (Jensen et al., 2000; Pucher and Buehler, 2005b). The post

World War II years were a period of increasing motor vehicle ownership and corresponding traffic, which led to a decline in bicycle use until it became a marginal transport mode (British Medical Association, 1992; Pucher and Buehler, 2008). For example, by the 1980s, some UK cities had the perception that a cyclist was a second-class citizen (Tolley, 1997). The focus of transport planners has therefore moved from being primarily concerned with riding surface, as they were prior to the introduction of the motor vehicle, to the more difficult problem of managing motor vehicle-bicycle conflict (Ploeger, 2003).

In many western urban centres rates of commuter cycling are low and often declining (Figure 1.2). New Zealand has experienced large drops in commuter cycling mode share at each census over the last ten years. Cycling rates in the United States of America (USA) have had a small decline in the rate of commuter cycling. On the other hand, Canada has had a small increase occurring between 1996 and 2001.

Figure 1.2 Rates of commuter cycling in NZ, USA and Canada
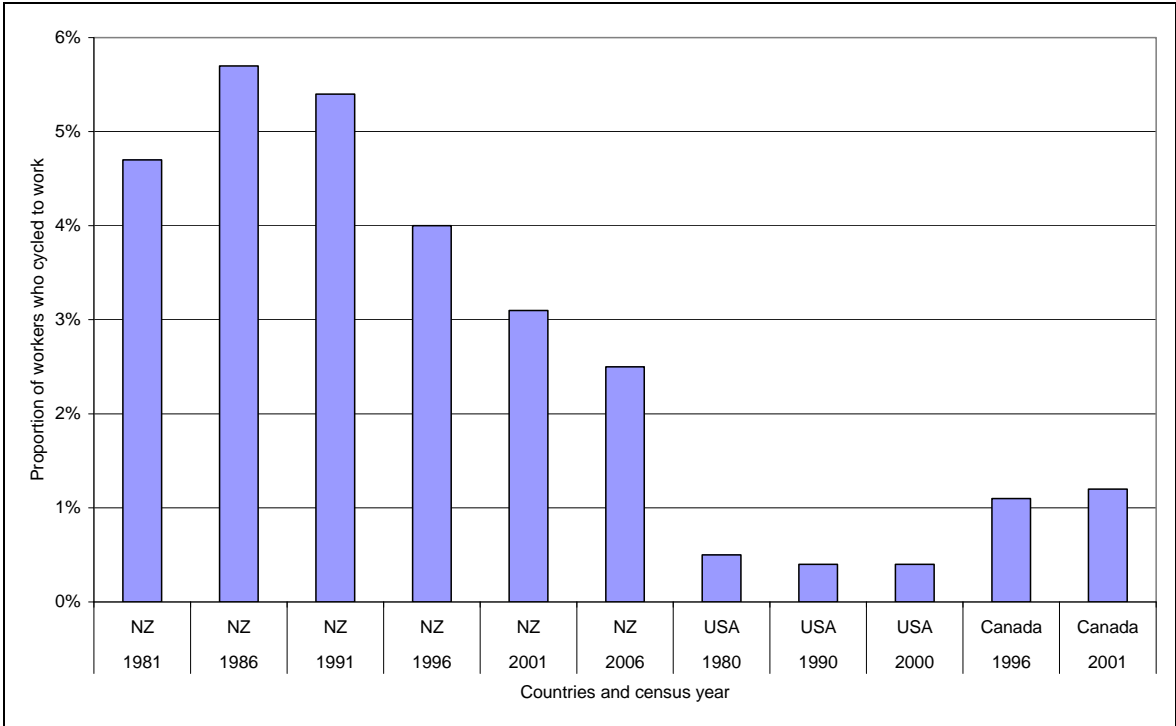
Source: New Zealand (Statistics New Zealand, 2008)[2] USA and Canada (Pucher and Buehler, 2006)

All these rates, however, are extremely low in compassion to England and Wales with eleven percent[3] of workers cycling in 2001 (Office for National Statistics, 2008), Japan

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[2] calculated using number of people who went to work on census day and did not work from home and the number of people who cycled on census day

[3] Calculated using UK Census data using workers who do not work from home and number of workers who cycled to work

with seventeen percent commuter trips by bicycle in 2001 (Koike et al., 2000) and the Netherlands with twenty-five percent of commuter trips by bicycle (Mobycon et al., 2009).

The increase in the UK are possible signs of a cycling renaissance (Horton, 2007), however, this trend is probably due to the large amounts of money and effort put into cycling. Western European countries altered their policies to curb motor vehicle use in the 1970s (Pucher and Buehler, 2006) and this resulted in a cycling revival in the Netherlands, Germany and Denmark (Pucher and Buehler, 2008). However, the policies implemented in the 1970s did not take effect until the 1990s (Welleman, 1997).

1.4 Aims and objectives of the research

New Zealand has a predominately urban population, mainly resident in several large urban centres that have expanded rapidly into low-density, decentralised spaces. The private motor vehicle dominates transport options and in some cities congestion and the impacts of the motor vehicle are becoming clear. Sustainable transport modes have generally decreased and cycling is, at best, a minor transport mode, with a national commuter share of less than two percent on census day 2006 (Statistics New Zealand, 2008). In response, central and local planning authorities are attempting to reverse this negative change in cycling rates. One example of these policies is the national strategy for walking and cycling (Ministry of Transport, 2005).

This research aimed to investigate the motivations and barriers for increasing cycling rates in New Zealand through studying Christchurch, one of the largest cities in New Zealand. Christchurch was historically a cycling city in the 1930s (Thull and Lausterer, 2003) but the rate of utilitarian cycling has rapidly decreased. Nonetheless, of the urban centres Christchurch has the second highest rate of commuter cycling at the 2006 census while Nelson had the highest rate of commuter cycling (Statistics New Zealand, 2008). Benefits of Christchurch for cycling are the predominantly flat topography (Thull and Lausterer, 2003), climate and wide transport corridors, which mean the focus of transport planners can be on other factors such as safety and the workplace environment.

There were two objectives addressed by this study; firstly to identify and characterise people interested in utilitarian cycling, who do not currently cycle for utility reasons on a regular basis. Secondly, to investigate the motivations barriers that people perceive for utilitarian cycling with a particular focus on the reasons for not cycling. These motivations and barriers were explored using the themes that arise in the literature review. Particular

focus was given to commuter travel and the barriers that have the potential to be mitigated, such as infrastructure, rather than those policies one cannot affect such as weather. This research will add to the existing literature through a unique study in the New Zealand context. In addition, the research will further investigate the link between recreational and utilitarian cycling.

1.5 Outline of thesis

The benefits of cycling, characteristics of people who cycle, potential for utilitarian cycling, and the motivations and barriers for cycling are further discussed in the literature review, Chapter Two. Chapter Three then sets out the methodology and conceptual framework for the research. The methods used in this research were quantitative analysis of census data, questionnaires and qualitative research using focus groups. Census data, including commuter transport trends in New Zealand and characteristics of commuter cyclists, are discussed in Chapter Four. Chapter Five presents the quantitative data, from the University of Canterbury Travel Survey 2008 and the Recreational Cyclist Questionnaire. Focus group findings are presented in the following two chapters, Six and Seven. Chapter Six outlines the general motivations and barriers discussed in focus groups while Chapter Seven focuses on the significant barrier of safety and related issues regarding infrastructure. Finally, Chapter Eight draws together the findings of the research to discuss final conclusions on the motivations and barriers for utilitarian cycling. Areas for further research and limitations of the study are also brought together in Chapter Eight.

2.0   Chapter Two – Background

Throughout the 20th Century rapid change occurred in urban centres, as outlined in Chapter One, resulting in a shift from non-motorised transport modes to motorised modes. Technological advancements in transport provided many opportunities for travel and consequently impacted upon the spatial development of urban spaces. In most residential areas, these transport opportunities have resulted in dispersed urban centres where the dominant transport mode is the private motor vehicle. Unfortunately, there are many negative effects of a private motor vehicle orientated transport system including the decline of sustainable modes of transport including walking, cycling and public transport. Consequently there is a need to focus on sustainable transport modes, particularly focusing on a modal shift from the private motor vehicle for the commute to work. This chapter considers the possibilities for increasing utilitarian cycling through investigating the potential for cycling, the characteristics of people who currently cycle and the motivations and barriers for utilitarian cycling particularly the issues of safety and fear. The motivations and barriers discussed in this chapter form the basis of the questions for the questionnaires and topics discussed in the focus groups.

There are two purposes for cycling, utilitarian cycling is cycling for day to day travel (Skinner and Rosen, 2007), in other words the purpose is in getting to an activity, while recreational or leisure cycling is when the purpose is the journey (Land Transport NZ, 2005). As stated in Chapter One, for the purposes of this thesis, cycling is used to refer to utilitarian cycling, while commuter cycling, referring solely to the daily trip between the home and workplace or educational institution, and recreational cycling are specified. Modal share relates to the proportion of trips undertaken by that mode for any transport purpose while commuter mode share is the proportion of commuter trips made by a particular mode of transport. In this thesis, several cycle facility terms are used, as outlined in the glossary. Cycle lanes refer to on-road cycle facilities, cycle paths to cycle routes that are separated from the carriageway, whether these are in the road space or away from transport corridors, and cycleways is an encompassing term that refers to both on-road and off-road facilities.

2.1 Reasons for promoting utilitarian cycling

There are several environmental, social, health and economical benefits of promoting cycling for transport and the benefits of increasing cycle trips are to both the individual and society in general (Jensen et al., 2000; Morris, 2004).

2.1.1 Environmental impacts of bicycle transport

Environmental impacts of transport, particularly the motor vehicle, are wide ranging and one of the most commonly cited is air pollution, especially greenhouse gases (Banister, 1994). Transport is one of the biggest contributors to air pollution through exhaust gases, lead and particulate emissions causing health and environmental problems (Pacione, 2001). The sustainability of the wider community is affected by increasing motor vehicle use (Docherty, 2003) due to the broad impacts of environmental issues, such as global warming. On the other hand, cycling has an almost negligible environmental impact and produces no pollution, apart from initial production of the bicycle, making it an appropriate response to environmental concerns regarding transport (Hillman, 1997b). In addition, encouraging bicycle commuting is also a solution to traffic congestion and its associated effects such as energy dependence (Noland and Kunreuther, 1995). Other flow on effects include reduced air and noise pollution (Pucher and Dijkstra, 2003).

2.1.2 Social impacts of bicycle transport

High social costs result from the environmental and safety issues caused by a transport system dominated by the private motor vehicle (Ploeger, 2003). Consequently there are important social and community benefits of increasing cycling mode share. Community sustainability can be affected by unequal access to transport leading to an inability to access services and therefore contributing to the social exclusion of members of the community (Docherty, 2003). Encouraging cycling allows for greater and more equitable transport choice, a reduction in community severance due to reduced need for roadways, and increased community interaction (McClintock, 2002b) primarily through improved access and sociability (Austroads, 2005) leading to more inclusive and interactive communities. The only mode of transport cheaper than the bicycle is walking (Pucher and Buehler, 2008; Pucher et al., 1999).

Another positive social benefit of cycling is that disadvantaged people, those less likely to have motor vehicles, use the bicycle out of necessity and therefore benefit from improved cycling conditions will be greater access to jobs and local facilities (McClintock, 2002b). Additionally, the increasingly unhealthy population puts demands on health and social

services resulting in a drain on society as a whole (Hillman, 1997a). Other social impacts arise from the transport infrastructure, such as noise and visual impacts and severance of communities (Pacione, 2001) caused by construction, increased carriageway and higher traffic flows.

2.1.3 Health impacts of bicycle transport

As cycling is an active transport mode it has considerable benefit for an individual's health and has no effect on other people's health while a motor vehicle driver is affecting the communities health (Hillman, 1997a). Cycling to work is an excellent way of fitting exercise into daily routine (Geus et al., 2008). The focus of planners, academics and health advocates on active transport arises from the change to more mechanised activities, including transport, and the resulting decrease in the general population's fitness, meaning increased physical activity needs to be incorporated into daily life (Hillman, 1997a). Regular physical exercise has an important impact on health (Austroads, 2005). Exercising 30 minutes a day, three or more times a week will result in an individual being less prone to illness, more capable of performing everyday tasks with less stress and having better physical control (Hillman, 1997a).

It is possible for adults to incorporate the recommended 30 minutes of exercise per day by cycling four or five kilometres to work (Jensen et al., 2000). This means the recognised health benefits of exercise can be incorporated into the commute, rather than attempting to implement exercise through recreation and sport which is associated with difficulties such as joint stress, weather, time, costs, organisation of participants and childcare responsibilities (Hillman, 1997a). The bicycle does not have the impact on muscles and tendons that many other activities can have and it is an easily accessible form of exercise for adults and children (British Medical Association, 1992). A wider range of health affected people can cycle, for example those with arthritis find it easier to cycle than to walk (Hillman, 1997a). In addition, the bicycle does not increase risk of injury for other road users as the motor vehicle does (British Medical Association, 1992).

2.1.4 Economic impacts of bicycle transport

Cycle facilities are worthwhile in economic terms (Hopkinson, 1996) with economical benefits of cycling including roadway cost savings, reduced traffic congestion, reduced parking problems and the cost of providing parking (McClintock, 2002b). Cycling is more cost-effective than providing for the motor vehicle and public transport with less user and

public infrastructure costs (Pucher and Buehler, 2008) and investment in cycle facilities is considered a cost-effective use of transport funds (Macbeth, 1985).

Quantifying the economic benefit of cycling is difficult, however, some governments have endeavoured to do so. In Australia, the estimated potential savings from transferring motor vehicle trips to the bicycle is A$0.60 per kilometre for short trips (Austroads, 2005). Cope (2006) found that for every British Pound spent on implementing a positive cycling and walking environment, thirty-two British Pounds of benefits were generated through reduced travel time, reduced accidents, reduced absenteeism at work, improved journey ambience and increased physical fitness. Another study found the cost benefit ratio for different types of improvements for cycle safety was 1:8 for roundabout improvements, 1:10 for area wide speed reduction and cycle lanes and 1:12 for an Advanced Stop Line (or Advanced Stop Box) (Wittink, 2003).

Individuals also consider the cost of different transport modes, for example current interest focuses on increasing petrol prices. Compared to Europe the motor vehicle is a very easy and cheap mode in the USA (Komanoff and Pucher, 2003) as well as the UK, Australia and New Zealand. Petrol, in particular, is cheap in comparison to Europe. Changes in petrol prices can affect transport use, sometimes for several years after the price increase. The oil shock price rises of 1973 provoked reflection on the increased reliance on motor vehicle travel (Monheim, 2003) and a dramatic increase in cycle use before later decreasing (Mathew, 1997). This was also seen in the New Zealand census results where cycling was declining prior to 1976 but then the cycling mode share grew faster than any other mode between the 1976 and 1981 census (Macbeth, 1985). Current price increases have resulted in discussion about how to change reliance on motor vehicles for transport. Another global issue is terrorist attacks, which have also affected cycling numbers. In 2005 cycling in London increased after the July bombings as the fear of using public transport proved greater than the fear of the risks when cycling (Horton, 2007).

Petrol, however, is not the only cost associated with transport and people generally overlook factors that affect the cost of driving and therefore do not fully account for transport costs (Goldsmith, 1992). Australian studies estimate the economic and environmental savings based on cycling twenty kilometres to work rather than driving a motor vehicle for the same distance is A$770 per annum (including motor vehicle depreciation) and 1.3 tonnes of greenhouse gas emissions per annum (Austroads, 2005). On the other hand, including the motor vehicle depreciation rate in these calculations

implies that people who cycle will no longer own a motor vehicle, which is contrary to the characteristics of people who cycle.

2.2 Potential for cycling

There is ample opportunity for transferring trips of a reasonable distance from the motor vehicle to bicycle as many journeys are short, with sixty percent of motor vehicle journeys in the UK less than eight kilometres (Davies et al., 1996). New Zealand research has found that thirteen percent of trip chains, a journey between two points, are less than two kilometres and forty-two percent less than six kilometres for motor vehicle driver trips. In addition, forty-six percent of all simple work commutes are less than ten kilometres (O'Fallon and Sullivan, 2005). This suggests that New Zealand drivers make many short trips that could potentially be made using a sustainable form of transport.

Evidence also exists that people are open to the idea of cycling. For example, in Christchurch a 2005 survey of residents found that twenty-seven percent of non-cyclists would cycle again (Opinions Market Research Ltd, 2005). A Sport and Recreation New Zealand (SPARC) study found that thiry-seven percent of respondents were prepared to replace motor vehicle trips with either walking or cycling two or more days a week (Sullivan and O'Fallon, 2006). De Dios Ortúzar (2000) found that a properly constructed cycle network may lead to cycling mode share being increased to 5.81 percent from 1.6 percent.

Other evidence of latent demand is the number of cycles owned and their use rate. In 1992 in the UK, four million bicycles were used at least weekly but less than one third of these are for commuting (British Medical Association, 1992). Bicycle ownership started to increase in the early 1970s after the oil crisis with fourteen bicycles owned per 100 people in 1972/73 and twenty-seven per 100 people in 89/91 with one in three people owning a bicycle in 1996 (Davies et al., 1996). Bicycle sales increased during the 1990s and forty-nine percent of a 2002 British Automobile Association survey of 1000 participants had access to a bicycle (Lawson, 2002). There is also a disparity between the number of bicycles owned and bicycles used for transport, which suggests there is potential for increasing cycle use (McClintock, 2002a; Tolley, 1997). There are also more yearly cycle sales than motor vehicle sales in the UK (Skinner and Rosen, 2007) as well as anecdotally in New Zealand and Australia. Additionally, the average UK motor vehicle spends 95 percent of its time parked (Adams, 1997).

2.3 Characteristics of people who cycle

In general, people who cycle are categorised through either their trip purpose or their skill level or both ability and trip purpose. New South Wales defines four groups of people who cycle including vulnerable, commuter, recreational and local errand groups (NSW Government, 2004). Davis et al., (1996) also classify cyclists as vulnerable, commuter and sport. Environment Canterbury (2005) recognises three types of utilitarian cyclists that have different needs; novice or vulnerable cyclists who are usually young children or inexperienced adults, intermediate cyclists who are normal adults and children with some experience and advanced cyclists those who are proficient at cycling and are confident to cycle anywhere. Commuter cyclists are more likely to be intermediate or experienced cyclists while people completing local errands may be of any skill level. This research focuses on people cycling for utilitarian reasons, such as commuter or local errand groups, which may include vulnerable cyclists. People who cycle have different needs depending on their skill level and trip purpose (Land Transport NZ, 2005).

There are some common characteristics that can indicate who may cycle for utility over other groups. There is also a significant proportion of society who cycle for recreation and forty percent of general cycle trips are undertaken for recreational reasons (Lumsdon, 1997). Recreational cyclists may include mountain bikers, road cyclists or multisporters. Howard and Burns (2001) assume that recreational and utilitarian cycling groups are not independent as many commuter cyclists are also recreational cyclists. Therefore, recreational cyclists who do not currently cycle for utilitarian reasons are an important group as they have the potential to cycle for utility reasons. The theory that recreational cyclists will progress to utilitarian cycling is, however, unproven and therefore Lumsdon (1997) suggests further research in this area.

Travel behaviour is also influenced by various socioeconomic factors including income, age, race, ethnicity (Pucher and Renne, 2003), gender, socio-economic status and location (Rissel and Garrard, 2006). People who cycle regularly to work tend to have a series of particular characteristics. For example, a study of USA and Canadian bicycle commuters found that a cyclist is more likely to be male, work in a professional job, have an income of greater than US$45,000 per annum and to own a motor vehicle (Morritz, 1997). This summary includes the primary characteristics of cyclists, age, gender and occupation, which can be used to identify what people have the potential to start cycling for utility reasons, as well as spatial location of people who cycle and cycling facilities.

2.3.1 Age and ethnicity

Age affects propensity to cycle and studies have found that younger people are more likely to cycle than older people (Stinson and Bhat, 2004). A New Zealand study found that cycling levels, including recreational cycling, decreased with age (Sullivan and O'Fallon, 2006). There is evidence, however, that middle aged people, particularly male, are potential cyclists, for example cycling growth in Quebec has been through middle-aged and older adults (Pucher and Buehler, 2005a). Possibly, this shift is due to an increase of middle-aged men engaging in recreational road cycling. Similarly, a 2001 survey of Christchurch residents found that the age groups most likely to cycle were those between 15-19 and 30-49 (Christchurch City Council, 2001) While this finding reinforces the idea of older people being interested in cycling, it also notes that there is a younger group of people, old enough to have a motor vehicle licence, who are interested in cycling for utility reasons.

Different ethnic minorities also have varying levels of cycling. In the Netherlands, planners have identified that children of immigrants cycle less than Dutch children, because cycling was not part of their parents culture, consequently they target these groups for cycle promotion (Pucher and Buehler, 2007). USA research found that being either white or male increased the likelihood of cycling by three times (Moudon et al., 2005). In New Zealand, a 2003 survey found that Pacific Islanders and Asians had significantly lower levels of cycling and that 5.8 percent of respondents had never learned to cycle, with higher rates of Pacific Islanders and Asians never having learned to cycle (Sullivan and O'Fallon, 2006).

2.3.2 Gender

Gender is an important variable in regards to utility cyclists. When the bicycle emerged in the 19th century it became socially significant to women as it offered them opportunities to move independently, and particularly for middle class women to move beyond the social and geographical boundaries placed on them (Simpson, 2007). Today, however, women have much lower rates of cycling compared to males and these gender differences are more pronounced in countries that have low levels of utilitarian cycling (Garrad et al., 2008). This change is perhaps due to the wider access females have to different modes. Studies of cyclists and potential cyclists in western countries have found that women are less likely to cycle than males (Dickinson et al., 2003; Stinson and Bhat, 2004). Countries with high levels of utilitarian cycling have relatively equal numbers of female and male cyclists.

Table 2.1 combines data from different countries to show the disproportion of female and male cyclists. Other studies of utilitarian cycling have found similar variations in gender. For instance, an Australian observational study of cyclists in Melbourne found that 79.4 percent of the 6589 people observed cycling were male (Garrad et al., 2008) .

Table 2.1 Rates of utilitarian cycling by gender

Country	Cycling Rate			Figures based on
	Female	**Male**	**Total**	
USA	0.5%	1.2%	0.9%	2001 National Household Travel Survey Modal Share
Australia	0.4%	1.39%	0.94%	2001 Census Commuter Share
NZL	1.15%	3.4%	2.35%	2001 Census Commuter Share

Sources: (Pucher and Renne, 2003: 21; Rissel and Garrard, 2006: 50; Statistics New Zealand, 2008)

There is potential for increasing the utilitarian cycling rate through encouraging females to cycle. In Germany, females significantly increased in numbers cycling during the bicycle boom in the mid to late twentieth century (Lehner-Lierz, 2003). However, a Chilean study found that gender did not have a significant effect on people willing to cycle (de Dios Ortúzar, 2000). This finding suggests that women may be willing to cycle; however, there are difficulties that restrict their ability to cycle, which are most probably different to those that males face.

One potential factor behind the difference in utilitarian cycling levels between women and men could be their different mobility needs. Women have an increased likelihood of having complicated travel patterns, for example completing shopping or childcare tasks on the way to or from work (Dickinson et al., 2003) as they are often responsible for a household and are more dependent on opening hours of educational, retail and recreational activities (Lehner-Lierz, 2003). A New Zealand study found that having young children significantly affected women's cycling levels (Sullivan and O'Fallon, 2006) probably because young children need to be accompanied to various locations and this is easiest to accomplish by motor vehicle.

Women are also more likely to be forced to have jobs closer to home and the combination of these factors results in women having numerous shorter trips compared to males having fewer longer trips (Howard and Burnes, 2001; Lehner-Lierz, 1997). A Seattle survey conducted in 1993, however, found that gender had no effect on the length of commute (Shafizadeh and Niemeier, 1997).

Gender differences in the relationships between people and the urban environment could also affect females' transport mode choice. Males tend to dominate the organisations that affect urban development (Saville-Smith, 2000). Transport surveys often focus on employment and therefore are more focused on male mobility. Hence, there is a lack of understanding about the transport needs of women, and often they are assumed to be the same as men's (Lehner-Lierz, 2003).

Men and women also approach cycling differently, with men usually being more hands on and prepared to fix bicycles and adjust to their circumstances, while women usually get others to do repairs (Skinner and Rosen, 2007). Women, on the other hand, are more likely to cycle for environmental reasons (Hopkinson, 1996). They are also less likely to have a motor vehicle available and or to have a driving licence (Lehner-Lierz, 2003) although this trend is changing amongst members of the younger generations. A study conducted in Phoenix, Arizona that found females also had less cycling experience (Howard and Burnes, 2001).

2.3.3 Socio-economics

A further three factors thought to affect cycling levels are income, motor vehicle ownership and occupation, either at a household or individual level. While it would seem reasonable to assume that someone without a motor vehicle, on a low income would be more likely to cycle, evidence suggests that groups with higher rates of utility cycling are those that can opt to cycle, for example higher income earners and professionals with access to other modes of transport. This theory arises because cycling is an economic or moral choice, people chose to cycle because it is cheap and/or good for the environment (Geus et al., 2008).

In Amsterdam affluent groups cycle more frequently than lower income groups, who tend to identify with the motor vehicle as a status symbol, compared to the bicycle, which is perceived as the poor man's vehicle (Pucher and Buehler, 2007). In the USA, however, urban adults from lower socio-economic areas tend to have higher walking and cycling rates than other groups (Hoehner et al., 2005; Plaut, 2005) and people who cycle have lower incomes than those who drive (Dill and Carr, 2003). On the other hand, USA research using the National Household Travel Survey (NHTS) found that cycling mode share was approximately the same for all incomes with 0.9 percent of all trips but lower income households made shorter walking and cycling trips than higher income households (Pucher and Renne, 2003). On the other hand, Moritz (1997) found that cycling rates in the

USA increased as income increased (Table 2.2). These data suggest that possibly the groups that cycle are the lower income groups, due to circumstance, and the higher income groups, due to choice.

Table 2.2 Income and proportion cycling

Income in 1000s of US$	<15	15 -30	30-45	45-60	60+
Proportion cycling	4.5%	11%	17.5%	19.2%	43.9%

Source: (Morritz, 1997: 98)

People who cycle can also be characterised by occupation and employment status. Moritz (1997) found that 57.5 percent of respondents in a North American study of cycle commuters were professionals. Ten years later, another study identified engineers as more likely to cycle than other occupations (Skinner and Rosen, 2007). Research of Christchurch cyclists found full-time employed or tertiary students were more likely to cycle (Christchurch City Council, 2001) One reason that full-time employment status may result in a greater likelihood to cycle for transport is the regularity of the activity. New Zealand census data does not include tertiary students who travel to their place of education. University students have high levels of cycling (Pucher et al., 1999) and this is reflected in university towns having higher mode share of cycling than non-university towns. Tertiary education also has an impact with cycling rates increasing where there are a high percentage of college educated residents in areas of the USA (Zahran et al., 2008). Another study also found that higher education and social support would have a positive effect on cycling to work (Geus et al., 2008). Cambridge, Oxford and York in England all have commuter cycling rates of twenty percent (Davies et al., 1996) and these are towns with university populations.

Another factor linked to income and occupation is the issue of motor vehicle ownership. In the USA, people who cycle for commuting have a higher proportion owning one or more motor vehicles than non-cyclists (Moudon et al., 2005). On the other hand, Canada has higher rates of cycling and their society is less dependent on the motor vehicle than in the USA, potentially due to the greater options for sustainable transport modes (Pucher and Buehler, 2006). A study of North American bicycle commuters found that twelve percent did not own a motor vehicle and of this group ninety percent chose not to own a motor vehicle (Moritz, 1997).

There may be a tentative link, therefore, that people who walk or use public transport occasionally are also more likely to cycle and those who are more reliant on their motor vehicle are less likely to cycle for utility. Research on public transport has shown that it is easier to encourage current users, targeting those who travel occasionally to travel more than it is to attract new passengers. It is possible that the same could be said for cycling (Jensen et al., 2000). This idea links to a British survey of drivers that found people with the least knowledge and least interest in acquiring knowledge about public transport were most reliant on their motor vehicles (Jones and Solman, 2003).

2.3.4 Spatial location of cycle facilities

There is a suggestion that cyclists' geographical location in the urban environment can affect their inclination to cycle. Non-motorised commuters tend to live closer to work (Plaut, 2005). There is also evidence that people who cycle are more likely to live closer to cycle facilities. An intercept survey in 1993 of Seattle cyclists found that thirteen percent of cycle commuters had a trip generation point of between 0.4 and 0.8 kilometres from a separated cycle path and a total of fifty-three percent were within 1.2 km of a separated cycle path (Shafizadeh and Niemeier, 1997). These data led the authors to conclude that there will be a 0.8-1.2 kilometre bikeshed around a cycle facility within which people will access the path to cycle, while those outside the shed will take a more direct route (Shafizadeh and Niemeier, 1997). Australian authorities suggest that a bikeshed will be approximately five minutes cycling or 1.5 kilometres (Austroads, 2005). Another study in the USA also found that an area with sufficient cycling infrastructure making a network of lanes has highest rate of cycling (Zahran et al., 2008).

McDonald et al. (2007) argue that there is a positive association between location of cycle facilities and the proportion of work trips by cycle. A USA study hypothesised that proximity to a cycle facility meant increased cycle rates, and found this true for nine out of thirteen urban trails (Morris, 2004). On the other hand, a new bicycle lane may attract people but if it is on a marginal route rather than a main route the impact is minor (Howard and Burnes, 2001). New highways have been found to affect population change either through growth or decline depending on the appropriateness of the location (Voss and Chi, 2006).

2.3.5 Spatial distribution of cyclists

Geographical differences also occur with areas having varying cycling rates. Spatial and climatic differences occur within the USA, where cycling has a higher mode share in the Pacific region (1.1 percent) while the lowest rate is in the East South Central (0.4 percent) with the rest of the country between 0.7-0.9 percent (Pucher and Renne, 2003). Some internal variances might be related to topography such as in East Anglia, Britain, where fifty percent of households have bicycles compared to only thirty-three percent in Wales (Hopkinson, 1996). Canada also has huge variances across the country with the provinces of British Colombia and Yukon having the highest cycling rates (see Figure 2.1) (Pucher and Buehler, 2006).

Figure 2.1 Modal split of workers cycling to work in Canadian Provinces and Territories, 2001
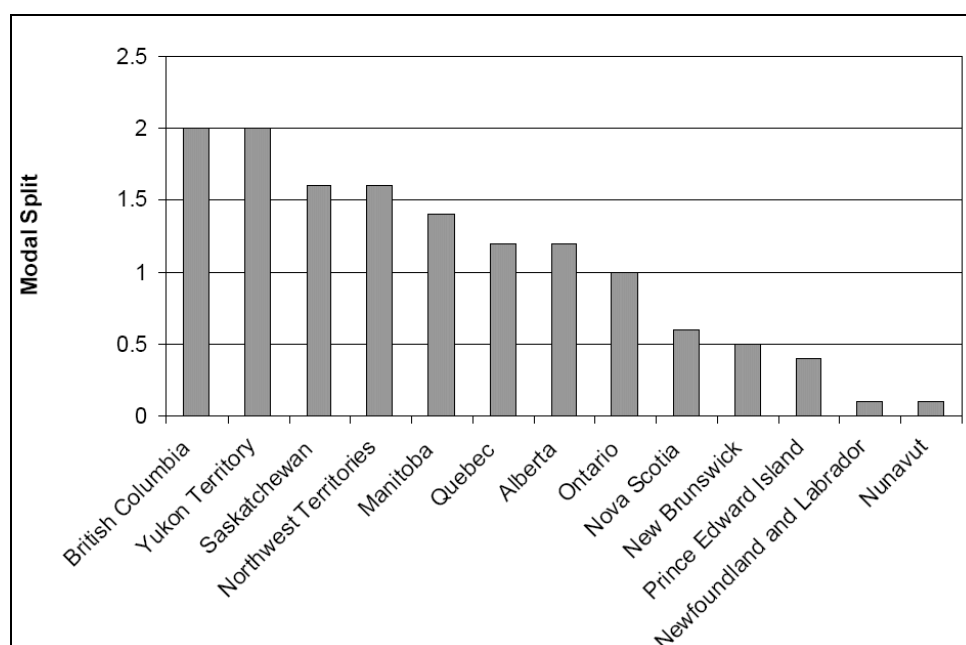
Source: Statistics Canada (2003) in (Pucher and Buehler, 2005a: 4)

Regional difference could also be due to land-use, social and cultural factors. Canadian cities have up to three times higher cycle rates for work trips than USA cities, due to a variety of factors including higher density and mixed land use in Canada resulting in shorter work trips, lower motor vehicle ownership levels, less availability and higher costs for motor vehicle parking and greater transit opportunities, which has lead to a less motor vehicle dependent lifestyle for Canadians (Pucher and Buehler, 2006). Another reason for variance is the local conditions which have an effect on the success of cycle infrastructure improvements (Goldsmith, 1992).

Another factor in the mode of transport used by different socio-economic groups is their spatial distribution within the urban area. Research in the USA on transport shows that

higher-income families live in more auto-dependent suburbs (Pucher and Renne, 2003). Other research found that higher income groups commenced their trips from locations of greatest distance from the Central Business District (CBD) while their destinations were clustered in the CBD, resulting in longer commute times (Shafizadeh and Niemeier, 1997). This research compares with a 1993 intercept survey completed in Seattle, which found that workers from households with incomes of US$7,500-$15,000 had shorter commutes (Shafizadeh and Niemeier, 1997). USA research has also found that walkers and cyclists were more likely to live in central areas (Plaut, 2005), perhaps due to USA trends that lower income groups are more likely to located within central cities, and therefore closer to attractors (Komanoff and Pucher, 2003).

2.4 Motivations and barriers for utilitarian cycling

While there are many motivations for cycling, there are also various barriers and it is important to understand both (Skinner and Rosen, 2007). Reasons to start cycling include health, fitness, environment, traffic congestion, cost of petrol, parking availability and enjoyment of cycling (Moritz, 1997). Barriers can be as diverse as climate, social constraints or physical infrastructure. It is also important to remember that there is a section of the population who simply do not wish to cycle. A UK study of workplaces found twenty-four percent of respondents would not cycle even if they lived near enough and encouragement was provided (Dickinson et al., 2003). The SPARC 2003 survey of New Zealanders found that 41.1 percent of respondents would never cycle even if the conditions were favourable (Sullivan and O'Fallon, 2006). A study in Santiago interviewed respondents about their trips and the possibility of cycling if there was a fully integrated cycle network. They found that 86.6 percent of trips were still not able to be cycled (de Dios Ortúzar, 2000). As discussed above, however, there is potential for increasing cycling rates and efforts in this regard may impact on those not currently interested in cycling for transport.

Individual transport choices are very complicated and link many personal assumptions including individual, domestic and work-based situations as well as obligations and priorities (Skinner and Rosen, 2007). It is also very difficult to apply a universal framework to modal choice (Stone, 2008). The decision to cycle therefore, is a personal rather than an environmental choice (Moudon et al., 2005) and involves both subjective factors, a person's perception and interpretation of their needs, and objective factors, things

that exist for everyone (Goldsmith, 1992) or personal and environmental issues (Geus et al., 2008).

Factors identified as affecting cycling include: distance; weather; topography; cost of transport; availability of motor vehicles and public transport; exposure to fumes; convenience; gender; emotions; previous experience of cycling; expectations of dress; attitudes to health and fitness; awareness and perceived responsibility of environmental issues; physical exertion; necessity of a motor vehicle for errands; social norms and cycling culture; land-use density; transport infrastructure; availability of parking; facilities at work; road safety; fear of accident and resulting injury and cultural attitudes to safety (British Medical Association, 1992; Goldsmith, 1992; Jensen et al., 2000; Jones and Solman, 2003; Komanoff and Pucher, 2003; Skinner and Rosen, 2007; Stinson and Bhat, 2004).

The choice between motorised and non-motorised forms of transport is often based on distance and connectivity (Geus et al., 2008). Distance is one of the most frequently cited and important factors involved in cycling to work and can be a significant barrier. While it can be argued that distance is not the only measurement for ability to cycle (Noland and Kunreuther, 1995) it does separate the population between those who live within a reasonable distance and those who do not. A reasonable cycling distance depends on the perception of the individual, however, people within a distance of eight kilometres of their destination are usually considered to be within a reasonable distance (British Medical Association, 1992). This distance is based on studies of current cyclists including a UK study found that seventy-nine percent of people who responded that they lived close enough to work to cycle lived within a eight kilometres radius (Dickinson et al., 2003). A study of school children in New Zealand found that very few children less than one kilometre from school cycled, while eighty percent of those that lived up to five kilometres cycled and twenty-one percent of those greater than five kilometres cycled (Thull and Lausterer, 2003). While this is a general distance, some people will cycle longer distances of fifteen or twenty kilometres. People also assess a journey on a temporal basis, for example cycling rather than walking reduces the travel time to a third, and conversely increases distance for active transport by three times (Cleary, 2002). Someone who cycles for transport is likely to be more aware of how long the journey will take than someone who does not cycle (Geus et al., 2008).

Unfortunately, distance, climate and topography are not variables that can be directly influenced by cycling policy (Hopkinson, 1996). While distance could be influenced by urban growth plans and land use planning, little can be done to affect change in topography and also weather, which is a significant deterrent for some cyclists. Topography affects cycling with sloping terrain decreasing the attractiveness of walking and cycling (Rodriguez and Joo, 2004).

Weather, the short term changes, and climate, longer-term seasonal changes (Nankervis, 1999), are both cited as barriers to cycling. Seasonal impacts are that in winter months resulting in a lower mode share for cycling and a higher mode share for motor vehicle commuting (Stinson and Bhat, 2004). On the other hand, places with a temperate summer and low humidity will result in higher numbers of people cycling to work (Zahran et al., 2008). A New Zealand report stated that rain days were likely to reduce cyclist numbers by an average of sixty-four percent from those expected on a fine day (McDonald et al., 2007). A Swedish study of workers found that there was a twenty-seven percent increase in motor vehicle trips in winter and a forty-seven percent decrease in bicycle trips compared to summer and bicycle trips of longer than ten kilometres disappeared altogether in winter (Bergstrom and Magnusson, 2003). A similar seasonal fluctuation occurs in Denmark (Jensen et al., 2000) and was found in a study of Melbourne students with higher rates of utilitarian cycling in summer than winter (Nankervis, 1999). On the other hand, a study into commuter rates and weather in Vienna found lower numbers of utilitarian cycling in summer than winter, possibly due to school holidays and vacation time (Brandenburg et al., 2007).

Weather as a reason for not cycling is often perceived by people who do not cycle as a bigger deterrent than it is in reality, for example, people in Britain perceive that there are more rainy days a year than there actually are (McClintock, 2002c). On the other hand, utilitarian cycling is more likely to occur in colder weather and in rain than recreational cycling. A Vienna study found commuter cycling was ten percent higher than recreational cycling during rain (Brandenburg et al., 2007) and is backed up by Nankervis (1999) study in Australia.

Unfortunately, the decline in cycling during winter months exacerbates the effect of colder temperatures' potential to increase the emission rates of some pollutants (Bergstrom and Magnusson, 2003). This can affect potential cyclists as one barrier is that cycling will result in breathing air pollution (British Medical Association, 1992). Air pollution, along

with low density populations and longer distances, negatively impacts on cycling rates (Zahran et al., 2008). On the other hand, evidence exists that motor vehicle drivers are exposed to more air pollutants through their vent systems than any other transport mode. While cycling could have a negative health impact, health and fitness are definite motivations for using active transport. Fitness is also an example of a factor that can be considered from two different perspectives. It could be a barrier for a non-cyclist but also a motivator to try cycling (Rissel and Garrard, 2006).

There is USA research that shows higher motor vehicle ownership rates lead to lower rate of utilitarian cycling (Pucher and Buehler, 2006). In other countries however, a wider range of available transport modes can reduce motor vehicle dependency and hence increase the interest in cycling. Motor vehicle numbers, distance and public transport availability all have an impact on the decision to cycle (Geus et al., 2008). Alternatively, there are many other reasons to take a motor vehicle to work. Potential reasons for driving to work according to Dickinson et al. (2003) include using the motor vehicle for work during the day, personal security, convenience, lack of an alternative viable transport mode, free parking at work and cost. In Christchurch, integrating public transport and bicycles has had a successful six month trial and bicycle racks on buses will be implemented over time (Williams, 2009). Integrating public transport and cycling allows for longer trips to be undertaken either through transporting bicycles on public transport or integrating cycle to ride strategies with sufficient bicycle parking at public transport stops (Davies et al., 1996).

Cost of transport also impacts on an individuals' choice of transport mode. A New Zealand study found that a ten percent rise in the real cost of petrol would have ongoing effects on travel in different urban or rural areas as shown in Table 2.3 (Kennedy and Wallis, 2007). A model developed by Pucher and Buehler (2006) using data comparing the USA and Canada found that a ten cent (US$) increase in petrol prices results in a 0.3 percent increase in cycle mode share for trips to work, however, an additional cyclist death per 100,000 results in a fall in cycle commuter mode share of 0.15 percent.

Table 2.3 The impacts of a ten percent (real) rise in petrol prices on urban motor vehicle traffic

Type of environment	Impact on traffic in first year	Impact on traffic after two years
Urban off-peak	2.7 % decrease	3.6% decrease
Urban peak traffic	0.9% decrease	2.4% decrease
Rural	1.6% decrease	1.9% decrease

Source: (Kennedy and Wallis, 2007: 37)

Another issue with attempting to increase cycling is infrastructure requirements. These include cycle parking, availability of motor vehicle parking making it convenient to drive to work, workplace changing and showering facilities and transport infrastructure. Barriers found against active transport in a New Zealand study included not enough street lighting, heavy traffic, insufficient cycle lanes or paths and dog nuisance (Sullivan and O'Fallon, 2006). Appropriate bicycle parking at destinations is important and can result in a neater and less cluttered appearance (Davies et al., 1996).

Safety has an extremely significant impact on the choice to cycle. In particular, better or safer cycling routes and more consideration by drivers in their attitudes to cyclists will potentially result in more people cycling (McClintock, 2002c). Social safety and fear of cycling also have an important role in an individual's choice. This may include emotions, previous experience of cycling or the knowledge of how to cycle, expectations to dress as a 'cyclist', social norms that construct particular ideas of cycling, cultural attitudes to safety as well as the fear of an accident. These issues, safety, cycling facilities and fear of cycling are discussed separately in the following sections.

2.5 Physical safety of cycling

Pedestrians and cyclists are sensitive to the characteristics of the built environment (Rodriguez and Joo, 2004) and safety concerns are one cause of restricted cycle use (Noland and Kunreuther, 1995). Discussed in depth in cycling literature, particularly in regard to the decline of cycling and encouraging more people to cycle more frequently, it is concluded that safety is a significant tissue for utilitarian cycling. In general, cycling itself is not a dangerous activity but can be made dangerous by the transport environment (McClintock, 2002b). Safety issues arise primarily due to the incompatibility between motorised traffic and non-motorised traffic (Godefrooij, 1997). In fact, the first documented bicycle crash was a motor vehicle-bicycle conflict in New York City in 1896 (Allen-Munley et al., 2004). It is important to note that the perceptions and reality of safety

can be quite different. Perception of safety is given serious consideration as the risk perceived by potential and current cyclists is a more important criteria for behavioural response than the real risk (Parkin, 2007).

While some argue that cycling is one of the riskiest modes for travel, followed by motor vehicle, then walking (Noland and Kunreuther, 1995), studies have also suggested that the health benefits of cycling are likely to outweigh the costs. Although it is difficult to quantify, more life years are gained through health increases than those lost through accidents (British Medical Association, 1992). One of the reasons measuring actual safety is difficult is the lack of reliable data on bicycle crashes, injuries and kilometres travelled by bicycle. Anecdotal evidence has found that in New Zealand, and elsewhere, cycle accident reporting is very low (Turner et al., 2006). With one British study suggesting that approximately seventy percent of accidents are under reported and that those that are not reported are usually less serious (Allatt, 2006). In Sweden seventy-five percent of cases studied through medical centres in one study were unreported to the police (Eilert-Petersson, 1997). In addition, there are many bicycle accidents where people do not get medical treatment. While data from the USA shows approximately 580,000 people are treated annually in Emergency Departments for bicycle accidents (Rosenkranz and Sheridan, 2003) the actual number of injuries may be much higher. While this is a trend that also applies to other transport modes, under reporting is most common for cycle accidents.

2.5.1 Safety of the physical environment

While the incompatibility between motor vehicles and bicycles results in a significant proportion of the safety issues, this problem also arises because of increased provisions for the private motor vehicle marginalising the cycling environment. Where facilities are lacking, not only is safety compromised but walking and cycling are inconvenient and often unpleasant (Pucher and Dijkstra, 2003). It is now recognised by planners that if non-motorised transport goals for encouraging walking and cycling are to be met, then the environment they occur in must be safe (Allen-Munley et al., 2004). Creating cycle facilities is fundamental to the encouragement of more cycling (Hopkinson, 1996) as well as providing a safer physical environment for cyclists through traffic calming. For instance, increased safety and expansion of cycle facilities in Canada is considered one of the key reasons for cycling growth (Pucher and Buehler, 2005a). The creation of cycle facilities, such as separate paths, lanes and cycle traffic lights, however, are most commonly

introduced in response to safety issues such as a cycle accident problem (Davies et al., 1996).

Conflict occurs, and can only occur, when two people are trying to simultaneously use the same space (Walton et al., 2005). There is a finite amount of space available, particularly when providing for transport and limitations in space usually mean a transport mode that is considered less important is given considerably less or no space (Godefrooij, 1997). While Ploger (2003) raises the issue of whether it is functional to take space for cyclists or provide them with priority when creating a cycle network, cyclists without dedicated space are vulnerable road users (Walton et al., 2005). This issue is part of the underlying issue of limited space for transport where the motor vehicle is most often given significant space and priority over other modes. A qualitative study of cyclists in England had respondents reporting that they felt their needs for space on roads were denied (McKenna and Whatling, 2007). Providing for cyclists through dedicated facilities is now widely recognised by transport planners as a method of encouraging cycling. Public debate continues particularly in the councils responsible for cycle facilities, on the level of service that should be provided and the benefits that arise from the cost of facilities.

2.5.2 Segregation or integration

One of the major debates about providing facilities for cyclists is whether to segregate or integrate people cycling with motorised transport (NSW Government, 2004). Integration policies focus on adapting motor vehicle drivers' behaviour, through reducing motor vehicle numbers and speed, to allow for integrated uses. Segregation on the other hand gives incompatible modes their own separate space (Godefrooij, 1997). European guidelines suggest separating different user groups whenever possible is preferable (Ker et al., 2006).

Traffic calming is an integration method that has its roots in Delft, Netherlands, when in 1968 residents put planters out in the street to slow traffic down and reclaim streets for their use (King et al., 2002). Pucher and Buehler (2008) comment that traffic calming is of greatest benefit to pedestrians although it also helps in decreasing serious bicycle accidents. Traffic calming is most effective when it is over a wide area and consequently encourages through traffic to arterial routes rather than local streets, reducing speed and amount of traffic (Pucher and Dijkstra, 2003). In addition to the safety benefits of traffic calming, there are economic impacts with traffic calming shown to positively affect house prices (Jensen et al., 2000). While wider traffic management, including redistributing space

from motor vehicles to cyclists, can be equally effective as dedicated cycle facilities, facilities are more likely to affect the perception and actual level of safety for the cyclist (McClintock, 2002a).

While integration of cyclists usually focuses on changing motorised traffic behaviour to increase its compatibility with non-motorised modes there is an argument against cycle paths made by a group called 'vehicular cyclists'. The idea behind this group, is that cycle paths and facilities make cycling slower and therefore dangerous. In addition, these facilities promote the perception that cyclists are not legitimate road users, however, a counter is that this does not allow for different groups of cyclists, including those that are more vulnerable (Pucher et al., 1999). In general, academics and planners agree that some level of separation is required for cyclists' safety if there is no traffic management in existence. Alternatively, dual networks that cater for different groups of cyclists can be provided (Harrison, 2002).

The argument for keeping cyclists in the motorists' view is valid, however, and is represented in debates for on-road cycle lanes or paths close to the carriageway. Conversely, fully segregated facilities can have the potential for people cycling to acquire a false sense of safety and not provide them with the road sense required to cycle on the road (Davies et al., 1996). Goodefrooij (1997) notes that while segregation is important when traffic numbers or speed can not be reduced, integration methods should be used when segregation is not possible. Angenendt et al. (1993) suggest that providing for cyclists through on-road lanes is safer if there is insufficient space for a high quality cycle path network. On-road lanes result in cyclists remaining in the visual area of other road users. Jensen's (2007) before and after study found that cycle paths created a higher proportion of new cycle trips than cycle lanes, however, they also created more injuries.

Difficulties with on-road provision arise with misunderstandings about the rights of cycleway users and the legal status of on-road routes. For example, cycle lanes may be interpreted as parking space, particularly if there is high availability of parking in the area (Godefrooij, 1997). In Chile, it has been found that other users do not respect cycle lanes and therefore there is a need for better cycling facilities (de Dios Ortúzar, 2000). Another problem with lanes is that obstacles can force cyclists to take evasive action often into the traffic flow creating conflict with motor vehicles. In Odense, Denmark, this is combated by having cyclists who ride around identifying places that require fixing. These trouble

shooters then call in an issue and receive 3.30 Euro for every confirmed repair (Pucher and Buehler, 2007).

Cycle facilities adjacent to roadways but separate from the motorised traffic still provide a visual presence, however, they are also physically separated from the perceived and real dangers of cycling on road, therefore encouraging new and causal cyclists to bicycle more often (Pucher et al., 1999). Problems arise with providing fully segregated facilities. Firstly, cycle facilities are often provided in conjunction with provision for other modes, such as walking. While shared paths can reduced the possibility of accidents with motor vehicles, if they are built with insufficient space for all users they can increase the risk of cyclist-pedestrian collisions (McClintock and Cleary, 1996). These conflict issues can arise from users not respecting space, for example, not keeping to the left of a path or lane or users travelling in groups (Ker et al., 2006). While conflict concerns about shared paths can be real or perceived any concern a person has could affect their willingness to walk (Ker et al., 2006) and potentially cycle. In any case, cycling should not be promoted at the detriment of other active modes.

Pedestrians can perceive footpaths converted to shared paths negatively and newly created shared paths for cyclists and pedestrians are more widely accepted (McClintock, 2002a). Another negative impact of shared paths is cyclists getting the perception that there is tacit endorsement for riding on footpaths, even if this is not allowed under a country's law (McClintock and Cleary, 1996). In New Zealand cycling on the foot path is prohibited unless delivering letters or the path is declared a cycle path with signage (Ker and Huband, 2006). Newly created shared paths, however, are often designed solely for pedestrian and cyclist users and it is important that they are designed to be safe for all users, including disabled and visually impaired people (Ker et al., 2006). Other path users are also becoming increasingly frequent, for example, the ageing population results in increased use of mobility devices and trails built for cyclists often lack the space that these other forms of transport require (Landis et al., 2004). Other forms of transport that are appearing on paths and are not specifically catered for include scooters, inline skates and segways (Landis et al., 2004). Facility design can have an impact on this multiple use with a high proportion of respondents to a Swedish study on safety reporting that the cycle track design was the cause of the injury event (Eilert-Petersson, 1997).

While segregated routes may increase safety through reducing bicycle and motor vehicle conflict, there is a perceived social risk from cycling on paths where there is reduced

visibility to passers by (Jensen et al., 2000). Therefore, for vulnerable users, such as females, or at particular times, such as night, users may avoid those paths. When creating a high quality cycle network that includes shortcuts therefore, it is important not to overlook the personal safety of individuals (McClintock, 2002a). Another unintended consequence of providing off-road routes is the perception that arises that roads are not safe for cycling (Horton, 2007). Also, while segregation would remove the conflict issues between motor vehicles and cyclists, avoiding all conflict between cyclists and motorised transport is virtually impossible due to the nature of intersections, including driveways (Pucher and Buehler, 2008).

2.5.3 Traffic

In most cases, no matter how separated bicycle and motor vehicle networks are, there will be instances when both motor vehicles and people cycling need to share the same space. This interaction creates a safety issue due to the conflict between the different modes and how they behave in regards to each other. One reason for traffic increasingly becoming an issue for safety over the years is that higher traffic speeds result in less time to take evasive action (British Medical Association, 1992) and cause more serious injuries. In addition, motor vehicle numbers are mounting, as discussed in Chapter One, and an increase in traffic numbers also adds to safety concerns. Cyclists consider motor vehicle drivers a particular safety issue, partially as they are often unaware of cyclists' needs or rights. In the UK in 1992, three quarters of cycle fatalities or serious injuries were due to collisions with a motor vehicle (British Medical Association, 1992). In New Zealand between 2002 and 2006, 3050 cyclists were hospitalised for injuries, with forty-three percent of these crashes involving a motor vehicle and forty-eight of these cyclists died from their injuries (Ministry of Transport, 2007).

A large majority of accidents are due to motor vehicle-cyclist conflict where the two groups fail to see each other, or understand the other's movements and consequently fail to give way (Jensen et al., 2000). One New Zealand study found that the two most frequent reasons cyclists reported for major accident causes were 'traffic failed to notice me' (48 percent) or 'traffic failed to give way to me' (28 percent) (Turner et al., 2006). Only a minority of Christchurch residents perceive motorists as considerate to cyclists (thirty-six percent of the total respondents and thirty-two percent of respondents who cycled) (Christchurch City Council, 2001). New Zealand Travel survey data has found that in

sixty-four percent of bicycle crashes a motor vehicle was at fault (Ministry of Transport, 2007).

Cyclists tend to blame motor vehicle drivers for incidents on the road, however, motor vehicle drivers have difficulties with cyclists particularly when they ignore road rules (Jensen et al., 2000). It should be noted that there is usually little education of drivers as to cyclists' rights (Pucher et al., 1999) and studies have found that cycling promotion rarely addresses driver behaviour (McKenna and Whatling, 2007). In the Netherlands and Germany, traffic laws require motorists to drive in a manner minimising risk to pedestrians and cyclists even if the pedestrians and cyclists are acting contrary to traffic regulations (Pucher and Dijkstra, 2003). Overseas, one method of combating motorists attitudes towards cyclists has been to offer traffic safety courses in lieu of fines (Pucher et al., 1999). On the other hand, there is evidence that motor vehicle drivers who also cycle are more likely to anticipate cyclists needs (British Medical Association, 1992). As cycling levels increase, it would be realistic to assume that more motor vehicle drivers would have cycling experience leading to the theory of safety in numbers.

2.5.4 Safety in numbers

Safety in numbers suggests that as cycling mode share increases, either in cyclist numbers or in distance cycled, cycling itself will become safer. Statistics for the Netherlands in general show that between 1978 and 2006 there was an eighty-one percent decrease in the fatality rate for cyclists while the kilometres cycled by Dutch people increased thirty-six percent (Pucher and Buehler, 2008). Inversely, downward spiralling numbers of cyclists have resulted in cyclists feeling less safe, which is linked to the theory that a minority perceives itself to be less safe than a majority, however, cyclists are also less safe in reality as other road users tend to be less considerate (Horton, 2007).

Other evidence for the theory of safety in numbers is that countries with the highest levels of utilitarian cycling have the lowest levels of cycle accidents. The cities and countries with higher levels of cycling have decreased levels of serious or fatal accidents (Wittink, 2003). Table 2.4 and Figure 2.2 give a comparison of cycle safety between countries based on the fatalities per 100 million kilometres cycled. The data displayed show that countries with lower rates of utilitarian cycling, such as the USA and UK have higher fatality rates.

Table 2.4 Comparison of cycle safety between 2002-2005

Country	Cycle fatalities per 100 million kilometres cycled
USA	5.8
UK	3.6
Germany	1.7
Denmark	1.5
Netherlands	1.1

Source: (Pucher and Buehler, 2008: 12)

Figure 2.2 Bicycle distance per person per day and killed cyclists per 100 million kilometres in ten countries
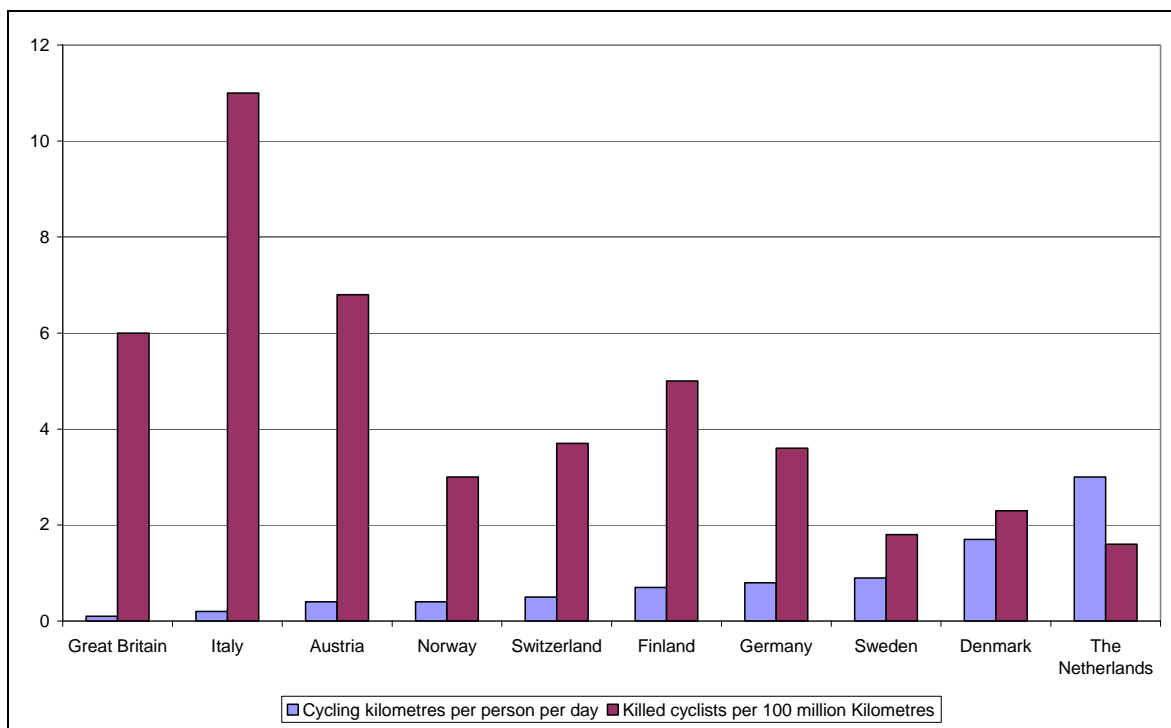
Source: Based on (Wittink, 2003: 172)

The proposed reasoning behind these statistics is that when there are more cyclists on the road and visible to other road users, everyone becomes more aware of cyclists and their needs. Increased levels of cyclists mean drivers have higher awareness levels and are more vigilant of expecting or anticipating cyclists (Wittink, 2003). Another effect of more cyclists on the road is that more people consider it a meaningful transport mode. Although an individual making minor changes to cycling in their transport may seem small, this can make a difference to the overall picture (Jensen et al., 2000) and where more cyclists are

seen more people may be encouraged to try cycling. Pucher and Buehler (2006) have a theory for linking safety and cycling where safer cycling encourages more people to cycle leading to more cycling facilities resulting in more cycle training making motorists more aware and considerate of cyclists, making cycling safer.

2.5.5 Helmets

The issue of whether helmets should be compulsory is hotly debated amongst planners and researchers, particularly the issue that the inconvenience or 'uncoolness' of the helmet discourages people from cycling, negating the positive safety effects of a helmet. There is an assumption that some people will quit cycling when a compulsory cycle law is introduced (Taylor and Scuffham, 2002). A USA study found that seventy-five percent of cyclist patients with head injuries were not wearing a helmet, however, the study only looked at hospitalised patients and this could produce results that are distorted by non-helmet wearing cyclists (Rosenkranz and Sheridan, 2003). Mandatory laws requiring helmets have some benefit in reducing injuries, however, also have limitations (Taylor and Scuffham, 2002).

In North America, safety campaigns have focused on helmets (Pucher et al., 1999) but the countries with the highest levels of cycling are anti-helmets and do not see them adding significantly to the safety of cyclists. Dutch planners interviewed by Pucher and Buehler (2008) saw helmets as detrimental to cycling due to their inconvenience, lack of comfort and style. Their other concern was that wearing a helmet could lead to people cycling undertaking riskier behaviour due to a false sense of safety. The Danish and Germans, however, are more in favour of helmets than the Dutch (Pucher and Buehler, 2008). Helmets also have an effect on children cycling to school. In New Zealand helmets were made compulsory in 1994 and likely contributed to the decrease in cycling to school (Thull and Lausterer, 2003). A study in New Zealand of the cost and benefits of a mandatory helmet law found that the costs, such as purchasing helmet, versus benefits was only positive for five to twelve year olds, however, costs were likely understated and many benefits were not included (Taylor and Scuffham, 2002).

Another argument is that helmets make cyclists responsible for their safety as opposed to increasing safety through provision of cycle facilities (Wittink, 2003) or better motorist behaviour. Road safety education campaigns are also based on this idea of increasing the safety of individual's interacting with the environment, rather than protecting and encouraging a safe urban environment. Unfortunately, road safety education, such as

helmet campaigns or child safety campaigns, can add to the construction of cycling as a fearful activity, and provides disincentives rather than incentives for active transport (Horton, 2007).

2.6 Fear of cycling

One of the major reasons for not cycling is the fear of accidents and injury (British Medical Association, 1992). Fear of cycling, however, is constructed and different groups perceive cycling as having varying levels of safety. One variance occurs from different experiences of cycling. Joshi and Senior (1998) argue that those who cycle for utilitarian reasons have less fear of traffic danger than those who have no experience. It is also very difficult to measure fear of traffic by empirical methods especially as regular and non-regular cyclist may have varying viewpoints of safety (Allatt, 2006). On the other hand, a European student study found that those people who cycled regularly were more aware of traffic dangers potentially due to personal experience (Titze et al., 2007).

Gender is another factor where perception of safety can differ remarkably. Males occasionally have a different perspective on safety depending on who they are considering, for example they may not worry about personal safety for themselves but could be concerned if wives and daughters were to cycle (Skinner and Rosen, 2007). While women may have greater safety fears, a Swedish study found that men had a greater risk of bicycle injury than females (Eilert-Petersson, 1997). Potentially this study could have been influenced by the greater number of males cycling resulting in higher numbers of men being injured. Perception is, however, the major factor and there is a possible link between the traffic increases of the 1980s and the decline in female cyclists of the same period (Mathew, 1997).

A person's perception of safety can be formed easily, for example, someone can get upset from one negative incident (Ker et al., 2006) and be put off using a facility or transport mode. To break down the barrier of perceived lack of safety it is important for researchers and policy makers to understand what actual differences can be made to increase safety levels for cycling as well as the perception of safety levels. Traffic is a major contributor to the perception of safety and although speeds may be low, the volume of traffic on a route can affect a cyclists' perception of the safety (Jensen et al., 2000). A study of students at the University of Graz in Austria found that students who perceived traffic levels as high were less likely to cycle (Titze et al., 2007).

Fear of the urban environment has also contributed to increasing motor vehicle use and decreasing levels of active transport. A reason for increased motor vehicle use is that walking alone is more dangerous compared to historically and the consequence is that people drive in motor vehicles (Tolley, 1997). The motor vehicle is a method of separating oneself from the landscape which constructs fear, including dangerous places and people (Horton, 2007).

The construction of fear of cycling, however, is more than the simple fear of having an accident or personal danger, it includes the fear of becoming a 'cyclist', which is culturally based and therefore difficult to change (Horton, 2007). There are certain characteristics assigned to everyday cyclists in the western world, such as brave, fit or alternatively foolish and inconsiderate, (Skinner and Rosen, 2007). The fear of becoming a cyclists is the fear of loss of identity to a constructed identity linked to gender, race, class and status (Horton, 2007).

Cycling is seen in a different light in the Netherlands, Germany and Demark. In these countries, a cyclist does not require expensive equipment, advanced training or fitness (Pucher and Buehler, 2008) as is often perceived to be the case in New Zealand and other countries. There is also a fear of being inept at cycling which is linked to the vulnerability that can occur from undertaking physical activity in public spaces (Horton, 2007). Some countries have a cultural bias against cycling. For example, in Chile cycling for transport has been marginalised by various means including motor vehicle advertisements (de Dios Ortúzar, 2000) and this negatively affects cycling mode share. In cities where cycling is prominent and has a high mode share, such as Davis, California, people who cycle are no longer perceived as eccentrics or enthusiasts but as normal people using bicycles as transport (Komanoff and Pucher, 2003). While increases in cycling may lead to this eventuality, a person's fear of cycling may also increase as the environment becomes more cycle friendly as they feel amplified opportunities, and possibly pressure, to commence cycling (Horton, 2007). It is therefore important to provide opportunities and encouragement for people to commence cycling as a mode of transport without making people feel pressured to cycle.

2.7 Cycling infrastructure

Providing cycling specific infrastructures to create a safer and more convenient network is an essential tool to encourage cycling, however, there is no single correct solution (Davies et al., 1996). Planning for cycling will make the urban environment both physically safer for people cycling and increase the perception of a safe environment. People often perceive they are safer when they have their own space in the road network. Routes should be safe, comfortable, direct, coherent and attractive (Land Transport NZ, 2005; NSW Government, 2004). It is important to realise, however, that utilitarian travel is more comprehensive than just the journey to work and this needs to be considered when creating a cycling network. Social, recreational and shopping trips have very different logistical needs, such as luggage capacity, due to their various purposes and locations making these trips harder to cycle (Stinson and Bhat, 2004). Commuter cyclists are more likely to be more experienced on the road and the groups more likely to use facilities include females and those travelling to retail or educational facilities, possibly reflecting the greater traffic concerns that these groups have (McClintock and Cleary, 1996). In this regard, a high quality cycle network should benefit women as they will be able to combine their trips more easily and safely. Utility bicycles also need to be equipped with a variety of extras for daily use, such as luggage carriers, baskets and a child seat or child trailer (Lehner-Lierz, 2003).

As a bicycle requires one tenth of the space that a motor vehicle requires (British Medical Association, 1992) it is seen as space efficient by traffic planners and also provides for less congestion through reduction in motor vehicle drivers (Pucher et al., 1999). This fact has meant that providing specifically for cyclists has gained increased momentum in recent years; however, it is difficult to retro-fit a motor vehicle-orientated city with off-road cycle paths. This problem results in on-road lanes being built for practical and economic reasons; however, these may not provide the level of separation needed to attract female cyclists (Garrad et al., 2008) and potentially other vulnerable groups. Provisions for cyclists in the urban space can also have an effect on the perceptions of safety and enjoyment. A USA study looking at urban activity found that adults who perceived bicycle lanes were present in most areas of the community were significantly more likely to cycle for transport or to meet exercise recommendations (Hoehner et al., 2005). While facilities are a way to manage safety and perception of fear, the provision of facilities at junctions may lead to cyclists perceiving it as more risky (Parkin, 2007). The following sections discuss a variety

of different types of infrastructure that will be investigated in this study. These range from no provision, to cycle lanes, to separated paths.

2.7.1 No specific provision for cyclists

When no provision is given on the road for cyclists they are required to find their own space where it is possible. In some cases, such as Figure 2.3, a cyclist may have a wide shoulder on which to ride, in others there is little space and all motor vehicles are expected to share the same space as in Figure 2.4. In particular, space is extremely narrow on rural roads such as in Figure 2.5. Figure 2.6 is typical of a normal suburban street where no provision is provided for people cycling and there is no marked curb on which to ride. On the other hand, these types of streets have significantly lower motor vehicle numbers compared to arterial roads and lower speeds than rural roads.

Figure 2.3 A wide sealed shoulder on Marshland Road, Christchurch, New Zealand

Source: (Land Transport NZ, 2005: 38)

Figure 2.4 An arterial road with little space for cyclists in Victoria, Canada (image inverted)

Source: (Koorey, 2008)

Figure 2.5 Typical space on a rural New Zealand Road

Source: (Land Transport NZ, 2005: 14)

Figure 2.6 A typical suburban street, New Zealand

Source: (Land Transport NZ, 2005: 39)

Traffic calming does not usually include providing directly for cyclists but can result in improved cycling conditions on local streets (Land Transport NZ, 2005). Measures aim to reduce speed and volume of vehicles and should therefore benefit cyclists (Davies et al., 1996). Usually, techniques include slowing traffic through speed bumps or narrowed streets or alternatively reducing traffic flow. Moving through traffic to arterial routes is the primary outcome from these methods and is achieved through reducing motorists' links between residential streets, while maintaining cyclist and pedestrian links. Some of the methods used to calm streets or manage traffic speeds, such as speed bumps, can cause a more disrupted surface for cyclists (Figure 2.7). Traffic calming, however, should aim to improve the environment for cycling because if people cycling are not considered then traffic calming measures can make things more dangerous (Davies et al., 1996). Figure 2.8 shows provision for cyclists provided around speed bumps.

Figure 2.7 Traffic calming in Germany

Source: (Koorey, 2008)

Figure 2.8 Provision for cyclists around traffic calming in Palmerston North, New Zealand

Source: (Morris, 2008)

2.7.2 Cycle lanes

Cycle lanes are the first stage of providing specific facilities for cyclists. They are usually identified through roadway markings on the outside of the lane, painted cycle signs inside the lane and occasionally cyclist signs on posts or coloured paint. It is important lanes are designed with adequate width so that people cycling can overtake others in the cycle lane and be overtaken by motor vehicles (Davies et al., 1996). Figure 2.9 shows a typical cycle lane marked with a dotted white line and a cycle picture, although the general standard in Christchurch has now changed to a solid white line in line with the rest of the country and the national standard, such as Figure 2.10. In Figure 2.9, there is no parking provision and

therefore the cyclist does not need to watch for motor vehicle doors opening into the lane. This compares to Figures 2.10 and 2.11 where cyclists constantly need to be on the alert for motor vehicles pulling in and out of the parking space and doors opening. The primary problem with cycle lanes is that they are not respected by drivers and common difficulties are motorists opening doors into the lane and performing parking manoeuvres that result in crossing the cycle lane (Land Transport NZ, 2005).

Figure 2.9 Kerbside cycle lane, North Shore City, New Zealand

Source: (Land Transport NZ, 2005: 36)

Figure 2.10 Cycle lane next to parking with solid white line in Hamilton, New Zealand

Source: (Land Transport NZ, 2005: 25)

Figure 2.11 Cycle lane next to parking, New Zealand

Source: (Land Transport NZ, 2005: 25)

Figure 2.12 shows a form of highlighting the lane through coloured green paint on the road surface. Colour differentiation is a useful technique for increasing the visibility of cycle lanes and they are usually painted red, however, green is also utilised (Davies et al., 1996).

Figure 2.12 Painted cycle lane, New Zealand

Source: (Koorey, 2008)

One way to provide priority to people cycling and increase motorists' awareness is the contra-flow lane. This lane permits cyclists to ride against the traffic flow, usually on a one way street (Land Transport NZ, 2005). Another form of lane is the kerbed lane where an additional road kerb is placed along the edge of the cycle lane for example Figure 2.13. While this forms no physical barrier for a motor vehicle, it does provide an additional

identification for the lane. Alternatively, Figure 2.14 shows a lane placed between parking and pedestrian space, removing the cyclists from the need for motor vehicles to cross the lane on the way to parking space.

Figure 2.13 Kerbed cycle lane with parking behind in Melbourne, Australia

Source: (Barber, 2008)

Figure 2.14 Cycle lane behind parking, Denmark

Source: (Barber, 2008)

An Australian study found that placing a separator between the traffic lane (Figure 2.15) and a cycle lane created few problems for people cycling and made them feel safer as the

boundary was more obvious to drivers and consequently they were more likely to stay out of the lane (Sinclair Knight Mertz, 2008).

Figure 2.15 Useable lane width and separator, Australia
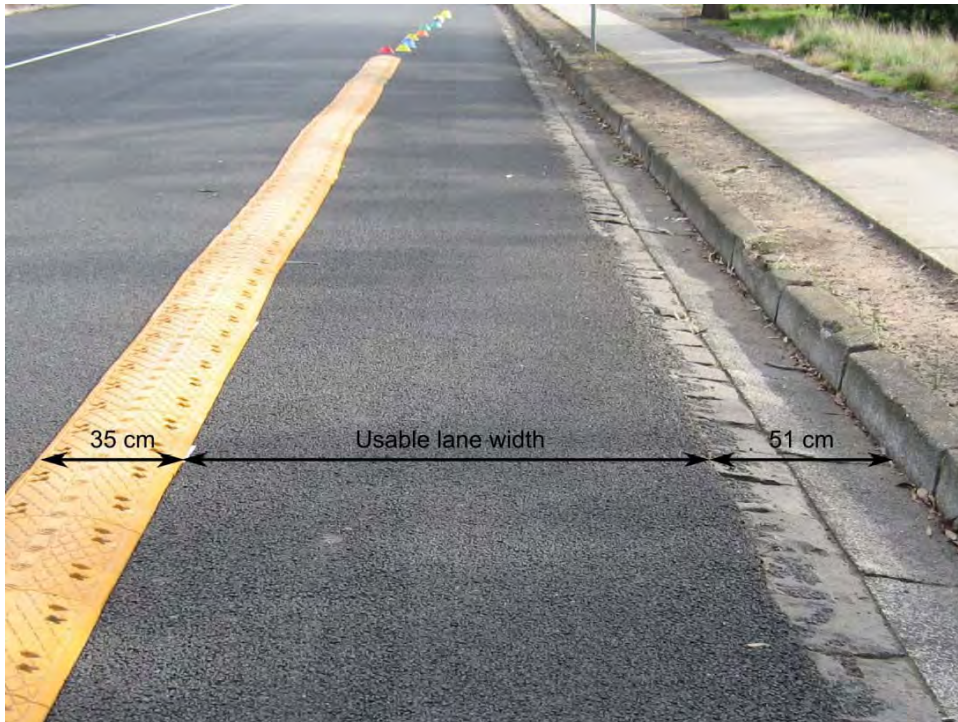
Source: (Sinclair Knight Mertz, 2008: 36)

Intersections are where cyclists are at the highest risk (Land Transport NZ, 2005) and a cycle network is only as good as its weakest feature (Davies et al., 1996). At intersections, lanes typically continue up to the intersection space and restart on the opposite side (Figure 2.16), leaving the cyclists to make their way across in time with the traffic signals. Painted lanes are more predominate at intersections in Christchurch and other cities as it is recognised that at intersections cyclists need recognised space. One way to approach intersections is to bend the cycleway from the main carriage way by four to eight metres and provide a crossing over the minor road (Davies et al., 1996).

Figure 2.16 Cycle lane at an intersection in Christchurch, New Zealand

Source: (Koorey, 2008)

Turning right on a bicycle can be difficult, particularly where motor vehicles are turning left or going straight (Davies et al., 1996). Two methods to assist people cycling to undertake these manoeuvres are advanced stop boxes (ASB) (Figure 2.17) or right hand turn lanes (Figure 2.18) may be provided for cyclists to gain an advantage over stopped traffic or to turn right at an intersection. ASBs create an area for people on bicycle to wait ahead of traffic (Davies et al., 1996). Another method of assisting cyclists to turn right is the hook turn (Figure 2.19), which requires two light phases to complete. A person will cycle straight through the intersection on the first phase, waiting in a designated area and then proceeding straight ahead into the side road when the lights change.

Figure 2.17 Advanced stop box in North America

Source: (Koorey, 2008)

Figure 2.18 Right hand turn cycle lane in Christchurch, New Zealand

Source:(Wilke, 2008)

Figure 2.19 Hook turn in Christchurch, New Zealand

Source: (Macbeth, 2008)

Roundabouts are another difficult intersection and more cycle injuries occur on roundabouts than at any other type of intersection (Land Transport NZ, 2005) and people cycling are more likely to suffer an accident than motorists (Davies et al., 1996). They are the most feared feature for cyclists even experienced cyclists detour to avoid them (Davies et al., 1996). In New Zealand lanes usually stop prior to the entry point. There are instances of lanes provided around the outside of traffic lanes, however, such as the example in Figure 2.20. Another case is from York where directional lanes are provided to give more comprehension of cyclists intentions (Figure 2.21).

Figure 2.20 A cycle lane around the roundabout, Netherlands

Source: (Jensen et al., 2000: 92)

Figure 2.21 Directional cycle lanes around a roundabout in York, England

Source: (Koorey, 2008)

2.7.3 Cycle paths

The following pictures are of a series of separated paths ranging from those within view of the roadway to those fully separated routes. Cycle paths away from the carriageway can be attractive to people with little experience cycling or families (Davies et al., 1996). Cycle paths remove people cycling from hostile traffic conditions and provide higher comfort, consequently they are popularly demanded by people when asked how to encourage cycling but, on the downside, require more land (Davies et al., 1996). Figure 2.22 shows a separated cycle path along side a motorway, which otherwise would not allow for cyclists. Exclusive paths such as shown in these pictures are preferred for high commuter traffic (Land Transport NZ, 2005). A rural shared path is seen in Figure 2.23 alongside a rural road. Both of these cases provide cycling only space away from all other forms of traffic, however, difficulty can arise when the path intersects another cycleway or traffic lane.

Figure 2.22 Cycle path in Auckland, New Zealand

Source: (Land Transport NZ, 2005: 24)

Figure 2.23 Cycle path along a rural highway, New Zealand

Source: (Land Transport NZ, 2005: 26)

Figure 2.24 is an international example of a two way cycle path alongside an urban roadway. Placing the cycle path next to road, a common technique in Europe, results in less stress and a more attractive route but people cycling have to give way at side roads (Land Transport NZ, 2005). Figure 2.25 and 2.26 give two examples of Australian two way paths that are separated from the roadway, potentially giving the cyclist shorter or alternative routes to following standard roads.

Figure 2.24 Dual cycle pathway, Netherlands

Source: (Jensen et al., 2000: 54)

Figure 2.25 Australian cycle path

Source: (Land Transport NZ, 2005: 40)

Figure 2.26 Off-road Australian cycle path

Source: (Land Transport NZ, 2005: 26)

The final type of cycle path is a shared pathway, usually with walkers but also other types of transport. In UK and continental Europe, shared paths typically suffer from inadequate width, interruption by side roads, hazards from driveways and poor surfaces (Davies et al., 1996). In most cases, such as Figures 2.27 and 2.28 there are few markings indicating which side of the path walkers and cyclists should travel on. Shared paths, for community use, often result in concerns about conflict between pedestrians and people cycling occurring (Land Transport NZ, 2005). While some of these concerns can be perceived and others actual both are important on willingness to walk (Ker and Huband, 2006). There are also a wide range of other users on the path and this can cause confusion (Ker and Huband, 2006). Separated paths can result in less conflict (Land Transport NZ, 2005) and cycle and pedestrian logos are one way to encourage people to keep to their side (Davies et al., 1996).

Figure 2.27 Shared path in Hamilton, New Zealand

Source: (Land Transport NZ, 2005: 41)

Figure 2.28 Shared path through Hagley Park, Christchurch, New Zealand

Source: (Land Transport NZ, 2005: 28)

The primary difficulty with intersections and separated paths is re-integrating the various routes in a safe and recognisable manner. It is important that drivers know where to expect cyclists (Davies et al., 1996). While one way is to return cyclists to cycle lanes and provide for them as discussed above, there are a few other techniques used to maintain separation of road users. Firstly, cyclists remain on their cycle path and cross with traffic lights, either general pedestrian or cycle signals, as in the example in Figure 2.29. These can be difficult for cyclists turning right however, and they may need two phases to complete their turn. On the other hand, there are examples of head-start lights (Figure 2.30), which allow cyclists their own phasing of lights with which to navigate the intersection.

Figure 2.29 Cyclist path crossing at traffic lights, Germany

Source: (Wilke, 2008)

Figure 2.30 Right hand turn cycle light, Palmerston North, New Zealand

Source: (Wilke, 2008)

Roundabouts are also difficult to navigate with separate paths, but if sufficient space is available cycle paths can be provided around the roundabout with (Figure 2.31) or without priority (Figure 2.32). Where priority is given to the cyclist, space is provided for motor vehicles to give way to the cycle path and also to wait for access to the roundabout. The alternative, where motor vehicles have priority, means cyclists wait at each road crossing point and are usually provided with a rail with which to maintain their balance. Another

option for navigating roundabouts is underpasses, which can keep cyclists completely separated from traffic (Figure 2.33). Unfortunately, personal safety issues commonly arise when this option is presented, particularly when underpasses are poorly designed to allow sufficient light or space for walkers and cyclists.

Figure 2.31 Dutch roundabout with cyclist priority

Source: (Kingham, 2008)

Figure 2.32 Cyclists path around roundabout without cyclist priority

Source: (Koorey, 2008)

Figure 2.33 Underpass for cyclists, USA (image inverted)

Source: (Koorey, 2008)

2.8 Children and cycling

Child commuting is important for children's health and fitness and a focus on the school commute occurs as childhood is the preferred time to put in place habits of regular exercise through active transport that will be carried into later life (Cleary, 2002; Hillman, 1997a; Lehner-Lierz, 2003). Unfortunately, there are declining rates of walking and cycling to school (Thull and Lausterer, 2003). In addition, schools are also a significant contributor to localised congestion (McMillan, 2007) and environmental, economic and social issues can be addressed by easing this congestion.

Encouraging active behaviour in children is also important for their health and well-being, particularly as child obesity is becoming an important problem. A USA study of elementary school children in Colombia, South Carolina, found that those who regularly used active modes to get to school were generally more active than those who commuted by motorised modes (Sirard et al., 2005). European research found that cycling to school was associated with higher activity levels for boys than those who were driven, but this was not the case for girls (Cooper et al., 2005). Active commuting also allows more social interaction between children. A study found that caregivers who realised and appreciated the benefits of social interaction were more likely to allow their children to walk or cycle to school (McMillan, 2007).

In Denmark, children, particularly the 6-15 year old age group, cycle more kilometres than adults (Jensen et al., 2000) and are one of the groups that are more vulnerable and require

greater protection. In Odense, cycling is common as a mode of transport to school and even more common to other activities. From nine years old, walking and motor vehicle use decrease as those children cycling increase in numbers (Andersen, 1997). While one reason for a decline in school cycle commuting is an increase in cycle theft (Mathew, 1997) the policy focus tends to be on physical and personal safety of children cycling to school. In Germany, children's vulnerability is recognised in law where anyone under eight years old must ride on the footpath or a separate path (Pucher and Buehler, 2007).

Parental perception of safety for children is extremely important as to whether a child will be allowed to walk or cycle to school. In the UK stranger danger fears have been enhanced by media coverage of occasional attacks (Tolley, 1997). A UK study found that parent's concern about stranger danger had an impact on the freedoms they would allow their children to have, however, the research found traffic danger was more often discussed (Sissons-Joshi et al., 1999). In the USA, a study found that parents' perception of heavy traffic in the neighbourhood was negatively associated with walking and cycling and this was particularly the case for girls (Carver et al., 2005). The concerns of parents can place peer pressure on those who allow their children to commute to school by alternative means. In fact, anecdotal evidence from the UK found that some parents expressed guilt for not taking their children in the motor vehicle but letting them walk to school (Tolley, 1997). A New Zealand study of Hutt parents found that those who drove their children to school perceived a higher risk of harm to cyclists than those who allowed their children to cycle (Walton et al., 2005). This finding suggests that those parents who do not allow their children freedom of movement perceive greater risks.

There are, however, real risks for young people and children are often marginalised by transport planning and systems being biased towards adult commuters, as is the case in New Zealand (O'Connor, 2003). A Swedish study found that children and young persons were most affected by bicycle injuries (Eilert-Petersson, 1997). In New Zealand, out of all people who cycle, ten to fourteen year olds are most at risk of hospitalisation after a cycle crash (Ministry of Transport, 2007). Safety concerns from schools have resulted in bans to some forms of transport such as cycling (Cleary, 2002) and others, including scooters. Children also have a lesser ability to cope with traffic danger than adults. While cycling provides children with the ability to access a greater area they are neither able to cope with all rules and signs as efficiently as adults nor effectively judge gaps in the traffic. In addition, they are more likely to play or show off resulting in risk taking on the road

(McClintock, 2002b). Accompanying children to school, however, can help them to understand the dangers of transport. A study of children's travel to school found that children accompanied by an adult were more likely to mention traffic danger and that thirty-one percent of the children studied mentioned stranger danger (Sissons-Joshi et al., 1999).

Accompanying a child to school can also affect their spatial ability and a study investigated to see if the mode of transport used had an effect. It has been theorised that children who travel to school by active means are more spatially aware, but this study found no significant difference by mode of transport in spatial ability (Sissons-Joshi et al., 1999). There was a correlation between accompanied children, either through walking or in motor vehicles, using more landmarks and one possible reason was that these children would spend more time discussing the area with an adult (Sissons-Joshi et al., 1999). A Swiss study found that five year olds who travelled without accompaniment or played outside were advantaged in their travel development (Lehner-Lierz, 2003). A New Zealand study of walking school buses found that children who participated in a walking school bus were independently mobile at a younger age (Kingham and Ussher, 2008).

It is not just in regards to safety that parental perception has an effect on cycling to school. A New Zealand study has found that parents who allow their children to cycle to school are more likely to enjoy cycling now and/or liked cycling to high school and/or thought it was safe at high school (Walton et al., 2005). Parents in this study who drove their children to school also thought that their children would be more tired if they cycled, and if driven they knew they were at school on time, but they also did not think these were good excuses not to cycle.

2.9 Policy implications

Increasing cycling numbers is an ongoing process that needs the constant and continued introduction of new policy measures (Jensen et al., 2000). Arguably, planners take the wrong approach with encouraging cycling. In many instances they concentrate on providing cycle facilities rather than the larger problem of addressing motor vehicle dominance (Tolley, 1997). Often an overall concept for transport planning is missing (Thull and Lausterer, 2003).

Methods used to increase and promote cycling mostly utilise more than infrastructural improvements as infrastructure will have limited impact if it is not implemented in

conjunction with other promotional activities (McClintock, 2002c) as it is important to link both soft and hard campaigns and policies (Jensen et al., 2000). Conventional policies of providing infrastructure could assist the ongoing marginalisation of cyclists (Stone, 2008). "Promoting cycling solely through improvements in the physical conditions for cyclists is an expensive strategy, which moves relatively few motorists to bicycles, but reduces the number of bus and train passengers in the larger towns (Jensen et al., 2000: 24)".

Hard policies are those that focus on providing infrastructure for cyclists with a belief that new facilities will increase cycling levels (Skinner and Rosen, 2007). Cycling networks need to be coherent, direct, attractive, safe and comfortable (Ploeger, 2003) with minimal motor vehicle interaction (Wittink, 2003). There are geographical differences in rates of physical activity such as aesthetics, density of urban area, land use and street connectivity (Badland and Schofield, 2006). To encourage walking and cycling, therefore, spatial layouts of cities need to be designed with safety and convenience with the main aim of creating direct routes (McClintock, 2002a).

A constant problem with cycle infrastructure is route continuity; often the facilities provided abandon the cyclist when they need it the most, for example at intersections (McClintock, 2002a) and route continuity is crucial (Davies et al., 1996). As the motor vehicle has an ability to provide door to door transport, cycle facilities need to be provided extensively so they can replicate this ability to travel from location to location with ease (Tolley, 1997).

Facilities at the place of employment are another policy often mentioned as a method of promoting cycling and deterrents by people who do not cycle. Studies have found that workplace conditions are important for shaping mobility (Skinner and Rosen, 2007). Employers are now encouraged to provide facilities such as covered bicycle stands, maintenance kits, lockers, showers and changing rooms as well as other incentives such as emergency transport, bicycle groups financial incentives (Sport & Recreation NZ, 2006). Cycle friendly employer schemes can be very effective (Davies et al., 1996). Deterrents to cycling are perceived differently by commuters and non-commuters, for example commuters would prefer facilities at work but this does not have an effect on their cycling habits (Stinson and Bhat, 2004). On the other hand, non-cyclists often state lack of facilities at work as a deterrent.

Soft campaigns may include targeting regular and casual cyclists to continue encouraging them to cycle or to attract motor vehicle drivers and passengers to cycling (Jensen et al., 2000). Travel demand management is one method but people will respond in various ways, either through creating more efficient trips through increased planning or suppressing trips through activity changes (Loukopoulos et al., 2004). Some programmes for encouraging active transport, however, focus on the workplace, rather than the network that needs to be navigated to reach the destination (Howard and Burnes, 2001).

Restricting motor vehicle use is another aspect of soft policies. This option comes from the argument that the goal is not to increase walking and cycling as such but rather to reduce motor vehicle traffic (Tolley, 2003b). The reasoning behind restricting motor vehicle use is that making motor vehicles less convenient should result in a decrease in motor vehicle commuters (Noland and Kunreuther, 1995).

A travel demand management technique that can impact travel choice is introducing road pricing, which results in increased travel costs for motorists, however, these coercive strategies can have negative effects outweighing benefits or force sacrifices that households will not accept (Loukopoulos et al., 2004). Another way of affecting the price and utility of travel is to change the urban environment (Handy et al., 2002). Road pricing has historically been used for infrastructural costs of roads, but there are added benefits, including reduced congestion, improved consistency for journeys, reduction in peak traffic numbers, improved air quality, improved urban environment and a provision of more resources for public transport, and the possibility of spending income from congestion charges on improving the environment for sustainable transport (James and Date, 2007).

Traffic congestion charges are a method of reducing motor vehicle dependence and can aid sustainable transport by using profits to improve public transport, walking and cycling. However, they need to be carefully applied, for example they should cover a broad area not just a space that traffic is already avoiding (Adams, 1997). In London, the central area road congestion charge has resulted in increased traffic speeds with reduced traffic numbers and a modal shift to public transport (James and Date, 2007).

Often cycling policy is held back by the difficulty of gauging the benefits of low increases in cycling mode share over time. Western European countries with high cycling mode shares today altered their policies to curb motor vehicle use in the 1970s (Pucher and Buehler, 2006). The 1992 recommendation of the British Medical Association (1992) was

to reduce motor vehicle speeds, provide cycle infrastructure and integrate with public transport. In Britain today, cycling is just beginning to increase, which is more evidence that it takes ten to twenty years for cycling policies to have a significant affect on cycling mode share.

Implementing policies for promoting cycling can result in a public backlash, usually based on people's love of the motor vehicle when faced with motor vehicle restraint policies (Skinner and Rosen, 2007). Anti-cycling arguments that arise, usually focus on anti-social behaviour displayed by people cycling (McKenna and Whatling, 2007). People who cycle often get labelled as 'cyclists' and are often considered as a group apart from 'motorists'. These groups are often stereotyped as to the effect they have on society. Motorists are often considered negatively by active transport groups as they are "perpetrating injustice on those who have to or chose to travel by walking and cycling" (Hillman, 1997b: 72).

2.10 Conclusion

While cycling is a minor transport mode this chapter has outlined the reasons and potential for increasing utilitarian cycling levels. The reasons for promoting utilitarian cycling, including environmental, social, heath and economic impacts of transport. Now that the rationale for increasing utilitarian cycling has been laid out, the reminder of this thesis will consider possibilities for encouraging cycling.

Chapter Three will outline the methodology in regards to the background developed in Chapters One and Two. In particular, the characteristics of cyclists were used to develop the questionnaires and identify potential cyclists, such as age, gender, income and distance. The motivations and barriers for utilitarian cycling identified in this chapter included safety, helmets, fear of cycling, cycling infrastructure, weather, topography, cost of transport, motor vehicle dependency, exposure to fumes, convenience, gender, previous experience of cycling, cycling clothing, attitudes to health and fitness, awareness and perceived responsibility of environmental issues, cycling culture, availability of parking, and facilities at work. In particular safety, fear of cycling and cycling infrastructure were significant issues and are given due consideration in the focus groups with the hope of gaining insights into how potential cyclists perceive these issues.

3.0   Chapter Three – Methodology

An investigation of latent demand for utilitarian cycling requires the inclusion of all possible people who are interested in cycling for transport, as often research into cyclists' perceptions of cycle facilities and the impact cycleways have on their experience of the journey, study people who currently cycle (Durdin and Ferigo, 2007; Hughes, 2007). Commuter cyclists and non-commuter cyclists, however, perceive the motivations and barriers differently (Stinson and Bhat, 2003). Consequently, this research aimed to investigate the issues for people interested in cycling but who do not currently cycle regularly. Therefore, the primary issue in deciding the methodology for this research was meeting the challenges of accessing people who belong to the latent demand group for utilitarian cycling. While there is evidence of latent demand, as discussed in Chapter Two, finding and talking to these people remained problematic. Therefore, a multi-method approach consisting of qualitative and quantitative data gathering was chosen. Once an analysis of current commuter trends was undertaken using census data, quantitative questionnaires were used to survey a wide range of people from which a smaller group were invited to undertake a qualitative investigation through focus groups into the issues involved with utilitarian cycling. In this chapter, the research problem, theoretical perspective and methods adopted in this research are outlined. In addition, how each method was guided by the literature review as will as its effectiveness and limitations are discussed.

3.1   Research problem

The broad aim of this research was to investigate the issues and barriers associated with the level of cycling as a utilitarian transport mode in Christchurch. This aim was completed by addressing two objectives. Objective one was to identify and characterise the group that potentially make up latent demand for utilitarian cycling. These people do not currently cycle to work but are interested in doing so, or are those who cycle infrequently and could potentially cycle more frequently.

Objective two was to investigate the motivations and barriers that this group perceive regarding utilitarian cycling and explore these issues in relation to the themes arising form the literature review. Particular focus was given to barriers that have the potential to be mitigated, such as infrastructure, rather than those that there is little influence over such as weather.

One area that was not covered by the research but arose in the literature review was the issue of children's travel to school, an area where declining rates of walking and cycling have also been apparent. Unfortunately, the extra difficulties in getting ethical approval to research children meant that researching school children's travel to school was not feasible for the resources of this research. Consequently, parents who participated in the focus groups were asked about children and cycling but no further research into this area was completed.

3.2 Theoretical perspective

This research was informed by naturalist and empiricist theoretical perspectives. Naturalism allows for social science research to be investigated in the same manner as a natural science by using evidence, or empirical data, to undertake the research (Graham, 2005). The data that is gathered can then be used to draw conclusions about the research problem that is being investigated. As this research involves looking at human behaviour it is important that humanism is given consideration. Therefore, the research is sensitive to the nature of humans as humanism requires (Graham, 2005) and consequently human ethics have been considered at each stage of the research.

Theoretical perspectives relating to sustainable transport in the urban environment were outlined in Chapter Two. The issues previously discussed provided the basis for the target groups of this methodology. These target groups were workers as well as recreational cyclists and students, both of which are targeted through specific questionnaires in this research. The motivations and barriers for utilitarian cycling outlined in the literature review formed the basis of the questionnaires. Additionally, these issues became the promoted topics in the focus groups, which also allowed for other issues in utilitarian cycling to arise through discussion in them.

3.3 Census data

New Zealand census data was retrieved from Statistics New Zealand using Tablebuilder and data held by the Geography Department, University of Canterbury. Tablebuilder allows for cross tabulations to be calculated from the unit data, as opposed to the aggregated data more commonly available. Unfortunately, the information that can be gained from these tables is limited to what Statistics New Zealand has placed on their website. Excel and ArcGIS were then used to analyse the data and investigate national and local trends.

Census data can be broken down into various spatial units. The majority of the data used in this research is based on the administrative units of regional or district councils as these boundaries commonly line up with the urban areas of New Zealand. ArcGIS was used to analyse spatial trends in Christchurch commuter transport modes at the Census Area Unit (CAU) level. A CAU is a non-administrative boundary that consists of a population of between 3000 and 5000 residents in urban areas (Statistics New Zealand, 2008).

In some cases, original census categories were combined as the independent variables did not add to the research. For instance, 'drove a private car or van' and 'drove a company car or van' into one category 'drove a motor vehicle' were combined. Secondly, a 'public transport' category was created using the combined data for bus and train commuters. When considering household data and motor vehicle ownership all the categories for households with two or more motor vehicles were combined into one group. In addition, proportions of people using a particular mode for commuter transport were calculated out of the total people employed who travelled to work rather than the total people employed.

Analysis of census data focused on trends of cycling mode share for commuter transport, spatial variation in cycling patterns and demographics of cyclists. Primarily this was done through creating graphs and tables showing the percentage of respondents who belong to each category. When considering the demographics of cyclists, however, cross tabulations were used to find what proportion of people cycling belonged to different groups within gender, age, income and occupation.

Unfortunately, there are some significant limitations with using census data for mode of transport to work yet it is the only available transport data set for the entire country. The main limitation with the data is that the question regarding transport only asks respondents over the age of fifteen and employed how they travelled to work on that particular day. Consequently, the data may have been influenced by a variety of factors including weather, day of the week and one-off events.

In addition, the census question only considers the journey to work; consequently there is no data on children or tertiary students' travel patterns to school. Tertiary students may have worked census day and consequently answered the question in regards to how they travelled to paid work, however, there is no data on how they travelled to their tertiary institution. Finally, people do not necessarily use the same mode of transport to travel to work every day. Increasingly, people use various modes depending on the situation,

including a different mode to and from their workplace. There is also no ability for people to respond that they used two modes in one day, one to get to work and a different one to get home or alternatively that they used two or more modes on each leg. For example, someone may cycle to the bus stop, catch a bus and then walk to work.

These limitations mean that relying on the data from one count every five years does not provide a full depiction of how New Zealanders travel to work. On the other hand, it is a reliable data source that can give an indication of the ongoing transport trends in New Zealand.

3.4 Questionnaires

The questionnaires served a dual purpose. While they collected quantitative travel data to complement the data already available from the census, their primary purpose was to identify people who may belong to the latent demand group. Questionnaires are used to gather classification, behavioural and attitudes data (Parfitt, 2005). The purpose of these questionnaires was to ask a variety of travel questions aimed at gauging current travel behaviour and openness to sustainable modes of transport. These included how the person usually travelled to work, what were their reasons for using this form of transport, what other forms of transport they used to get to work, whether they lived a reasonable distance for cycling to work and what, if anything, would encourage them to cycle to work. One draw back of self reporting about behaviours is that what people say may differ from their actual behaviour (Parfitt, 2005). Finally, respondents to the questionnaires were asked if they were prepared to participate in further research and if they were they provided contact details. This allowed the researcher to identify potential cyclists and then invite them to focus groups, the next stage of the research.

In general, the questionnaires were to be undertaken in conjunction with other research projects occurring at large employers. This included the University of Canterbury Travel Survey 2008 and Work Travel Plan Questionnaires at Canterbury District Health Board (CDHB) sites: Community and Public Health (CPH), an organisation that works on policies for improving health in the community, and Princess Margaret Hospital (PMH), a hospital that specialises in older persons care and mental health. The CDHB questionnaires were distributed in July and August 2008 online by Beca, however, the data and final reports for these questionnaires are still unavailable and therefore not reported in this thesis. Focus group participants were still drawn from these questionnaires. Another target group were recreational cyclists as these have been identified in the research as having the

potential to also cycle for utilitarian reasons and these people were surveyed by the researcher as described in Section 3.4.2.

3.4.1 University of Canterbury questionnaire

The University of Canterbury Travel Survey was undertaken on the 22nd of July, 2008 through electronic and paper methods. Development of the questionnaire was completed by the University of Canterbury Transport Group and based on previous surveys undertaken at four year intervals. A copy of the questionnaire can be found in Appendix A, which was administered online with questions in a slightly different order. All staff and students were sent an email inviting them to participate in the questionnaire and directing them to a website. Some support staff that do not have an email address were given paper questionnaires that were entered into the database at a later stage. Promotion was also undertaken throughout the day to encourage students and staff to respond to the questionnaire.

Topics covered in the questionnaire were broader than required for this research, however, the relevant information could be easily separated out including respondents' willingness to participate in further research. There were a total of 4772 respondents to the University of Canterbury questionnaire resulting in a rigorous sample. A small amount of bias may still have resulted from self-selection. In the past, samples have been chosen by asking specific lectures to respond to the questionnaire. Having moved to an electronic questionnaire with all UC staff and students invited to respond may have resulted in those more interested in transport, for personal or academic reasons, having a greater impact on the results than the general population. It is unlikely, however, that this had a significant effect on the findings of this research.

3.4.2 Recreational cyclists questionnaires

A recreational questionnaire was developed from the questions asked in the UC Questionnaire, in order to obtain consistency. A small pilot was also run amongst student members of the Geography Department who completed and commented on the questionnaire, resulting in some minor changes. The target population was recreational cyclists identified using population characteristics as opposed to geographical or temporal boundaries (Parfitt, 2005). This stage of the research was undertaken by the researcher and consequently a Low-Risk Ethics Application was completed and granted by the Department of Geography (see Appendix B).

Two methods were utilised to undertake the questionnaire, a paper intercept questionnaire at four sites and an electronic questionnaire emailed to contacts. The paper version is in Appendix C and this was converted into an online questionnaire using Survey Monkey, a website for designing online questionnaires. Originally, the electronic questionnaire was to be emailed to recreational cyclists on a council database but this proved not possible as the council did not have the database of email addresses available at the time of questionnaire distribution. Subsequently, a link to the online questionnaire and invitation for recreational cyclists to complete it was placed on a forum on popular cycling websites Vorb (http://www.vorb.org.nz) and Ridestrong (www.ridestrong.org.nz) in November 2008 and were removed in late January 2009. This method resulted in 110 online responses.

The four sites for intercept questionnaires were McLean's Island, Bottle Lake Forest, Sumner and the Little River Rail Trail, as shown in Figure 3.1. Questionnaires were completed at weekends between August and October 2008. Table 3.1 shows the numbers of questionnaires completed at each site as well as the total number of questionnaires completed through either intercept or electronic methods.

Table 3.1 Number of recreational questionnaires completed

McLean's Island	Bottle Lake Forest	Sumner	Little River Rail Trail	Subtotal	Electronic Questionnaires	Total
34	33	18	27	111	110	221

Figure 3.1 Map of intercept sites for the recreational cyclist questionnaire

In general, the intercept questionnaires were easy to complete as most people were approached as they loaded or unloaded their bicycles from their motor vehicles and the researcher asked the questions orally. The Little River Rail Trail was a quieter location than the others and consequently it was more difficult to obtain numbers there. Sumner, however, was the most difficult location as it does not have a concentrated area for approaching cyclists such as a car park or trail end. Additionally, these tended to be road cyclists as opposed to the mountain bicycle cyclists found at the other locations. This meant that people tended to cycle to Sumner from home. Consequently, the researcher spent some time at Sumner Coffee Culture (Figure 3.2) and approached cyclists as they drank some coffee during their break for their ride. Overall, the response rate to the intercept questionnaire was approximately ninety-five percent.

Figure 3.2 Bicycles outside Sumner Coffee Culture, Christchurch, New Zealand.

Source: (Katherine Taylor, 2008)

Potential limitations of the recreational cyclists questionnaire are lack of respondents from different sub groups of recreational cyclists and self selection on the electronic questionnaire. There are different subgroups of recreational cyclists, the primary ones being road cyclists, family cyclists and mountain bike cyclists. Intercept questionnaires were completed at various locations to attempt to capture various types of recreational cyclists. The primary location for finding road cyclists, however, was Sumner and as discussed there were significant difficulties in intercepting this group. Secondly, another limitation could arise from people self selecting to complete the online questionnaire. Due to the nature of the questionnaire, recreational cyclists who are interested in utilitarian cycling or who cycle to work may have responded to the questionnaire in greater numbers than those who have no interest in utilitarian cycling. Consequently, results from the questionnaires are given for the total respondents as well as subtotals for the intercept and online questionnaires. As the number of responses completed in each subgroup is almost even, 111 and 110 respectively, it was possible to analyse the variation between the groups in Chapter Five.

3.5 Focus groups

The second stage of the research, the qualitative portion, was to undertake focus groups with potential cyclists for the purpose of further discussing the issues in regards to

utilitarian cycling. These were held between late October and mid November 2008. Focus groups have two main uses, firstly to gain insight into a spectrum of views from individuals on an issue and secondly to capture the nature of interaction between participants regarding a topic (Conradson, 2005). Focus groups have the benefit that participants bounce ideas off one another rather than the researcher as in an interview. In particular, this method allows the researcher to observe viewpoints as they arise from a social context (Conradson, 2005). This means that the ideas are more impartial as the researcher makes fewer suggestions and comments throughout the process. Another benefit of focus groups is that they are a useful tool for exploring the difference between what people report they do and their actual actions (Conradson, 2005). It is also possible to propose various solutions and initialise discussion around the benefits and disadvantages of each solution.

A total of twenty-six people participated in eight focus groups. Table 3.2 shows the groups that each of these people belong to. In addition, a University of Canterbury staff member and one PMH person were also recreational cyclists and provided this viewpoint in focus groups. The data on potential cyclists from the CDHB questionnaires was calculated by Beca and names and contact details provided to the researcher. In general, participants were recruited through the questionnaires as planned, however, in two instances participants were recruited directly to a focus group. One of these was a University of Canterbury student needed to make up numbers in the group and it was confirmed that she met the required criteria of being interested in cycling to University. Secondly, a recruitment drive was undertaken at CPH and this meant seven people came to the focus group. Of these, four were also identified through the workplace travel questionnaire. Selection was based on respondents the following: their usual mode of transport was not the bicycle and preferably the motor vehicle, they perceived they lived a reasonable distance from their workplace to cycle, they indicated that something would encourage them to cycle and that they had no other significant barriers to cycling for transport. While there was an attempt to balance the genders, no other characteristic such as age or ethnicity were used to choose focus group participants.

Table 3.2 Focus group participants

	UC Staff	UC Students	CPH	PMH	Recreational	Total
Questionnaires	11	3	4	3	1	21
Recruitment	0	1	3	0	0	5
Total	11	4	7	3	1	26

The groups ranged in size from two to seven people and were primarily held at the University of Canterbury. Two groups were held elsewhere, one at CPH and one at PMH. Each lasted approximately ninety minutes depending on the time taken to discuss each topic and refreshments were provided. As part of the ethics application each participant was fully briefed via an information sheet prior to participating and signed a consent form (Appendix D), including giving permission to be tape recorded. Full anonymity was assured for all participants.

Figure 3.3 Focus group in action at University of Canterbury

Source: (Koorey, 2008)

A variety of topics were covered in the focus groups covering transport issues in general and more specific issues regarding cycling. The list of prompted topics is included in Appendix E. The second part of the focus group was to show a PowerPoint of different levels of cycling infrastructure and get participants to rate in a short questionnaire how comfortable they would be to cycle on that level of infrastructure. The questionnaire and slides shown are in Appendices F and G respectively. There was a concern that if the slides were shown in a particular order that bias could be created, particularly if this was an order

from 'worst' to 'best' infrastructure from the researcher's perspective. Consequently, each group was shown a slideshow with the slides in a different order.

For mid-block, straight pieces of road, participants were shown the following infrastructure types: no specific cycling provision, cycle lane, cycle lane with extra highlighting, kerbed cycle lane, cycleway directly behind parking, cycleway behind parking with separation and shared path with pedestrians. Intersections were split into straight ahead and right hand manoeuvres with no specific cycling provision, cycle lane, cycle path going with general traffic signals and cycle path going with cycle/pedestrian signals shown for straight ahead manoeuvres. Right hand turn facilities shown were: no specific traffic provision, right hand turn traffic lane, right hand turn cycle lane, advanced stop box, hook-turn and head-start lights. Finally, the facilities shown for roundabouts were: no specific cycling provision, cycle lanes, directional cycle lanes, cycle path with no priority, cycle path with priority and underpasses.

Focus groups were transcribed and quotes are used to illustrate points made in Chapters Six and Seven. The major limitation in regards to the focus groups was the number of participants and another was clarity of recordings, however, it was a minor issue. Preferably focus groups numbers range from four to ten participants but sometimes they may have to be run with fewer numbers (Conradson, 2005) as was the case for this research. There was significant difficulty in recruiting people who met the criteria, were happy to participate and were available at the same time. In addition, there were several cases where people who had confirmed they were coming to the focus group failed to turn up on the day. This resulted in some focus groups being run with less than ideal numbers. In general, these smaller groups had participants who were willing to talk, but the smaller numbers resulted in more prompting from the researcher and less discussion arising from participants having varying viewpoints. Another drawback is that unequal time is given to each participant's viewpoint (Conradson, 2005) and consequently some bias to answers may have been introduced.

3.6 Conclusion

Overall, the multi method approach allowed for different types of findings to be collected resulting in substantial data. Firstly, census data allowed a general picture of New Zealand transport patterns to be outlined and compared to international studies completing similar aims. Secondly, questionnaires served a dual purpose of understanding workplace travel patterns and issues for a broad group of workers and students, while also providing a

method of locating potential focus group participants who belonged to the latent demand group for utilitarian cycling. Finally, the qualitative approach of focus groups allowed the motivations and barriers for utilitarian cycling outlined in Chapter Two to be discussed and solutions developed.

The findings from these different methods will be outlined over the following four chapters. Firstly, Chapters Four and Five will outline the quantitative findings with New Zealand census data presented in Chapter Four and the findings from the questionnaires in Chapter Five. This chapter also introduces results for the motivations and barriers, and their relative importance, derived from these questionnaires. Chapter Six will then outline the general issues discussed in the focus group while Chapter Seven will focus solely on safety and cycle infrastructure. Finally, Chapter Eight will bring all the results together to outline the issues involved with encouraging more people to cycle more often and potential solutions for encouraging cycling.

4.0 Chapter Four – Transport Trends in New Zealand

This chapter provides an overview of the current situation of transport in New Zealand and the trends that have occurred over time, in particular from 1986 to 2006. The data is based on the censuses conducted every five years from 1986 to 2006 as they are the most recent available and provide comparable data sets on transport patterns. Firstly, the change in commuter share from 1986 to 2006 for motor vehicle drivers, motor vehicle passengers, public transport users, people who cycled and walkers is examined. These data are followed by a brief outline of the change in motor vehicle ownership between 1996 and 2006, then gender, occupation, income and age and their impact on mode of transport in 2001 are discussed. The 2001 census is used to consider selected factors as the 2006 data is not yet freely available from Statistics New Zealand. These factors were selected as they were characteristics of cyclists discussed in the literature as noted in Chapter Two. Finally, spatial differences in people who drove, walked or cycled on census day 2006 in Christchurch are considered to understand the spatial location of people who cycle.

Trends in travel to work and characteristics of cyclists outlined here will then be used to compare the questionnaires to the national data set in Chapter Five. This comparison will highlight differences between the sample groups surveyed in the questionnaires and the general population. The areas for which data are calculated in this chapter are the main urban regions and districts of New Zealand. Throughout the chapter Greater Auckland refers to the Auckland Region and Greater Wellington refers to the Wellington Region.

4.1 Travel to work

Data on travel to work was drawn from the census question asking those over fifteen and employed how they travelled to work on the day of the census. To calculate commuter mode share the proportion of people using each mode is calculated using the total number of people who travelled to work not the total number of people employed. These data provided overall trends for how the national population usually travel to work and trends over time. Table 4.1 shows the modal change for the whole of New Zealand from 1986 to 2006. As might be expected of a western country, the motor vehicle is the predominant mode of transport and has increased in commuter mode share over the twenty years to seventy-seven percent in 2006. This figure for motor vehicle travel to work reflects the New Zealand Travel Survey data that has found eighty percent to fall time travelling is as a driver or passenger (Ministry of Transport, 2008). Public transport has also increased,

since 1996, although to a much smaller extent, while the trends of cycling and walking have both dropped, cycling more than walking, since 1986.

Table 4.1 Change in commuter mode share in New Zealand, 1986 to 2006

Census Year	Drove a Motor Vehicle	Public Transport	Bicycle	Walking or Jogging
1986	61.4%	9.8%	5.7%	10.3%
1991	69.2%	5.1%	5.4%	8.4%
1996	73.9%	4.8%	4.0%	7.3%
2001	76.5%	5.2%	3.1%	7.1%
2006	77.0%	5.2%	2.5%	7.0%

Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

Data at the national level, however, includes large portions of rural areas where sustainable modes are not as viable due to the distances involved and lack of public transport. Small towns are also included and walking and cycling can often be high in these places as the urban centres are compact and often there is little traffic. On the other hand, regional data for these small towns often includes areas of rural land. Consequently, the following sections of this chapter analyse the main methods of transport, motor vehicle drivers and passengers, public transport, cycling and walking in more depth for the main urban areas of New Zealand. These include the regions of Auckland, Waikato, Hawke's Bay, Wellington, Nelson-Marlborough, Canterbury and Otago. As some of these regions include large areas of rural land the districts of Whangarei, North Shore, Waitakere, Auckland, Manukau, Hamilton, Tauranga, Rotorua, Napier, Palmerston North, Porirura, Upper Hutt, Lower Hutt, Wellington, Nelson, Christchurch, Ashburton, Timaru, Queenstown-Lakes, Dunedin and Invercargill are also considered. All percentages presented are the number of workers who use that transport mode out of the number of people working in that subgroup.

4.1.1 Drove a motor vehicle

Figure 4.1 shows the regional break down for those that drove a motor vehicle to work in the regions where New Zealand's largest cities are located. Greater Wellington is the only region to have a modal share for drivers below seventy percent in 2006 with sixty-one percent of commuters driving, most likely due to its high usage of other forms of transport such as public transport and walking. Most regions have seen a growth in the percent of people driving to work for each census over time. The exceptions are: Greater Auckland which dropped slightly between 2001 and 2006 and Greater Wellington which has fallen steadily since 1996.

Figure 4.1 Commuter share for driving to work on census day by region, 1986-2006
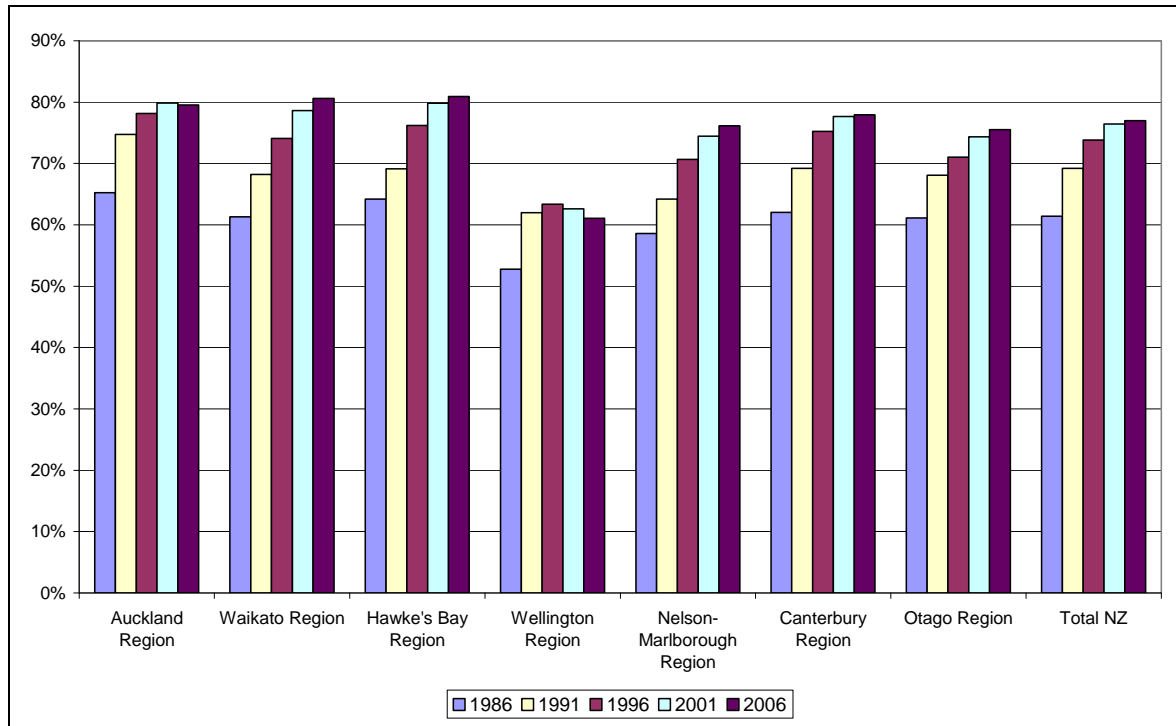
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

Considering the data at district level confirms the conclusion drawn for the regional data that the motor vehicle is the predominant mode of transport for commuters in New Zealand and use of the motor vehicle has generally been increasing at each census. Figure 4.2 shows again that Wellington City has the lowest levels of motor vehicle usage for transport to work, forty-nine percent in 2006, and this figure has been steadily decreasing since 1991. Lower Hutt has maintained a constant commuter share between 2001 and 2006 after falling slightly between 1996 and 2001 while Upper Hutt and Porirua have continued to have increases in the proportion of people driving to work. Overall, this shows that Wellington is one of the least motor vehicle dependent cities in the country. It is possible that Wellington has the right combinations of factors, including topography, a compact city centre and efficient public transport networks, to allow for greater use of sustainable transport modes. North Shore, Waitakere and Auckland have all experienced a minute decrease in the rate of motor vehicle use to work between 2001 and 2006. Whangarei has maintained stable levels of motor vehicle use while all other urban districts have continued to experience rises in the proportion of people driving to work in a motor vehicle.

Figure 4.2 Commuter share for driving to work on census day by district, 1986-2006
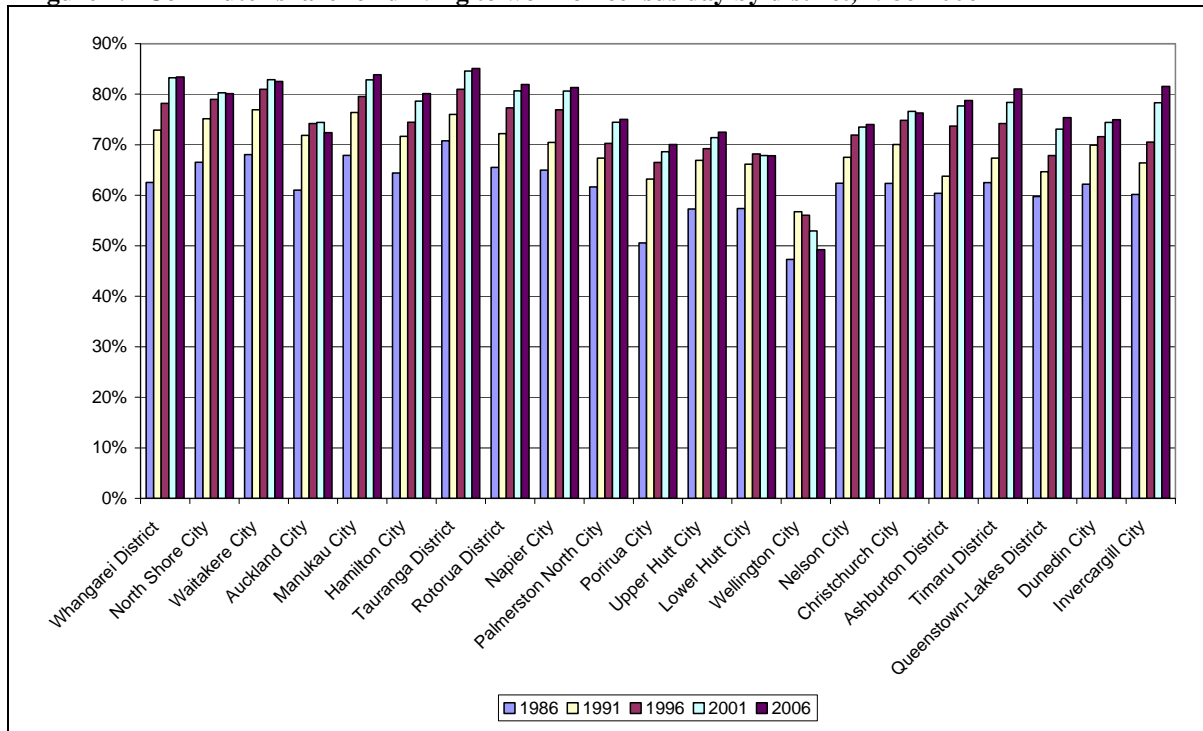
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

4.1.2 Passengers in a motor vehicle

Another aspect of motor vehicle travel is the percentage of single occupancy motor vehicles versus multiple occupancy motor vehicles. Passengers in motor vehicles show more fluctuation than some of the other modes in the country over time (Figure 4.3). Between 1986 and 1991 the proportion of passengers increased in all regions except the Waikato, although some of these increases were very minor. Passenger numbers then decreased in all areas, except Hawke's Bay, between 1991 and 2001. Hawke's Bay experienced a growth in passenger numbers between 1991 and 1996 before a drop between 1996 and 2001. The drop in the number of commuter passengers would seem reasonable as the number of people driving to work has generally increased over the same period, suggesting passengers are becoming drivers and there are more motor vehicles on the road overall. On the other hand, since 2001 the commuter share for passengers has remained stable or increased in every region except for Hawke's Bay and Nelson-Marlborough, which have experienced small decreases. Potential reasons for increases in passengers could be mounting public awareness of environmental issues, congestion or higher petrol and diesel prices encouraging people to once again consider motor vehicle sharing to work. It should be remembered that some of the changes in proportion of people travelling by each mode is extremely small and could be related to outside factors rather than displaying a general trend in the change of mode used for commuter transport.

Figure 4.3 Commuter share for passengers on census day by region, 1986-2006
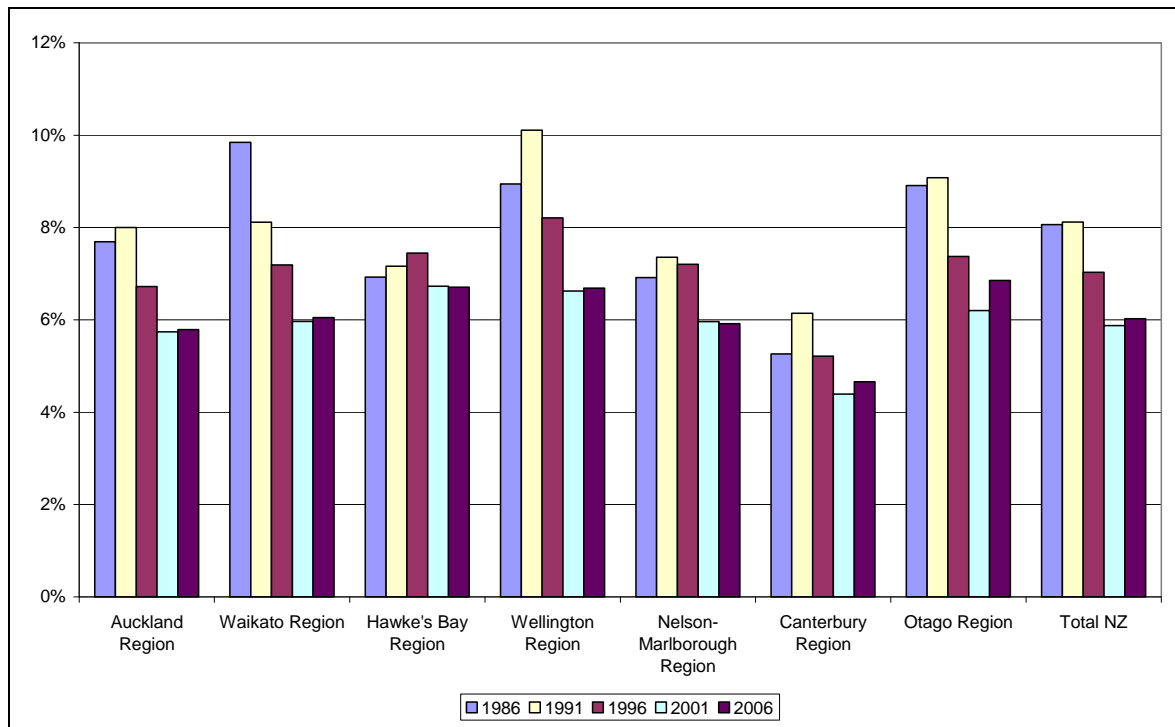
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

Figure 4.4 displays the change in commuter mode share for passengers across the urban districts, with more pronounced differences evident between the census years compared to the regional data. Passenger share has generally increased between 1986 and 1991 and then fallen from 1991 to 2001 with Whangarei, North Shore, Tauranga, Rotorua and Queenstown-Lakes experiencing falls from 1986 to 2001. From 2001 to 2006 passenger share has risen, apart from in Waitakere, Auckland, Napier, Upper Hutt and Wellington. In Napier, passenger share has remained steady while it has fallen in the other exceptions. The trend in Napier is expected as it reflects the regional data for Hawke's Bay, however, it is interesting to note the change in Waitakere, Auckland, Manukau, Upper Hutt and Wellington compared to the regional data for Greater Auckland and Wellington. Neither of these variances was apparent in the regional data for Greater Auckland and Greater Wellington, however, the differences are extremely small and could again be due to outside impacts on modal choice on census day, for example weather, rather than highlighting general trends. On the other hand, variances could be a result of local changes to transport accessibility in these cities resulting in increased public transport use or similar rather than passenger mode share.

Figure 4.4 Commuter share for passengers in a motor vehicle on census day by district, 1986-2006
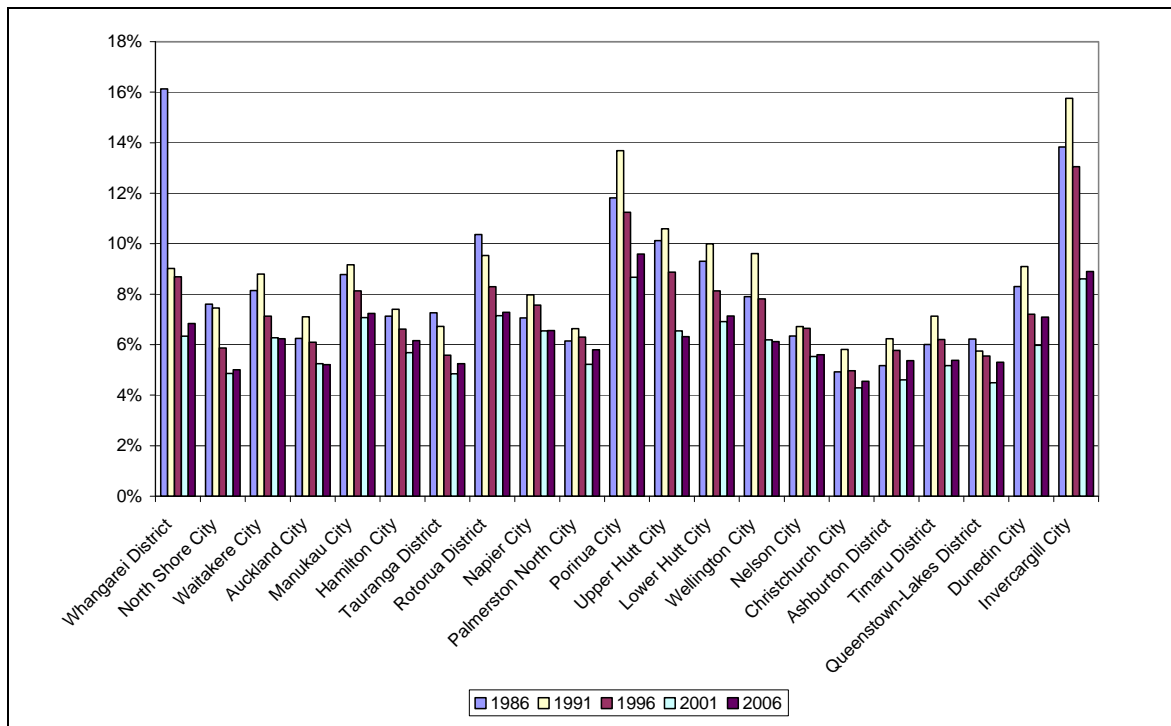
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

4.1.3 Public transport

Public transport use, Figure 4.5, shows that Greater Wellington had the highest rates of public transport use in New Zealand with growth between each census year. This category is an aggregation of the data for bus and train in each area. The regions experienced a large drop in public transport use from 1986 to 1991 and a very small drop between 1991 and 1996, except for Wellington where a tiny increase was recorded. Greater Wellington, Greater Auckland and Canterbury have experienced growth in public transport use between 1996 and 2006 while Otago has experienced a decline. Waikato, Nelson and Hawke's Bay have public transport use of less than one percent and therefore, trends cannot be drawn reliably. Nelson and Hawke's Bay possibly have minimal use of public transport because they do not have a large city boosting transit passengers and they lack the congestion that would encourage people to reduce motor vehicle use.

Figure 4.5 Commuter share for public transport on census day by region, 1986-2006
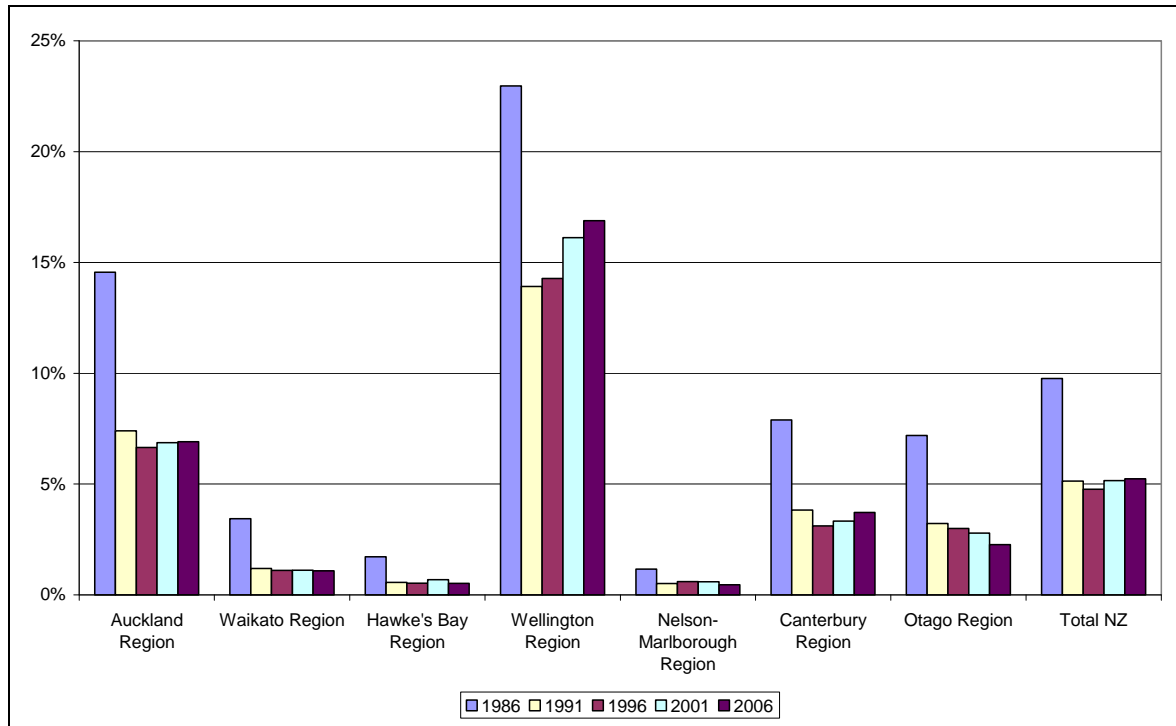
Source: (Koorey, 2008) based on (Statistics New Zealand, 2008)

Public transport has a higher modal share in the larger urban districts (Figure 4.6) as would be expected from the higher and denser levels of population. Denser residential areas allow for the provision of public transport as opposed to the difficulties in servicing decentralised populations (Docherty and Shaw, 2003). The districts that make up Greater Wellington have the highest rates of public transport use in the country. In all areas, public transport use dropped between a third and half between 1986 and 1991 and public transport use continued to drop between 1991 and 1996 except in Upper Hutt, Lower Hutt, Wellington and Queenstown-Lakes. Generally, public transport use has then increased between 1996 and 2006 although in some areas very marginally. The exceptions are Manukau, Timaru, Queenstown-Lakes, Dunedin and Invercargill, where use has continued to drop, and those areas where use has fluctuated. These cities include Whangarei, Napier, Porirua, Nelson, Ashburton with growth between 1996 and 2001 before use dropped in 2006, and Waitakere where use decreased and then increased.

Figure 4.6 Commuter share for public transport on census day by district, 1986-2006
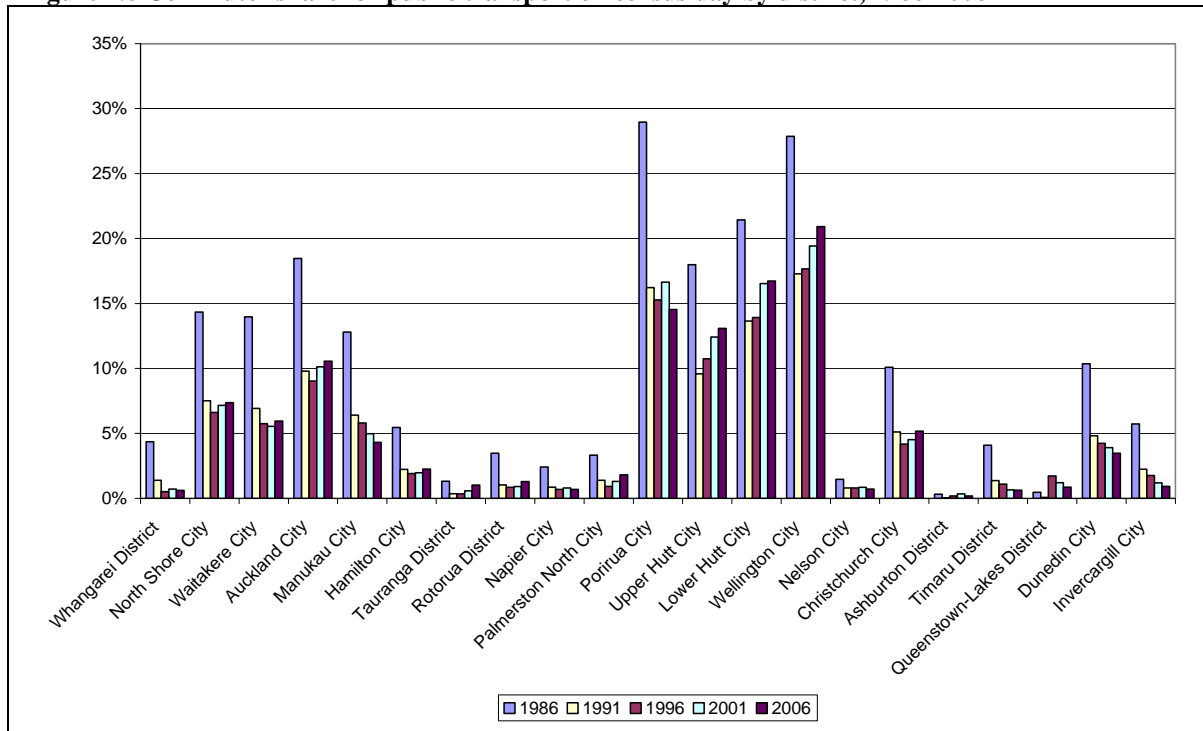
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

4.1.4 Cycled

Regionally, there were differences in cycling rates to work, with Greater Auckland, the warmest, but also wet, urban area of the country, having the lowest rates. One reason for lower rates of cycling in Auckland may be the higher levels of traffic resulting from a denser population. Cycling has been declining in all the major urban regions, especially Waikato and Hawke's Bay since 1991. All areas also declined between 1986 and 1991 except Greater Wellington and Otago where rates of cycling increased. Nelson-Marlborough had the highest commuter share for cycling in 2006 followed by Canterbury with 5.9 and 5.4 percent respectively. All other regions have rates less than 3.0 percent for 2006, except Hawke's Bay with 3.5 percent (Figure 4.7). These figures show that Canterbury traditionally had a high cycling mode share for commuter transport.

Figure 4.7 Commuter share for cycling to work on census day by region, 1986-2006
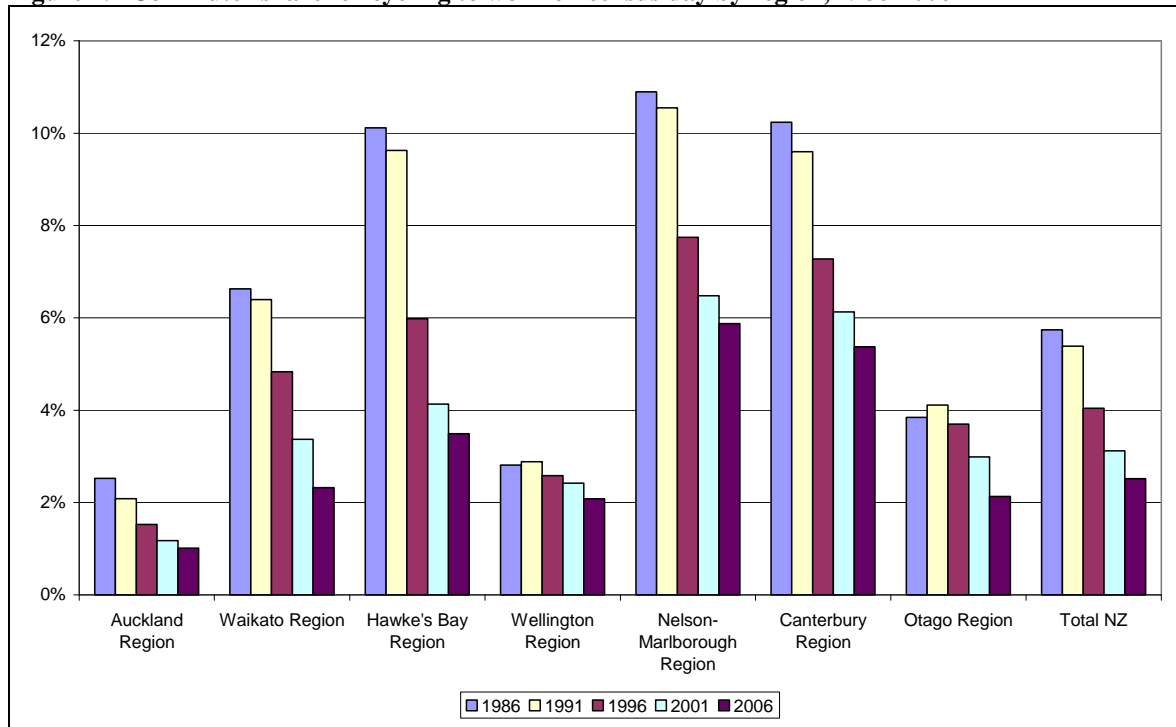
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

At the district level (Figure 4.8) cycling to work has generally declined since 1986 following the trend of western cities where cycling is becoming a marginal transport mode (British Medical Association, 1992; Pucher and Buehler, 2008). Increases in cycling commuter mode share occurred between 1986 and 1991 in Whangarei, Tauranga, Rotorua, Porirua, Upper Hutt, Nelson, Timaru and Queenstown-Lakes and Dunedin. Wellington is the only place to show a steady increase in the number of people cycling, however, the commuter share was still only 2.5 percent in 2006, well below that of Nelson and Christchurch. One reason for these small increases could be that the topography is not conducive to cycling in Wellington. It would be interesting to further investigate the reasons for this change in Wellington as it is usually considered the New Zealand city with the least reliance on motor vehicles and high reliance on sustainable modes, as seen in the previous sections. Consequently, it would be interesting to see what has kept cycling in Wellington low, with one potential reason being the emphasis on public transport and walking in the region.

Palmerston North had the highest rate of cycling between 1986 and 1996 but has since dropped dramatically to be the third highest city behind Nelson and Christchurch. While cycling commuter mode share has reduced in both Christchurch and Nelson, both cities are still well ahead of other areas with a commuter mode share for cycling in 2006 of greater than six and seven percent respectively. Ashburton and Napier had a commuter share of

slightly over four percent while Hamilton, Tauranga, Rotorua, Wellington, Timaru and Queenstown-Lakes range from two to three percent. All the major urban areas making up the Auckland Region have very low cycling rates, as do Porirua, and both Lower and Upper Hutts.

It is worth noting that the smaller North Island cities have higher rates of cycling than Greater Auckland and Greater Wellington. Potential reasons for this difference could be traffic and safety. In these smaller urban centres there is less traffic for cyclists to contend with. Another reason for higher cycling rates in these areas is their geography. Smaller areas are more compact making cycling more feasible. In addition, Hamilton, Tauranga and Napier are all on comparably flat terrain and have mild climates that are conducive to cycling.

Figure 4.8 Commuter share for cycling to work on census day by district, 1986-2006
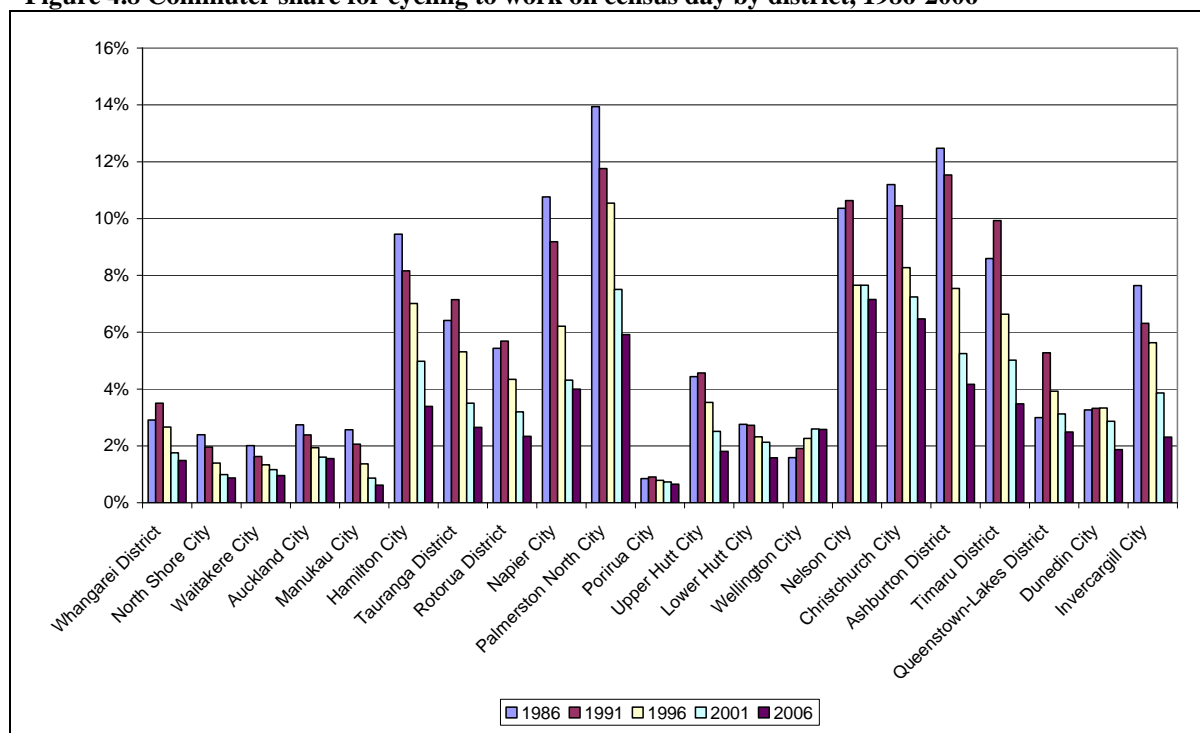
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

Christchurch has the second highest mode share for cycling in 2006 in New Zealand and it is approximately three times higher than Wellington or Auckland and the other urban districts that make up Greater Auckland and Greater Wellington. This finding suggests that Christchurch is conducive to cycling, despite the higher traffic flows and associated safety concerns usually found in large cities. Other reasons for the high rates of cycling in Christchurch are topography and weather, both of which may restrict cycling in Wellington. Consequently, Christchurch is an interesting area to study the issue of

encouraging cycling as it has many environmental positives yet still has a declining rate of commuter cycling.

National Travel Survey data (Ministry of Transport, 2008) has found that nationally cycling makes up one percent of all trip legs and time spent travelling, and 0.5 percent of the distance travelled by New Zealanders. Mode share of trip legs is highest for cycling in Canterbury, Nelson-Marlborough and the West Coast with three percent of mode trips by bicycle in each region. These figures suggest that cycling has a higher mode share amongst commuters than for general utilitarian travel.

4.1.5 Walked or jogged

Regionally, Greater Wellington and Otago have the highest rates of walking to work. This may be affected by their urban form; both have reasonably compact centres with surrounding hills, Wellington more so than Dunedin. Also, the major universities in both centres are downtown but the effect this may have on transport to work is unknown as student travel is not included in this analysis. They do have opposing trends over time, however, with Greater Wellington rates of walking increasing since 1991 while Otago's are decreasing with a minor increase between 1991 and 1996. Rates of walking are also decreasing in Waikato, Hawke's Bay and Nelson-Marlborough. While Auckland has had an increase in walking rates between 2001 and 2006 they had previously decreased resulting in fluctuating levels over the ten years. In Canterbury, rates of walking have generally decreased with a minor increase between 1996 and 2001 but not a noteworthy amount.

Figure 4.9 Commuter share for walking or jogging to work on census day by region, 1986-2006
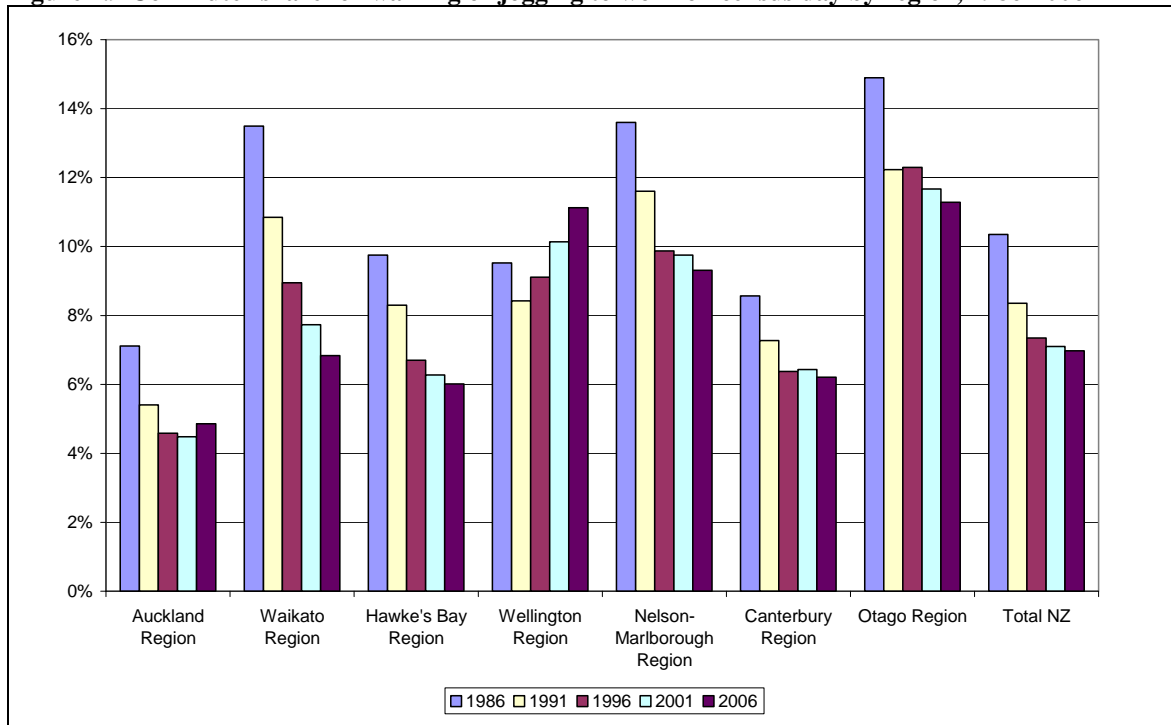
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

Amongst the districts examined, Wellington City has the highest levels of walking and jogging, but the other cities in Greater Wellington compare with some of the other minor cities around New Zealand rather than Wellington City. This finding adds to the conclusion that central Wellington's topography, in addition to other factors such as parking and congestion, encourages public transport and walking but discourages cycling and motor vehicle transport. In general, rates of walking or jogging to work are declining across the country with some minor variances, less than 0.5 percent, causing slight increases before further decreases. Exceptions are Auckland, Palmerston North, Nelson and Dunedin in addition to Wellington. Dunedin's levels are also high as expected, having increased between 1991 and 1996, and then remained stable but considerably less than Wellington. Auckland and Nelson's rates of walking have increased since 1996 and Palmerston North since 1991. One of the causes for increased walking rates in these areas could be residential intensification of the CBDs and more people living close to work.

Figure 4.10 Commuter share for walking or jogging to work on census day by district, 1986-2006
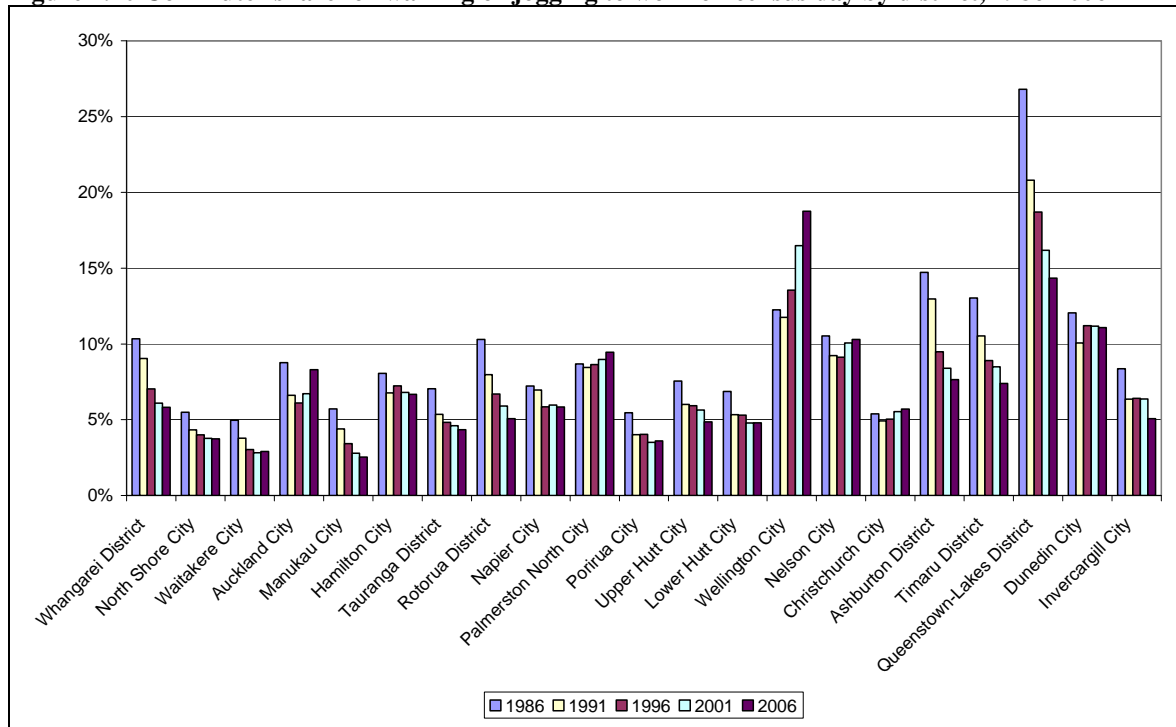
Source: Data compiled by Koorey (2008) based on (Statistics New Zealand, 2008)

4.2 Motor vehicle ownership

Motor vehicle ownership is a very telling statistic for New Zealand transport and also has an effect on cycling. One international study found that households with one or no motor vehicles are more likely to cycle (Moudon et al., 2005). In almost every region and city considered in this analysis the proportion of households with no motor vehicles and households with one motor vehicle has dropped from 1996 to 2006. On the other hand households with two or more motor vehicles have increased over the same period. Therefore, only New Zealand as a whole, Greater Wellington and Wellington City are shown in Figure 4.11. The difference between one motor vehicle and two or more motor vehicle households is least in Greater Wellington where households with two plus motor vehicles first had a greater proportion than one motor vehicle households in 2006, whereas every other region reached this level in 1996 or 2001. In addition, Wellington is the only place where one motor vehicle households outnumbered two or more motor vehicle households at the time of the 2006 census.

Figure 4.11 New Zealand and Wellington trends for motor vehicle ownership, 1996-2006
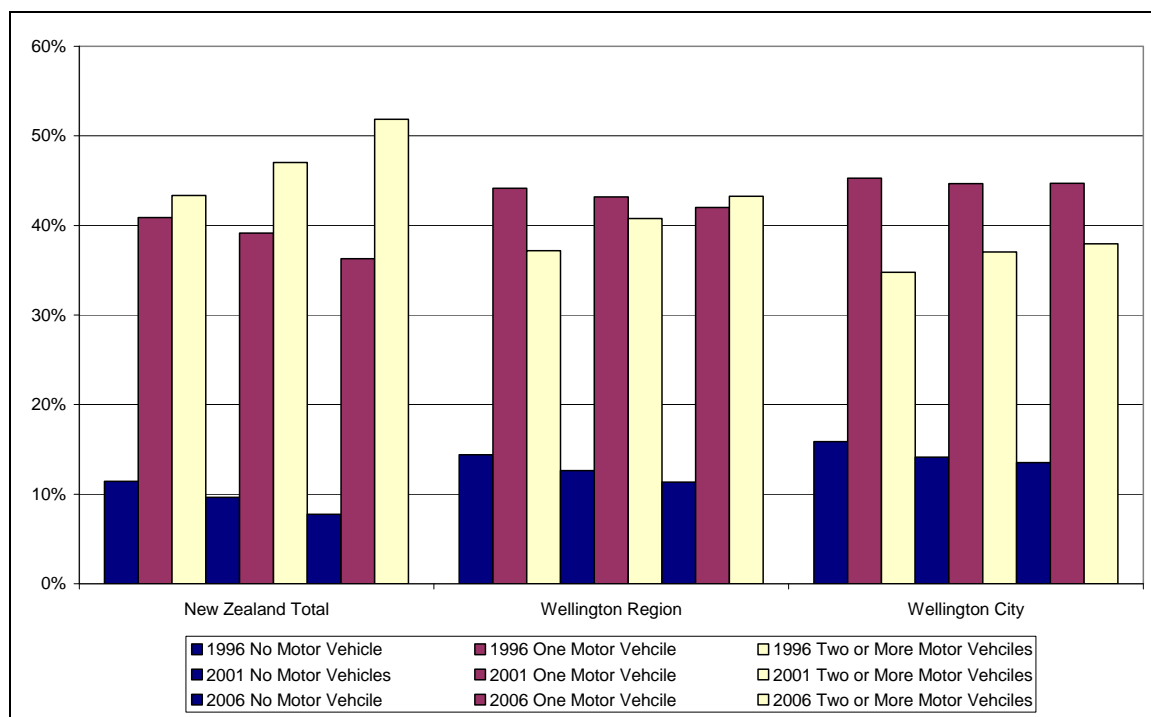
Source: (Statistics New Zealand, 2008)

4.3 Socio-demographics of people who cycle

Cross tabulations allow for census data to be compared between two separate variables at the unit level. From these tables, a picture can be drawn about the different socio-economic characteristics of cyclists. In this research the 2001 census data is used to consider characteristics of cyclists as this is the most recent data available from Statistics New Zealand for cross tabulations. Gender, occupation, income and age are analysed to see the effect each has on cycling for transport. These factors were chosen as they were the primary characteristics of cyclists raised in the literature review as having an effect on inclination to cycle for utility reasons. In each graph, the percentage of workers who cycled to work is shown out of all workers for that variable. For some variables, only the national trends or areas that differ significantly from national trends are shown as the majority of the urban regions show similar patterns.

4.3.1 Gender and transport

Figure 4.12 shows that New Zealand has higher rates of male cyclists than female cyclists. This is an expected finding in a western country with low levels of utilitarian cycling (Dickinson et al., 2003; Garrad et al., 2008; Stinson and Bhat, 2004). Regionally, Canterbury and Nelson male cyclists have a modal share of greater than six percent. This is almost double the rate of modal share for male cyclists across New Zealand. These are also

the regions with the highest rates of female cyclists, as would be assumed by the higher levels of commuter cycling overall. Similar differences in gender are found in all the districts (Figure 4.13).

Figure 4.12 Gender by cycling rates for travel to work in 2001 by region
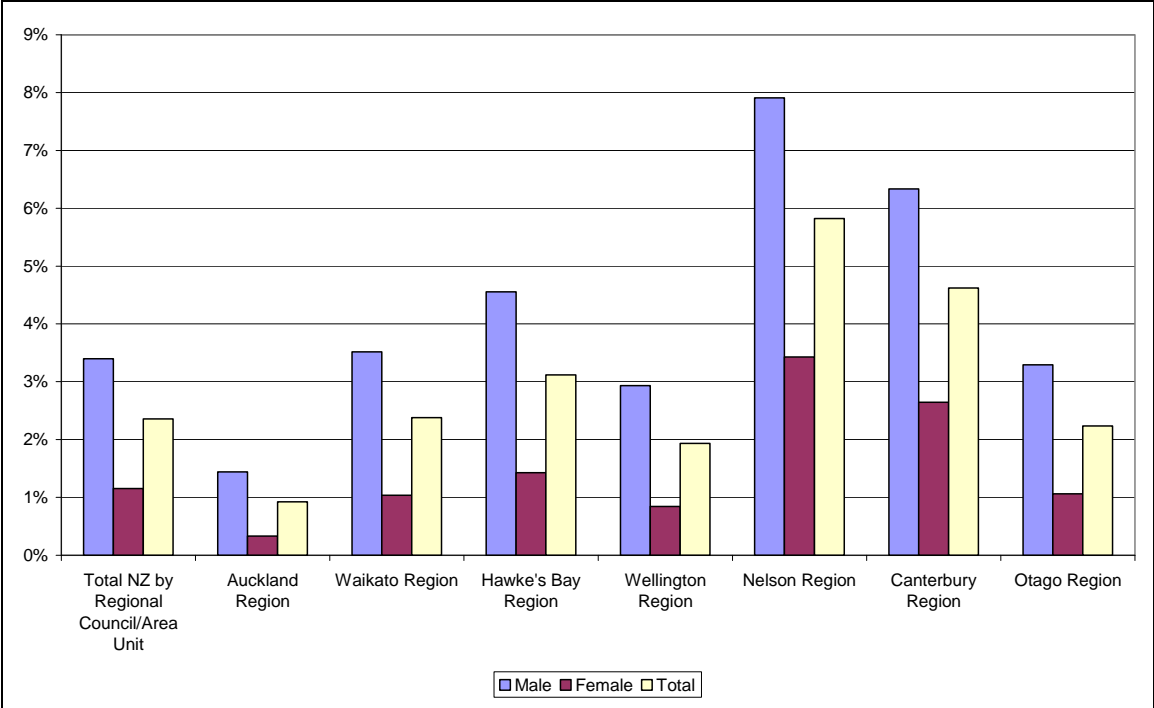
Source: (Statistics New Zealand, 2008)

Figure 4.13 Gender by cycling rates for travel to work in 2001 by district
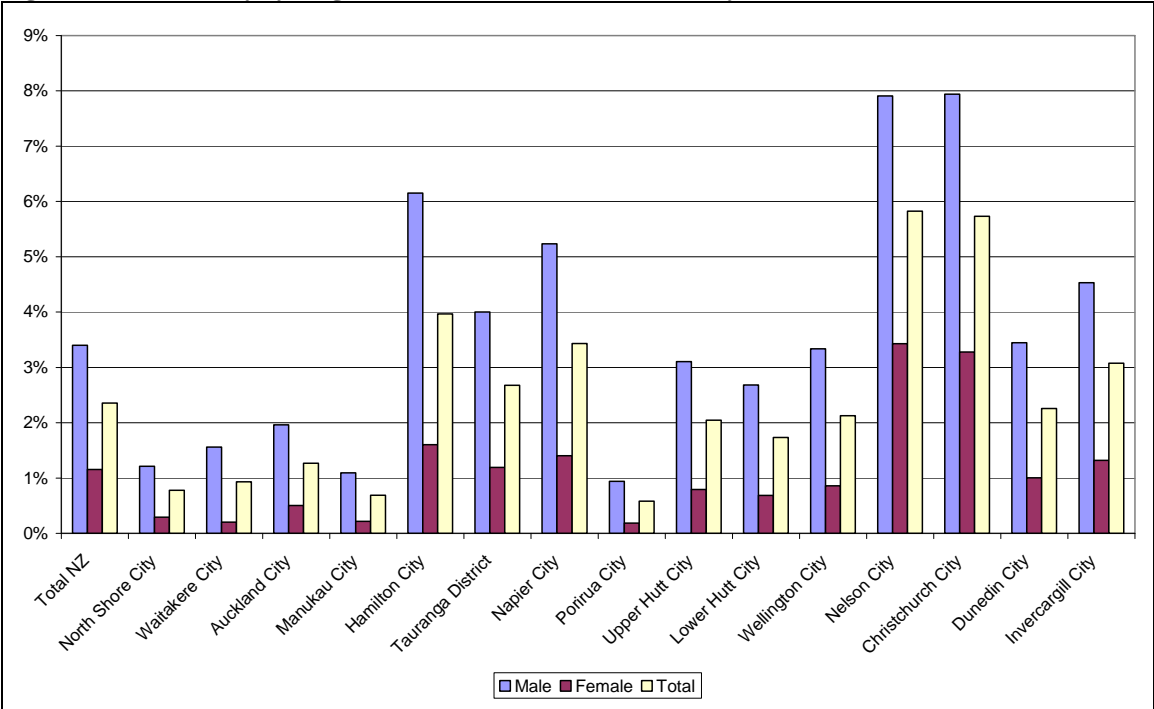
Source: (Statistics New Zealand, 2008)

Of the districts considered, the urban centre with the greatest variation between the genders in terms of percentage is Christchurch. On the other hand, considering the ratios of male to

female cyclists suggests that the genders are closer in Nelson and Christchurch than other parts of New Zealand. The ratio of male to female cyclists nationally is 3.4:1. In both Nelson and Christchurch the ratio is 2.7:1. Other areas have even greater ratios of male to female cyclists, with 5:1 in Greater Auckland and approximately 4:1 in Greater Wellington, Auckland and Wellington. This finding suggests that Christchurch is a good city for considering how to encourage more females to cycle as, despite a smaller proportion of females cycling than males, relatively the genders are closer than in other regions.

4.3.2 Employment and transport

Studies have found that occupation has an effect on the inclination to cycle for transport (Christchurch City Council, 2001; Moritz, 1997; Skinner and Rosen, 2007). Unfortunately, this data does not consider tertiary or secondary school students and their mode of transport to their education, which is also a factor in transport use. On the other hand, an understanding can be drawn of what occupations or industries are more likely to have workers commuting by bicycle. Figure 4.14 shows the national trend for occupation and cycling, which reflects the trends in the urban regions and districts of New Zealand. Generally in New Zealand, Elementary Occupations, those employed in unskilled or semi-skilled work such as cleaners or labourers, have the highest rates of cycling everywhere. Second are Trades Workers with Plant and Machine Operators and Assemblers third, except in Greater Wellington and Canterbury. In these two regions Professionals are placed in the top three. Professionals are also an occupation that also has a high rate of cycling in Nelson.

At the district level similar patterns appear. The only difference is in the districts that make up Greater Wellington region. Porirua has a high rate of Agriculture and Fishery Workers cycling to work, outstripping all other occupations in that district. This occupation also has a high modal share for cycling in Lower Hutt. Upper Hutt on the other hand, has a high rate of Service and Sales workers cycling to work, making it one of the top three occupations for cycling, while Wellington City is dominated by Professional and Technicians and Associate Professionals cycling to work. It is of course possible that when calculating the rate of cyclists in each occupation the dominance of a particular type of occupation in an area has an effect on the proportions shown in these graphs.

Figure 4.14 Occupation by cycling rates for travel to work in 2001
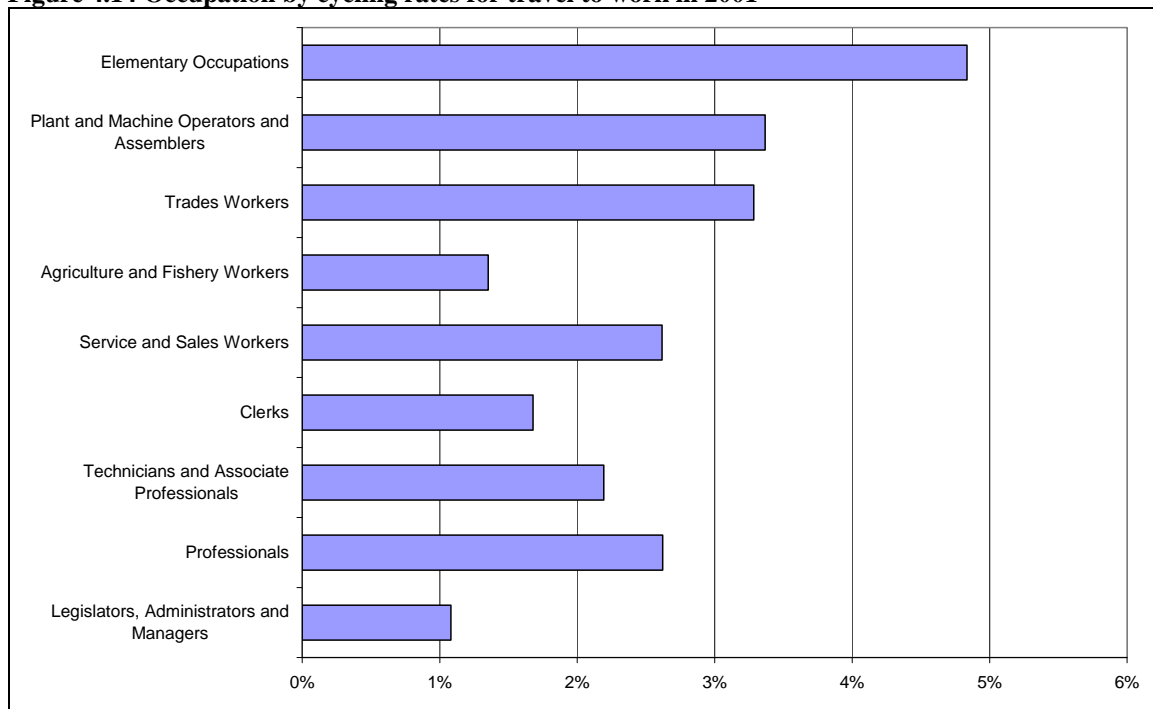
Source: (Statistics New Zealand, 2008)

The following graph (Figure 4.15) considers cycling by the industry that people are employed within. Similarly to occupation, only the national trend is shown as the smaller areas reflect the same pattern. Generally, the top three industries for rates of cycling are Communication Services, Government Administration and Defence and Manufacturing. In the Waikato, Hawke's Bay, Greater Wellington and Nelson Electricity, Gas and Water Supply is in the top three replacing Government Administration and Defence, while in Otago Retail Trade was in the top three.

At the district level similar industries have high levels of commuter cyclists. Communications in particular was higher in the urban centres of Auckland, Hamilton, Wellington, Christchurch and Dunedin. One of the limitations in considering the data for employment is that the rate of cycling within an occupation or industry possibly reflects the income bracket or spatial location of the employment, for example whether that job is usually located in the CBDs, suburbs or rural areas.

Figure 4.15 Industry by cycling rates for travel to work in 2001
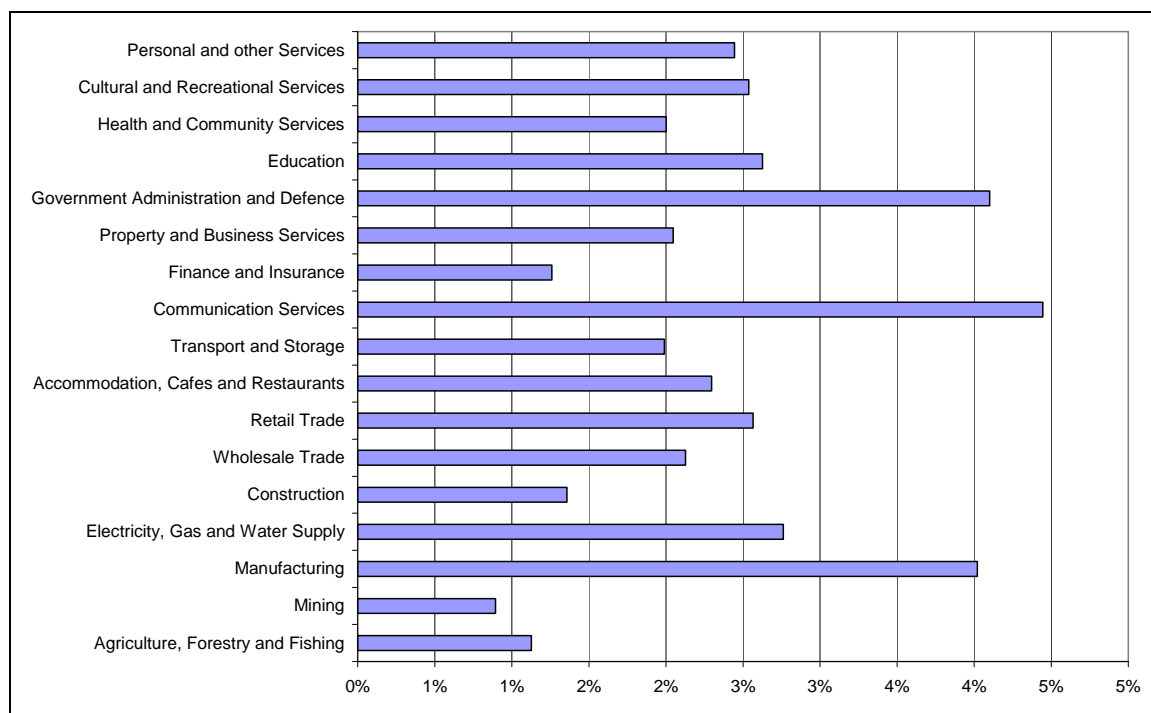
Source: (Statistics New Zealand, 2008)

4.3.3 Income and transport

Income is another factor in cycling to work, and a difference is seen between the regions with lower rates of cycling and those with higher rates of cycling. Literature suggests that these two opposing groups will cycle, the more affluent and the people from lower-socio economic groups, rather than the people in between (Hoehner et al., 2005; Plaut, 2005; Pucher and Buehler, 2007). Figure 4.16 shows the rate of cycling for each income level in New Zealand, North Shore, Waitakere, Auckland, Upper Hutt, Lower Hutt, Wellington and Nelson. Regionally, in the areas of low commuter cycling such as Auckland, Waikato, Hawke's Bay and Otago, people in the lowest income bracket of $1-$5000 have the highest rates of cycling. In Nelson, however, the $40,001-$50,000 bracket has the highest rate of cycling, with the $20,001-$25000 and $1-$5000 brackets also high. Wellington does not have an income bracket that is significantly higher than any other but the brackets with higher rates of cycling range from $40,001-$100,000 and $1-$5000.

Figure 4.16 Income breakdown for cycling to work in 2001
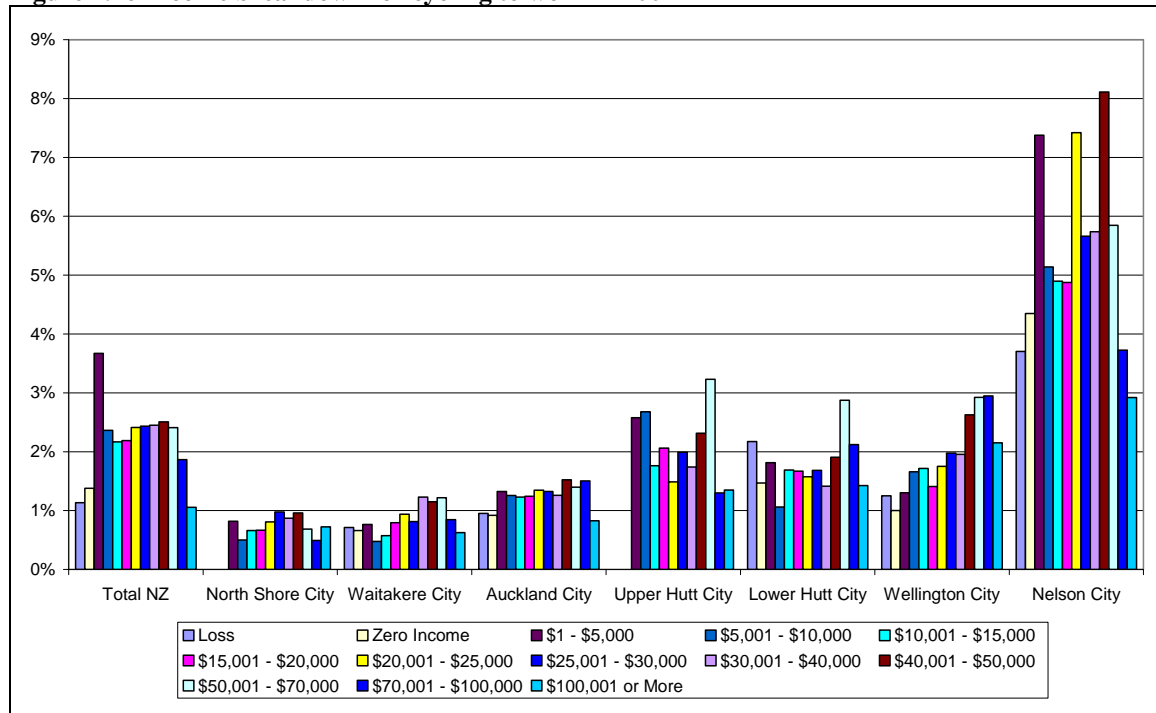
Source: (Statistics New Zealand, 2008)

The districts show more variation in the income bracket with the highest rates of cycling. Lower income brackets have the highest rates of people cycling to work in several places, with the loss of income bracket in Dunedin having the highest rate of cycling, zero income in Invercargill, Porirua and Napier, and $1-$5000 in Christchurch, Hamilton and Manukau. Middle incomes have the highest rates in the Auckland region with $25,001-$30,000 in North Shore and $30,001-$40,000 in Waitakere. In Nelson and Auckland City highest rates of cycling are found in the $40,001-$50,000 bracket, while Wellington has the highest rates of cyclists amongst the affluent. In Lower and Upper Hutts $50,001-$70,000 is the income bracket with the highest rates of cycling while for Wellington City it is $70,001-$100,000. Interestingly, the income brackets between $5001 and $25,000 do not have high rates of cycling in any region, reinforcing the idea that lower and higher incomes are more likely to cycle.

Figure 4.17 shows the correlation between rate of cycling and the deprivation index, one being a high socio-economic area and ten being a low socio-economic area, for CAUs in Christchurch. It is apparent that as the deprivation index of an area increases, the rate of cycling also increases. Therefore, it can be concluded from all the data on social-economic status that those in broadly defined lower-socio economic groups have higher rates of cycling than those living in higher socio-economic areas. There is also the factor here of where these groups live in relation to their work, as often lower cost housing is located

further away from the CBD making it harder to cycle to work in central areas. In addition, one of the variables on which the deprivation index is based is motor vehicle ownership (Statistics New Zealand, 2008). One North American study, however, found that some bicycle commuters may opt not to own a bicycle (Moritz, 1997) and this could have an impact on deprivation index calculation, although the low number of cycle commuters means that any impact at the CAU level is likely to be very small. An area of further research could be to spatially analyse income, social-economic status and cycling mode share to further examine the extent to which these variables are related.

Figure 4.17 Scatter graph of proportion of people who cycled to work and deprivation index by CAU for Christchurch in 2006
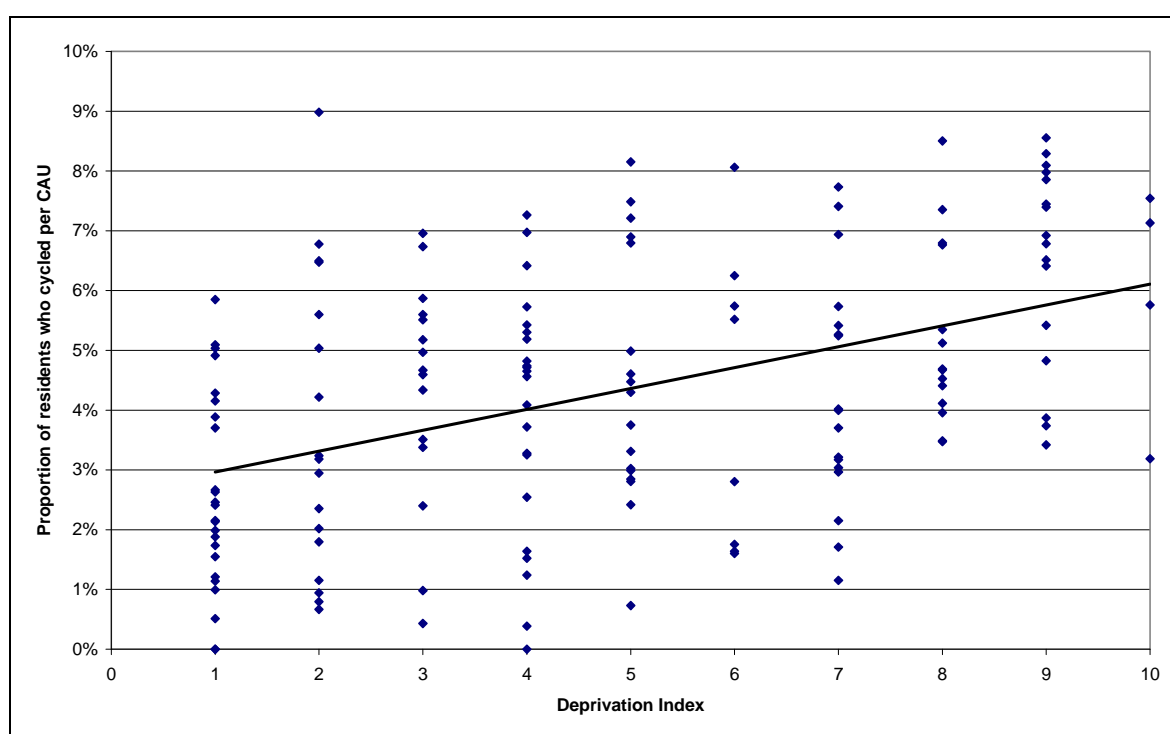
Source: (Statistics New Zealand, 2008)

4.3.4 Age and transport

Age affects cycling with cycling rates usually decreasing as age increases, although there is potential for middle-aged males to take up cycling to work (Pucher and Buehler, 2005a; Stinson and Bhat, 2004; Sullivan and O'Fallon, 2006). Because Nelson is the only area to differ noticeably from the national trend, only the data for New Zealand total and Nelson are included in Figure 4.18. Generally, the age group with the highest level of cycling is the 15-19 year olds, except for Greater Auckland and Greater Wellington, North Shore,

[4] The CAU of Burnham, a military town on the outskirts of Christchurch, was removed from the data because it was an outlier. The rate of cycling to work in Burnham was 14 percent, much higher than any other CAU, presumably caused by the demographics of the population.

Waitakere, Auckland, and Dunedin. In Greater Auckland as well as North Shore, Waitakere and Dunedin, the age group 25-29 has the highest rates of cycling. In Greater Wellington it is the group aged 30-34 and in Auckland it is the 20-24 year olds.

Overall, the rate of commuter cyclists falls for each age group, however, in some cases the 25-29 and 30-34 age groups have an increase in the level of cycling to work. In Nelson the age group 40-44 has a higher rate of cycling than the 35-39 year olds. Overall, this suggests that younger people, who may not have gained their licence or own their own motor vehicle, are most likely to cycle to work. They are also the age group most likely to be travelling to school or tertiary institutions and possibly have lower incomes. The 20-24 year olds are less likely to cycle but as people get older 25-34 they start cycling to work more frequently. From 35 onwards, however, commuter cycling rates tend to decrease as people get older. Consequently, one could assume that the most potential for encouraging cycling is in age groups where there are currently high rates of people cycling and the age groups in close proximity, for example amongst people in their early twenties to mid to late forties. Age groups from fifty onwards have declining rates of cycling, and therefore, it would seem that there was potential to increase rates in these groups. On the other hand, older age groups are always likely to always have lower rates of cycling (Stinson and Bhat, 2004; Sullivan and O'Fallon, 2006).

Figure 4.18 Age group breakdown for cycling to work in 2001
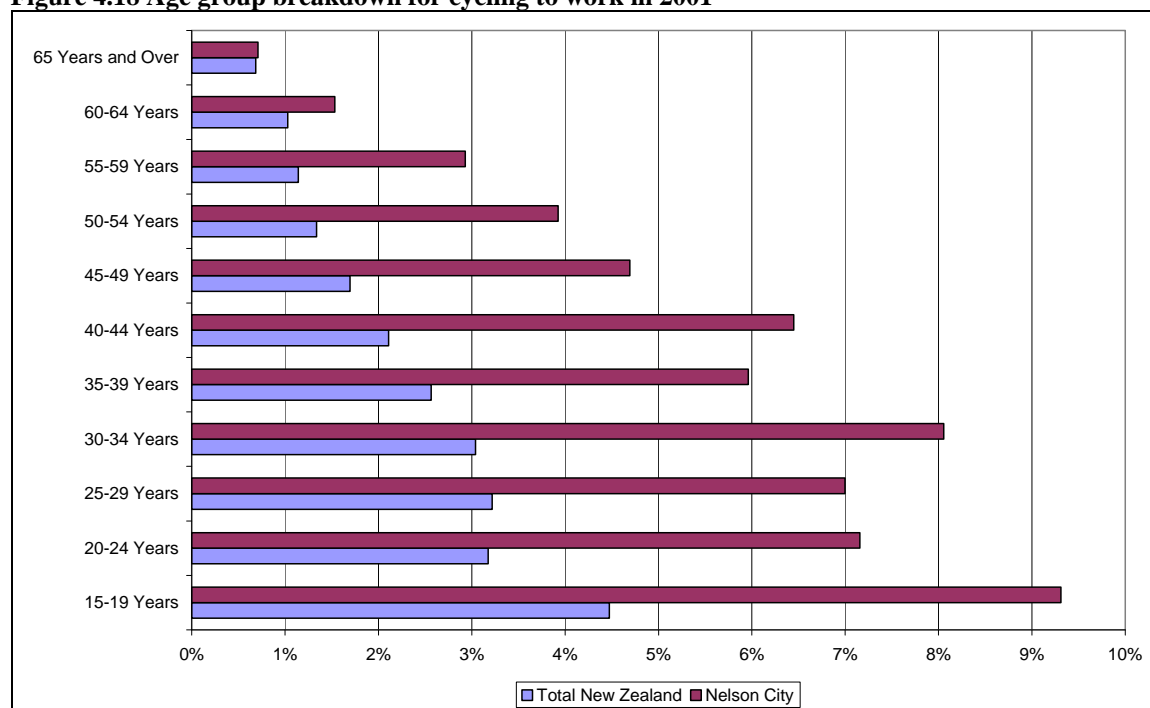
Source: (Statistics New Zealand, 2008)\

4.4 Spatial differences in transport mode

The following three figures (Figure 4.20, Figure 4.21, Figure 4.22) show the residential location of Christchurch people who walked, cycled or drove a private motor vehicle to work on census day in 2006. Spatial data shown is based on their residential location, not the area where they were employed and calculated at CAU level for all Christchurch suburbs. There are some clear spatial trends occurring, despite the data not including residents' workplace destination. Walkers were typically found in the CBD of Christchurch or in the inner ring of suburbs with a concentration also found near Hornby. People who cycled were concentrated in the inner ring of suburbs but were more spread out across the city. Finally, motor vehicle drivers were concentrated in the outer suburbs of Christchurch, although higher proportions of people drive to work from anywhere in the city than people who cycle to work. Walkers on the other hand, had a higher commuter mode share within the CBD than drivers. The important conclusion that can be drawn from these figures is that people who cycle live over a wide spatial area and, therefore, it is reasonable to assume that many people are within a cycling distance of their workplace. This assumption would mean there is a high level of latent demand for cycling in Christchurch.

Figure 4.19 Spatial location of the usually resident population who walked to work on census day, 2006 by CAU in Christchurch.
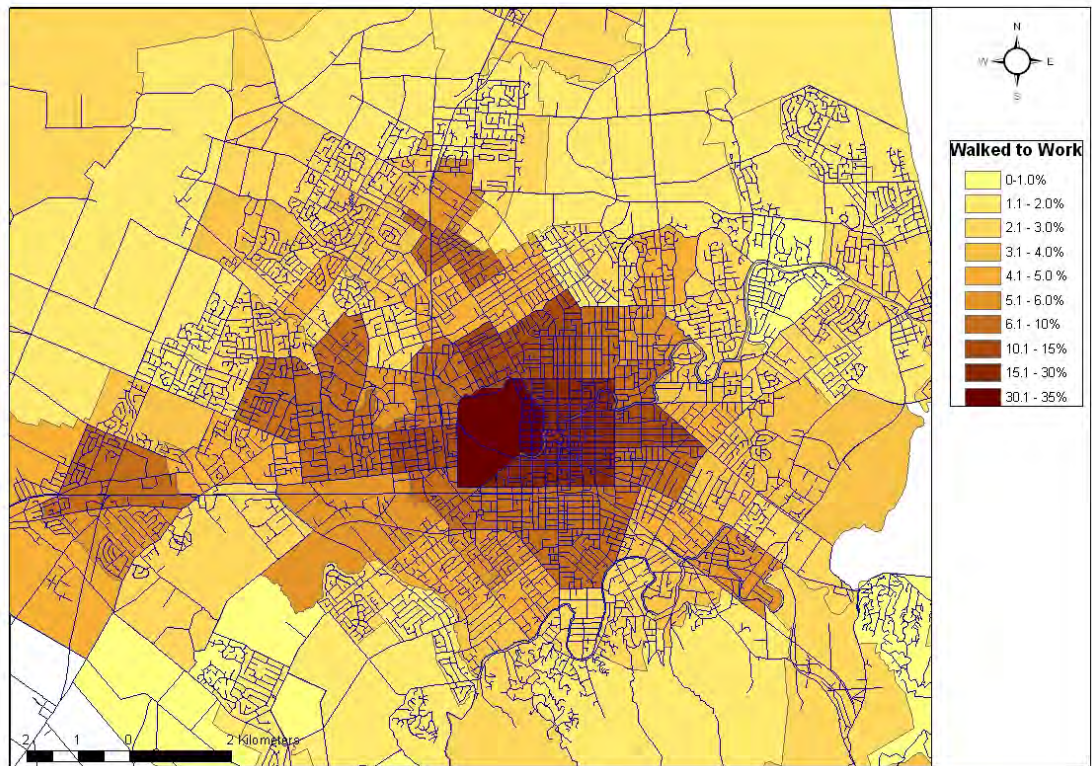
Source: (Statistics New Zealand, 2008)

Figure 4.20 Spatial location of the usually resident population who cycled to work on census day, 2006 by CAU in Christchurch,
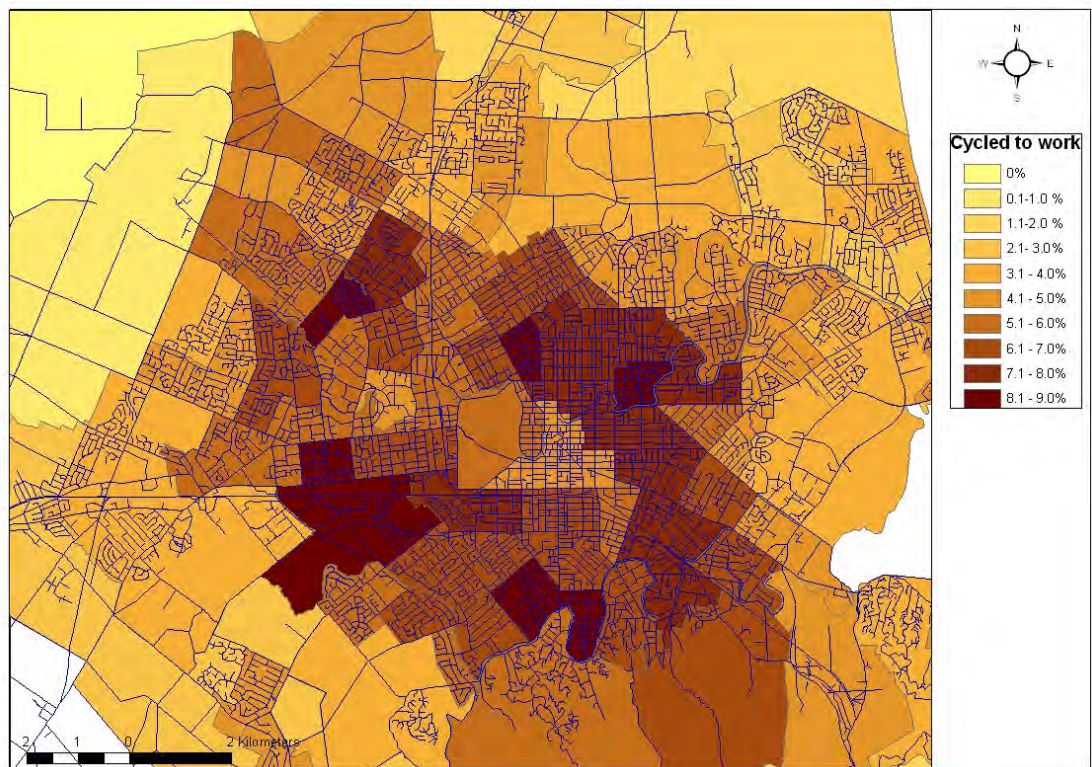
Source: (Statistics New Zealand, 2008)

Figure 4.21 Spatial location of the usually resident population who drove to work in a private motor vehicle to work on census day, 2006 by CAU in Christchurch.
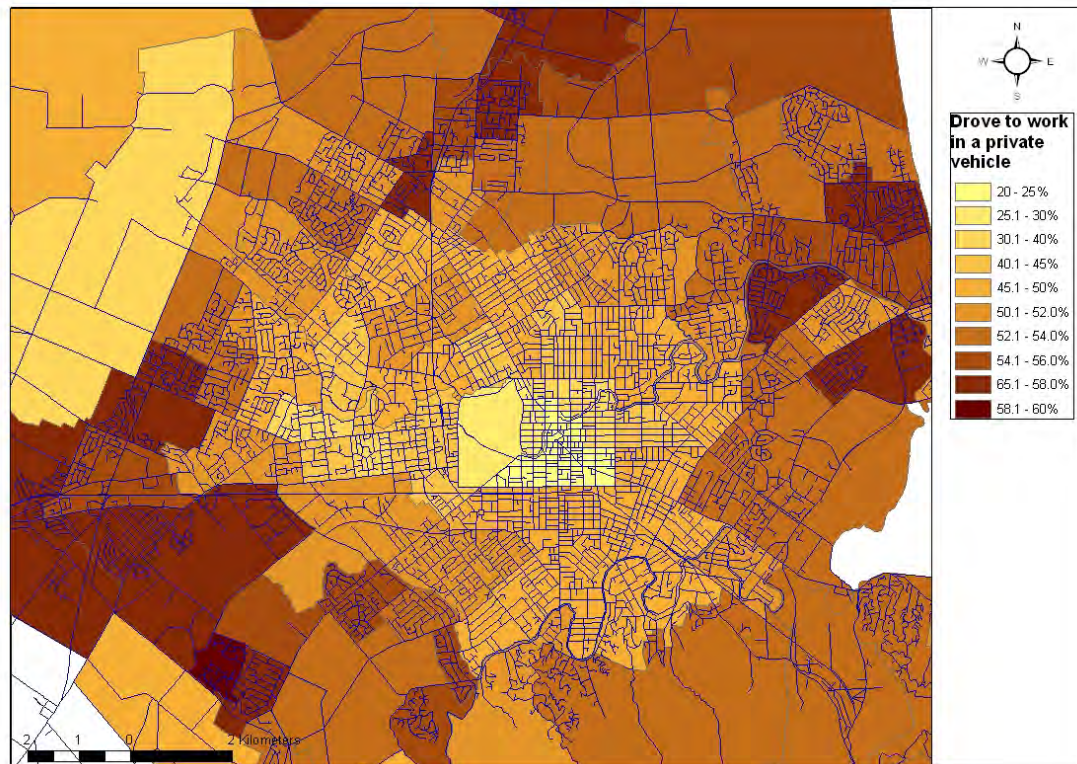
Source: (Statistics New Zealand, 2008)

4.5 Conclusion

Commuter transport trends in New Zealand show that the motor vehicle clearly dominates mode share and that walking, cycling and public transport have minor mode shares in the major urban areas of the country. Greater Wellington is the least motor vehicle dependent area, with low rates of motor vehicle ownership and high rates of public transport and walking. While Wellington City has increasing rates of commuter cycling, Nelson and Christchurch have declining, but still higher proportions, of cyclists. National Travel Survey data complements these findings with Christchurch having a higher proportion of trip legs being completed by bicycle than other regions, however, the motor vehicle continues to dominate utilitarian transport. These data suggest that while Christchurch is a major urban area, it is more conducive to cycling due to environmental factors such as topography, climate and traffic than other major urban areas in New Zealand. On the other hand, the city is becoming more motor-vehicle dependent and consequently it makes a useful case study for investigating latent demand for cycling.

Characteristics of people who cycle were also analysed, with gender given particular consideration. Males cycle more than females in most areas of New Zealand, although the ratio of male to females is smallest in Nelson and Christchurch. People employed in

Elementary occupations are likely to have higher rates of cycling and this is closely related to the finding that people in lower income brackets, or from lower socio-economic areas, are more likely to cycle. These factors are likely to affect each other and, therefore, investigating the impact of employment and income on cycling in New Zealand is an area for further research. Finally, younger people have higher rates of cycling, however, the higher incidence of these people in education and part-time work could have an impact on their choice of mode. There are also increases in cycling amongst those aged in the late twenties to early thirties. This finding suggests that policies targeting people interested in cycling should be aimed at those aged between early twenties and mid-late forties.

Finally, spatial difference in transport mode were considered in Christchurch and despite the data not including the workplace destination of workers there were clear trends for different transport modes. Walkers were concentrated in the CBD and inner suburbs while motor vehicle drivers were found primarily in the outer suburbs, and the only area where fewer people drive than walk or cycle is in the CBD. People who cycle are spread across the urban area but there is some concentration in the inner suburbs. The spatial spread of people who currently cycle suggests that the majority of people in Christchurch are potentially within a reasonable cycling distance of their workplace but further research into residence, workplace location and choice of transport mode would need to be undertaken to confirm this finding.

The findings in this chapter will be compared to the findings outlined in Chapter Five from the questionnaires undertaken as the next stage of this research. Finally, the potential issues that affect the people who are more likely to cycle were investigated through a series of focus groups. Chapter Six and Seven will outline the findings of the focus groups, while Chapter Eight will discuss overall conclusions from the study and recommendations for how to encourage cycling in New Zealand.

5.0 Chapter Five – The Potential for Utilitarian Cycling

Two questionnaires were undertaken as the quantitative component of the research process. In addition, focus group participants were drawn from CDHB questionnaires that were part of their workplace travel plan process at PMH and CPH. This quantitative component, as outlined in the methodology in Chapter Three, aimed to identify potential cyclists as well as gather more data on the characteristics of current commuter cyclists. In addition, quantitative information was gathered from respondents on their motivations and barriers for cycling and their usual transport mode. Gathering these data meant that the most common trends among people who might be interested in cycling for transport could be identified and further explored through focus groups. Comparisons could also be drawn between the census data for commuter cyclists as reported in Chapter Four and the data gathered through the questionnaire components of the research.

It is important to note that the questionnaires completed in workplaces were undertaken for the wider application of workplace travel planning rather than answering the limited aims of this study. Consequently, these questionnaires gathered data not relevant to this study and only data pertaining to general transport information or motivations and barriers for cycling have been considered in this chapter. The final questionnaire reported here, of recreational cyclists, was undertaken solely for the purpose of this research so all data gathered from it is included below.

One aspect of the questionnaires was to gather information on the factors that would encourage people to cycle (or cycle more frequently) to work. Data from these questionnaires are outlined below and used to identify the main issues for a broad range of people. The order of categories on graphs is taken from the order of responses in questionnaires rather than organised through proportion of responses. Motivations and barriers raised in data from the questionnaires complement the themes raised in Chapter Two and form the basis of discussion in the focus groups. A more through analysis of these barriers and their effect on utilitarian cycling is provided in Chapter Six.

5.1 University of Canterbury questionnaire

The University of Canterbury Travel Survey 2008 consisted of a questionnaire completed online by 4772 respondents in July 2008. This questionnaire occurs on a regular basis of every four years as part of the University's research into transport and sustainability. Table 5.1 shows the breakdown of gender and staff/student proportions for respondents to the

University questionnaire. A higher proportion of male students responded to the questionnaire than male staff, although in all cases more than half the respondents were female. This minor difference between the genders could be expected as females made up fifty-one percent of the general population in 2006 (Statistics New Zealand, 2008) and generally have slightly higher rates of qualifications, therefore, likely to make up a bigger proportion of students than males.

Table 5.1 Cross-tabulation of respondents' gender and university status

	Male		Female		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Staff	456	44%	571	56%	1027	22%
Students	1756	47 %	1989	53%	3745	78%
Total	2212	46%	2560	54%	4772	100%

Source: University of Canterbury Questionnaire 2008

A significant proportion of respondents, nearly eighty percent, were aged between 18-24 years (Figure 5.1). It can be assumed that these were mainly students and this is confirmed when looking at the age breakdown of students as almost eighty percent are 18-24 years old. Students in the 25-34 year old age category are also reasonably frequent but less so than staff in this category. Staff appear to be primarily aged between 25 to 54 years old, with the majority aged 45-54.

Figure 5.1 Proportion of staff and students in each age group
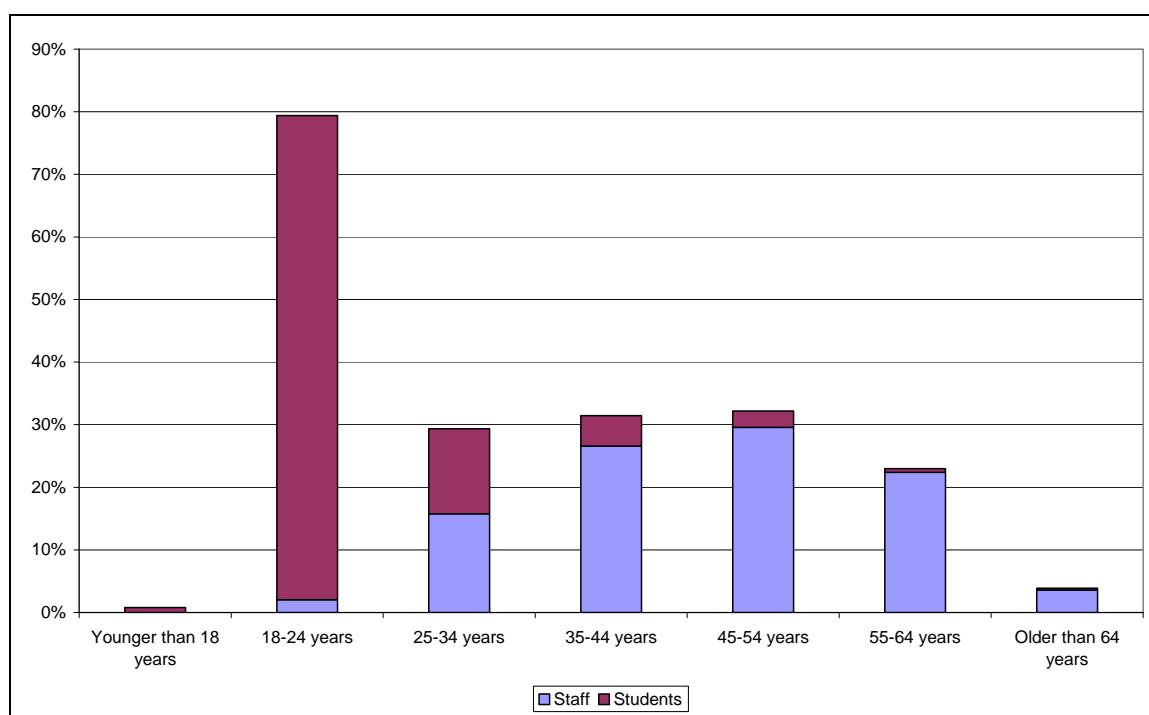
Source: University of Canterbury Questionnaire 2008

5.1.1 General transport patterns

All respondents were asked to report their usual (most frequent) form of transport to the University of Canterbury in addition to how they travelled to and from the University on the day of the travel survey. The data in this section is based on the usual transport mode reported by respondents and is shown in Figure 5.2. Thirty-nine percent of respondents drove to work while another four percent were passengers in a motor vehicle. This commuter mode share for motor vehicles was less than the commuter mode share for motor vehicle drivers for New Zealand or Christchurch, both of which are above seventy percent (Statistics New Zealand, 2008). Walking, cycling and bus all had higher commuter shares than the national or regional trends, reinforcing the proposition that students and academics are higher users of sustainable transport modes compared to the remainder of the population (Pucher et al., 1999). These figures also suggest that the University population is less motor vehicle reliant than Christchurch or New Zealand in general, meaning members of the University of Canterbury population could be more open to the idea of cycling. On the other hand, this trend may mean that the issues experienced in regards to cycling for University of Canterbury staff and students are different to those for the rest of the population. For students at least, income and age appear to have a major influence on their travel mode.

Figure 5.2 Usual (most frequent) mode of transport for all respondents
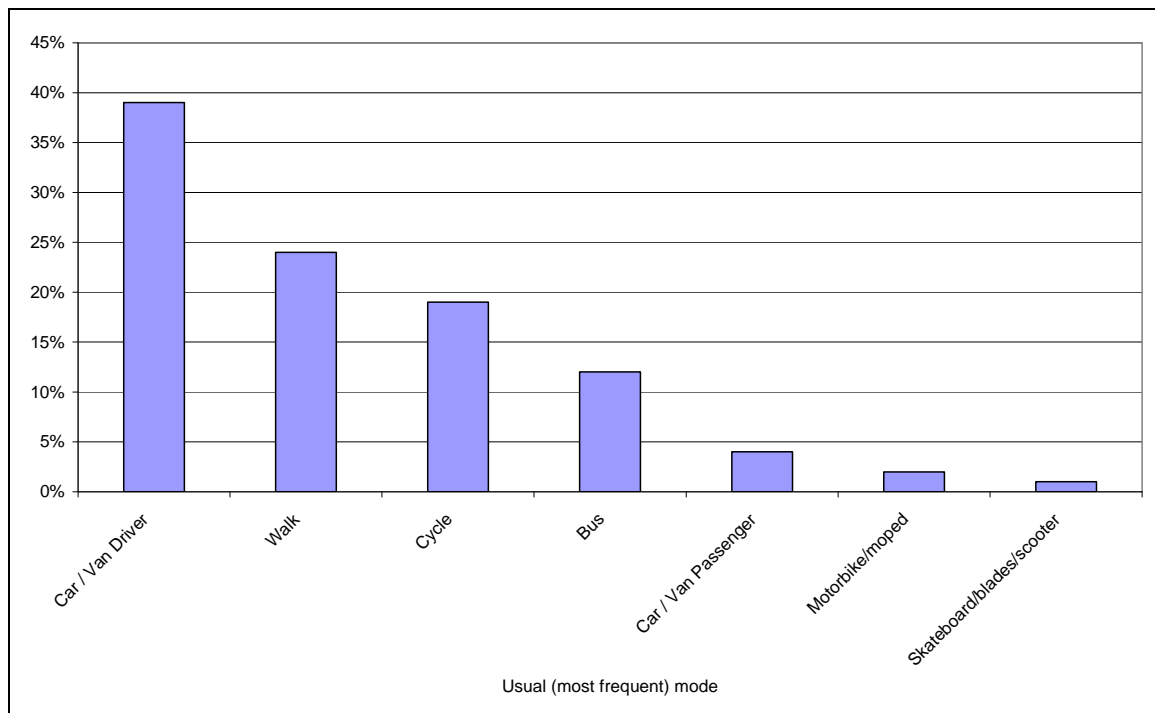
Source: University of Canterbury Questionnaire 2008

Two factors that may have an effect on transport mode choice are gender and occupation, as raised in the literature review and discussed in Chapter Four in relation to census data. It is important to remember that staff may be academic staff or general staff including librarians, computer technicians, administrative staff as well as security, cleaners and maintenance staff. From Figure 5.3 it can be deduced that a higher proportion of females drove to work or were passengers than males. Females were also more likely to take the bus or walk to University of Canterbury, while males were more likely to cycle or use the two minor transport modes, skateboard/blades/scooter and motorbike/moped. Most significantly for this study, there was more than double the proportion of males cycling to University of Canterbury than females on a regular basis. Unfortunately, it is not possible to compare these figures for students to national data as students are not included in census travel to work.

Figure 5.3 Gender breakdown for usual (most frequent) transport mode
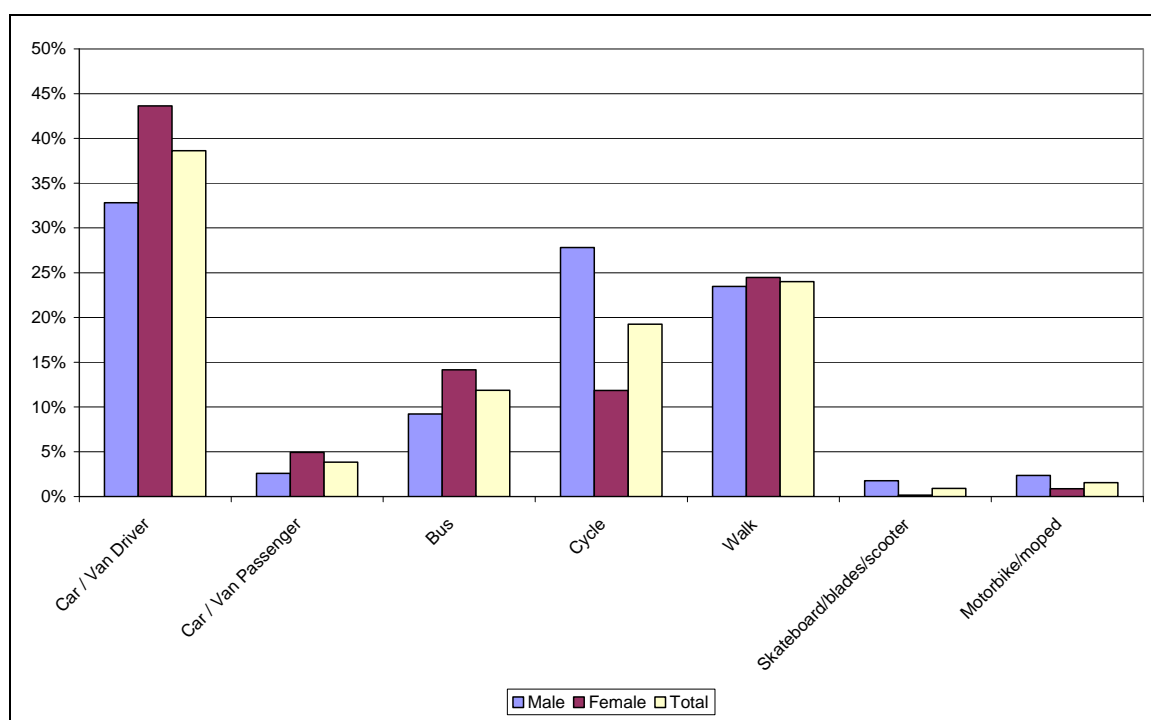
Source: University of Canterbury Questionnaire 2008

Considering the data on staff and students in Figure 5.4, a higher proportion of staff drove to work despite the fact that there were twice as many student drivers compared to staff drivers. Students had higher proportions of people walking, cycling and taking public transport. One potential reason there are very high proportions of students walking could be the close proximity of the halls of residence to the main campus. Many students also aim to live close to campus so that they can walk or cycle for convenience. In addition,

students are more likely to be concerned by economic factors such as petrol costs, resulting in their use of cheaper transport modes or having less access to motor vehicles.

Figure 5.4 Staff and student breakdown of usual (most frequent) transport mode
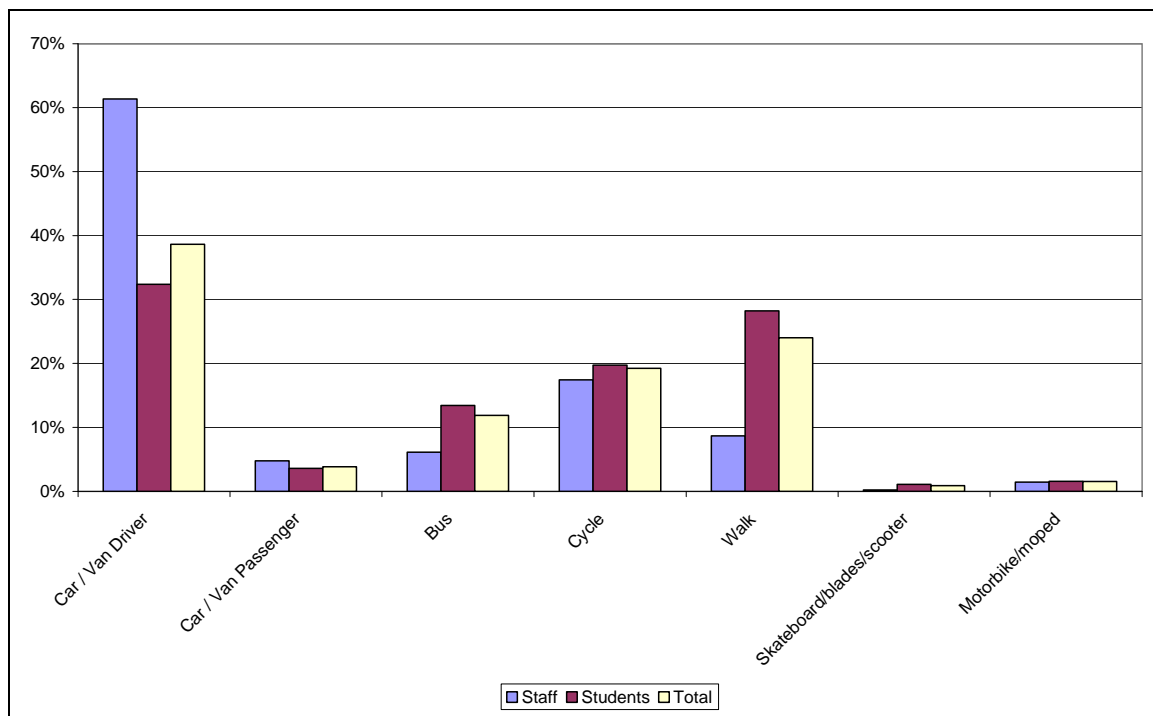
Source: University of Canterbury Questionnaire 2008

Figure 5.5 displays the modal share of each transport mode for different age groups. It was only for those less than 25 years old that motor vehicle drivers have a smaller mode share than other modes. This age group is predominantly made up of students so this result is unsurprising. For people aged less than 18 years the bus was the most frequently used transport mode followed by walking, however, there were only 29 people in this age category so this finding is unlikely to be representative. Another factor in motor vehicle driving being low for this age group may be that not many people have a licence or access to their own motor vehicle. On the other hand, the number of people in this age group is extremely low. Walking also had a higher transport mode share than driving for the 18-24 years olds but declines for other age groups and was lowest for the 35-44 year olds. Cycling on the other hand, had a reasonably steady mode share for all age groups between 18 and 44 before declining in the older age groups. Overall, however, cycling maintained a commuter share of over ten percent for all age groups other than those older than sixty-four years, and all age groups are higher than the national or Christchurch commuter mode share for cycling. This finding reinforces the proposition that universities have higher use of sustainable transport modes, particularly cycling.

Figure 5.5 Age breakdown for each mode of transport used by respondents
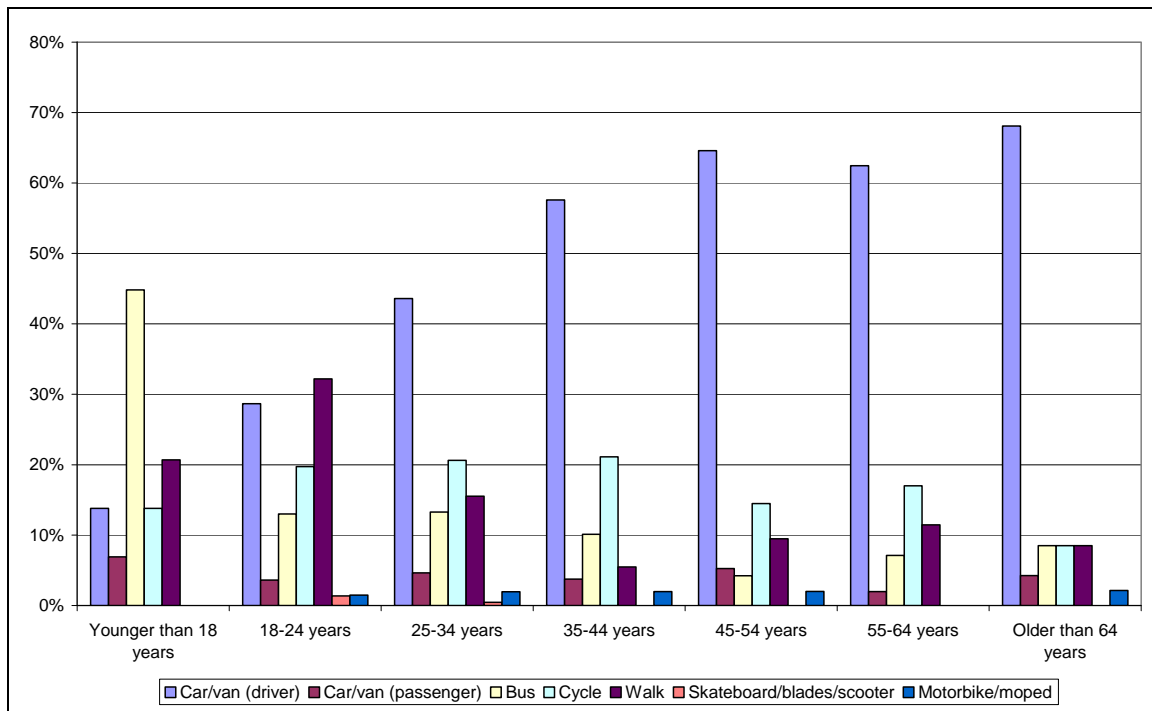
Source: University of Canterbury Questionnaire 2008

The final consideration under general transport modes is the reasons that people give for their modal choice (Figure 5.6). These reasons can also be used to evaluate potential for latent demand for utilitarian cycling as some reasons will be difficult to overcome for people to start cycling over driving, for example transporting children to school on the way to work. Respondents could indicate as many reasons as applied to them and, therefore, the proportion of total responses to the question is shown in Figure 5.6. The reason for the respondent's current transport modes with the highest proportion of responses was 'because it is quicker' followed by 'because it is cheaper'. This reason may be a motivating factor for students' to walk, cycle or take public transport. Another reason that was frequently reported was 'because it is healthier' followed by 'lack of a viable alternative form of transport', suggesting that some people live too far away to walk or cycle or may not have a direct bus route to the University of Canterbury. Finally, respondents were asked to indicate which reason was most important in their modal choice. For twenty-nine percent of respondents speed was the most important reason and a further twenty-five percent reported that cost was the most important reason. Lack of a viable alternative, other and 'because it is healthier' were also important reasons with eleven, nine and seven percent of respondents indicating these reasons were the most important respectively. All other reasons had less than five percent of respondents indicating them as most important.

Figure 5.6 Reasons for using current mode of transport for all respondents
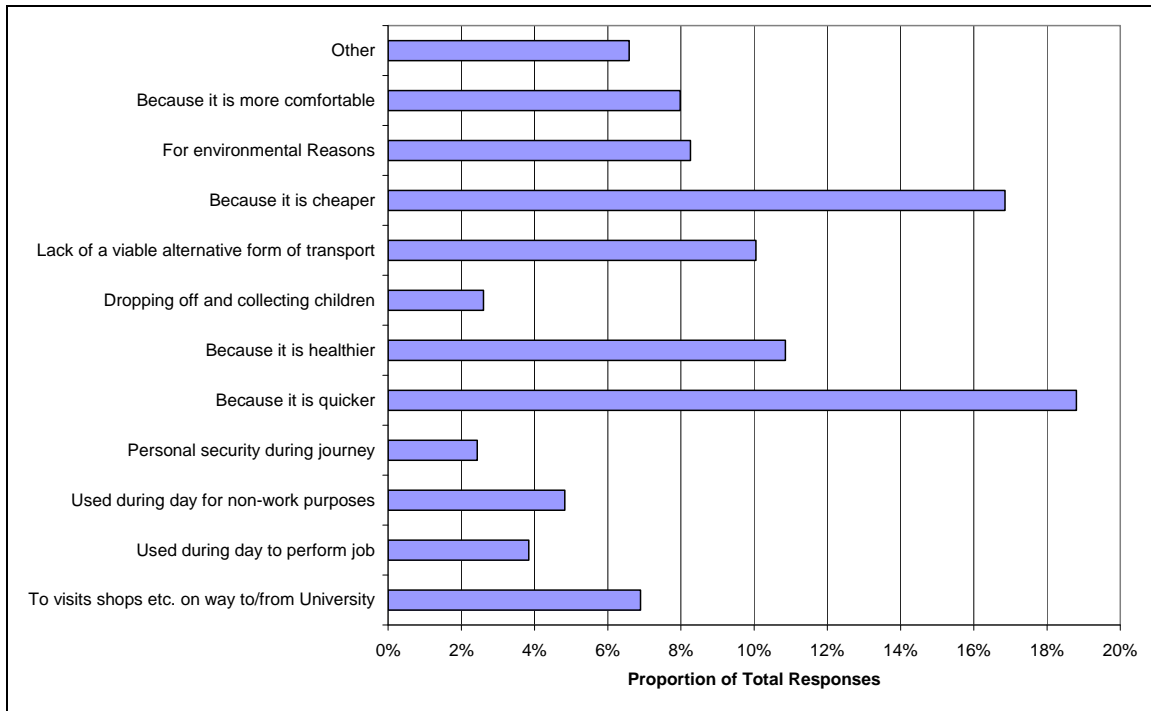
Source: University of Canterbury Questionnaire 2008

5.1.2 Qualifying latent demand

One of the main aims of the questionnaires was to identify latent demand for utilitarian cycling. Part of the questionnaire, therefore, asked questions relating to each transport modes' accessibility, such as whether people lived a reasonable distance from the University to cycle or owned a bicycle. In this section, the questions relating to cycling are analysed to look at the potential for latent demand. Firstly, the proportion of respondents who own or have access to a bicycle was considered. Over half of respondents were not asked this question as they had previously indicated they cycled to University, another quarter of respondents have access to a bicycle and the remaining twenty-four percent do not have access (Table 5.2). These figures suggest that seventy-five percent of people have access to a bicycle and therefore one obvious barrier is discounted or removed. This finding is interesting compared to New Zealand Travel Survey data which found that seventy-nine percent of people living alone do not have access to a bicycle, suggesting that either people share bicycles in multi-occupancy households or that the academic community has higher rates of accessing bicycles than the general population (Ministry of Transport, 2008). Not having access to a bicycle, however, is not necessarily a barrier to considering cycling for transport and these people were not automatically removed from the latent demand group because their responses about cycling indicated they were interested in cycling as a transport mode.

Table 5.2 Respondents who own or have access to a bicycle

	Yes	No	Not Asked
Proportion of respondents	25%	24%	51%

Source: University of Canterbury Questionnaire 2008

Another factor in determining latent demand for cycling is to ask respondents whether they live a reasonable distance to cycle. The response to this question is dependent on the respondent's perception if they live within what the literature determines as a reasonable distance, usually considered to be one to eight kilometres as discussed in the literature review. Of all respondents, seventy percent perceive they live a reasonable distance from University of Canterbury to cycle meaning that for a high proportion of the University population the most difficult barrier to overcome, distance, is not an issue.

While someone may have access to a bicycle and live within a reasonable distance to cycle to work or study, they may still not be open to the idea of cycling. As part of the question asking respondents what, if anything, would encourage them to cycle (or cycle more) the option of nothing would encourage them to cycle to University of Canterbury was provided. Thirty percent of respondents ticked this answer saying that nothing would encourage them to cycle to University of Canterbury. These people generally belong to the third group of people who are not considered in this study, non-cyclists who are not open to the idea of commuter cycling. The exception to this is shown in Figure 5.7 which shows the proportion of people who could not be encouraged to cycle to the University. Just over fifteen percent of these people already cycle to University for each mode. Two possible reasons for why they do not believe anything could encourage them to cycle to University is that either they cycle every day or have barriers that they do not believe can be overcome on the days that they do not cycle. Motor vehicle drivers had the highest proportion of people stated nothing would encourage them to cycle, followed by passengers and public transport users. A quarter of walkers also stated nothing would encourage them to cycle. One potential reason for walkers not to cycle is that they live too close to University of Canterbury as opposed to drivers who may live too far from campus to cycle.

Figure 5.7 Proportion of respondents in each mode who stated nothing would encourage them to cycle
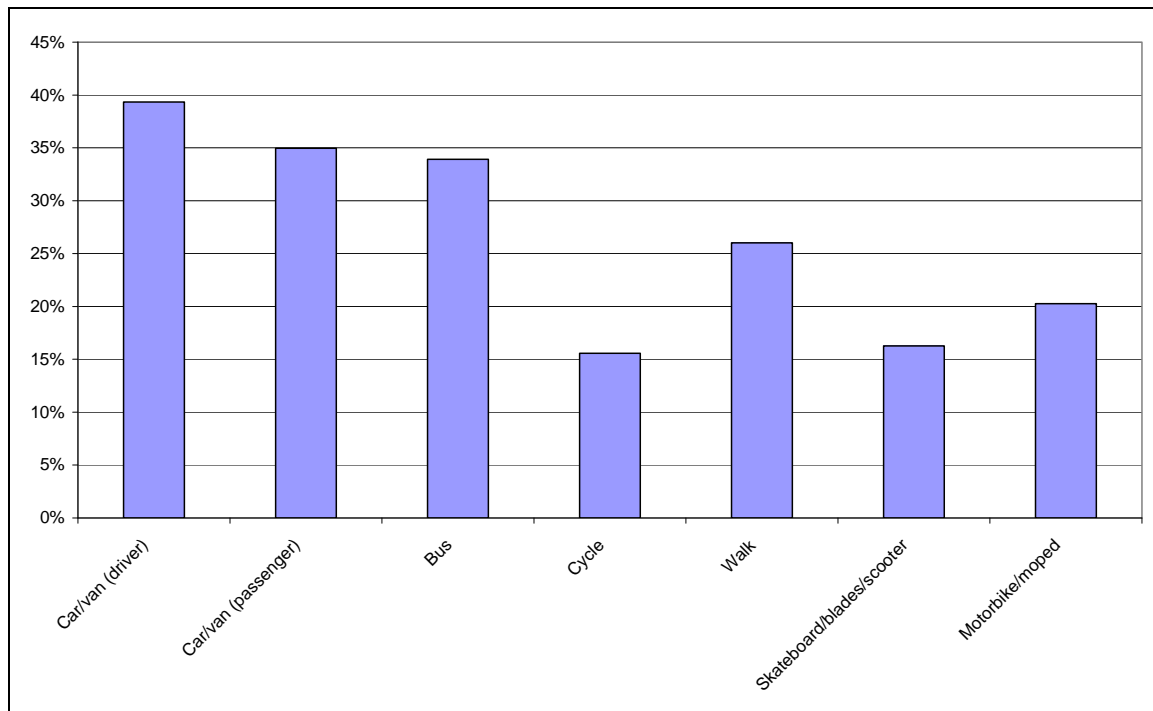
Source: University of Canterbury Questionnaire 2008

A cross-tabulation between the factors of whether people perceived they lived within a reasonable distance to cycle and their mode was completed (Table 5.3). Over fifty percent of the people who drove to University or took public transport, and just under fifty percent of those who were passengers, perceived they lived an unreasonable distance to cycle. Nearly everyone who cycled, walked or came on a skateboard/blades/scooter considered they lived a reasonable distance to cycle.

Table 5.3 Modal share for respondents perception of whether they live reasonable distance to cycle

	Reasonable Distance	Unreasonable Distance
Car/Van Driver	46%	54%
Car/Van passenger	52%	48%
Bus	48%	52%
Cycle	99%	1%
Walk	98%	2%
Skateboard/blades/scooter	95%	5%
Motorbike/moped	68%	32%
Total	100%	100%

Source: University of Canterbury Questionnaire 2008

Fifty-two percent of people who did not live a reasonable distance from University indicated that nothing would encourage them to cycle. This result suggests that forty-eight percent of people who were not a reasonable distance from University are still open to cycling if the distance barrier was removed.

5.1.3 Distance

Respondents to the University of Canterbury Questionnaire were asked to supply their address as part of the questionnaire. These addresses were geocoded in ArcGIS so that spatial analysis could be performed regarding distance and mode of transport. Of the 4772 respondents, 2767 supplied addresses that were successfully geocoded (Figure 5.8). The remaining 2005 respondents' addresses could not be used, primarily because respondents had not provided an addresses or a street number. Table 5.4 shows the frequency of respondents in each distance category. One limitation of the following data is that distance is calculated in a straight line from the University rather than actual distance travelled along the road network. Another is that the College of Education is not included within the University of Canterbury spatial file, however, there were education students and staff who responded to the questionnaire.

Table 5.4 Frequency of geocoded addresses in each distance category

Distance (radius) from UC	Frequency of respondents		Cumulative Distance	Cumulative Frequency	
<1.0 km	983	36%	<1km	983	
1.1- 2.0 km	336	12%	<2km	1319	
2.1 – 5.0 km	661	24%	<5km	1980	
5.1 – 10.0 km	485	18%	<10km	2465	
10.1 – 15.0 km	168	6%	<15km	2633	
15.1 – 20.0 km	63	2%	<20km	2969	
20.0km +	71	2%			
Total	2767	100%	Total	2767	

Source: University of Canterbury Questionnaire 2008

Figure 5.8 Respondents whose location was geocoded and their usual mode of transport
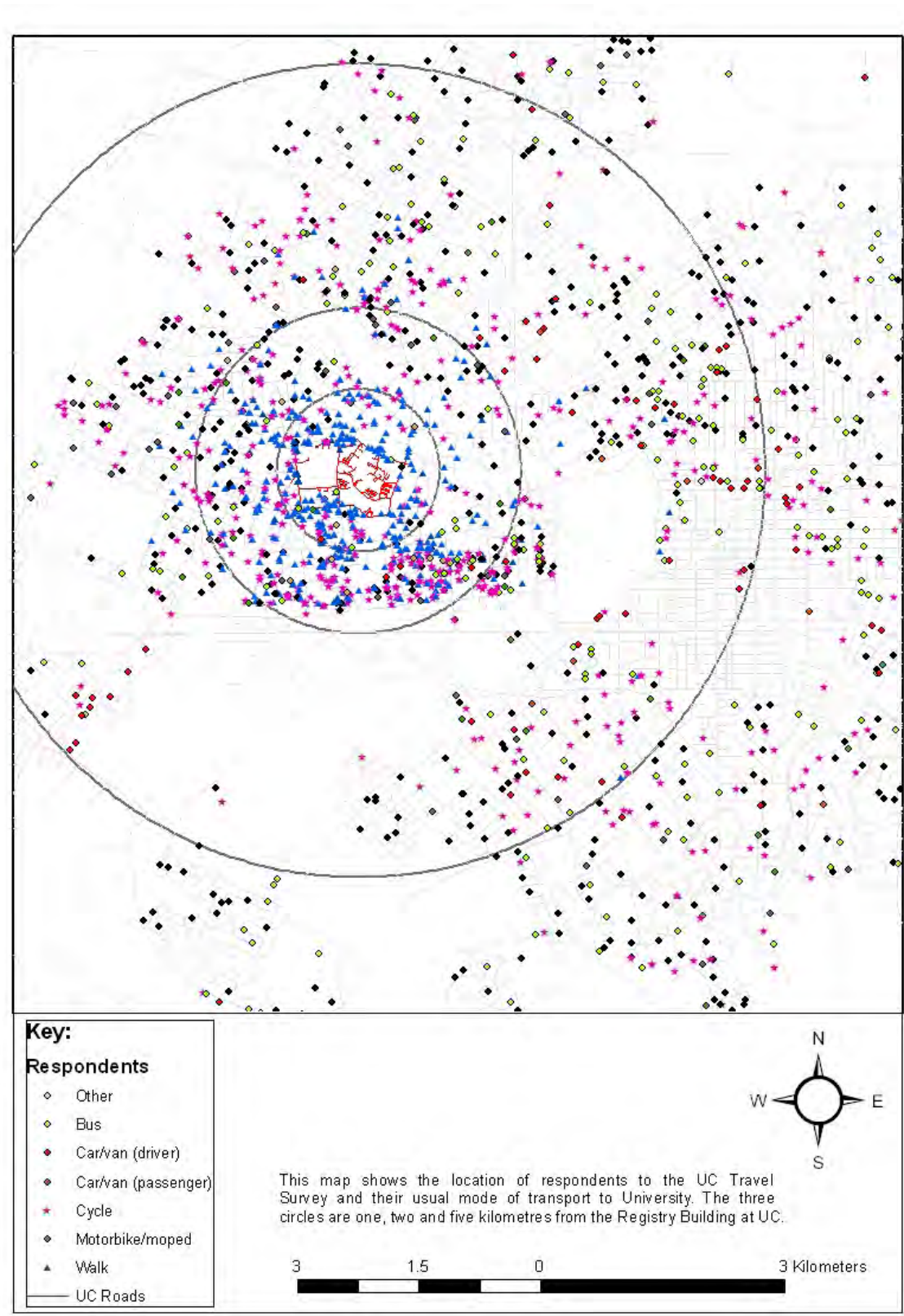
Source: University of Canterbury Questionnaire 2008

Spatial analysis was then undertaken to calculate the modal share for respondents in each distance category (Table 5.5 and Figure 5.8). Two categories, drove to University and

passengers in a motor vehicle were combined into one category, travelled in a motor vehicle. Other modes, such as the bus, skateboarding and motorcycling are not included in this analysis of modal share but were not removed from the total number of respondents. As one might expect, walking had the highest modal share (66 percent) for people who lived less than one kilometre from the University. Another twenty-one percent from this zone cycled to the University and seven percent travelled in a motor vehicle. Walking mode share then drops dramatically with only nineteen percent of people walking between 1.1 and two kilometres to University. Within this distance category, cycling is slightly higher than travelling in a motor vehicle with thirty-four and thirty-three percent respectively. Cycling is still higher for 2.1–5 kilometres with twenty-three percent modal share but drops to fifteen percent for 5.1–10 kilometres. Travelling in a motor vehicle, however, steadily increases for each distance category.

Table 5.5 Modal share for cycling, walking and motor vehicles for each distance category

Distance (radius) from UC	Frequency of respondents	Cycle		Walk		Travelled in a motor vehicle	
<1.0 km	983	208	21%	651	66%	70	7%
1.1- 2.0 km	336	113	34%	65	19%	111	33%
2.1 – 5.0 km	661	152	23%	21	3%	337	51%
5.1 – 10.0 km	485	72	15%	6	1%	279	58%
10.1 – 15.0 km	168	5	3%	0	0%	119	71%
15.1 – 20.0 km	63	1	2%	0	0%	53	84%

Source: University of Canterbury Questionnaire

The spatial dataset was then used to analyse what proportion of people perceived each distance category to be a reasonable distance to cycle so as to further understand how far people are willing to cycle for transport. These figures are shown in Table 5.6 and it is clear that the majority of people consider five kilometres or less a reasonable distance to cycle. A further forty-three percent of people who live five to ten kilometres away perceived the distance reasonable for cycling. Finally, a higher proportion perceived ten to fifteen and fifteen to twenty kilometres as reasonable for cycling than those people who currently cycle to University in these groups. One of the issues with asking people what

they perceive is a reasonable distance to cycle is that people can be unaware how far they are able to cycle in a reasonable time period (Geus et al., 2008).

Table 5.6 Proportion of people who perceive the distance to be reasonable for cycling

Distance (radius) from UC	Frequency of respondents	Number who state it is a reasonable distance to cycle	Percentage who state it is a reasonable distance to cycle
<1.0 km	983	960	98%
1.1- 2.0 km	336	325	97%
2.1 – 5.0 km	661	515	78%
5.1 – 10.0 km	485	208	43%
10.1 – 15.0 km	168	16	10%
15.1 – 20.0 km	63	3	5%

Source: University of Canterbury Questionnaire

5.1.4 Barriers and motivations for cycling

This section discusses the responses to what factors would encourage people to cycle (or cycle more frequently) to University of Canterbury. In part, this provides information on what barriers and motivations people perceive for cycling as well as giving information on what are the most significant factors for focusing on when trying to improve the environment to encourage cycling. Respondents were able to indicate as many factors as they wanted (Figure 5.9) so the proportion of total responses is shown. The most frequently cited factors were 'more courteous motor vehicle drivers' followed closely by 'less traffic on the roads', both with fourteen percent or more of responses. These factors indicate that the interaction between motorised traffic and cyclists was of serious concern to many people. The third most commonly cited factor, with almost twelve percent of responses, was 'more cycle routes on the way to University', which was also a factor closely linked to the issue of traffic interaction. There were then four different factors with between eight and ten percent of responses, including 'discount to buy a bicycle', 'more easily accessible showering and changing facilities,' a 'large increase in fuel costs' and 'other'. The discount to buy a bicycle is interesting as it relates to the people who do not have access to a bicycle, reinforcing the idea that these people were open to the idea of utilitarian cycling if they could overcome this hurdle. More lockers at the University and more secure bicycle

parking facilities each had more than six percent of responses, while the remaining factors had lower response rates. Overall, these data suggest that the major factors of safety, motor vehicle interaction and cycle specific facilities raised in the literature review were also most commonly perceived as issues by the respondents to the University of Canterbury Questionnaire.

Figure 5.9 Factors that would encourage staff and students to cycle (or cycle more frequently) to University of Canterbury
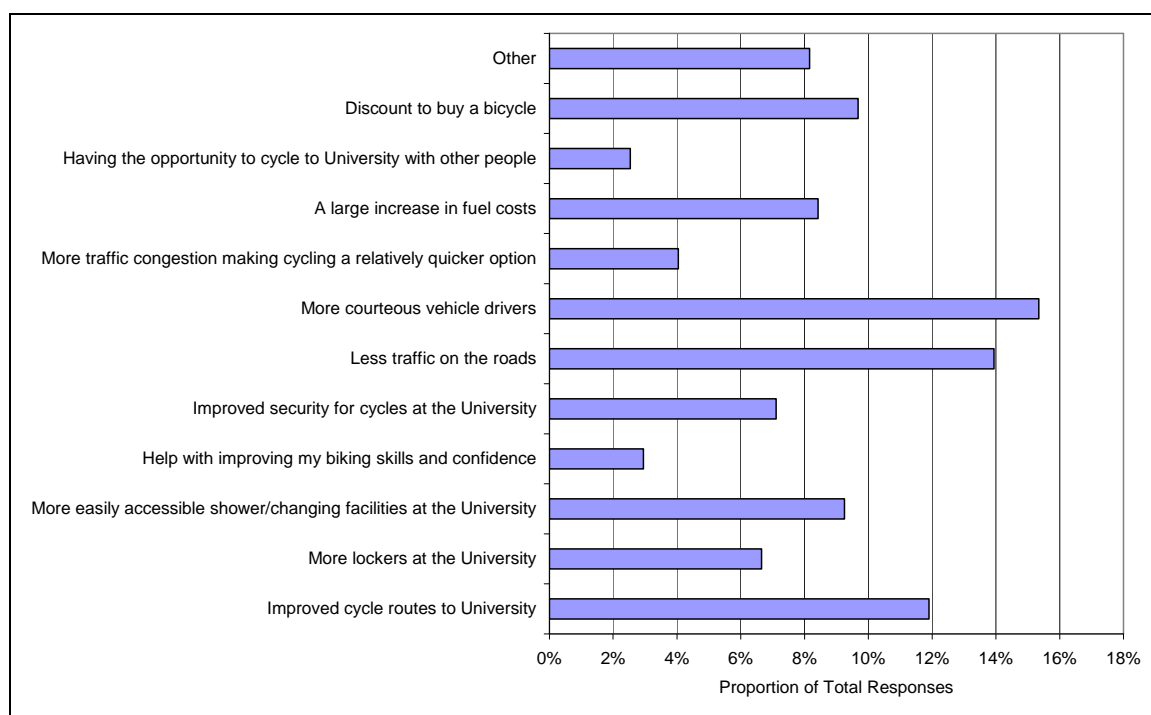
Source: University of Canterbury Questionnaire 2008

Figure 5.10 is a graph of the most important factor for encouraging people to cycle. Unfortunately, the most common response was nothing, but this result may be because all those who believed nothing would encourage them to cycle indicated this response, as opposed to the other respondents who spread their responses across the twelve other factors. Of these, other was the most important factor followed by more lockers at the University. 'Discount to buy a bicycle' was also higher than 'less traffic on the roads' and 'more courteous motor vehicle drivers', two factors that might have been expected to be the most important reason from their frequency of response in Figure 5.9.

Figure 5.10 Most important factor for encouraging more cycling to University
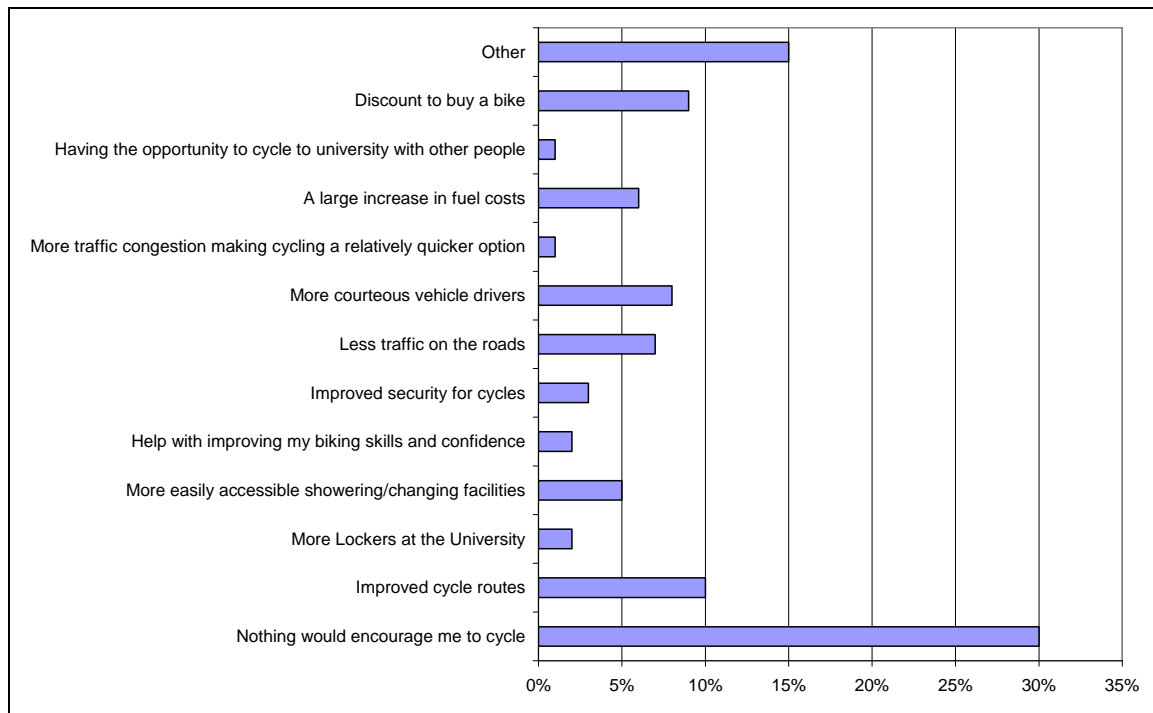
Source: University of Canterbury Questionnaire 2008

5.2 Recreational cyclists questionnaire

The recreational cyclist questionnaire was completed in two parts, the paper questionnaires completed as intercept questionnaires and the online questionnaire distributed through cycling forums in New Zealand. Results for both questionnaires are shown here and are discussed both as two separate groups and the overall group of recreational cyclists. The intercept questionnaire had a total of 111 respondents while the online questionnaire had 110 responses resulting in 221 recreational cyclists surveyed through the two methods. Table 5.7 displays the gender proportions of respondents to the questionnaire. Of the intercept respondents sixty-nine percent were male while eighty-nine percent of the online respondents were male. This statistic is disproportionate, particularly in the online questionnaire, to the other questionnaire undertaken and the ratio or males to females in New Zealand, although the male to female ratio of cyclists is approximately three to one as discussed in Chapter Four. The most obvious reason for this disparity is that males are more likely to participate in recreational cycling than females. Consequently, the data from the recreational cyclist questionnaire may have a bias towards males' perceptions.

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Table 5.7 Gender of respondents

	Male	Female
Intercept Respondents	69%	31%
Online Respondents	89%	11%
Total Respondents	79%	21%

Source: Recreational cyclist questionnaire

Figure 5.11 displays the percentage of respondents in each age category for the intercept questionnaire. Thirty-six percent of respondents were aged between 35-44 with another twenty-six percent aged between 45-54 and twenty-one percent aged 25-34 years. For the online questionnaire, thirty-nine percent of respondents were aged 25-34 with a further thirty-nine percent aged 35-44, with only thirteen percent aged 45-54 and only one person older than 55 answered the online questionnaire. One potential reason for the lack of older respondents to the online questionnaire could be that older people are less likely to surf internet sites and be posting on forums. This information reinforces anecdotal evidence that recreational cycling is being taking up by middle-aged males, however, questionnaire self-selection bias may also be a cause of this difference in responses. On the other hand, the age groups that are predominant for recreational cyclists are different to the age groups that have high levels of commuter cyclists from census data as discussed in Chapter Four.

Figure 5.11 Age breakdown for respondents
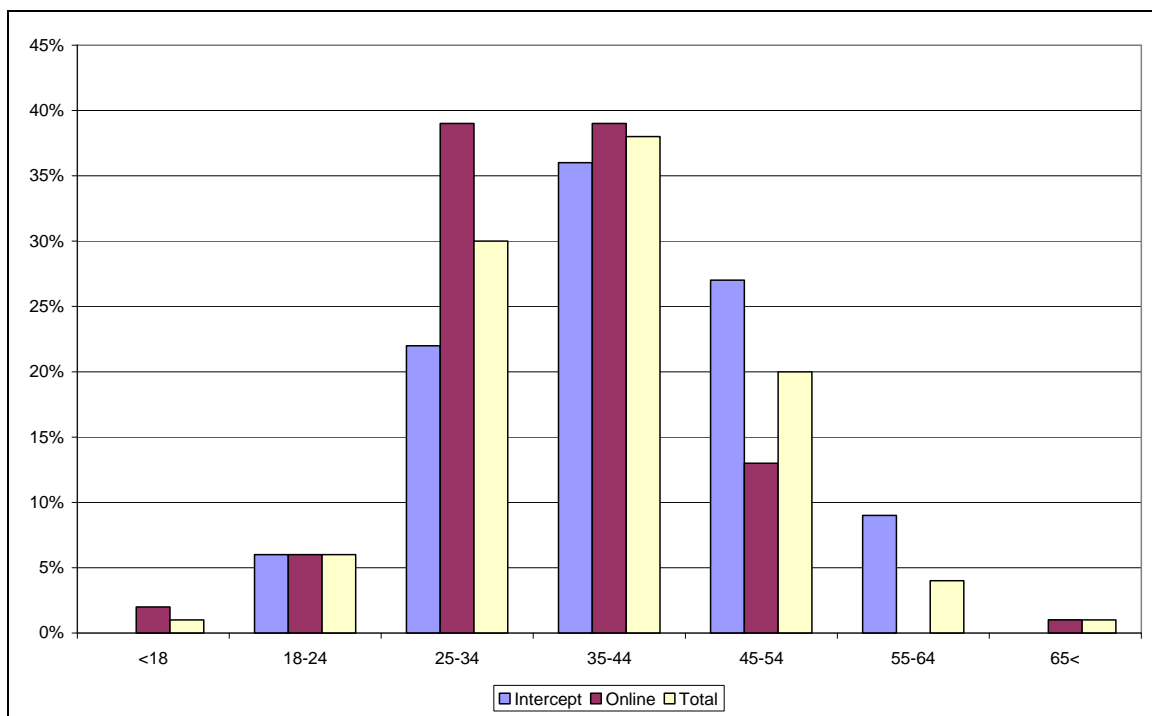
Source: Recreational cyclist questionnaire

The online recreational questionnaire allowed for, and expected but did not aim for, non-Christchurch respondents. Consequently, the online questionnaire included a question

about where respondents resided (Table 5.8). This question also acted as a filter for focus groups as these were only held in Christchurch. Forty percent of the online respondents came from Greater Wellington, twenty-one percent from Canterbury, sixteen percent came from Greater Auckland and the remaining respondents were scattered throughout the country. Of the respondents from Canterbury, nineteen were from Christchurch City, one from Rangiora, two from Woodend-Pegasus and one from Prebbleton-Lincoln.

Table 5.8 Location of respondents to the online recreational questionnaire

Location	Percentage
Northland Region	0%
Auckland Region	16%
Waikato Region	3%
Bay of Plenty Region	6%
Taranaki Region	1%
Gisborne Region	0%
Hawke's Bay Region	3%
Manawatu-Wanganui	4%
Wellington Region	40%
Tasman Region	0%
Nelson Region	2%
Marlborough Region	1%
West Coast Region	0%
Canterbury Region	21%
Otago Region	2%
Southland Region	1%
Other	3%

Source: Recreational cyclist questionnaire

5.2.1 General transport patterns

General transport patterns for intercept recreational cyclists are in some respects similar to national trends, as displayed in Figure 5.12, as sixty-eight percent of intercept respondents drove to work as their usual form of transport and a further five percent walked to work. The difference comes with travel to work, as might be expected, with seventeen percent of respondents cycling to work. Online questionnaire respondents had a significantly different response rate, however, with sixty percent of respondents cycling to work and only twenty-five percent driving. There is, therefore, a high probability that an element of bias occurred through recreational cyclists with an interest in utility cycling responding to the online questionnaire, whereas intercept respondents were chosen randomly within the target audience of recreational cyclists. Also, intercept respondents who drove to work often appeared during interviews as being embarrassed that they did not cycle to work. This may have been similar for some recreational cyclists who found the online questionnaire on the

forums but simply chose not to respond to it. It should also be noted that the option of skateboard/in-line skates was provided to respondents but no-one indicated using this mode for travel to work so it is not shown in the graph.

Figure 5.12 Usual (most frequent) form of transport for respondents
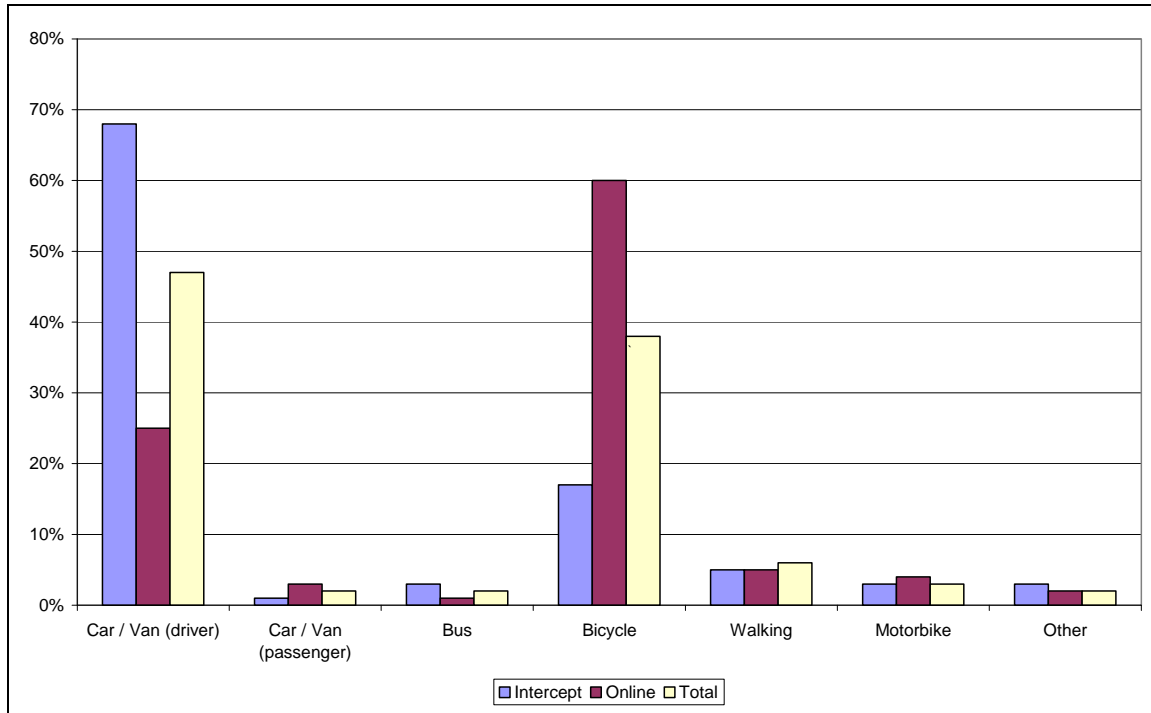
Source: Recreational cyclist questionnaire

Interestingly, gender does not appear to have much effect on transport mode choice as seen in Table 5.9. More female respondents to the online questionnaire drove to work than males, but more males from the intercept questionnaires drove motor vehicles compared to females. Bus was the only mode where females had higher proportions travelling to work by that mode than males for both groups. One reason for this may be the low number of female respondents to the questionnaires. For the online questionnaire it is difficult to analyse the female sample as there are only twelve female respondents. What can be deduced, however, is that sixty percent to the males cycled while approximately twenty percent drove to work.

Table 5.9 Gender breakdown the usual (most frequent) form of transport for respondents to the recreational cyclists questionnaire

	Intercept		Online		Total	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Car / Van (driver)	71%	62%	23%	42%	45%	57%
Car / Van (passenger)	0%	3%	3%	0%	2%	2%
Bus	1%	6%	0%	8%	1%	7%
Bicycle	18%	15%	61%	50%	42%	24%
Walking	3%	12%	6%	0%	5%	9%
Motorbike	4%	0%	4%	0%	4%	0%
Other	3%	3%	2%	0%	2%	2%
Total	100%	100%	100%	100%	100%	100%

Source: Recreational cyclist questionnaire

There is anecdotal evidence that middle aged males are more likely to be recreational cyclists, but is also interesting to consider if age is a factor for transport to work amongst these respondents (Table 5.10). For the online recreational respondents there are too few respondents in several categories to use to draw conclusions. In the predominant categories of 25-34 and 35-44 however, it can be seen that the younger group are more likely to cycle while the 35-44 year olds are more likely to drive to work. This finding compares to the census data in Chapter Four where 20-24 year olds were less likely to cycle than the older 25-34 year old group.

Table 5.10 Age breakdown for usual (most frequent) form of transport of respondents

	<18	18-24			25-34			35-44			45-54			55-64	65+
	Online	Intercept	Online	Total	Intercept	Online	Total	Intercept	Online	Total	Intercept	Online	Total	Intercept	Online
Driver	50%	43%	29%	36%	63%	16%	33%	78%	28%	52%	0%	36%	33%	70%	100%
Pass	0%	0%	14%	7%	0%	5%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Bus	0%	0%	0%	0%	4%	0%	1%	3%	2%	2%	100%	0%	7%	0%	0%
Bike	50%	0%	57%	29%	25%	67%	52%	15%	56%	36%	0%	57%	53%	30%	0%
Walk	0%	57%	0%	29%	8%	7%	7%	0%	7%	4%	0%	0%	0%	0%	0%
Moped	0%	0%	0%	0%	0%	2%	1%	3%	5%	4%	0%	7%	7%	0%	0%
Other	0%	0%	0%	0%	0%	2%	1%	3%	2%	2%	0%	0%	0%	0%	0%

Source: Recreational cyclist questionnaire

Another important factor for investigating utilitarian cycling is to consider why people use their transport mode (Figure 5.13). All respondents were asked why they used that form of transport and were able to indicate as many responses as applied to them. Intercept respondents had 'other' as their most frequent response, followed by 'because it was quicker' and 'because they used the mode for work'. When being interviewed, many respondents replied that they used a company motor vehicle otherwise they would be likely to cycle. For recreational cyclists responding to the online questionnaire, the top two reasons were the mode being quicker and healthier, and the third was that their usual mode was cheaper. These reasons reflect the higher modal share cycling had for this group of respondents.

Figure 5.13 Reasons for using main form of transport
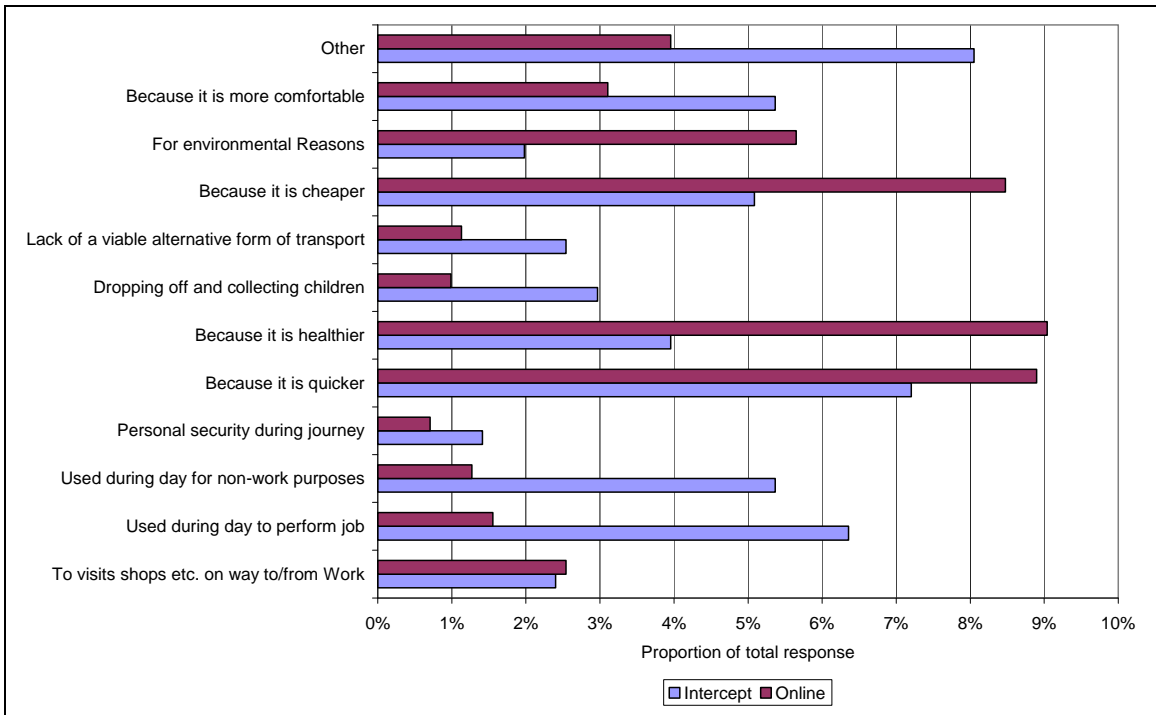
Source: Recreational cyclist questionnaire

Respondents who indicated 'other' were asked to specify their reason. Responses and the number of people who made a similar comment are outlined below and every response given is in Appendix H. For cyclists and motorcyclists, one of the major reasons was enjoyment, particularly amongst online respondents. Amongst intercept respondents, motor vehicle drivers often indicated shift hours, equipment to carry, laziness and company motor vehicle as reasons for driving to work. Company motor vehicle was another recurring answer for recreational cyclists. Unfortunately, none of these people were able to participate in focus groups so this issue could not be further explored. It is, however, linked

to the issue of work motor vehicles but differs as company motor vehicles have more perks attached than simply having a motor vehicle to use during work hours.

Comments regarding other reasons for using their usual form of transport by recreational cyclists were:

Very close [walking] *5
Distance [Car/Van Driver]*7
Company car [Car/Van Driver] *8
Convenience [Car/Van Driver]*3
Carry equipment for work [Car/Van Driver]*3
To get to work [Car/Van Driver]
Odd hours of work [Car/Van Driver]*3
Enjoyment [bicycle]*15
Safer [Car/Van Driver]
Work purposes [Car/Van Driver]*4
Bus times or routes aren't feasible [Car/Van Driver] *4
Too close [other]
Getting children ready on time – lack of time for travel [Car/Van Driver]
Car-sharing [Car/Van Driver]
Lazy [Car/Van Driver]*3
Weather [Car/Van Driver]
Enjoyable [motorbike]*3
Topography for biking [Car/Van Driver]*2
Keeping fit [bicycle]*2
Convenient [bus]
Would take as long to drive, park in free park and then walk [walking]
Do stuff after work [Car/Van Driver]
Saves me time as I can integrate training rides into my daily commute [bicycle]*5
Easier to park [bicycle]*6
Easier than having to shower at work [Car/Van Driver]*2

5.2.2 Qualifying latent demand

The recreational questionnaire did not ask respondents if they had access to a bicycle as it was assumed they would if they were participating in recreational cycling activities. Unfortunately, no discussion was held with respondents about the type of bicycle they would use to commute to work compared to the bicycle they may undertake recreational activities on, resulting in a limitation for this study. Table 5.11 displays whether respondents perceived they lived a reasonable distance from work for commuter cycling or not, with a total of eighty-two percent, which is more than for the University of Canterbury questionnaire, perceiving they did. The figure for online respondents was slightly higher at eighty-eight percent while seventy-six percent of intercept respondents perceived they lived a reasonable distance to cycle. This figure for online respondents corresponds to the higher number of respondents cycling to work. It is also possible that recreational cyclists have a better perception of how long it takes to cycle a certain distance, consequently they

are better able to perceive whether their distance between place of residence and workplace is reasonable compared to the more general population surveyed in the University questionnaire.

Table 5.11 Proportion of respondents who perceive they live a reasonable distance from work to cycle

	Yes	No
Intercept	76%	24%
Online	88%	12%
Total	82%	18%

Source: Recreational cyclist questionnaire

While it would normally be assumed that respondents stating they did not live a reasonable distance lived too far to cycle, there were both people who cycled and walked who stated they did not live a reasonable distance to cycle. Table 5.12 shows the proportion of respondents for each mode who perceived they lived a reasonable distance from work to cycle or not. The majority of the people who perceive they do not live a reasonable distance from work to cycle, drove to work, although there are some walkers and presumably they felt they live too close to work to cycle. Online respondents had an interesting result with six percent of people cycling perceiving they are an unreasonable distance to cycle to work.

Table 5.12 Respondents perception of whether they lived a reasonable distance to cycle by mode

	Intercept		Online		Total	
	Yes	No	Yes	No	yes	No
Car / Van (driver)	70%	30%	82%	18%	73%	27%
Car / Van (passenger)	100%	0%	100%	0%	100%	0%
Bus	100%	0%	100%	0%	100%	0%
Bicycle	100%	0%	94%	6%	95%	5%
Walking	83%	17%	50%	50%	67%	33%
Motorbike	100%	0%	100%	0%	100%	0%
Other	0%	100%	50%	50%	25%	75%

Source: Recreational cyclist questionnaire

To understand the reasons behind why recreational cyclists perceive their distances as unreasonable, comments were invited during the online questionnaire. These comments are listed below along with the distance each person lived from work and their response to whether it was reasonable or not. In general, people who thought the distance was unreasonable considered it too short for an acceptable ride. This finding is interesting compared to the National Travel Survey, which found twenty-seven percent of cycle trips are one to three kilometres long with a further sixteen percent three to five kilometres long (Ministry of Transport, 2008). Other factors identified as to why people did not cycle the distance between their home and workplace included safety, which will be further

investigated in the focus groups, and topography. Topography is not an issue researched in depth in this study due to the terrain in Christchurch being predominantly flat.

Comments regarding distance to work by recreational cyclists were:

900m...no...too short

1km...yes...in the past, I have cycled 15km to work each way

1.5km...no...too short to cycle. Walking short cut much more direct than road alternative.

2km...no...too short [walker]

2km...yes...for commuting, not for training

2.5km...no...very short distance, not much time to ride

3km...no... too short, just barely getting going before you have to stop again.

3km...no...too short a distance; hassle factor of clothing etc outweighs any health benefits

3km...yes...if anything it's a little short actually

3.5km...no...could be longer any shorter and could walk

4km...yes...would be even better if the roads weren't squeeze points with the big logging trucks and hoons who throw bottles out of cars every weekend

About 5kms...yes... I'd consider commuting to a distance of about 20ks as long as there were decent facilities where I was cycling to.

5ish km...yes...bit short for a decent ride really!

5km...no...6km is nothing – anything over 70km is a reasonable distance!

5km...yes... but on the short side

5kms...yes...don't need to change clothes as distance short

5kms ... yes... I do cycle to work when I have no other commitments - eg school holidays and no children to collect or drop off

5km...is too short

6.25km...yes...I often cycle a longer route home (11km) for more exercise

6.35km...yes...wish it was a bit longer in summer, and a bit shorter in winter! ☺

7km...yes...that is why I cycle

8km...yes...I sometimes run it instead, maybe on alternate days

8.5km...on short side

11km...yes... For a basic commute it's a good distance as it is just as quick (and sometimes quicker) as taking the car.

14km...yes...previously cycled 27km each way – 14 is much better ☺

14-15km...not cyclable as from Governor's Bay,[but] would be on the flat

15km...yes... I can ride up to 300k per week on my bike for sport/fitness. A 15k ride to and from work isn't a challenging distance for me, but I find it impractical.

17km...yes...I live well up a large hill, so riding home is a bit daunting

17km...yes...what is reasonable? It's not a problem to ride that distance

20km...yes... yes I ride to work 2-3 times a weeks and train 2-3 times a week

20kms...no...bad and unsafe commuting route on a state highway

25km...yes...when I'm fitter

30km...no...it's uphill the entire way

30km...yes...be quicker and way shorter if there was a cycle path under the harbour bridge

30km...yes... Try to commute between Rangiora and Christchurch Airport around 3 days a week. Can't do any more as I have kids to drop off and collect. I also use this commute as part of my training pattern.

40-45km…fine

The other aspect of potential for latent demand that is considered here is those who believe nothing would encourage them to cycle (or cycle more frequently) to work. For recreational cyclists, fourteen percent believe nothing would encourage them to cycle, with the majority of these people being from the intercept questionnaire, again highlighting the difference between the distribution methods (Table 5.13). These respondents who perceived nothing would encourage them to cycle were then cross tabulated with their answers to the perception of distance question. Slightly over half of the respondents who believed nothing would encourage them to cycle also perceived that they lived an unreasonable distance to cycle, Table 5.14. On the other hand, this suggests that forty-five percent of people who perceive they live a reasonable distance have significant barriers to overcome for utilitarian cycling. Of these people, the majority drive to work, eighty-four percent, with smaller proportions taking public transport, walking, cycling or other (Table 5.15). It could be assumed that the people cycling do so every day, or on days when they do not cycle have a significant barrier to overcome.

Table 5.13 Respondents who stated that nothing would encourage them to cycle to work

	Frequency	Percentage
Intercept	26	23%
Online	5	5%
Total	31	14%

Source: Recreational cyclist questionnaire

Table 5.14 Respondents who stated nothing would encourage them to cycle

	Intercept	Online	Total
Reasonable Distance	50%	40%	45%
Unreasonable Distance	50%	60%	55%

Source: Recreational cyclist questionnaire

Table 5.15 Modal breakdown for respondents who stated nothing would encourage them to cycle

	Intercept	Online	Total
Car / Van (driver)	85%	80%	84%
Train	0%	20%	3%
Bicycle	4%	0%	3%
Walking	8%	0%	6%
Other	4%	0%	3%

Source: Recreational cyclist questionnaire

5.2.3 Barriers and motivations for cycling

The top three factors for encouraging cycling for recreational cyclists (Figure 5.14) were the same as for the University of Canterbury questionnaire, namely, more courteous motor vehicle drivers, improved cycle routes to work and less traffic on the road. Changing facilities, however, were important and significantly higher than in the other questionnaires. These responses reinforce the theory that safety and provision for cyclists are the most important factors in utility cycling. Improved changing facilities at workplace and financial incentives were the next most commonly cited factors, apart from 'other'. Improved workplace security for cycles and better located bicycle stands both had more than five percent of responses but were obviously of less importance than the safety and traffic interaction issues. This questionnaire, however, did not allow respondents to indicate which factor was most important to them as did the University of Canterbury Questionnaire. In addition, four of the online questionnaire respondents skipped this question entirely including indicating the option that nothing would encourage them to cycle.

Figure 5.14 Factors that would encourage recreational cyclists to cycle (or cycle more frequently)
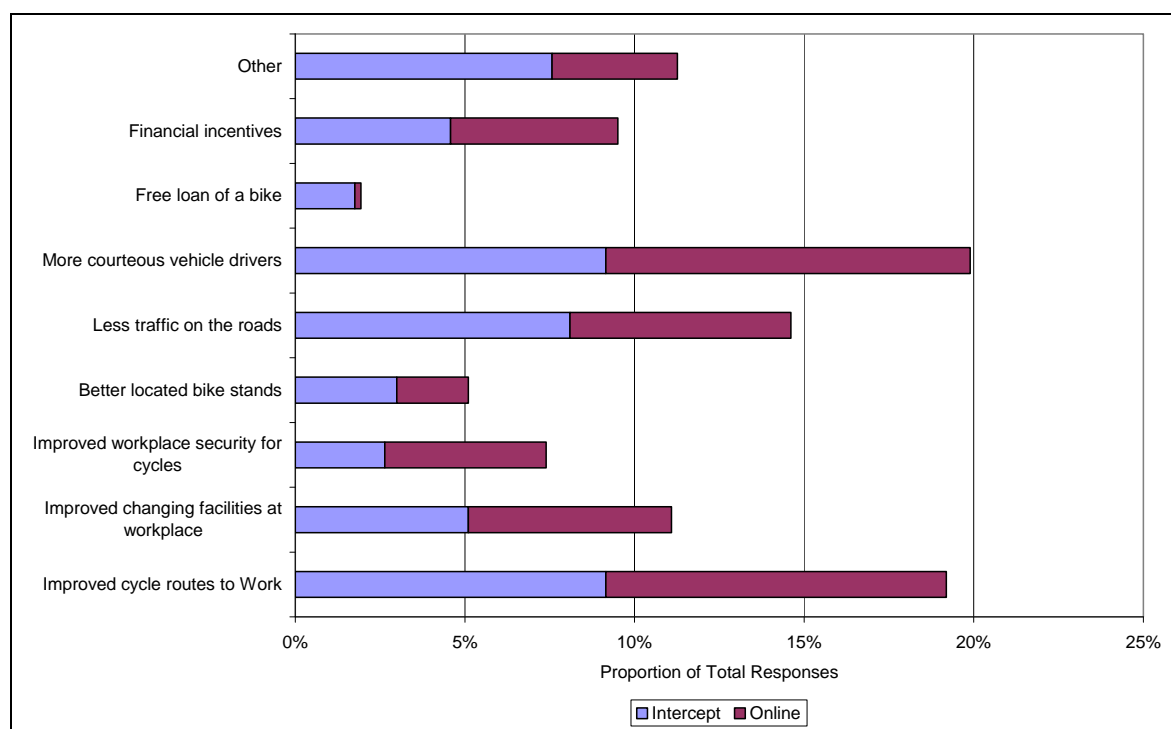
Source: Recreational cyclist questionnaire

5.3 Conclusion

In general, the workplace travel questionnaires had trends for commuter transport patterns consistent with the nationally collected census data discussed in Chapter Four. University

students, with their younger demographics and low incomes, and staff with their predominantly professional composition are more likely to use walking, cycling and public transport than the population in general. Recreational cyclists are also much more likely to cycle than general population figures indicate. There is definitely potential for cycling in all groups surveyed and these people were invited to discuss the issues of utilitarian cycling further in focus groups. With regard to encouraging cycling to work, the most important factors were safety or traffic related, increasing the number of cycle facilities, reducing traffic and having more courteous motor vehicle drivers. Other important factors were showering and changing facilities at work and assistance to purchase a bicycle. Chapter Six will discuss the factors that focus group respondents perceived as important and will discuss why these factors are important for encouraging potential cyclists. A further discussion of cycle facilities the focus group participants would prefer to cycle on is undertaken in Chapter Seven and an overall discussion of the issues and possible solutions will be completed in Chapter Eight.

6.0 Chapter Six – Encouraging Utilitarian Cycling

An objective of this research was to investigate the motivations and barriers for utilitarian cycling perceived by potential cyclists. Focus groups were used to research this objective and the issues discussed included the current mode participants used, their reasons for using that mode and their thoughts on utilitarian cycling. The motivations and barriers identified and discussed in Chapter Two were used as prompts during the focus groups as well as any other significant issues that arose. This chapter deals with the motivations and barriers for cycling, but safety including cycling infrastructure and traffic behaviour, is discussed in Chapter Seven. Data from the questionnaires found that the most important issues were safety related, including traffic and infrastructure. Similar concerns were raised in the focus groups with safety being most important, followed by showering and changing facilities at the workplace.

Primarily, discussions centred around commuter cycling rather than utilitarian cycling in general although many of the issues, such as safety, clothing, luggage capacity, helmets, are similar. There are some specific comments from participants about cycling to other activities highlighting specific issues that are difficult for cyclists, however, the general focus of the comments is on commuter cycling. Firstly, this chapter considers general transport themes including participants' current mode of transport and their reasons for that mode, general benefits and disadvantages of sustainable modes, petrol and environmental factors, vehicle dependency and priority of cycling. Secondly, the chapter considers the motivations and barriers for cycling before drawing some conclusions about recreational cyclists and the most significant issues for encouraging cycling overall.

Specific quotes from the focus groups are used to emphasis points made in this chapter. All the quotes on each issue are laid out in Appendix I under the same headings as used in this chapter. Names and identifying details have been removed from the quotes and participants are identified using their gender, classification and a personal letter. Classifications are student, worker and recreational cyclist. All recreational cyclists were also workers but are specified as recreational cyclists so that specific issues for this group can be drawn out.

6.1 General transport issues

The majority of the focus group participants used the private motor vehicle for their usual transport mode, although there were a variety of other modes also used on an occasional basis. Participants recruited from the workplaces involved in health were more likely to use

a variety of modes and were less dependent on their motor vehicle. In addition, one of the factors in selecting participants was that they lived a reasonable distance to cycle to their workplace, and this was confirmed during the focus groups. Consequently, their reasons for driving to work varied but were generally issues that could potentially be overcome rather than the more entrenched issue of the distance between home and work. Topography was also not an issue for participants due to the predominantly flat terrain of Christchurch, although some participants lived on the Port Hills. Discussions of transport issues also covered the push factors of petrol and the environment, other transport modes and the general dominance of the motor vehicle in New Zealand transport.

6.1.1 Participants' current mode of transport

While participants were asked to discuss why they used their primary transport mode they automatically outlined the reasons why they did not cycle to work. These reasons for not cycling generally included safety, luggage equipment, trip chaining, showering needs after cycling and children, all issues that were discussed in more depth throughout the focus groups. For recreational cyclists the issue that came through strongly was organisation. Several people also commented that they had previously cycled to work, investigated cycling to work or wanted to do so but that they had not fully investigated commuter cycling. These comments confirmed that the focus group participants were potential utilitarian cyclists and had a variety of different reasons that constrained them. Perhaps the most interesting aspect was that environmental and petrol costs issues did not come through strongly, although there were some mentions of these issues.

> *Female recreational cyclist A: I normally drive because if I intend to do something after work... occasionally I do bike, but it's just, load up my lunch, load up my clothes... that's my excuse (laughs)*

> *Male Recreational Cyclist: for me to get into work at [workplace] there is a reasonably direct [route] ... it's not so much the traffic that's bad for me, I am quite happy about that, but it's probably the timeliness of getting to work at the hour of the day when I need to and the other sorts of commitments that I have. Um, I have a youngish family that I have responsibility for getting off to school, and I would find it quite difficult to get them to school and then to be able to get to work in a reasonably timely sort of manner in a condition that I feel fit for undertaking work functions. In my role I need to wear a suit, so I would have to go to work and shower and so there's that added complication about ties and shirts and clean shirts and suits and where do I store all that sort of stuff and where can I find a shower. Work makes it easy, there are certainly lockable cycle places, but it is all the other aspects of dealing with how I need to prepare for a work day that comes into the challenge.*

Female Student B: I carry quite a lot of stuff with me to uni, like textbooks, my laptop which is in a really awkward case to try and both walk with and I guess bike with. It's just, I guess it's convenient also, I mean you can choose when you leave, you don't have to you know, wait at a bus stop. I often stay until quite late in the evening, so particularly in the winter it's kind of like for safety, I live in like a super-dodgy area as well

Male worker C: I live in [suburb], I usually drive to work and I come 3 days a week, and I come with my [child] who is at the childcare centre, the other 2 days a week I work...so I do 1 till 9... somewhere else and then come to work by car, and the Thursday....by car... yeah, I used to bike to work on campus, previously...that's partly it [having to trip chain]...[and having], a passenger, and partly, I mean I come from [suburb] and it is actually quicker on a bike than it is driving, ..., but it's a sense of safety...perceived ... I don't think the traffic is actually that dangerous, but there is that sense of danger

Female worker B: I live over [suburb] a lot of people cycle from there but I don't. I drive most days, usually just because it is easier.

Female worker H: whatever allows me to get to work without getting too hot and sweaty

Female worker L: um, I do a mixture of walking and driving, but probably primarily drive to work, yeah on a day that I do walk it's an hour each way to walk, so I need to be organised

6.1.2 Petrol

Petrol prices have risen sharply over recent years and the resulting fluctuation in prices has evoked wide discussion in the media about the cost of petrol (Brown, 2008; Dominon Post, 2008; Williamson, 2008). Consequently, the cost of travel, particularly petrol prices, was a prompted topic in the focus groups particularly as the cost of petrol is associated with the number of commuters cycling (Dill and Carr, 2003). Interestingly, the cost of transport did not arise frequently from the focus group participants themselves but once prompted was usually considered a factor in participants' modal choice. Generally, petrol cost had not resulted in a change to transport mode, but had certainly given rise to consideration of the cost of transport. Other participants commented about changing their travel patterns and reducing unnecessary trips. There was also the occasional comment about having changed the vehicle that they used for day to day travel. Over the time the focus groups were held petrol prices dropped considerably (Figure 6.1) meaning people were less inclined to cycle as they were no longer worried about the petrol prices.

Figure 6.1 Weekly average components of regular petrol price
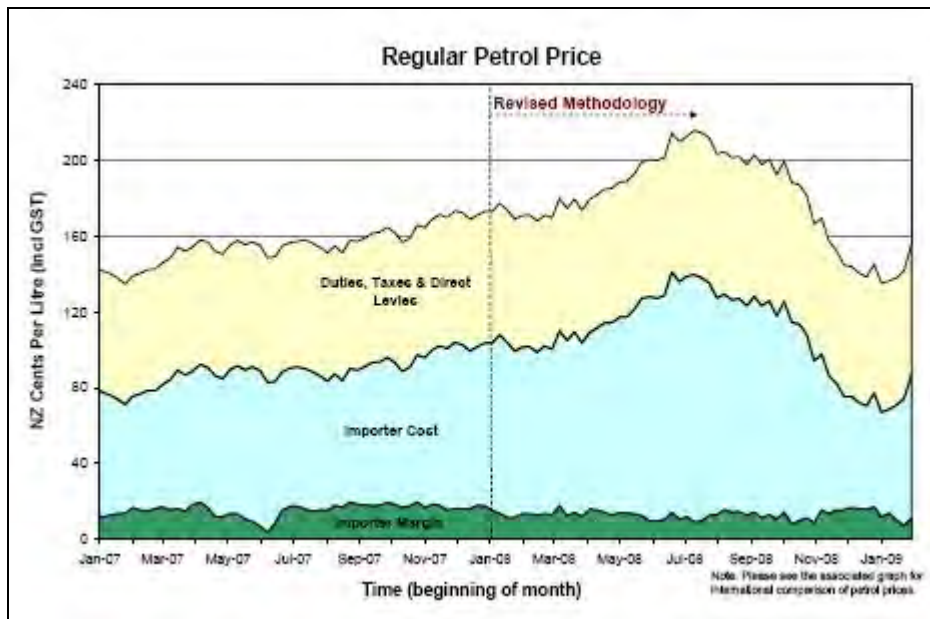
Source: (Ministry of Economic Development et al., 2008)

Overall, it could be concluded that petrol had been a concern to many people but the recent drop in prices meant it was no longer a significant push factor for changing to sustainable transport modes. On the other hand, petrol prices have been increasing again suggesting that petrol prices may well be a factor again in the future. The comments outlined represent participants' comments about the issue of cost of transport.

> *Female recreational cyclist A: it was a factor [cost of travel], but it wouldn't, it's definitely not my primary reason*
> *Female recreational cyclist B: no I noticed it [cost of travel] about the petrol but I didn't use the car any less*
>
> *Female student B: it's almost become to me, to use the car is like, I guess a treat really rather than just something I do in the background of my life, it's like an actual decision "I'm going to drive" because, and not do something else maybe... I don't use it on the weekends anymore... I go on the bus sometimes or I just walk with friends... or my boyfriend's car's cheaper than mine (laughs) so,*
>
> *Male recreational cyclist: I was going to say I think from a personal perspective that's something I've noticed as the price of petrol increased, more and more bicycle users are apparent, that whole concept of, I should be doing something different became much more heightened as the price of gas rose. But as it has dropped I don't get the same due cause, in fact thinking about driving home tonight how much gas you would use, how careful you would have to be about accelerating, I don't think about that at the moment because the price of gas has fallen sufficiently that actually it is a minor consideration therefore it is not consideration to look at alternatives. And I actually in many respects, the heightened price of petrol made alternatives, considered more at the time.*

> *Female worker M: And I just got a new car last week which is far more economical that what I was driving, I was driving a four-wheel drive a diesel. So um, yeah. It was smoky sometimes*

6.1.3 Environmental issues

Environmental concerns, including air pollution, arose occasionally during the focus groups, most often after the researcher prompted. In general, participants did not see environmental issues as a major motivation for adopting more sustainable transport behaviour. There were some comments that suggested participants had considered the need for more sustainable practices but were not ready to personally change habits for environmental reasons alone. The other issue that arose was air pollution with participants being concerned about breathing increased amounts of air pollution when cycling as opposed to driving.

> *Female student B: I think it's an environmental thing as well, I mean for me it's kind of, the cycling seems like a better long-term option maybe for a lot of people living in the city, than cars I think, it's kind of, cars are number one, way, way, number one, way up there, but I think that probably needs to change, particularly in the city*

> *Female worker H: I also wonder, personally, in the winter, if it's really that good for you with some of the air, especially early in the morning it can be quite smoggy*

> *Male worker E: my view there is that it's[air quality] a lot better than it was 20 or 30 years ago when everyone was cycling*

> *Female worker F: not so much for me [fitness]… so for me it's more, I guess helping the environment, less cars on the road and I probably should be cycling all the time anyway because it's such a short distance so*

6.1.4 Comparing walking and cycling

Other modes of transport were used by participants for various reasons, including the cost of travel, environmental issues and personal preference. In several cases participants mentioned walking to work currently or previously, for long distances. Some people had walked up to one hour each way to work and also mentioned they would like to cycle as this would cut down on their transport time. In general, the reason people chose to walk as opposed to cycle was that they perceived walking as safer and more relaxing. In particular, having space on the footpath removed the issue of having to be constantly vigilant for traffic on a bicycle, making the journey by foot more enjoyable. In contrast, recreational cyclists commented that they preferred cycling as an enjoyable mode of transport. These comments highlight the issue of transport being enjoyable, suggesting that people will

cycle more frequently if the journey is pleasant and relaxing as opposed to the current perceived stress of cycling.

> *Male worker E: ... I find the attraction of walking that I can organize my day and my thoughts, walking isn't for me an issue where you need to watch out for traffic much, and I also have quite a scenic walk including a section along the Avon river.*

> *Female recreational cyclist B: I used to be a walker, or walker/runner but now definitely prefer the bike for exercise anyway, and for transport... it's just faster, you get there quicker wherever you want to go*

> *Female student B: I would say cycling is more dangerous [than walking]*
> *Female student A: me too, yeah, me too, only because we have the street and we have to be by the car, walking we have the footpath and we don't see the cars crossing the footpath (laughs)*
> *Female student B: not usually (laughs) every now and then*
> *Female student A: every now and then, but I feel much more exposed to danger when I'm cycling, definitely, I think it's not about the actual rate of accidents*

> *Female worker F: I find [walking] more relaxing, I do that on the way home*
> *Female worker G: you're not so conscious of space when you're walking, whereas if I'm on the road on a bike I'm always, you know, thinking what car's behind me or when I need to turn*
> *Female worker F: what's that car door doing?*
> *Female worker G: yeah, who's going to open their car doors or walk in front of you*

> *Female worker I: but I never daydream on a bike, never, ever, ever, I think I'm hyper vigilant, I'm just looking around all the time, I just never, ever allow myself to, like you walk to work and you can think about things*
> *Male worker E: you can switch off*
> *Female worker I: you do that in traffic more, but I feel like I'm thinking on behalf of the drivers as well as for me, and that's quite stressful, but I'm used to it*

6.1.5 Buses

Public transport was also used and discussed by participants. Pucher and Buehler (2006) theorised that Canada had higher levels of cycling because the population was overall less car dependent, partly due to their access to sustainable modes including public transport, as discussed in Chapter Two. Buses were discussed by participants, particularly in regards to the convenience of bus routes and time between participants' homes and workplaces. Many participants had to take two different buses to get to their workplace and found this too time consuming compared to taking their vehicle. Several comparisons were drawn with travel in other cities, with people mentioning they were happy to use public transport elsewhere and that the services overseas seemed to be more reliable and frequent than in Christchurch.

Female worker A: in fact I'd probably rather cycle than catch the bus

Female worker L: um, I have to catch two buses so that's another incentive to wanting to either bike or walk, because by the time I would wait to get two buses, because first of all, I mean it's so close here but there's nothing direct here

Female worker M: I can get into work probably on one bus, but its then going out during the day ... um but it's also that concept of buses which is quite difficult, um I'll use a bus quite happily when I'm away or overseas, but in Christchurch I very rarely use them. And I went down to use the bus a month ago deliberately and I'd missed it ... I was pretty sure that I was right on time too, but that whole reliability thing for me.

Female student B: there's just one ... but still it's a frequency thing as well, (yeah) each bus only comes every half hour

Female student C: there's also time constraints, for me, living where I do live, if I want to bus it's an hour and a half for two buses and so like, it would be easier for me to put my bike on a bus ..., [child]'s bike on the front of the bus, head into [school], then hop on my bike and cycle the rest of the way to uni.

Female worker C- Yes I do [have a direct bus route], but ... the car is more convenient.

Female worker N: I was really interested that the buses weren't cheaper; I know that sounds really silly

6.1.6 Vehicle dependency

The primary modes used by participants and their comments regarding sustainable modes such as walking, cycling and public transport suggest that Christchurch is very motor vehicle orientated. This finding is reinforced by the comments made by some participants, in particular the necessity of owning a car in Christchurch. Motor vehicle ownership is high in Christchurch, as discussed in Chapter Four, and these findings also link to the issue of car ownership discussed in Chapter Two.

Female student B: ... here everyone is expected to have a car and if you don't have a car you're either really, really poor or something else (laughs)
Female student A: yeah ...you're choosing not to... it's quite interesting, I mean is there a class system of transport here? I mean people sort of drive more 4 wheel drives here in Christchurch

6.1.7 Priority of transport

In New Zealand, transport planning tends to prioritise motor vehicles above sustainable modes including cycling. In Europe, however, sustainable modes are more important in transport planning with resulting higher levels of sustainable transport use. In contrast with the views of the focus groups, three-quarters of European Union residents think that

cycling should be given priority over motor vehicles even if motorists are disadvantaged (Tolley and Hallsworth, 1997). In some focus groups, discussions centred on the topic of the priority given to modes of transport and whether New Zealand should put cycling at a higher priority level. In general, participants thought planners should place more focus on sustainable modes, but that motor vehicles should still have a high priority in the transport system. Their reasoning for maintaining the priority of the motor vehicle was the current social status and dominance the private motor vehicle has as a mode of transport in New Zealand. There were, however, some people who said cycling needs should be placed very highly in the transport system.

> *Female recreational cyclist A: it [priority of transport] needs to be equal, maybe not predominantly but just more accepting of cyclists, I mean Christchurch has got a huge cyclist population probably, but I guess for the size of the city it's amazing it is so big given some of the, um, what's the word, barriers I guess there are, maybe it's more accepting of cycling, if that's the right term*

> *Female worker A - Yeah think that [giving pedestrians and cyclists priority] would be wonderful. I think they should build cycle lanes that have curbs that only have cycles in them like in the Netherlands. Or I was in Belgium for a few months earlier this year and there they have cycle lanes that were off the road and were for just these people cycling to University on university cycles, it was wonderful.*

6.2 Motivations and barriers

The following sections cover the findings from the focus groups relating to the general motivations and barriers for utilitarian cycling. Firstly, some workplace issues are presented including bicycle parking, work transport and showers, followed by the luggage constraints of the bicycle as well as cycling equipment. The issues of time, organisation and trip chaining are then discussed before issues of fear including night time cycling and confidence. Finally, distance, weather and gender are discussed before the more minor issues of cycling culture, fitness, enjoyment and punctures.

6.2.1 Bicycle parking

In general, most workplaces appeared to have plenty of bicycle parking, usually undercover and often including lockable bicycle storage. One workplace had an issue of a limited amount of space available and would potentially have to look at expanding available spaces if more people commenced biking to work. There was one person who was concerned that their workplace did not have a lockable facility, but this did not appear to be an issue to other people. On the other hand, while some bicycle parking is freely available, it is not always in the most convenient of locations at large workplaces.

Female recreational cyclist A: yeah, that's fine [bike parking at work]
Female recreational cyclist B: yep
Female recreational cyclist A: plus with the basement that isn't even being used as well, [space for bike parking]
Female recreational cyclist B: yeah, absolutely no problem there, lockable bike sheds

Female worker G: there's also the issue of where you put your bike, there's nowhere safe over in Manchester Street, they're talking about upgrading the bike, but you can just get into the bike sheds, … so it's ridiculous, I've only ever biked to work once, and I brought my bike with me up to my office, I'm not leaving my bike outside
Female worker C: and our one here gets full pretty quickly doesn't it
Female worker G: yeah, there's one, there's two rooms, and one of the rooms you can get locked in, I was a bit late leaving and it was about quarter to six and if I was two seconds later I would have been locked in and I wouldn't have been able to get out

6.2.2 Work vehicles

Another difficulty with transport to work is the need to head offsite during the day for work related reasons. Therefore, people who mentioned they had to go offsite were asked if they had access to work motor vehicles and how much of an issue work travel was when they made their modal choice. In all cases, work vehicles were available to participants although there were varying levels of access. In the case of the CDHB workplaces, participants had ample and easy access to the work motor vehicles or taxis and no requirement to use personal vehicles. For participants from the University, however, there was more difficulty in using the available work vehicles, particularly for people not working at the main campus site. The primary issue for these people was not the lack of vehicles available, rather that they still had to travel from their workplace to where the work vehicles were located, usually with equipment. The recreational questionnaire findings noted that driving a company vehicle was a common reason for driving to work as opposed to cycling or taking another sustainable mode. Company motor vehicles did come up again during the focus groups and would be an area of further research.

Female worker L: I'm out and about but we just use the work car, so there's no expectation to have to use your own car

Female worker N: Well that's the difficulty, we are [location] and the fleet cars are here on [main campus]. So if for example I am going [offsite] and I don't take my own car, then I have to get a taxi to here to get a fleet car and then I have to pick up a car here … we can get reimbursed for our mileage if we use our own car, but it actually is quite frustrating because if you are going out of town, like I went to Timaru yesterday, I left about 6.30 in the morning, and its like do I get up an hour earlier to get there to pick up a car, so its just a timing thing, and then if you are

going over a certain distance you use a rental car, and if I am taking a rental I'll get my husband to drop me off. But the only other difficulty is the budgets, we try to put together. So if I'm going to the Coast for example, and I'm leaving 9.00 at night where I am going to have tea. Sorry. So transport is a very big part of my work. So yeah, our carbon footprint is shocking when you think about it.

6.2.3 Work facilities

One of the differences between active transport and driving to work, or even taking public transport, is the exercise completed by the commuter. For most people, after undertaking such exercise they want to shower and change clothes. Consequently, it is important to investigate whether workplaces have adequate facilities for showering, changing and storing clothes. This issue varied between the different workplaces that focus groups were recruited from for this research and, therefore, the barrier that the lack of these facilities could cause also varies. There were also several comments from people who said they would be cycling for transport rather than exercise and would therefore cycle at a rate that would result in little perspiration and no need to take a shower or change clothes. Another aspect of showering facilities was their location within large workplaces, an issue at the University. One suggestion was to integrate showering and changing facilities with the lockable bicycle parking sheds to increase convenience and ease of use.

On the other hand, there were several comments of people not being aware of the available showering and changing facilities because they had not investigated them. This lack of awareness often appeared to come from the fact that there are other barriers that are more significant than showering when considering commencing to cycle for transport. Students had more difficulties, particularly from the undergraduate perspective, because they do not have their own space and are forced to use more communal facilities for storing equipment, as opposed to post-graduates who usually have dedicated space in their department. Often discussing showering and changing facilities brought up other issues, such as the time it took to change needing to be factored into the day, and having to carry extra items on your bicycle.

> *Female worker L: we don't have showers in the [workplace], not that I'm aware of but I guess that to me probably isn't a barrier because I live quite close and I do other forms of exercise so I wouldn't be cycling for exercise, I'd be cycling to like save money and to kind of better for the environment, because I do other activity outside, so I wouldn't probably be cycling here in a mad dash where I'd break out in a sweat, so I'd be kind of quite happy to bike here and not worry about showering*

Female recreational cyclist A: um, I haven't used the showers at work I have to say, um, and I haven't used lockers, I work in an office that we can, we lock the door anyway … so that kind of isn't an issue for me as such, um, yeah and I haven't checked out the showers so I don't know

Female worker N: certainly showers, don't know about clothing to be honest, I haven't investigated that, I guess I've kind of dismissed it because of the other constraints which is the timeliness issue more than anything else.

Female worker M: Yeah, yup. [have showers] That wouldn't be a problem. I'm all set to go, I just need safe roads and I'm off.

Male worker A: at [workplace] that's one of the issues, to have a shower, a place to hang a suit overnight, this isn't...
Male worker C: you guys must bike faster than me if you need a shower (laughs)
Male worker A: yeah, I wouldn't dream of biking to work if I hadn't had a shower, if you've done some physical exercise
Male worker C: yeah, and it would be physical exercise

Female worker A: I struggle to get biking for a number of reasons, one of which is that I'm lazy and I don't like getting up to much of a sweat in that, but I'd like to do that for fitness purposes, but I think the real barrier for me is that I arrive and I'm like, you know, messy and I really need a shower badly. There is nowhere to have a shower close to where I work, I have to trek halfway across the [workplace], and as far as time wise, you know, appearing for work at the right time, it's making the thing so much more um, its taking up so much time...Yeah, if we had a shower in the [department] where I work that would be great. It'd be perfect. … I could park my bike reasonably close to the [department] and pop up there and have a shower.

Female worker B: We've got lockers, if we want them … [but no] place for changing and showering.

Female worker C: I think it makes more sense to have like a situation where you could keep some stuff in your locker near where you work and have the shower right there as well. And so you've got all this stuff and you don't have to go out in public with your toiletry bag with you, you could leave one in your locker and its right next to the shower. So that would make a lot of sense.

6.2.4 Luggage capacity of the bicycle

One of the obvious differences between the bicycle and the motor vehicle is the luggage capacity of the different modes. When discussing showering and changing facilities the issue of having to carry more clothes and equipment was raised, but for most workers or students there is a variety of other items that need to be carried, for example, books and laptops. While it is possible to outfit a bicycle with luggage capacity most participants said they would use a backpack. One participant mentioned they had a basket on the front of their bicycle, despite the negative image this can invoke. Generally it seemed that participants were more concerned about other issues and had not fully contemplated the

idea of how they would carry equipment on their bicycle. It was mentioned that people would not purchase specific luggage equipment until they had tried cycling and were in the habit of cycling regularly.

The issue of luggage capacity was also significant for other utilitarian travel, such as cycling to shopping facilities. In general, people were concerned that they might shop somewhere and be unable to take purchases home on the bicycle. There was also the associated issue of security that arises with luggage on your bicycle. Firstly, it is not easy to lock items to the bicycle and secondly bags often cannot be taken into shops but there is no safe location to leave them while shopping.

> *Female student A: it's kind of one of the reasons I put a basket in front, I mean, to me if it works for me, I don't really care what people think (laughs), it may not look pretty but I like it, so I have it*

> *Female recreational cyclist A: I've got my back pack*
> *Female recreational cyclist B: yeah I use my back pack*

> *Male worker C: I live in [suburb], and at [suburb] shopping area there is just about everything that you need around you, and you can get around quite easy on a bike, the problem with a bike often is that you go to Mitre 10 and you buy a garden shed, well, you can't bring that home on your bike, or you go to Mitre 10 not planning on buying anything, but you buy a whole lot of **** and you can't bring it home on a bike anyway (laughs) same… like we always try to go to the supermarket, it's not an issue about one little green bag, it's about 10 little green bags, and you're just going to say well, you've got to use the car, but yeah, a bike that could store stuff, like if you're thinking about…*

> *Female student C: the other thing is you're going to a shop and you've got your backpack, you've got to leave it at the door, and they're not secure anymore, and I've left my backpack and someone's come along and whipped it and it had my library books and some other things in it, so I had to pay for them*

> *Female worker B: Um well I can get my laptop and some books in my backpack and when I cycle that's ok. If I've got boxes of stuff then I wouldn't even think about cycling*

> *Female worker D: I can't answer that question really without actually doing it, but … even then I'd still be up against the fact that there are times when I'm carrying stuff that I really wouldn't want to have to carry around on my bike or my bag on my back or something, I mean I could pare it down a bit I suppose, but it becomes just a military campaign just to do that, but probably I would have felt a bit more motivated too, I mean the balance of all the things on one side or the other are pretty heavily favoured to stay in the car*

6.2.5 Cycling equipment

While cycling is seen as a cheap transport mode there is an initial set up cost of getting a bicycle and then the costs of purchasing safety equipment such as lights and fluorescent (fluro) vests. In general, people were not concerned about the cost of the safety equipment as they stated that if they were going to cycle they would purchase appropriate equipment. A few people were concerned about the cost and would not purchase such equipment, however, the general conclusion participants came to was that safety equipment was a necessary part of setting themselves up for cycling. Participants who had cycled occasionally were more likely to make comments that they ought to have safety equipment compared with participants who had little experience of cycling.

> *Female recreational cyclist A: I haven't got one of those either [fluro vest], I probably should have*
> *Female recreational cyclist B: yeah, I have to say I did get myself a fluro vest*
>
> *Male worker E: I have one general comment, which is that cycling is relatively cheap to get into in terms of other forms of transport, I bought my wife a 12 speed bike off Trade Me for $70 and all we did was get her a better seat and a helmet and to me that's pretty cheap, for getting a form of transport*
> *...*
> *Female worker F: you've got to do it [getting equipment] in stages really...*
> *...*
> *Female worker H: I actually prefer to wear a backpack[than have panniers] because I find it's more stable ...*
> *Female worker F: I've never ridden with them [panniers], I don't know whether I'm going to like it or not*

For the people that did not own a bicycle, some had investigated purchasing and others had purchased a new commuting bicycle. These people had mixed views on the topic, with some participants mentioning not knowing much about purchasing a bicycle posed a difficulty and were nervous about doing so, particularly when they had other issues that were significant when considering commencing utility cycling. When it came to people who had purchased a bicycle some had found a bicycle store very helpful. On the other hand, others found the range of bicycles available in New Zealand was restrictive for commuter cycling.

> *Female worker L: yeah, it's just kind of knowing where to start, I don't know...what type of bike do you need, I guess probably the main barrier is maybe safety, like I don't know the road rules on a bike and*
> *Male worker D: same here*
> *Female worker L: and that's probably the biggest thing for me in buying a bike is not actually knowing, like I can ride a bike, but not actually knowing all those things*

Male worker F: it's easy to carry things [walking], a bit hard on a bike, unless you've got the right bags set up and that, but I mean interesting talking about going in and buying a bike, um, it was just by chance there was a cycle ...we actually got a bike for half price, so you get a very reasonable bike, and the thing about it is getting on the bike and taking it for a ride, and they actually set it up for you, so they set up, 'oh no, that seat's a bit low, let's get that right', just go around the car park and test out the gears and that sort of thing too

Male recreational cyclist: I'd probably look at a different cycle to the one I've got as well, I mean I've got a mountain bike, I wouldn't actually choose to ride that to work because its actually not that great for cycling on the road.
Female worker N: I think that is a good point, um if you need a different bike from the one you have now that is something to consider

I: do think there's less available in New Zealand in a way?
Female student A: yeah, and you know the size of it as well, for me like I have short legs so I can't use a lot of bicycles that have been sold here because they're too high for me, and back in Japan we would have tones of those shorter peoples' ones available, it's just availability

Male worker C: yeah, there's some interesting things about that, one is that if the design, if bicycles were designed better...like if you want to buy a commuter bike there's only one style per brand, if you want a road bike there's about 100 different styles per brand, but if you want a commuter bike there's only one style and it's basic, it hasn't got any of the extras on that you actually might like, for commuting around town in terms of doing those things, so you then have to buy a carrier, and all this other stuff

6.2.6 Clothing

One of the issues with cycling is that people often prefer to wear different clothing when cycling than when taking other modes of transport. This preference is tied up with the issue of sweat as discussed above regarding changing and showering facilities, which arises for most people when undertaking a physical activity. In addition, there is also the issue that clothes for one situation may not be appropriate for another. University students mentioned this as they could attend education in casual clothes, as compared to workers, but these clothes may not be appropriate for going to other places on the way to or from University. Overall there was a definite perception that cycling to work in a suit or business attire would not be the first choice for participants. Consequently, the issue of clothing and sweat also ties back to previous issues of luggage capacity, having to carry extra changes of clothes, and time. Time arises as a factor due to the extra time it takes on arrival to make oneself presentable through changing and showering.

Female worker M: ... You know, getting into this type of weather, particularly in the summer where, you know, and in the type of job I have where your students are

disappearing shortly, you've kind of got a window there where you can be more casually dressed. That's the time when I would, you know, look at that type of activity...

I: so you don't want to come in and change?
Female student B: yeah
Female student A: no, so if I'm cycling here, I just wear jeans and comfortable shoes and then I would know what's happening for the rest of the day, for sure, because if I feel like going shopping afterwards I can't.
Female student B: yeah (laughs)

Female recreational cyclist B: personally I haven't [perceived clothing as an issue], but that's probably more about me not feeling pressured to do that, but I can easily see how some people would for sure
Female recreational cyclist A: yeah, I'm all for my own choice, I'm quite independent enough to, I mean I actually like that look, but it's what I can afford and so I just go for choice and I just wear comfort I guess, more seasonal, practical, you know
I: because you've both indicated that if you were cycling to work you'd probably wear something down and then get changed, would that be true?
Female recreational cyclist A: yes
Female recreational cyclist B: yep

Male worker F: I mean I just tend to wear pretty casual, I will not be seen in lycra, I will not put on lycra, I will not wear lycra (laughs), you can put in quote and unquote, 'I will never wear lycra', so if there's one thing you get out of this, I will not wear lycra, that's a fact, no, I just wear whatever's comfortable and then it's easy enough, I've done it other times, is fold your trousers, fold your shirt up, have it in a bag, you know, and you have your toiletries and stuff and you go and shower when you get here, usually you're here early enough to give you, for me I've got about quarter of an hour to cool down, you know, and then you can go and have a shower, get changed and that's it for the day

Female worker J: it's not the fact about being hot and sweaty, it's the fact that it eats into your time when you get into work to get showered and changed
Female worker I: and you have to carry your clothes with you
Female worker G: you have to carry everything, yeah
Female worker I: we do have lockers but you've still got to get your clothing here and no hooks anywhere and you think, oh ****

6.2.7 Helmets

Helmets are another issue linked to the clothing people wear when cycling. In New Zealand, helmets are compulsory for cyclists since the introduction of the law on the first of January 1994 (Taylor and Scuffham, 2002), however, there is the issue of 'helmet hair' and people being uncomfortable or 'uncool' when wearing a helmet. One of the prompts, therefore, was asking participants whether they would continue to wear their helmet if the law was changed so that it became optional. There was almost complete agreement across

all focus groups that people would continue to wear their helmet due to safety reasons. There was some discussion around the benefits of not wearing their helmet and there were several participants who would prefer to not wear a helmet. The conclusion drawn by the groups was that in the current situation in New Zealand helmets were a necessity, but people would prefer to not wear helmets if safety could be improved. There were also several comments that the number of people cycling without a helmet was increasing and it did not appear that the law is being enforced.

> *Female student A: I would be happy to cycle in high heels if I felt comfortable, but then again you know, the helmet, you have to wear the helmet, back in Japan I didn't have to wear the helmet, but it's a safety thing so I agree with it*
> *Female student B: well, even that puts people off, I was just going to say that on the girl question, why they don't, I think it's also the 'cool' factor of wearing it*

> *I: if the law was changed and the helmets were optional, would you still wear your helmet?*
> *Male worker F: yes, too many close calls*
> *Female worker L: yeah*

> *Female student A: in New Zealand, with the circumstances, I would never cycle without a helmet, I don't think it's safe, I think it's far too dangerous*

> *Female worker A: I'm surprised at how many people don't wear a helmet, um particularly around here. I mean I don't know why you wouldn't wear a helmet when you were cycling*

6.2.8 Time and organisation

An issue that was more open to varying perceptions than safety and equipment was travel time and the associated issue of organisation. This issue encompasses the time taken for travel, including the perception of whether it is faster or slower than other modes, and also the extra time that people perceived was required to get organised to cycle to work. In most cases people perceived cycling to take a similar amount of time as driving to their workplace, particularly if this was at the peak commuting time of the day. Alternatively, participants were happy for their trip to take a little longer than normal as they enjoyed cycling. In general, it appeared that those who were more open to the idea of cycling perceived the time factor as less of an issue than those who were less interested in cycling. For recreational cyclists, the time issue was that of getting organised for the bicycle ride would take as long, if not longer, than the actual ride and would have no direct benefits to their training or recreational activities.

> *Female student B: ...it would depend what time of day I was going from my house because I live near two schools, so at 8.30 in the morning it's just crazy, the traffic,*

and my flatmate always sees me[in my car in traffic] then when he bikes, ... no it doesn't really bother me really because I like the fresh air and I like the exercise, if I've got the time

Male worker F: but I've found even like biking home, I would get home at the same time as I do in a car, um, you're keeping up with traffic, and actually when I worked out at [suburb] you were actually faster ...

Female worker I: and its [arriving wet] all taken time out of your time to get yourself sorted again ...
I: so it goes back to the time factor primarily?
Female worker G: yeah
Female worker J: especially when you've got children and you're trying to get your hours in, but the time you've got them to school you're not getting here until nine, if you've then got another 20 minutes that takes you till 20 past nine, where do you make that 20 minutes up? It's an eight hour day

Female recreational cyclist B: not unless I did it [training] after work, and left my bag at work, I've done that when I've worked in the weekends, I've sort of biked to work in the weekend and then done ...whatever the training is and then come back, that's the only way I'd incorporate it into my training, because 7 minutes is nothing,
Female recreational cyclist A: it takes longer to pack all my stuff up
Female recreational cyclist B: seriously, yeah, absolutely
Female recreational cyclist A: yep, go out to the garage, get my bike out of the garage, lock the garage up
Female recreational cyclist B: yep, absolutely

Apart from the time taken to cycle to work, there was also the issue that participants stated it would take longer to get ready to cycle to work than to drive. The factors that contribute to the extra time required were packing required items into appropriate bags, getting the bicycle ready to go, locking the bicycle up at work, and for some showering and changing after arriving at work. Where this issue was raised by participants it was from those who had tried cycling to work and from recreational cyclists. For these people, the organisation factor was often one of the biggest deterrents. Recreational cyclists also admitted that there is an element of laziness in not making the effort to get organised to cycle to work, which is not evident in most of the other participants' comments. This factor also arose during recreational cyclist questionnaire data presented in Chapter Five. In addition, the participants who had children mentioned that this was an additional factor that made cycling to work difficult organisationally, particularly in the morning.

Female recreational cyclist B: getting organized... for example tonight we have this spin class after work, we've done what about six or seven weeks of that, with one of those I cycled to work
Female recreational cyclist A: oh did you

Female recreational cyclist B: yeah and then went to spin and then cycled home and that was absolutely fine, and I just happened to have been organized enough to do that, other nights, um, we have bunch riding on a Wednesday night after work, I really do need to go home and get my bike and then go because I just, I guess I could leave my work stuff at work, yeah, I don't know, it just becomes far too difficult

Male worker F: um, no I suppose I've got very little barriers because I've been on a bike before and it's just getting back into practice of using that instead of the car, you know, the car's being used out of pure added convenience more than anything, I mean if it was a short walking distance to a shop, yeah likely to walk not cycle, it's easy to carry things, a bit hard on a bike, unless you've got the right bags set up and that...

6.2.9 Trip chaining

Another barrier to commuter cycling is trip chaining, completing several different tasks at different attractors, such as shops, or appointments, during the same trip away from home. Often participants perceived that they would only cycle to work and would not complete other tasks on the journey for a variety of reasons. One reason was that sometimes the distances or logistics prevented cycling. Another was that trip chaining required more organisation preparation for the trip to be undertaken. Trip chaining also links back into luggage capacity as often trip chaining included shopping. Another problem was emergencies that arose during the day, particularly in the case of children, that require picking someone up and transporting them places, which can be difficult on a bicycle. While participants had ample access to work vehicles there was no indication that they had similar access to transport for emergencies.

Female worker L: I mean if I had something else on, I probably wouldn't do it every day, um if I had something on after work then I'd have to bring the car or go on the bus

Female worker H: but mainly I don't cycle because I've got quite a few things to do on the way home

Female worker B: I guess a lot of the time I go to the shops after work so I wouldn't do that on a bicycle because I'd have too much stuff to carry, I mean there would be more than you could get in a backpack. Um and if I had to go somewhere else often it would be late like I'd go into town to do something in the evenings, or I would wait at work and then go um then it would be dark and I wouldn't want to cycle at night for safety reasons. Um so yeah, I guess it's not worth it. So yeah, doing those other things, I probably wouldn't do them on a cycle. But I guess you could start re-arranging things so that if you did have the car one day you could do that, you know, plan your timetable a bit better, rather than, oh yeah ill just do that today because I have the car

I: how do you, you mentioned like if you were going somewhere else after work, you'd bring the car, how much do you think you would cycle those other activities, so you know, if you're going down the road to the shops, would any of you cycle in that instance at all?
Male worker F: no
I: would you consider it, or?
Female worker L: yeah, probably would, in [suburb] I'd walk to the shops though because they're really close, so, because I don't have a bike at the moment, so, yeah, like I'd walk to the library or to the bank...but if I had a bike I could...[go more places]

6.2.10   Night time cycling

Cycling after dark presents different difficulties to cycling during daytime, specifically that people can feel less safe due to reduced numbers of people around or because there is limited visibility at night time to be seen in advance. On the other hand, some people commented that they preferred cycling at night time as there are fewer people on the road meaning the significant issue of safety due to traffic is almost neutralised. Discussion was raised over what times people would cycle until, particularly in winter. Most people were prepared to cycle in the dark if there were still people around, for example, until approximately six pm in winter, or nine to ten pm in summer. There also appeared to be a gender difference in the safety concern. Females were more concerned about personal safety resulting from reduced people on the street while males were more concerned about visual safety in the darkness. While the issues of physical safety on the road are discussed in more depth in the next chapter, overcoming the barrier of perceived social safety at night time is not a focus of this thesis.

Female recreational cyclist A: like during winter, um, because it's just, it's dark quite early in the mornings and it gets dark quite early in the evenings, um, that kind of does put me off

Male worker F: yes, at night you don't have as many cars on the road, there's a big difference between biking home at 5 o'clock and biking home at 8, because you found that traditionally when biking home at 8 in the morning, cars, all the traffic's going the other way, you're going home, they're all heading to work, whereas when you're actually at 5 o'clock it's all there, it's actually 'oh, game on', you've really got to concentrate on what you're doing (laughs), but going to work, I worked at midnight for a while and going to work no problems at all, you were lucky if you saw ten cars
I: so the visibility issue doesn't worry you?
Male worker F: no, because you're going through lit streets and that, if you were going on dark streets it would be a bit different
I: how do you feel about it?
Female worker L: I wouldn't bike either because I'm probably more a morning person than a night, so I go to the gym, like a couple of mornings I do a class at

6.30, so there's no way that on those days I would bike from home into town to [the gym] and then bike from [the gym] to work and then home, because I'd have to get up so early and it would be dark, maybe not so much now, it's quite light in the mornings, but definitely in the Winter I wouldn't feel safe

Female student A: safety would be a big thing for me too, yeah, well I mean, at the moment the weather is getting warmer and the day is getting longer, so I don't have to worry about that nearly as much. But it does help to feel safe and at night time, cycling doesn't feel safe.

Female worker H: I won't cycle then [at night]... I'd have lights... you have to have lights
Female worker I: you need to be a bit more prepared definitely, need to have lights on your bike that you can actually turn on when you need it...
Female worker H: are you just meaning in the dark or like 6 o'clock can be dark sometimes, or do you mean 10 o'clock at night?... yeah, I'd feel less safe at 10 o'clock..., there's less people around...wouldn't really like walking in the dark at about 10 o'clock, but I could probably...
Female worker F: probably the traffic would make you feel safer, surely, or not, or do you think there's a different type of traffic?
Female worker I: yeah
Female worker H: yeah
Female worker F: more boy-racer types, crazy guys,
Female worker H: people that want to grab you and hurt you

6.2.11   Confidence on a bicycle

Confidence appeared to be one of the issues that highlighted the differences between participants with more past experience cycling and those who had only considered cycling for transport and never or rarely attempted to do so. Those with past experience cycling were more likely to cycle in the dark and were in general more confident on the road. While several people had concerns about their ability on the road, women in particular had more concerns about their skill level for cycling. One aspect was having the confidence to cycle on the road, particularly knowing how to navigate intersections, including how to correctly use cycle infrastructure. Several inexperienced cyclists mentioned that they did not know where they should position themselves as a cyclist at intersections. This lack of knowledge however, did not appear to arise from the inconsistency of cycle lanes. A related issue was a fear of acting incorrectly and having people, particularly vehicle drivers, act offensively towards the cyclist.

Female worker L: I wouldn't be because the way that I come would be down the main roads and there would be like two intersections and then a round-a-bout, so I wouldn't get through (laughs), like I would if there wasn't any traffic coming, but I would, I obviously need some training because I don't bike on the road

Female student D: yeah, you're very nervous about things

Male worker D: intersections are probably the biggest worry for me, I mean do you sit in the queue at the back, or do you ride to the front and, like most cyclists, if I'm, as a driver I seem to recall that cyclists would come right up past the big long queue and sit at the front, and I think "oh lucky you", but when I'm cycling I'm wondering well is that an appropriate thing to do? Or is it even a safe thing to do? ...
Female worker D: I felt very unsure of just how I was expected to behave, in fact I felt very much, having ascertained that the car drivers were sort of pretty aggressive on the whole, that I needed to take a sort of submissive sort of role here, and what would I have to do to be least provocative to the motorist, and I sort of don't really want to be in that position either frankly, you know, not knowing what I was doing was right or wrong or safe or unsafe, but what would be the least provocative...
Male worker D: well it's true, you're absolutely right because, you know, the same feeling, no one wants to have someone yell at them or a loud toot or something like that, you know, with a horn, yeah, I guess
Female student D: that's something also, I mean, I don't bike, but I don't know what to do, well I wouldn't know what to do in an intersection on a bike, like where do you sit, and like there's one little intersection on Clyde Road where the bike lane's in the middle, but what do you do if you want to go straight ahead? Do you have to come and go on the left and then get in the way of the people turning left even though the bike's on the right, if you go straight ahead from there you're on the wrong side, so I don't know what you do,
Female worker D: I have to say, I'd be hopelessly ignorant, and I hadn't realized how ignorant I was about that until I actually came to try and do it ...

Female recreational cyclist A: or suddenly car doors opening, I'm paranoid, I hate them, or 'parked cars' shall I say ...it's probably the time of the day too with traffic, depending on where I'm going or what I'm doing, like at the moment I hate the downhills, so I'm not going to be doing that in the peak hour when all the cars are coming through, because that's just scary, yeah it would be even worse for me, so that is a consideration
Female recreational cyclist B: yeah, yeah, I'd say the same, a few times I've cycled
Female recreational cyclist A: it depends what you're doing or yeah, if you've not got the confidence
Female recreational cyclist B: I did a... training session here a few months ago about cycle week safety, and that was really good and gave me heaps of confidence about cycling in peak hour traffic, just, you know, signalling and where to position yourself on the road, and those kind of things, so that definitely helped and motivated me to try and get on my bike a little bit more, so I think things like that would help encourage people

6.2.12 Distance

One aspect of cycling that was intentionally taken out of the equation for this aspect of the study was the distance between home and work. All participants had been asked if they perceived the distance they commuted over to be reasonable for cycling and they all agreed so. A small amount of discussion arose, however, about the distance people were prepared to cycle, showing that six kilometres was easily acceptable and fifteen kilometres was an

upper limit. This finding is contradictory to the comments about distance from the recreational cyclist questionnaire outlined in Chapter Five where longer distances were said to be preferred for commuting. On the other hand, the recreational cyclists noted that the distance they lived from work was too short for training as will be discussed in Section 6.2.20.

> *Female worker M: I live with in 6km of work and to me that is too far to walk in the morning, but I'd like to cycle*
>
> *I: what would be your upper limit of how far you would consider cycling?*
> *Female student A: 15km one way maybe?*
>
> *I: can I ask, you said the distance was too short?*
> *Female recreational cyclist B: well, it's embarrassing, I don't know where [Female recreational cyclist A] is but I'm, when I've timed it, it's between a 5 and 7 minute bike ride, it's not really a warm up but you know*
> *I: so how long a distance would you be happy to bike to work, or would you need to bike to work to make it (laughs)*
> *Female recreational cyclist B: oh well (all laughing and talking) I'm contradicting what I'm saying there because I'd probably be happier, the shorter the distance the better, but um, I guess, but I guess I answered that like you said I could incorporate it into my training, but it hardly would be for that distance*
>
> *Male worker E: just continuing on, it's the infrastructure for me, but it's also the journey length, I find walking in 2km, I'd probably still want to walk for that distance, it would need to be longer for me to feel that the time I'd save cycling would be worth the change*
> *…*
> *Female worker F: I live at 10km out, so probably it's going to take me about, I don't know, with traffic and that's 25 minutes, half an hour at the most*

6.2.13   Weather

Weather did not appear to be a significant issue, although there were different perspectives. Rain was the most commonly mentioned atmospheric condition. Some people were prepared to cycle in the rain while others would opt to take a motor vehicle and gave cycling in the rain no consideration. Wind, particularly the nor-west wind prevalent in Canterbury, was an issue from some participants, while others noted that they had not considered wind before someone else brought it up. Another issue that was commented on was ice on the roads in winter making cycling surfaces slippery. It is unlikely that anything could be done to reduce the barrier of weather for any of these conditions, rather it should be accepted that there are people who will cycle in the rain or wind and others who will not.

Female worker B: No I've got the gear, but I still wouldn't want to be biking if the weather was horrible, I mean I guess its not so much the wet weather gear either, its more the reflective stuff, the helmet, and making sure people see you, which isn't necessarily because its raining, it might be dark, you want to make sure they notice you

Female worker M: Weather probably, I'm certainly adverse to cycling in the rain
Male recreational cyclist: Yeah I probably feel a bit uncomfortable in some of the poor weather we get in particularly winter. Wet weather in particular. Cycling in the cold isn't so much a problem, I dress for that, but it's more the wet weather, icy roads type
I: So is it a safety concern rather than a being uncomfortable?
Male recreational cyclist: Yeah
Female worker N: For me it would be ice that would probably scare me most, because when I broke my leg I broke it quite badly so it took me a year to be able to walk again, and so 15 months I think after the first break I slipped on a on wet floor and broke my tail bone, so that's when, its naturally very uncomfortable for me on my bike, and I just don't think in terms of work I could do that

Female worker I: one thing I would say about the weather, in summertime the wind puts me off, it really does, not so much going home because you can just slog it out and have a good work out, but coming to work against the wind, no I wouldn't be interested
I: is wind much of a consideration for anyone else?
Female worker G: no
Female worker I: biking up against a headwind
Male worker E: Christchurch has been notorious in terms of cycling with either the Easterly or the Southerly

Female student B: no (laughs) not much fun, and cycling in the snow, it's not something I....I've got a mountain bike so I at least have some grip and things, but still (laughs)
Female student A: yeah, it helps a bit, yeah I used to cycle in the rain and the snow, back in Japan and it was alright, but it does slip in the snow (laughs)

Female student B: you're always having to think, "is it going to change?"
Female student A: that's right, you look at the sky and you think "mmm, it looks quite nice", but then oh, (laughs) I mean you have to change what you wear as well, I mean if I didn't have to think about what I wear, you know, or am I going to put make-up on today, or am I going to not bother, it's important when you're cycling, I mean you can't wear skirts and high heels in New Zealand, yeah

I: How much does weather play a part in your considerations?
Female worker B: Probably quite a bit, I'd probably bring the car in if it was raining.
Female worker C: I would think that yeah, not so bad in the morning, but going home, particularly in winter, it gets dark so early

Female worker H: I think…people who live above the smoke line…and it's actually quite a bit colder as well when you come down. I know the cold wouldn't put me off

Female worker G: tough English girl (laughs)
Female worker H: it puts people off though
I: what about everyone else, does the colder temperature in winter put you off?
Female worker I: it's not the cold, it's the wet
Female worker K: wet
Female worker F: cold is fine, but wet

6.2.14 Gender

As discussed in the literature review (Chapter Two) and the findings of census data (Chapter Four) and questionnaire data (Chapter Five), there is a gender disparity for cycling to work with females considerably less likely to use this transport mode than males. Consequently, focus group participants were asked why they thought this difference occurs. This section reports only the ideas that arose from this prompt, not the other trends that have come through the transcripts. The most common responses from participants were that women are more likely to have different responsibilities, children and households, or be more concerned about their appearance. It was interesting to note, however, that everyone seemed very reluctant to give female responsibilities as an issue, most probably as they were concerned about being politically correct.

Female recreational cyclist A: probably vanity, I suppose, some of them, well not me personally, but some with bad hair days and things, to help my hair, I don't know
Female recreational cyclist B: I could be to do with the workplace, it's easier for a guy to roll a suit up or to leave his suit jacket at work or whatever, I guess that's part of the issue for me, is that, you know, I often do wear high heels and a skirt so it just becomes a whole lot more complicated, if I could wear jeans and T-shirt then it wouldn't be such an issue
Female recreational cyclist A: that's if it fits in, I don't know
Female recreational cyclist B: I also wonder if it has something to do with females, this is a generalization, they're more likely to be the ones to go, to do errands like pick up the kids or do the grocery shopping on their way home and things like that
Female recreational cyclist A: true, yeah

Female worker N: Maybe the helmets and the hair thing might be, it does bug me a lot
Male recreational cyclist: I wonder just what types of other activities that males and females end up doing. And the sort of normal traditional roles of caregiver sort of functional roles that they might like, be likely to have, that if I look at my own family environment, it would be much more difficult for my wife to undertake a cycling activity to work, because she is probably more of the caregiver for our children in that regard than what I am, its probably more acceptable for me to be earlier to work and later home, um, which I could manage if I was cycling, because she is the one that would tend to try and be home for the kids after that type of activity. Incorporating cycling into that creates another time pressure and issues that would be really challenging for her. So I wonder if it is related to the nature of

family kind of interactions, I mean that's a very stereotypical theory, dare it say it, but it is the reality of life
Female worker M: Don't really know why it would be necessarily, I mean I know a lot of women who cycle, and some cycle to work

Female student A: back in Japan I used to cycle with skirts on, you know, um it was no problem because people around you do that too, and then I came to New Zealand and then I found that the bicycles here have put that bar across in the middle that was much higher compared with what I was used to, so I stopped cycling in skirts, really because to start with I couldn't go over the bar with a skirt and I found the one that has lower things, I could use that, but still, it's not structured the same, it's not designed to accommodate for that sort of need

6.2.15 Children

Due to issues with ethics, the researcher decided not to talk to children directly, instead, parents who participated in the focus groups were asked to discuss children and cycling. Unfortunately, this method did not gather much data on children and cycling but a small number of comments were recorded. One reason given as to why teenagers cycle is their inability to drive due to a lack of a licence. For parents, the presence of children made it more difficult to organise their time, especially in the morning, to get ready for work. Secondly, mothers were concerned about cycling to work with children on bicycle seats due to the safety issues. On the other hand, there were also comments that children ought to be able to cycle on the roads to establish their independence, linking to the issue of increasing perceived and actual safety as will be discussed in Chapter Seven.

Female student A: that's right, well back then I was younger and I didn't have a drivers' licence, and that was one of the reasons… yeah, under 18 and you're not allowed to drive

Male worker F: yeah, we've got them [children], but that's our job to make sure he knows what to do on the road, I mean eventually he'll get to an age where he'll be cycling on the road, we'll be cycling with him though, you know, if he wanted to go on the road at 8, yeah, but we'll be there, he's not going to be on that road at 8 by himself (laughs), yeah

Female worker J: I'm looking at hoping that I can do it when he goes to his Dad's, but when I've got him, I can't physically get on the bike, take him to school, get here on time, pick him up after school
Female worker F: no, you can't do it
Female worker J: can't do it
Female worker H: I think the thing with children on a bike, we've got a bike seat but I only really use it on little tracks
Female worker K: little tracks or round the back streets, yeah
Female worker H: I feel that, like this evening, I feel that I probably, hopefully wouldn't fall off but I just don't trust other drivers when I've got a small child (others agreeing)

Female worker J: not on the road
Female worker H: not on the road, yeah, (all talking at once, all agreeing)
Female worker J: like on tracks
Female worker H: where the river is...
Female worker F: yeah it is a big barrier, yeah, I cringe when I see kids on the back of bikes on a busy road, yeah, it's a big barrier for mums

6.2.16　　　Transport culture

While there was recognition from most participants that there were differences between cyclists and motorists, everyone generally seemed to accept that people need to co-exist on the roads. In addition, most participants did not feel that the road infrastructure belonged to any particular group. This finding indicates that participants were neither cyclist nor motorist orientated. Consequently, it could be concluded that there were three groups of people as opposed to the two 'motorists' and 'cyclists' groups normally represented in media. This third group were the people who cycle and drive and are open to the viewpoints of both groups.

Female student B: yeah, sometimes, it's weird, a lot of my friends bike but they're mostly guys, um, none of my girl friends bike, I think the 'cool' factor, afraid that if you do something stupid, everyone will laugh if you fall off, or if you have a basket on the front whether people are going to tease it....you know, no matter how, you know because it is a really good idea, but (laughs)

Male worker B: well, we have a culture of driving cars, we don't actually have a culture of biking, or community cycling, times have changed, as opposed to Holland or Denmark and places like that where cycling is cultural, there you could get on your bicycle with your wife on her bicycle and you could go into town to a restaurant, I mean, fancy doing that in New Zealand (laughs), so it's nothing to do with facilities, it's all to do with behaviour and the way use the roads

Female student D: some cyclists, you get several, perhaps ten per cent of them, they're really anti-drivers and you see them, they just like do whatever they feel like and slam on the brakes
Female worker D: yeah, this is what I've picked up, because, and I've picked it up both because when I went to this groupie thing whatever it was, you know about overcoming your fear of your cycle or something, um, the two people who dominated it, it was as if there was a real 'way you have to be', you know you're either a cyclist, it's like you know the……you know something, you've got to take one side or the other, there's no accommodation for each other, cyclists seem to hate motorists and motorists seem to hate cyclists, it's weird, in Christchurch it's weird, because it does work both ways
Male worker D: yeah there is a quite a hard-core cycling fraternity, aren't there, isn't there
Female worker D: I mean they're …whether it's just their collective experience or whether it's just part of an in built psyche thing
Male worker D: yeah, it's almost as if you're [in one group or the other] which is interesting, but that isn't the way to go about it

Female student D: yeah, some of them that don't obey the red lights because, you know I think you should either be a vehicle or you should a pedestrian, like cyclists belong in the vehicle category and some of them do, you know, they'll come to a red light and you see them stopping around and they turn themselves into a pedestrian so they can go across the pedestrian crossing, or they'll just bike down the footpath for a bit and come across and like that sort of thing is kind of worrying
Male worker D: very tempting though isn't it, as a cyclist though I mean it's really tempting to do that
Female student D: but as a pedestrian it scares me to death when I'm crossing the crossing and a bike comes at you 100k, yeah, I mean I'd say that's a minority, it's not, it's like motorists, I mean it's probably the minority that are really aggressive

I: Do you think that there is a culture around cycling that makes it hard for people to start cycling because they don't want to be perceived as a cyclist?
Female worker I: no
Female worker F: no
Female worker J: no, but listening to this lot has put me off

Female worker H: it's kind of funny because I biked a lot back then, in between having kids or….you can see from both sides, you can see it from being a driver and from being a cyclist
Female worker F: I think if you've been a cyclist, when you're driving I think you're looking out for cyclists, I think it's the people who don't or have never really been on a bike before, there the ones who just don't look and they don't care
Female worker I: and they own the road, what are we doing there
Female worker F: yeah, they don't understand, but if you do a bit of both

6.2.17 Fitness and health

One of the benefits of cycling discussed in the literature review is the undertaking of physical exercise through transport (Hillman, 1997a; Jensen et al., 2000). It was also mentioned how fitness could be both a motivation and a barrier as people may perceive that they are not fit enough to cycle to work. In general, most participants considered the fitness and health aspect of cycling to work to be a positive motivation. For the recreational cyclists, however, their commute was usually not long enough to be part of their training program, making a short distance a barrier for them. Other people also mentioned how they undertook other exercise and then drove to work, suggesting that cycling to work would be a good substitute for this activity if their other barriers to cycling could be broken down.

Male worker A: and that's how I deal with that at the moment, I go for a walk at 6 o'clock in the morning, come home and have a shower, put my suit on, hop in the car

Female student A: reasonably, I don't do a lot of exercise, so fitness would be one of the motivations for me for sure
Female student B: it seems like a good way of getting fit and actually doing something as well, I guess that's kind of the work thing too, if you don't have time to go to the gym, just cycling to work would be a good way of keeping fit and

functionality – getting to work … I know that most of my friends and I don't go during the day because we don't really want to have a shower at the gym and stuff, so yeah, biking is a good thing. Fitness would be one of the main considerations, apart from the cost of petrol

Female worker A: And fitness that would be an advantage, but um, I'm really unfit so I don't know if I could manage to bike to work. I don't know how long it would take me because I haven't bike and I'm not fit. So, um, I would probably be a bit of a mess when I got to work, but um, you know, a shower and a bit of a recovery would probably be alright. Certainly an advantage, yes

6.2.18 Enjoyment

One of the motivations that arose in the focus groups and also came through in some of the questionnaires, particularly from the recreational cyclists, was enjoyment. These people said they cycled because they enjoyed it as a transport mode rather than any other push factor. Enjoyment is possibly a major defining factor between potential cyclists and those people not interested in cycling. It would be logical to guess that the people who are not at all interested in cycling perceive it as an uncomfortable and unenjoyable activity. This factor of enjoyment also ties back into the discussion of walking versus cycling. The reason people will opt for walking, even when it increases the trip time, is that it is less stressful than cycling.

Female student A: I cycle only when it's comfortable or functional (laughs). Yeah, only if I'm doing something else and it just becomes convenient, or maybe I can just enjoy the weather because it happens to be a nice day and then you know, things like that
I: so how often would you cycle to other activities …?
Female student A: once a week or so, I have only a road bike, it's not a racing bike, or a mountain bike… yeah [like nice surfaces], and with a basket in front so you know, I'm not exactly a recreational cyclist

Female worker D: well I just quite like it, this is why early in the morning on the weekends is great because I can go from my place down to…and I can go there for a quick coffee and read the paper or something and then bike home, and that sort of decent sort of, um, activity sort of thing and I also I've got a friend in [suburb] and I'm sort of trying to gear myself up to thinking that I could do that as well, which is a bit further from where I am in [suburb], but that there would probably make it worth…so really I keep my cycling to the weekends

6.2.19 Punctures

Punctures as an issue only arose in one focus group where a participant used to cycle for transport. This person had had considerable difficulty with punctures but had adapted by carrying a repair kit. The interesting aspect was that he had not considered the possibility before it first happened and the other participants had not considered it at all. Skinner and

Rosen stated that males are more likely to be hands on with fixing a bicycle and it was the male in the group who was fixing his tyre while the female was concerned about punctures arising. Therefore, punctures are most likely an issue that would arise for people once they have started cycling.

> *Male worker F: I tell you what I've got really quick at fixing punctures, … because there's nothing worse than walking with a bike, it's not comfortable …you actually get used to it [fixing punctures], it becomes second nature, 'oh what's that?' your tyre's on, you go*
> *…*
> *Female worker L: I remember what [Male worker F] was saying about the punctures, like I'd never kind of considered that, that would really annoy me if my bike was getting punctures like quite often, like that would be a huge barrier for me, I would be really cross because it's just time, and yeah*
> *I: so it's not something, you haven't really considered that have you?*
> *Female worker L: no because I'd never really thought about it until now*
> *I: [to Male worker F], had you thought about it much before it happened?*
> *Male worker F: no, I mean it happened and I thought, I didn't have a puncture kit, it was a pain in the butt because it took about 40 minutes longer to get home, but when I had a puncture kit I got it down to 5 minutes, you could actually fix it and then you're gone, now it may not be right to last but it'll get you home*

6.2.20   Recreational cyclists

One of the groups identified in the literature as being potential cyclists are recreational cyclists (Howard and Burnes, 2001; Lumsdon, 1997) as it is assumed they have access to a bicycle and confidence cycling, although their experience may not be on the road. The issue discussed by recreational road cyclists was that the distance to work was not part of or sufficient for their training, and as they were cycling greater distances each day as part of training they were not interested in cycling to work. For recreational off-road cyclists it is more of a family activity or they prefer it because it is away from the traffic, reducing the safety concern. An interesting discussion started in one focus group came from the gender issue. Participants had noticed an increase in females cycling for recreation, which has the potential to transfer into increased women cycling for transport. Unfortunately, due to the difficulties in getting recreational cyclist focus group participants as discussed in Chapter Three, the conclusions that can be drawn here are limited.

> *Female recreational cyclist A: oh, possibly, I mean I'm probably more inclined to bike once I've done the long bays, maybe I'll get back into it again, biking to work when I'm not so much into training in the evenings*
> *Female recreational cyclist B: yeah, my intention was to cycle to work at least two days a week, um, and because I can not go to the gym two days of the week, um, but that kind of hasn't happened with this training I've been doing for the last 8 weeks*
> *Female recreational cyclist A: yeah, it's been full on*

Female recreational cyclist B: but I will try, once the training program's over in a couple of weeks time, to try and do that

Male recreational cyclist: So I guess for me at the moment, the cycling thing, is probably more of a recreational activity that I focus on. Particularly because it is an activity in which I can actually engage with my children. And it's a great activity for two boys, at 12 and 9 to go and do, um its good fitness work for us all and it's a nice thing to go and do, cause we can just go out to Bottle Lake and cycle at Maclean's Island and what ever. So, so it's more of a pleasure orientated as opposed to a necessity drive fitness activity going backwards and forwards to work for, and all the constraints I talked about before make it just tough, unachievable.

6.3 Biggest issue

Overall, the biggest issue for most people was the safety, including traffic behaviour and infrastructure for cyclists. This barrier was closely followed by showering facilities, similar to the findings of the questionnaires in Chapter Five, although for some participants showering was a greater issue than safety. While these conclusions could be drawn out from what participants have previously stated, they were also asked directly what their biggest issue regarding to cycling to work was.

I: And that's for all of you; traffic is the really big one isn't it? It would be a nice issue to get solved
Female worker C: Well I think it's the shower

Female worker B: I would say that [traffic and route] would be my main issue because obviously after a while you get used to cycling and fitness and I could work out how long it would take and prepare for it and have a shower when I get here and the rest of it, ah, really it's the route that is the problem

Male worker D: I would, for me it would just be having a designated cycle route or routes throughout the city... infrastructure, that would be it for me, then I could cope with other things like...
Female worker D: traffic and confidence I think, I mean it is scary

I: what do you think is the biggest issue for you ...?
Female student A: car drivers
Female student B: yeah I think the safety comes before everything else really, probably my main obstacle, to getting over wearing a helmet, wearing sensible shoes (laughs), yeah, I also think having just driven in cities, I actually think having things like the coloured bike lanes that would help me to know what to do, coz that's a fear as well, that I don't know, I know road rules from a driver's point of view, but I don't know, I mean I suppose cyclist's rules are pretty much the same I guess, in many ways, but that would help me to know where I'm supposed to be on the road as well)... it clarifies for everyone on the road, both me and
Female student A: but ideally though, there shouldn't be the need for all this elementary level markings, I mean ideally if everybody respects everybody else there would be no accidents, ideally..., I just think there is a lack of respect and lack of awareness to start with, that's the problem

6.4 Encouraging cycling overall

One of the other topics brought up in focus groups was how cycling could be encouraged overall not just the individual barriers and motivations perceived by each participant. In general, these issues came back to those already discussed but included cycle courses, public campaigns including trying to make cycling look 'cooler', or a properly constructed cycle network providing for different types of cyclists. The specific types of infrastructure that potential cyclists would like planners to concentrate on are discussed in the following chapter (Seven).

> *Female recreational cyclist A: I think the cycle-safety thing is really good, like I know that, um, I mean I was relatively confident on my bike before I did that little course thing a couple of months ago, but there were other people who did it who really weren't very confident and in fact even on this training program I noticed when I went out that some people just, um, they're not aware of the fact that they need to be signalling so that other cyclists and other vehicles can see and know what they're intending to do, um, so I think things like that are really important, although I do notice that schools take groups, school kids out*
> *Female recreational cyclist B: yeah that's what my flatmate does, he takes out, yeah the cycle safety*
> *Female recreational cyclist A: or maybe it's just that I missed that, I didn't do that at my school, I don't know, I think that would be, offering more of those kind of things would be really good. I guess making people more aware that's available too, for the adults*
> *…*
> *Female recreational cyclist B: I hadn't thought of [Female recreational cyclist A]'s idea, I mean I must admit I do agree, but having said apart from that there's a lot of advertising now anyway of different events, fun events and things happening, um, well I guess particularly through my work with health and stuff like that, there's a lot of that, so they're just making people more aware, I don't know which media because there's so much media now that you see it, but um,*
>
> *Female student A: maybe a public awareness campaign and everything would kind of push more awareness, but do I feel more like cycling or not? I quite like the idea, but there are just too many obstacles that I don't want to do it regularly, if the weather is nice, it's fine, but*
>
>
> *Male worker D: a nice kind of Utopia would be, I feel quite comfortable with this idea in my head which was every, either at 5 or 5.30, or whenever people finish their work, we just get on our bikes, it's a relaxing ride home, the sun is shining, (laughs) birds are singing, you know there's not too many cars on the road, there's a nice cycle lane and there's lots of other people out there enjoying their cycling as well, you know, that would be bliss, I mean you could say hi to people at the traffic lights (laughs)*
> *Female student D: although the other thing is, I mean people once again are different, you'll get the fast people who are just like "get out of my way" you know, and you'll have to pull over and let them past … and you see them, they're in such*

a hurry, and they come to the traffic lights and they don't want to get off their bike because it takes too much effort to stand up there (all talking and laughing) don't make me laugh

6.5 Conclusion

Apart from safety there are many issues involved with cycling to work. This chapter outlined these issues from the data gathered through focus groups. Use of focus groups allowed the research to utilise the resulting qualitative data to examine in more detail some of the transport patterns and motivations and barriers around utilitarian cycling identified in the literature, census data and survey results,

Firstly, the general transport patterns of participants was discussed, with the majority driving to work as their primary mode of transport, although people employed at the health organisations used a variety of different transport modes. Discussions were also held regarding the push factors of petrol prices and environmental issues. Neither of these appeared to be significant factors for participants' choice of transport mode. In addition, focus group participants commented about the motor vehicle-orientation of society, including the expectation of having a motor vehicle in Christchurch, the difficulty with timing and routes of buses, and distances involved in walking to work. On the other hand, there were also comments in several focus groups that walking was preferred to cycling as it did not involve the stress of having to be constantly aware of the surrounding traffic that is necessary when cycling.

The main motivations discussed in this chapter were petrol and the cost of travel, environmental issues, difficulties with direct or frequent public transport routes and fitness. Barriers for cycling considered in this chapter included destination issues such as bicycle parking, workplace showering and changing facilities as well as the use of work vehicles. Showering and workplace facilities were a major barrier for participants but other destination issues were relatively minor. Issues involved with the trip included the luggage capacity of a bicycle as well as cycling equipment, clothing and sweating and helmets were also discussed. Most people preferred to take a backpack, however, this meant they could be restricted about what they carried with them on their bicycle. Consequently, what clothes were worn for cycling and having a place to store equipment at attractors were also a minor barrier. Time was another factor including getting organised for transport and trip chaining, particularly when children were involved. Children also raised the issue of parents being able to attend emergency situations, such as collecting a sick child from school which is difficult on a bicycle. Another issue that arose was night time cycling, with

most participants concerned either about physical or personal safety after dark. Confidence on a bicycle was an issue, particularly for females and will be expanded further in regards to safety in the next chapter. Weather and, transport culture both arose but neither were portrayed as barriers by participants. One future issue, punctures, arose and this indicated that once people commenced utilitarian cycling there would be other issues that they would have to deal with. Enjoyment of the journey came through as being fairly important, particularly when considering modal choices between walking and cycling.

7.0 Chapter Seven – Safety and Cycle Infrastructure

This chapter outlines the findings, primarily from the focus groups, relating to safety, including cycling infrastructure. Safety was a significant issue raised in the literature review, both in regards to the transport environment (McClintock, 2002b), the incompatibility between motorised and non-motorised modes (Godefrooij, 1997) and the fear of an accident causing perceived safety risks (Parkin, 2007). An aspect of the focus groups was to try and ascertain the relative importance of each barrier. In focus groups it was apparent that safety, including physical safety, personal fears and traffic behaviour, was a more significant barrier for most participants than the other barriers outlined in Chapter Six, apart from showering and changing facilities. Safety was also one of the most commonly cited factors in encouraging cycling to work in the questionnaire data as reported in Chapter Five.

An important part of the focus groups method was to show a PowerPoint slides (see Appendix G) that outlined various types of infrastructure to discover what level of cycle facility would attract new cyclists. These facilities, as discussed in Chapter Two, included no infrastructure, cycle lanes, cycle paths and shared paths in various forms for mid-block, signalised intersections and roundabouts. Several of the pictures shown to respondents were international examples and others had been altered using a drawing program to achieve the desired example of a particular cycle facility and a similar traffic environment. The pictures in this chapter are from the PowerPoint. Specific comments outlining the viewpoints on each level of infrastructure are outlined below and all comments are in Appendix J, however, it was difficult to draw overall conclusions regarding the type of infrastructure preferred by potential cyclists because participants often had opposing views or could not conclusively say they preferred one type over another. Participants were also asked to indicate how regularly they would cycle on each level of infrastructure on a questionnaire (Appendix F) and the findings from this questionnaire are more conclusive regarding preferred type of cycle facility.

7.1 Safety

One of the issues most frequently raised and discussed by participants was safety, which supports the suggestion in Chapter Two that concern about safety is one of the major reasons for low rates of utilitarian cycling (Noland and Kunreuther, 1995). This concern was mainly based on a fear of getting hurt, most commonly from an incident involving motor vehicles. The possible conflicts that participants brought up were getting hit by a

moving motor vehicle, parked vehicles doors opening into the area where a cyclist was cycling and a lack of space for cyclists on the road. These comments regarding safety show that participants were basing their thoughts on their perceived safety on the road rather than knowledge of accident data which means that conclusions are about how safe people perceive the environment to be rather than how safe cycling actually is.

> *Female worker M: I'd like to cycle, but I consider the roads to be too dangerous. And that's what puts me off. … here the amount of traffic on the road and just what I've seen*

> *Female student B: I mean you can't even get off the road really when there's cars parked*
> *Female student A: yeah, cycling beside those parked cars and then cars flying past you, and then sometimes I notice there's no cycle lane at all, and I'm thinking, ok, I have to watch this one, for people swinging their doors open, and then the cars coming behind me*
> *Female student B: which is really hard to apply when you're biking*
> *Female student A: well, you have to be smart and everything, it just makes it much harder, yeah*

One of the major causes for the concern about safety raised by participants was traffic behaviour. In some cases, participants were concerned about traffic numbers and speed, although to a lesser extent, however, their primary argument was the lack of respect drivers give cyclists. This observation is backed up by Jensen et al. (2000) who note that accidents often occur when cyclists and drivers fail to understand and respect each others movements. This view is reinforced by participants who noted that cyclists also fail to act responsibly at times, most commonly when the recreational cyclists create pelotons resulting in several cyclists across taking up more space than the cycle lanes.

One suggestion from participants was that drivers need to be given more education about how to act around cyclists and how to respect cycle lanes. There were often comments, especially from recreational cyclists in the focus groups, that the cycle facilities in Christchurch were adequate, but they were still not perceived as safe because of how drivers treat cyclists and cyclist space. One of the possible reasons that drivers do not respect cyclists' space is that they are unaware that it is illegal to drive in the cycle lanes.

> *Female worker J: I just think the cycle paths are a token white line*
> *Female worker F: they're a door opening path not a cycle path*
> *Female worker I: yeah*
> *Female worker J: yeah*

Female recreational cyclist B: and the drivers be more aware, like the drivers that go and pull over in the cycle lane, like my flatmate, he does cycle safety as a job and so I'm learning from him, and I'm telling people off now, you know, just educating drivers about the cycle lane, or just being more considerate of cyclists

Female recreational cyclist A: for me it's numbers probably

Female recreational cyclist B: me, probably behaviour more than anything

Female student A: the other the danger for me... I have had a couple of incidents because of stupid, stupid drivers who just cut right across you, because they don't see you, they don't think or, you know, I'm not going fast so I could stop, but then still, it's you know, I have no protection, they have a car, you know
Female student B: car versus cyclist (laughs)
Female student A: yeah, you know, you can get injured you know, some people just don't think, some of the drivers are so rude here, sorry

Female worker D: ...I find the traffic here quite alarming,

7.2 Interacting with cycle facilities

During the first half of the focus groups, where general motivations and barriers for cycling were discussed, several comments were made regarding cycle facilities. In particular, these discussions outlined concerns about intersections, the inconsistency of cycle facilities and comments regarding what people would like to see in the way of facilities on the road.

Female student A: and you don't have[to] cycle on the road in Japan either, you can use the footpath if you wanted to, well actually, most of the time you use the footpath because there is heavy traffic... actually you're legally not allowed to cycle on the car lane ..., it's too dangerous, far too dangerous,

One of the issues discussed was how people negotiate intersections. Several participants commented that they would adjust their route, even if it took further, to avoid a particular intersection. There was some discussion around how much longer people would cycle to avoid a particular spot and there was agreement that five to ten minutes was definitely feasible on a one-way journey but that fifteen minutes was pushing the boundaries. Another concern raised by the participants from central city workplaces was the tram tracks and the dangers of an accident occurring through falling if their bicycle got caught in the tracks. In amongst this discussion, the recurring theme of enjoyment also arose through comments that the longer route was more likely to be safer and consequently more enjoyable, making the overall journey increasingly pleasant for the cyclists.

Male recreational cyclist A: ... because in fact often you find a safer route will often be faster, I suspect, because you have to take more care through a busier,

more complex, often it has more traffic lights, or has a greater volume of traffic that you kind of have to get yourself through. And it's the kind of stressing angle about having to do that that compensates for a slightly more longer route. I guess it depends on how much longer it would be. If it was an extra half an hour probably not, but if you are talking 5 minutes
Female worker N: Yeah I think you are right, 5 minutes isn't enough to have an impact, but maybe I was thinking 15 minutes might start to get be a bit long
Male recreational cyclist A: Particularly if you are talking then about an extra 15 minutes of getting there and coming home, I mean you are talking about adding an extra half hour of travel and that's where it starts to mount up. It's the combined component

Female worker C: There's just several places where cycle lanes run out in the middle of the road somewhere, there's just allsorts of really obvious places where you think, why did they do that, you know
Female worker A: I guess the problem is that a lot of it is sort of retroactive isn't it, cause they've started putting cycle lanes in but the road isn't necessarily prepared for it, and then they run out of space and stop, something silly like that

Male worker D: a lot more clarity, as we agreed on, cycling through parks is great and there's nice little lanes there, you're just not, it's a much more relaxed, the stress levels in cycling are much higher than driving

Female worker G: and there's not cycle lanes everywhere, like part of the route I would go if I had more confidence in it, and I could cycle on the road, hasn't got a cycle lane and cars (vehicle going past, hard to hear)...I watch people drive up cycle lanes to get into other lanes

Female worker I: I'd really like to see the road there, cars parked there, opening their doors into the traffic nice and carefully, and then bikes going down there [between parked cars and footpath], that's what I'd like to see...

Female worker I: but turning right at a big intersection, it's just scary isn't it, J: sometimes if you just go the way of the traffic lights and cross over with the pedestrians and in that way you can get back on the road again

7.3 Mid-block cycle facilities

The first set of pictures shown in the PowerPoint was a series of cycle facilities for mid-block road sections. Participants were asked to imagine they were cycling along a straight piece of main road at a peak traffic time and to make comments regarding how they viewed the infrastructure shown. They were also asked to disregard intersections at this stage as signalised intersections and roundabouts were dealt with later in the PowerPoint. Each focus group was shown a different PowerPoint, with the facilities organised into various orders to introduce randomness into the testing process, hence comments in this chapter are not necessarily in the same order as they were made in the focus groups.

7.3.1 No specific cycling provision

For use as a baseline, one set of diagrams and pictures related to no cycling provision (Figure 7.1). Often participants made no comments regarding these pictures but their expressions and any comments made indicated dislike for cycling along a piece of road with no cycle facility, generally because of the lack of space. Recreational cyclists were generally content to cycle where there was no provision but indicated they would do so with a serious amount of caution.

Figure 7.1 An arterial road with little space for cyclists in Victoria, Canada (image inverted)

Source: (Koorey, 2008)

> *Female worker B There's no space*
> *Female worker A: No room*
> *Female worker B: There is no space at all, I mean there is not even parking space there, you can't even encroach into*
> *Female worker A: Some times I would use it, but it depends where it was, cause I mean if it was in the middle of town, no, but if It was in a big wide rural, or residential streets, then there is a big difference isn't there?*
> *Female worker B: Yeah*
>
> *Female recreational cyclist B: Um, I would be happy to cycle on that road, but, um, I would avoid times when there was heavy traffic because you're basically travelling in the same path as the vehicles are travelling, um, and I would feel some level of nervousness around doing that as well, so you'd be much more aware of everything that's going on around you*

7.3.2 Cycle lane

One of the most common cycle facilities in New Zealand is the marked cycle lane (Figure 7.2) in this case indicated by a solid white line and cycle symbols along the lane. Generally, people made few comments or noted that it was a standard around Christchurch and they would be reasonably content to cycle along the lane. Although the ongoing concern remained that vehicles would not respect the lane or the cyclists' space.

Figure 7.2 Marked cycle lane, Christchurch, New Zealand.

Source: (Koorey, 2008)

> *Female worker C: Yeah, that's um, not too bad*
> *Female worker A: Usually I don't cycle so I don't know, it looks good, but its no guarantee that cars wont swerve and hit you is it, un like a cycle path*
>
> *Female recreational cyclist A: to me that's fine, for me that won't be a problem*
> *Female recreational cyclist B: yeah*
> *…*
> *Female recreational cyclist B: yeah, you've got a designated space to cycle in, not to say that vehicles won't necessarily cross that space but*
> *Female recreational cyclist A: you've got to look out for parked cars, but yeah*
> *Female recreational cyclist B: yeah, I would feel more confident*

7.3.3 Cycle lane with extra highlighting

In Christchurch, red paint is the common method of highlighting cycle lanes, particularly around intersections. A variety of different methods of highlighting were shown to participants, including full red or green paint (Figure 7.3), intermittent paint, painted squares, wider white lines and hatching. Participants often commented that they preferred the idea of extra highlighting, particularly if this was paint along the lane. One of the

concerns that arouse is that paint can result in slippery lanes, although there were also comments that the new paint on lanes in Christchurch had grit in them and were less of a problem.

Figure 7.3 Painted cycle lane, New Zealand.

Source: (Koorey, 2008)

> *Female student B: good, better for awareness as well*
>
> *Male worker B: the fact that I don't like painted roads doesn't matter I don't think ….but I like the width of the painted lines there*
> *…*
> *Male worker C: too much paint around is actually quite difficult for bikes and tyres to actually*
> *Male worker B: yeah, too slick*
> *Male worker C: some of them are made of that gritty stuff…*
> *Male worker B: but putting some on the white line too, you know*
>
> *Female worker K: …I'm not sure about the colours and the effect on the cars, I wouldn't feel confident*
> *…*
> *Female worker I: yeah, it's a half way there*

7.3.4 Kerbed cycle Lane

As shown in Figure 7.4 a kerbed cycle lane is placed between the traffic lane and the motor vehicle parking or edge of the road, however, rather than being identified by a white painted line or similar there is a second kerb between the cycle and traffic lane. In general, this kerb is very low profile but gives a physical barrier to the cycle lane. Generally, participants liked this cycle infrastructure and preferred it to the normal cycle lane. Their primary reason for this preference was that the kerbing provided a visual or audio barrier and drivers were more likely to recognise the cycle lane and not enter this space. The

issues that were indicated included width of the lane, concern about cycling over the kerb and that vehicles still had to cross the lane to reach motor vehicle parking.

Figure 7.4 Kerbed cycle lane with parking behind in Melbourne, Australia

Source: (Barber, 2008)

> *Male worker B: this is just a bit narrow, you can't get two people cycling side to side having a chat*
>
> *Male worker D: yeah, I think that's 10 times better than the previous way, there's an audio/tactile kind of thing going on for every driver that goes over those bumps and there's visual*
> *Female student D: and cars would just, you know, drivers just inherently don't go over kerbs, it's like the edge of the road, whereas a cycle lane's just like part of the road that's been blocked off but you can still drive over it, but you shouldn't you know, this way it's really designated*
> *Male worker D: yeah I think I'd feel comfortable with that*
>
> *Male worker F: that's good... I think that's a good example, it really differentiates between the lane and the road, ... there's actually something physical, you know, even if it is, a lot of people won't know, you know, 'I shouldn't be driving on this'*
>
> *Female recreational cyclist A: to me it kind of creates, um, a bit of a hazard for cyclists actually, so although it's a designated space, because there's less flexibility and you've got to be more conscious of the surface that you're riding on if you're going out, in and out of that cycle lane*
> *Female recreational cyclist B: yeah, for me it wouldn't be a problem, I'd be fine*

7.3.5 Cycleway directly behind parking

While the kerbed lane was popular with participants, a lane located behind parking (Figure 7.5) was perceived by some to have greater safety. The concerns that were then raised were the issue of passenger doors opening into the lane and visibility. It was also pointed out that passenger doors were less of a problem than driver doors as many vehicles are single occupancy. Primarily, participants were concerned that when the kerbed lane came up to an intersection, vehicles would not have spotted the cyclist because they were not visible behind parked vehicles on the approach to the intersection. Consequently, it could be concluded that this type of infrastructure along mid-block was perceived as safe, if the larger issue of intersections was appropriately addressed. There were also comments that if this type of cycle facility was consistently used it would be safer than if it appeared intermittently across a city.

Figure 7.5 Cycleway directly behind parking, Christchurch , New Zealand.

Source: (Koorey, 2008)

> *Female student A: yeah it kind of feels more like a footpath that I'm used to, but it's a cyclists' footpath*
>
> *Female worker B: It makes more sense because the cars don't have to cross the cycle lane to park*
>
> *Female worker I: now we're talking (laughs)*
> *Female worker G: you've then got passengers opening their doors*
> *Female worker I: well a percentage of most car journey's only one person, really high, a small percentage (are more?)*
> *Female worker F: I think I'd feel safer there*

Female worker I: the only trouble is crossing that side-road though and cars turning into it and they wouldn't have seen you because you're actually off the road a bit

Female recreational cyclist A: oh, no
Female recreational cyclist B: I think that really
Female recreational cyclist A: its potential for an accident I think
Female recreational cyclist B: yeah, in my mind that would really only work if that was everywhere, ...consistently everywhere, because otherwise, with the other versions you are essentially on the road, so if the cycle lane stopped at some point you just naturally move into the traffic lane, um, whereas something like this you are quite removed, and then I guess pedestrians
Female recreational cyclist A: coming to that corner too looks a bit dangerous, if they're going to go straight across
Female recreational cyclist B: parked cars could actually hide you
Female recreational cyclist A: yeah, I think it's just an accident waiting to happen personally

7.3.6 Cycleway behind parking with separation

As with the cycle lane behind parking, this facility (Figure 7.6) was perceived as safe by the majority of participants, particularly as it removed the issue of passenger doors. There were still issues with side roads raised, however, although no side roads are shown in this picture. Participants thought there was more visibility of cyclists on the approach to intersections with this facility than a cycleway behind parking without separation. One issue raised was the practicality of the facility due to the increased space needed for the total transport infrastructure.

Figure 7.6 Cycle lane behind parking with separation in Melbourne, Australia

Source: (Koorey, 2008)

Female worker I: oh beautiful...FD: because it's just more concrete, there's even more separation from moving cars, and there's an area for passengers to open their doors
I: do you have any concerns?

Female worker I: yeah, crossing the side-road you'd have to be quite defensive, if you're going straight ahead, but you know it's your life you're being defensive of so you could do that easily

Male worker A: it's interesting, it's a pretty bland cycle track, it's not very attractive
Male worker B: absolutely yeah, if you've got your handlebars down and you're a road cyclist speeding along there, but if you're a commuter cyclist it's actually quite pleasant to have a look around

Female worker B: Look at the cycle lane, its huge
Female worker A: I don't know, I mean that extra is great, but I don't know if it's actually quite, compared to the one before has any advantages
Female worker C: Well it takes up more space but I don't know if it actually adds heaps to it, the kerbing might just be sufficient without that extra barrier

Male worker D: that's even safer than the last one because there's less risk of a door being opened out into the cycle lane
Female worker D: that's right, that gives the door room to open and it's not an issue

Female recreational cyclist A: yeah, that's a bit more safer
…
Female recreational cyclist B: well, I guess because of opening the cars doors, if there's no barrier,… if a passenger opened their door, whereas you've got the barrier so it's unlikely to affect the cyclists
…
Female recreational cyclist A: ah, the side-road too I thought, yeah
Female recreational cyclist B: yeah, people tend to get across the road …
Female recreational cyclist A: lack of visibility from the parked cars, yeah

7.3.7 Shared path

Shared roadside pathways are off-road areas where pedestrian and cyclist space is adjacent or intermingled (Figure 7.7). Often, the only signage to identify pedestrian space from cyclist space is painted signs on the ground or signposts. While many participants felt the safety level of this type of infrastructure was high as it was away from the road space, they were concerned about the intermingling with pedestrians. Several people commented that they would cycle at a slow enough rate so as to be on the lookout for pedestrians, but noted that some commuters would cycle at higher speeds and this could cause cyclist pedestrian conflicts. Other comments centred on the issue that pedestrians may not obey the signage and take up more space on the pathway than they are allocated. There was also concern about conflict with vehicles and bicycles where driveways crossed the shared pathway as cyclists move faster than pedestrians and consequently, drivers may not see cyclists in sufficient time to react.

Figure 7.7 Shared path for pedestrians and cyclists, New Zealand.

Source: (Koorey, 2008)

Male worker B: but in some situations that's probably quite acceptable…, in high pedestrian volumes it's not acceptable, but in low pedestrian volumes it would be, I can't remember what the rule is now whether you can bike on the footpath here or not
Female student C: no
Male worker A: I mean for that to work it requires the discipline of the pedestrians and you know if there's 5 teenage schoolboys that are spread all across there…

Female worker A: I guess its good isn't it, because it gets you off the road, and you've still got, you've just got
Female worker B: I think if you wanted to get somewhere at speed it would be difficult though because there'd always be pedestrians wandering
Female worker A: Particularly if there were kids, they might step out
Female worker B: You'd have to cycle very slowly one assumes
Female worker A: And then there is drive ways as well, people pulling out of drive ways, cause at least on the road you've got that foot path space before they hit you.
Female worker C: Yeah they'd have to do speed limits for bikes there I mean you'd have to be, you couldn't go 30 km
Female worker B: A serious cyclist wouldn't like that, would they just go in the road? Or would they be expected to go on the road in a cycle lane rather than a cycle path?

Female student D: I do [have reservations] because from a pedestrian's point of view, because if you're there they could end up having to step out of the way or there could be an accident, I mean that's a really wide example, but like that one you showed just before, that one on the first slide was quite narrow, it was like a normal footpath, and you know, you see a cyclist coming and you'd just step out of the way to let them past, so if it's…

Female worker K: yeah, you need to have a dividing line
Female worker F: yeah, you do

Female worker K: especially for the bikes
Female worker G: yeah

7.4 Intersections

A major concern for planners and academics is that intersections are more difficult and dangerous to navigate on a bicycle than straight pieces of road (Davies et al., 1996). This theory is backed up with the numerous comments and concerns about intersections raised by participants throughout the first half of the focus group, including comments regarding mid-block facilities. The following sections outline the various infrastructure types put forward in the PowerPoint and the comments made by participants. For the first set of facilities cyclists were asked to imagine straight through or left hand turn manoeuvres, while for the second set they looked specifically at the right hand manoeuvre, and the final set considered roundabouts. Again, the order that these facilities were shown to participants within each case was random and consequently, there were several comments relating to other types of infrastructure that may not have been discussed prior to this section. In general, the intersections shown or implied were controlled by traffic lights and commonly had two lanes of traffic entering and leaving the intersection.

7.4.1 No specific cycling provision – straight through manoeuvre

The intersection shown for this facility was the corner of Ilam and Riccarton Roads (Figure 7.8), which has a reputation for being extremely dangerous. Using this picture may have influenced comments from University focus groups but in general people were already concerned about tackling such an intersection with no facilities. While some people would be prepared to cycle through it, the majority commented that they would avoid it either through taking a different route or walking their bicycle along the footpath and across at the pedestrian lights.

Figure 7.8 Riccarton and Ilam roads intersection with no cycle facility, Christchurch, New Zealand.

Source: (Koorey, 2008)

Female student B: ok, that is the worst intersection in the whole world, I'm sure of it (laughs). Every time I go there, there's like someone definitely dodgy...
Female student A: yeah, I just avoid it
Female student B: yeah, same, I never try to turn right from Ilam Road, it's just, it freaks me out
Female student A: yep

Female student C: yuck. Dangerous.
Male worker A: dangerous, I mean, would you let small children cycle through there? No
Female student C: no
Male student B: and in terms of volume of traffic in both those examples, something needs to be done
Male worker A: it's a classic case of what cyclist decides he's going to be a pedestrian and ride across the pedestrian crossing, not necessarily with the lights...but actually move into the walking space

Female worker B: Nightmare material
Female worker A: No I'd be a pedestrian at that stage
I: Would you go out of your way to avoid this intersection?
Female worker A: No I wouldn't, I'd get off my bike and go on the footpath and be a pedestrian
Female worker C: You would avoid it if there was an alternative ... instead of going through the intersection.

Female recreational cyclist B: oh, ***
...

Female recreational cyclist A: I would [cycle] but I'd be feeling pretty nervous
Female recreational cyclist B: yeah, I was going to say really, and especially
Female recreational cyclist A: and really kind of aware of people I think
Female recreational cyclist B: especially that bottom right
Female recreational cyclist A: because where do you go, if you're going straight through, you've got to squeeze through on the left there aren't you, I'd rarely use it
Female recreational cyclist B: yeah, that's exactly the type of thing that we practiced on that cycle thing, and so I would feel confident to cycle in that situation, but I would be feeling very nervous

7.4.2 Cycle lane – straight through manoeuvre

For the straight through manoeuvre, the majority of participants commented that they would be happy to cycle through the intersection with cycle lanes (Figure 7.9). Some commented that they would prefer more protection and that the manoeuvre would not be enjoyable. The other major concern was that left-turning traffic had to cross over the cycle lane as drivers have a reputation for not adequately adhering to the rules in this instance. Another issue raised by some participants was that the cycle lanes do not have arrow markings as vehicle lanes do, resulting in these people being unsure which lane they should be utilising.

Figure 7.9 Cycle lane at intersection in Christchurch, New Zealand

Source: (Koorey, 2008)

Male worker B: you've got to use it, but it's not appealing

Male worker A: yeah, when you're out in the middle of the…it's like you're actually putting the cyclists out in the traffic so they can get run over

Female worker M: No
I: You would still be walking?
Female worker M: mmm, yup
Female worker N: I'd be much happier with this because there is a clear path to the front, um but again I would still be pretty careful about it because you could

potentially be knocked by a car turning left and I would be very watchful of that, because if you are up at the front the likelihood of traffic turning left is pretty high

Male worker F: they actually work, like I've been in the ones where you're absolutely in the middle, as long as you don't then try and do something stupid like turn right or turn left, I've seen people do that, if you're in the middle one you're going straight ahead
…
Female worker L: yeah, that's fine, I still just don't get how you'd get to over the other side… yeah, but that would be fine to go straight ahead, but getting out of that lane
Male worker F: yeah, if you're getting, yeah like, if I had to turn right there I'd be a pedestrian, it's a busy intersection so I'm not, just not going to take chances

7.4.3 Cycle path going with general traffic signals – straight through manoeuvre

Although this cycle facility (Figure 7.10) removed cyclists from the traffic flow along the mid-block, it was a very unpopular facility for navigating intersections. The primary reason for this concern was that drivers would not notice the cyclists coming up to the intersection along the footpath when they were going to turn. Particularly, this was a concern when coming up behind a vehicle turning left across the straight ahead cycle traffic. The other concern was the issue of mixing pedestrians and cyclists, which was considered safe but not ideal for mid-block. In general, most focus group participants agreed that they would prefer to have an on-road cycle lane rather than this facility. On one hand, however, there was a lot of confusion about this type of infrastructure and consequently this confusion may have had an impact on how people perceived the facility. On the other, one of the issues raised is being able to understand the facility in advance and it appears that an off-road path proceeding with general traffic signals is too confusing for the majority of potential cyclists.

Figure 7.10 Cycle path going with general traffic signals, New Zealand

Source: (Koorey, 2008)

Female student A: so long as the car sees you, that's the other thing, the cars quite often don't see, well the drivers don't

Female student D: that looks like it belongs to the pedestrians
Female worker D: it does doesn't it, I'm trying to get my head around that one

Male recreational cyclist: I don't like that I would prefer to cycle on the road
…
Male recreational cyclist: Because I would worry that motorists didn't know I was there, because I am on the foot path

7.4.4 Cycle path going with cycle or pedestrian lights – straight through manoeuvre

In general, this facility (Figure 7.11) was preferred to the off road path going with the general traffic signals, but there were still numerous reservations about it. If there was a separate cycle light facility participants were generally happy to use this facility, but were not convinced it was a safer route than the on-road cycle lane. Overall, it was difficult to

draw a conclusion from participants regarding which of the cycle facilities they preferred for negotiating intersections when going straight ahead. It was relatively clear, however, that they perceived an intersection with no cycle provision as extremely unsafe.

Figure 7.11 Cycle path going with cycle/pedestrian lights, Europe.

Source: (Koorey, 2008)

Female student B: would that kind of protect you from slow cars turning?
…
Female student A: so the cyclists don't go with the traffic lights?
…
Female student A: well this particular picture I think you like more because of the bright red colouring, but the diagram itself with the cycle light, I don't trust it because I would feel that they (the cars) won't respect the signal or they won't even see it, that's how I feel, so I don't trust them in Christchurch
I: so you would actually trust B3 where you go with the general traffic signals
Female student B: yep
I: more than you would trust the pedestrians. What about you?
Female student B: well, I'm kind of assuming that maybe the cars would be on a red light or something that gives you…a head start would be good, because presumably the car won't go over the red light….but I see what you mean, because I've seen a lot of people have started, like say with the pedestrians crossing, are turning without even giving way to the pedestrians, particularly if they're not moving very quickly
I: like if we see there are pedestrians coming from the other side?
Female student B: yeah, and they just duck round
I: and they just turn left?
Female student B: yeah, I see heaps of these problems,
Female student A: it's just that compared to like the general mannerism (laughs)….
I mean unless it is employed city-wide, country-wide in every intersection and everything, identical ways, but we are not at this stage
…

Female student A: yeah, um, well going with the traffic flow? Yeah, I would think so, it's only because, um, of the way things are in New Zealand though, I mean, if that's normal in that country, then I'd be happier to just follow the rule because people respect it, it just depends on the intersection and the drivers, so no I don't trust that one

Female worker A: Yeah that's fine
I: So that is better than going with the general traffic signals?
Female worker A: Yeah, you can trust the cars more... Because they are on a red light, you would presume it's all co-ordinated so that if you are going they are not, mind you they are all going in this example
...
Female worker B: But if the cyclists have got a green light to go ahead, then we are thinking that the cars have not got a turn across that their not allowed to turn across that because, yeah same direction only
Female worker A: But I think I like having the cycle lights as well because drivers will see that as well
I: So again you like the markings across the intersection?
Female worker B: Oh yeah, yup, definitely

Female student D: what if you're travelling with kids, man I'd be too scared, I'd think 'oh my god' what if a car turns

Female worker N: Yeah it's great
Female worker M: I'd be more comfortable because eI'd feel I'd got the right of way signalled by lights so I'm not reliant on

Male worker F: that's fine because in that instance you've got the same rights as pedestrians, yeah, they've got to give way
Female worker L: yes [I'd be happy on this]

Female recreational cyclist A: yeah I think that's fine, they're free to cross
...
Female recreational cyclist B: yeah, I think that's, yeah
Female recreational cyclist A: yeah, they've got them round the park as well, at a couple of different spots around Hagley Park, yeah and it's good

7.4.5 No specific traffic provision – right hand turn manoeuvre

The next set of pictures considered the right-hand turn manoeuvre through a signalised intersection. For an intersection with two lanes, both going straight and turning (Figure 7.12), the majority of participants were extremely wary of cycling through the intersection. While the recreational cyclists may have been prepared to attempt the turn, depending on traffic, the majority of participants said they would walk their bicycles across two sets of lights as pedestrians or avoid such an intersection by taking a different route.

Figure 7.12 No specific provision for traffic turning right in Christchurch, New Zealand

Source: (Koorey, 2008)

> *Female student A: I hate it*
> *Female student B: ok, I'm freaked out turning right in a car, so (laughs) turning right as a cyclist is just not even...*
> *Female student A: I even use the pedestrian crossing, hop off the bike, go on the pedestrian crossing*
>
> *Female worker G: no*
> *Female worker H: less secure*
> *Female worker J: I'd be pushing it across with the pedestrians*
> *I: how many people would be off their bike and walking through the intersection?*
> *Female worker F: yep*
> *Female worker G: yep*
> *Female worker I: possibly*
> *Female worker H: yeah, probably*
> *I: at least 5 people, ok, how many people would go out of their way to avoid the intersection entirely on their route?*
> *Female worker G: yeah*
> *Female worker I: yep*
> *Female worker K: yeah*
> *Female worker H: yeah*
> *I: and you'd take a longer route to avoid it?*
> *Female worker G: yep*
> *Female worker I: yeah*
> *…*
> *Female worker I: because especially with that lane going straight ahead or right, so do you get on the right-hand side of that lane or do you get on the left-hand side of the lane?*
> *Female worker H: because you have to keep back to see what's coming up don't you*
> *Female worker I: yeah, because either way you're going to be in somebody's way*

Female worker H: I'd probably go on the right-hand side of the lane
Female worker I: I'd probably go right in the middle actually and just own it
(laughs)

Female worker B: Oh scary
Female worker C: Accident waiting to happen
Female worker A: Yup
Female worker C: Yeah I'd do that one but only if there wasn't an alternative

Female worker M: Well if I won't even go straight ahead I surely won't go right
Male recreational cyclist: I would do it, but it depends how traffic is that gets me, if it was during normal off peak hours

7.4.6 Right turning traffic lane – right hand turn manoeuvre

Introducing a traffic lane dedicated solely to right-hand traffic (Figure 7.13) increased the number of people prepared to attempt this intersection, however, there were still many participants who said they would avoid such an intersection. While the concerns in section 7.4.5 were around cycling down a lane that had traffic going in two directions (straight and right), one of the major concerns about this facility was having to cross one or two lanes of traffic in order to enter the right-hand turn lane.

Figure 7.13 Right hand turn traffic lane in Christchurch, New Zealand

Source: (Koorey, 2008)

Female worker A: How does the bike get across there though?
Female worker B: You go across two lanes of traffic you see
…
Female worker B: You plan it 300m up the road
Female worker C: Oh no no
…

Female worker A: Especially at 8 o'clock in the morning
...
Female worker C: Yup probably [walk the bike around]

I: So would you still avoid the intersection?
Male worker D: mmm, probably
Female student D: I would, because I still don't know where you're supposed to, like do you go on the left of that right hand turning lane and go around, or? Because the other people turning right would be out a bit more.

Female worker J: it's not that, it's getting across from the left-hand lane when you've been on the cycle lane, right across that traffic so that you have to turn right, that's the problem
I: how many people would still be off their bikes walking?
Female worker G: I would
Female worker I: possibly
Female worker H: there's sort of three lanes not two
I: would people still be avoiding the intersection entirely?
Female worker G: yep
Female worker K: yep

Female worker N: I'd be much happier with that, although you've not got a dedicated cycling place, the fact that you are out of the way of the traffic as its trying to go through, to me makes a difference, if you kind of park yourself there and wait. The risk is though that you will sit there and wait, you will wait for the lights to turn orange and try and get through there at the last minute, it is a risk.
I: You are not comfortable, you'd attempt it, but you are not happy
Female worker N: Yip, and particularly because you are going across

Female recreational cyclist A: yeah, I don't like that much
Female recreational cyclist B: it's trying to get across to that lane for a start isn't it, if you're on the left and you want to turn right, essentially you've got to cross there too
Female recreational cyclist A: yeah, I don't like it as much as the previous, um, example, ah, but I would be ok with doing that, but once again it depends on the volume of traffic, because presumably you're actually starting off on this far left-hand side so you actually have to move, because I've done that down Memorial Ave, you have to move right across

7.4.7 Right turning cycle lane – right hand turn manoeuvre

Participants who had some experience cycling had often mentioned the provision of right-hand turn cycle lanes prior to them being shown in the PowerPoint. Most participants were happy with this level of infrastructure (Figure 7.14) as it provided a specific cycle space on the road. The major concern about this facility was again regarding having to cross lanes of traffic to enter the cycle lane as in Section 7.4.6 and this meant that several people said they would still avoid the intersection entirely.

Figure 7.14 Right hand turn cycle lane in Christchurch, New Zealand

Source: (Koorey, 2008)

Female student A: yeah, but again, you still have to cross… a tiny little bit, it depends on how busy the road is though, if it's a busy road, it just doesn't seem to matter

Female worker L: oh, but how do you still get into that cycle lane?

Female worker C: That's good
Female worker A: That's nice
Female worker B: You still have to get across there
Female worker A: You still have to move into it, but at least there is room for you

7.4.8 Advanced stop box – right hand turn manoeuvre

The advanced stop box is an additional painted space on the road that stretches in front of the traffic lane at the intersection (Figure 7.15). When the light is red, cyclists can use this to move from the left-hand side of the road to the edge of the right-hand turning lane without having to cross the traffic flow. Many participants had either not seen this facility or did not know how to use it and were very sceptical of doing so once it was explained. They also pointed out the drawback that if the light is green cyclists are left to navigate the intersection on their own. They were also concerned about blocking vehicles and getting in the way of drivers, linking to the issues of confidence discussed in Chapter Six. On the other hand, some people saw this facility as providing cyclists with priority over vehicles and perceived this as a benefit to cycling.

Figure 7.15 Advanced stop box in Northern America (image inverted)

Source: (Koorey, 2008)

Female student A: um, I also noticed that a lot of the drivers in the cars behind, you know, they're hardly kind, it's really awkward because they are impatient... that can scare you a little bit
Female student B: the issue would also be if there are none that, like that they would actually be blocking the car going straight, and people get quite antsy to go on green, and you kind of feel that they're creeping up behind you which is not very nice
Female student A: and they don't necessarily respect that, the left turning traffic, at the corner there, they don't necessarily get more aware of the cyclists either

Female worker B: Ok, I just never knew what those were for, so the cyclists get in the way of the cars and go first
...
Female worker B: Ok so the cars behind you are going straight ahead or to the left? So you can only move across when they are stopped, so you come up and if the light is red you can shuffle across

Female worker J: you're just setting off and all the traffic's waiting, you'd have to get your arse into gear (laughs) to go around
Female worker I: sometimes I think I must need a circular line painted on because I think I'm going to be cycling out to the middle of the intersection, sitting there until I can actually turn right, but you don't actually know where the other cars are going to be going until you
Female worker H: well you're acting like a car there aren't you, you're kind of thinking like a car to turn right aren't you?

7.4.9 Hook turn – right hand turn manoeuvre

The hook-turn, although initially not understood, was the most popular facility for performing a right-hand turn. To undertaken a right hand turn manoeuvre on this type of infrastructure requires two phases of traffic lights. In the first phase, cyclists continue straight through the intersection and wait in the space provided (Figure 7.16). When the lights change the cyclist then proceeds into their target road with another straight ahead manoeuvre through the intersection (Land Transport NZ, 2005). One reason that this facility was popular was that the majority of participants would already take two phases of traffic signals to navigate a major intersection and the hook-turn boxes allowed them to do this while remaining on their bicycle rather than joining the pedestrians. This facility was also perceived as relatively safe for children and novice riders. Negative views of this type of facility were the time component being an issue for confident cyclists, still being on the road and ensuring that everyone understood how the facility worked before arriving at it by bicycle. Primarily, the concern regarding time arose when participants considered this viewpoint from a regular cyclists' perspective. For potential cyclists it was agreed the facility was beneficial. The hook-turn was also seen as a good compromise between bicycle safety and vehicle priority compared to the head-start lights.

Figure 7.16 Hook turn facility on Memorial Ave, Christchurch, New Zealand.

Source: (Koorey, 2008)

> *Female student A: ah, that's kind of what I do already, yeah*
>
> *Female worker A: So that would be similar to some of the pedestrian things we've got around the area*
> *…*
> *Female worker B: Yeah*
> *…*
> *Female worker A: I guess it's pretty slow, but it's easier than getting off your bike I suppose*

Male worker D: a lot of this comes down to being familiar with your intention, if I was familiar I'd probably do it, but if I just got there I'd think 'what the heck goes on here?' you know

Female worker L: in terms of, um, if you were on a busy road like waiting, you'd be waiting for a long to get across that road if you're having to stop at two [lights]
…
Male worker F: that's quite often at a really busy intersection, because one of the worst things that happens at intersections, now, people go 'yeah, lights changed, oh, the right turners are still going', so you can't get across sometimes until well into your phase, so it's not something you can do on a pedestrian crossing, but that would actually work
…
Female worker L: oh, I wouldn't be worried about it [the time], but I just thought that it would be longer than those other options
…
Male worker F: yeah, [consistency of rules] and that's what will, it's just actually knowing that there are a lot of, um, a lot of people who are ignorant and driving, and a lot of people, you know, and with changes like that you stop and think 'what's that?'

Female recreational cyclist A: I saw one when I just got in actually
…
Female recreational cyclist A: at least it makes it safe doesn't it
Female recreational cyclist B: mmm
…
Female recreational cyclist B: I think it's a great idea for those really busy intersections, I wouldn't want them on every intersection though, because presumably if that facility is there then you would have to use it, whereas if it wasn't a complete
…
Female recreational cyclist A: yeah, because if it wasn't at like a busy time of day then I'd rather actually just be out in the main lane with the traffic, yeah, but at, you know, your intersections which are busy the majority of the time, yep

7.4.10   Head start cycle lights – right hand turn manoeuvre

While having a cycle signal that allowed cyclists to take a right-hand turn across an intersection (Figure 7.17) on their own phasing of lights was appreciated by all participants, many were concerned about the practicality of this facility. Their primary reason for not endorsing the facility was that it would add extra time to vehicle signals and disrupt drivers. Another concern was that insufficient time would be allowed for cyclists to navigate the facility. Consequently, the majority of focus group participants agreed that the hook-turn would be a better facility to provide for cyclists.

Figure 7.17 Head start cycle lights, New Zealand.

Source: (Koorey, 2008)

> *Female student B: I like the concept but… the hook just seems like a compromise, this phase, but it's not a compromise for everyone else on the road*
> *Female student A: when you're going, the kerb across, I find that sometimes some cars seem keep driving, they don't seem to notice the red light and they go straight past*
>
> *Female worker A: Cars might not like that, especially if the cyclists come in dribs and drabs [occasionally]. I'm thinking of it as a driver; especially think of like a busy morning on your way to work*
> *Female worker C: It would be like a pedestrian crossing wouldn't it, I mean they'd still have to wait a certain amount of time before they'd be allowed to go again*
>
> *Female worker D: you certainly get the feeling that someone has actually thought it through rather than just sort of picking some random…*
>
> *Female worker M: Yeah, yup*
> *I: [Male recreational cyclist], are the children allowed to go?*
> *Male recreational cyclists: Yeah absolutely*
> *…*
> *Female worker N: … that's seeing cyclists as having a right to be on the road and that they are kept safe, I like that.*

7.5 Roundabouts

When showing the roundabout portion of the PowerPoint slides many participants commented that they would rather cycle through a four-way intersection rather than a roundabout. The following set of cycle facilities provides options, however, of ways to attempt a roundabout if there is no other route option.

7.5.1 No specific cycling provision

Roundabouts (Figure 7.18) in general were disliked by participants and most commented that they would only cycle through one with no facilities if there was little traffic. Most people would try to avoid a roundabout, however, there were generally fewer comments about walking their bicycle across the roundabout than were brought up when considering signalised intersections. Participants were asked to consider a roundabout that was correctly engineered to slow traffic to 30km/h in a 50km/h zone, however, many still made comments that roundabouts failed to slow traffic down.

Figure 7.18 Suburban roundabout in Christchurch, New Zealand
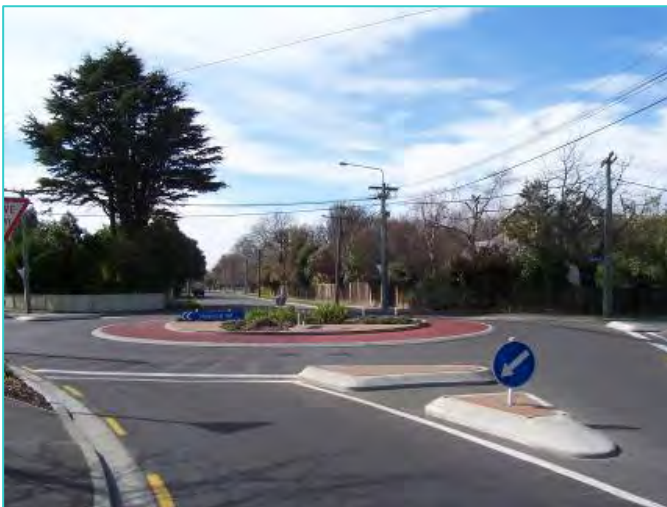
Source: (Koorey, 2008)

> *Female worker C: Oh I was knocked off at a roundabout so I don't like them very much*
> *Female worker A: Roundabouts are bad enough for people in cars, let alone on a bike*
> *Female worker C: They are worse if they have lanes though, if there are two lanes like the Sockburn one, it's a nightmare even for cars*
>
> *Male worker D: I try to get through roundabouts as quickly as possible, which I since reflected on as could be a dangerous thing as well, because you're not as visible, so if you go quickly through a roundabout a car might just come through*
> *Female student D: yeah, that's the thing with roundabouts, is that the drivers are distracted by what they need to do to steer around the roundabout and sometimes it can be quite narrow and*
> *Male worker D: and the other thing is, indicating as well, and that's a big thing on bikes, if I want to go, I mean strictly speaking I'm supposed to indicate when I turn left, sorry when I exit the roundabout, so if I was this car here and wanting to go straight ahead I'm supposed to indicate left, right? Correct? So, I'm on my bike, perhaps changing gears and I'm doing this as well making that sure people know I'm turning off the…(laughs) can you all see this?*
> *Female worker D: this would be another of the ones where I would keep to the footpath and cheat (laughs) and cross over roads to get to where I'm going (laughs)*

Male recreational cyclist: I'd go through there but I'm less happy about that than the basic traffic lights scenario and mainly because it is the experience of, you don't get a solid spot, if you are that cyclist at the bottom where all the cars are going, you don't know if the car coming up on the right hand side will slow down, they might actually just go straight through, so there is greater risk involved in that than at a intersection. At least you know when the lights are right you go

Female worker N: And it's hit and miss with our roundabouts, if it is low then I don't think so many people are concerned. We have a lot of roundabouts where the planting is quite high, and there are trees and you can't see even in a car, until you are almost round, so as a cyclist I'd worried they couldn't see me

Female recreational cyclist B: ah, it's ok, depends if it's single lane or double lane, um, and volume of traffic, but, yeah, ok
Female recreational cyclist A: what I find frustrating at the roundabout is when they're not using (hard to hear)...indicating, that's what I find frustrating, coming off or if they're going straight through, or they don't and you're waiting for them, that's what I find really frustrating, when they're not doing the right thing
...
Female recreational cyclist: yeah, you need to know where they're going to go, but apart from that
Female recreational cyclist: actually I have to say, I almost prefer traffic lights to roundabouts

7.5.2 Cycle lane

On-road cycle lanes (Figure 7.19) did not dissuade the majority of participants from being extremely concerned about roundabouts, but they were considered as a type of infrastructure that provided cyclists with space. In particular, participants preferred the lanes that were coloured as opposed to white lines. There were still concerns about drivers cutting cyclists off as they circled the roundabout, especially on two lane roundabouts. Another concern about roundabouts was signalling at the same time as controlling a bicycle to go around a corner. If cyclists fail to signal they can cause problems with other road users not understanding their actions. Conversely, drivers also fail to indicate accurately causing problems for cyclists and vehicles alike.

Figure 7.19 Roundabout with cycle lane, Europe

Source: (Koorey, 2008)

Female student A: colour is included, ok, I like that... yeah, I like that [on-road lane] very much

Female worker B: So if they are trying to leave the roundabout and you are there, they have to stop or run you over
…
Female worker A: So it's like a normal roundabout
…
Female worker C: Looks ok
…
Female worker A: Yeah because you've got your designated space, but I still wouldn't think it would solve any of those issues with people behind you
Female worker B: Or knowing where people were going because they hadn't indicated

Female worker I: token gesture
…
Female worker J: I think as a motorist you've just got too many lines going around
Female worker H: they still have to cross the line
Female worker F: yeah, that's right
I: how many people would be avoiding the intersection entirely?
Female worker I: depends on the hour, the time

Female worker N: I'd prefer it if there were colour… Well just the idea of there being colour in the lane

Male worker F: I would think that's, you're exactly the same as actually cycling the roundabout, no.
Female worker L: I think I'd feel safer on that one, because drivers would be more aware that that's actually a lane

7.5.3 Directional cycle lanes

Directional cycle lanes (Figure 7.20) were emphasised using an example from York, UK. In this, there are two cycle lanes going around the edge of the traffic lanes, with one cycle lane continuing in a circle and the second lane providing slipways off the roundabout at each intersection. This type of infrastructure provides drivers with a visual indication of where the cyclist is exiting the roundabout without the cyclist having to give hand signals. One of the major concerns about this cycle facility was that it was very confusing. The major benefit that was recognised, besides not having to signal, was sufficient space being given to cyclists. As with several of the other types of infrastructure shown throughout the PowerPoint slides, there was a discussion about understanding how to use the facility and the need for adequate signage and education for cyclists and drivers to explain these types of facilities.

Figure 7.20 York roundabout with directional cycle lanes, United Kingdom.

Source: (Koorey, 2008)

> *Female student A: yeah, I like that one if it's big intersections, especially the double-lane…*
> *…*
> *Female student A: yeah, I would be quite prepared to do it, yeah. Anything with this sort of red line, it's good, yeah*
> *Female student B: it's quite good because it separates bikes as well, like I just thought a lot of…where there's not a lot of cyclists as well, do you know what I mean? That's good, but*

Female student C: it's a bit confusing isn't it really
...
Female student C: yeah, too much and you've got to be watching that and everything else as well
Male worker B: although most British intersections would have a lot more signage too all over the place, to add to the fun...
Male worker C: ...for all the money they put into...they could have put the underpass underneath...

Female worker A: Yeah if you are going off they know that
...
Female worker B: Confusing
Female worker A: Yeah because you have lines all over the place, but, um, I guess its an improvement on the last one in terms of making people aware of what is happening
Female worker B: You'd still be expected to use hand signals anyway, and I mean hand signals would give the cars the same kind of advice as to when you were leaving the roundabout and continuing, so I don't know whether its actually any better

Female worker F: better than the other ones
I: how many people are still avoiding the intersection?
Female worker K: I would
Female worker J: I'd give it a whirl, but probably not
Female worker F: I'd give it a try...
Female worker I: it depends on how...they are, it's working up to it (laughs)... not at this stage I wouldn't feel safe, no

Female recreational cyclist: oh, ok, yeah that's a good idea, yeah

7.5.4 Cycle path without cyclist priority

Generally, most participants appreciated that this type of facility (Figure 7.21) provided excellent safety and separation from the traffic; they were just concerned that at peak periods it would take some time for the cyclist to navigate the roundabout, particularly when there are multiple lanes of traffic. While there were several participants agreeing that they may use such a facility, the general view was that the time it could take to navigate around the intersection was more detrimental than the safety benefits it provided.

Figure 7.21 Bexley Dyers roundabout cycle path without cyclist priority, Christchurch, New Zealand

Source: (Koorey, 2008)

Female student A: mmm, I don't like that as much
…
Female student A: absolutely, [prefer cycle lanes] yeah, well it's just that I noticed that at Sockburn roundabout it has islands that kind of work in a similar way, but I noticed that the cars just bowl up at you

Male worker B: who thought of that?
Male worker C: yeah, very unmarked
Male worker B: yeah, the cars should have to stop for the cyclists

Female worker A: For cyclists on a busy day you'd have to stop at each point to get the pedal ready again

Female student D: it would be probably the safest option but, well, I'd be happy with it, but then if you don't want to wait it would be a bit of a pain in the butt to be waiting
Male worker D: still it seems to be a bit better than the other two though, for me
Female student D: yeah, for me, I'd use that over the other two
Male worker D: because you're coming off a designated cycle, off-road cycle lane aren't you?

Male recreational cyclist: No I don't like this one
I: Don't like that? So you prefer the on road cycle lanes?
Male recreational cyclist: Yip, it's the same issue that we were talking about before with the separation, also the fact that you are then having to try and cross the road as a pedestrian is a significant issue with cars that have a right of way, you could get stranded there
Female worker N: Yeah I agree, could be there for ages

7.5.5 Cycle path with cyclist priority

The cycle facility demonstrated here was based on the Dutch roundabout system (Figure 7.22). In these, the cyclist has priority over the vehicles at each entry and exit point of the roundabout. While participants agreed this was safe, they were concerned about the effect on vehicles and resulting congestion from giving way to cyclists. This idea came from the overall view that cyclists should not be given priority over motor vehicles. There were also concerns that this type of facility would not be respected by drivers, particularly if it was inconsistently used in New Zealand. It was also noticeable that recreational cyclists and those with the most experience of cycling were more supportive of this type of facility and the higher priority it gives to cyclists than those with little experience.

Figure 7.22 Cycle path around a roundabout with cycle priority, Netherlands (image inverted)

Source: (Kingham, 2008)

> *Female student B: because there is sometimes, you hear people say "oh, cyclists just do what they want, they're on the road, they're on the footpath, they're anywhere", that respect, kind of…and that would be a problem, that red car*
> *…*
> *Female student B: I think it's investing in the future, I think more people, as petrol gets more expensive, it's a cost thing, and environmental thing, so, and a lot of these options would also be infrastructure for pedestrians as well to a certain extent, making them safer, like I know that round-a-bout near my house, people, there's like no pedestrian crossings, traffic light things, they just walk out into the, or they have to wail cars, you know to zoom past them, this would help them also.*
> *Female student A: I think from a, well, in Christchurch I'm interested that most cyclists are the racing bike cyclists that I notice here, those people may not like that*

Male worker B: when I first saw this in Holland with all the lanes and lines and things I just, initially I was confused, but as soon as I got used to using it, very easy

Female worker A: For a cyclist it looks pretty good for us commenting as car drivers, we are thinking oh this looks a bit
…
Female worker B: Yup, you'd need a lot of room to make it work well; you'd need a lot of space

Female worker H: the roundabout would just get absolutely gridlocked
Female worker G: yeah, just one car?
Female worker J: yeah when you're on a roundabout you put your foot down sometimes as a motorist to get in and out
Female worker I: yeah, you do

Female worker F: I'd feel quite confident about it, that's with the assumption that the driver would stop

Female worker N: Again it's about the educational thing, for motorists, so that they give you right of way
Male recreational cyclist: But as long as you had confidence as a cyclist that the motorists could see you and that they would stop
…
Female worker M: In theory I am happy with it, but um, I am not sure
Female worker N: Its better than the previous one, the previous one pedestrians and cyclists would get stuck

Participants were also asked if they thought that the cyclist crossing needed to be raised or if a coloured surface was sufficient. There were mixed opinions about this issue but it was generally concluded that if the crossing was coloured and properly signed then that would usually be sufficient. There were a few negative views expressed about raised crossings.

Female student B: I don't know how much, I mean they're visible, but I don't know how much, once the car hits the bump it's sort of a bit late if they haven't noticed that it's sort of, yeah

Female student D: raised up is more, um
Female worker D: a bit more visible
Male worker D: there's a visual cue for the motorist too because that section where the painting is just before the raised bit, this section here, you can see that from a distance so it's a signal to slow down anyway because there's a hump
Female student D: and it's not just a piece of painted road that doesn't have much impact on you, so it's more clear

7.5.6 Underpasses

The final type of infrastructure shown was underpasses (Figure 7.23). This facility was only shown in regards to roundabouts but the principles discussed could be applied to busy

intersections as well. Generally, everyone felt underpasses were a fantastic idea, until they considered personal safety issues and possible conflicts with pedestrians. The concerns that were raised were darkness, tagging, litter, being unable to see traffic on the other side and narrow passage ways. Everyone agreed that if properly designed they would most likely use the underpasses during the day time but would have serious concerns about using them after dark. This concern, however, links to the general concerns about night time cycling discussed previously in Chapter Six.

Figure 7.23 Underpass for cyclists, New Zealand.

Source: (Koorey, 2008)

Female student A: it does actually create spaces for taggers you know, more people hanging about, it doesn't feel like a safe place
Female student B: yeah, they always turn into kind of seedy

Male worker A: yeah, we'll have that
Female student C: we'll have that, yep
Male worker B: …build 4 bridges….
Male worker A: people don't like going into a dark tunnel though, you know, what's in there
…
Male worker B: well there's a whole lot of issues, it depends where it is, depends on whether there are homeless people sleeping in there or urinating in there, or broken bottles in there or, you know, near a school, but if you get all the other things out of the way, all those other problems have gone, then yeah, essentially you want to be away from the traffic as much as possible
…
Male worker C: it's a pretty expensive way of doing it, but if you're starting from scratch

Female worker A: Oh my goodness
…
Female worker A: Well it looks good
Female worker C: Yeah it looks great for cyclists, I'd be a bit worried about going there and what might be waiting for you in the tunnel

Female worker B: Yeah night time might be a bit more
Female worker C: Its not even then, you know, 7.30 in the morning you don't know who might be around

Female student D: pretty good, as long as you don't run over pedestrians

Female worker I: oh beautiful...
Female worker K: is that for cyclists? (laughs)

Female recreational cyclist A: yeah, definitely for busy, really busy intersections
Female recreational cyclist B: yeah, I mean, I guess I would be thinking of really, really busy intersections like, you know, kind of motorway-type situations, um, I always get a bit nervous with underpasses from the security point of view, like cycling at night I would almost rather
...
Female recreational cyclist B: be up on the road than in an underpass like that, so I'd probably just cycle on a different route
Female recreational cyclist A: that's true, well I wouldn't go under, I wouldn't go through there in the dark
Female recreational cyclist B: even with good lighting, I still wouldn't
I: but I think in the daytime if it's designed correctly it's all fully lit, so would you be happy?
Female recreational cyclist A: yeah, during the day

7.6 Overall preferred infrastructure

This section outlines some of the conclusions for the type of infrastructure preferred by participants. From the discussions it can be concluded that for mid-block, the favourite facilities were kerbed cycle lanes, as they were seen as keeping the cyclist in the view of vehicles, or a lane or path between parking and the footpath. For intersections where cyclists were performing a straight ahead manoeuvre, the favoured infrastructure was on-road cycle lanes and for right-hand turn manoeuvres hook-turns were most preferred. "Head-start" traffic lights were also given high regard by participants, but there were overriding concerns about slowing the general traffic with this type of facility, hence the hook-turn was preferred as a compromise. Roundabouts continued to be extremely difficult with most participants agreeing they would prefer signalised intersections. Underpasses were considered extremely safe in the physical sense, but there were concerns for social safety particularly after dark. There seemed to be little agreement on another type of infrastructure, but cycle lanes or paths had both benefits and difficulties.

I: so in general you decided with roundabouts you're happiest with on-road lanes,
Female student B: yeah
I: hook-turns for right-hand turns
Female student A: yep

I: but divided whether we wanted to go with pedestrian lights or traffic lights with straight through intersections
Female student A: yeah
Female student B: yeah
I: and we liked the kerbed lane, when you came on you had a bit of separation from the cars
Female student B: yeah

I: ok, so out of all the right-hand turn facilities, what would you most prefer?
Female worker G: the hook
Female worker J: the hook
Female worker I: the hook one
Female worker H: the hook, yeah

I: Out of interest, if the mid block of the road was fantastic and at the level that you really liked, how big a barrier are the intersections if they are not well managed?
Female worker M: It's a big barrier for me
I: So you would stop cycling or you would sort of
Female worker M: Yeah I might not even go and get on my bike until they'd done them, how long would it take, I'd love to get on my bike
Male recreational cyclist: I'm just worried about that one

Female worker L: … I thought that was quite good, and the roundabout one with the two-directional

Female recreational cyclist A: I like the ones where there's a separate cycle lane
Female recreational cyclist B: yep
Female recreational cyclist A: whether it be the one where you're turning right, or the cycle lane also to the right or wherever you're going within the roundabout where there's one direction
…
Female recreational cyclist: yeah, but also probably on the road rather than on [off road paths], like there was one … I was concerned when it went across the side-road, I prefer to cycle on the road and on the [path].

The following figures present the findings of the questionnaire that was undertaken during the focus groups to gather quantitative data on which type of infrastructure is preferred by participants. These figures provide more decisive data than the qualitative comments. Figure 7.24 shows that the cycleway behind parking with separation is by far the most favoured facility of all the options provided. For intersections, the cycle path going with cycle or pedestrian lights is preferred for straight ahead manoeuvres (Figure 7.25) with a head start light or hook turn for performing right hand turns (Figure 7.26). Finally, underpasses are the most preferred option for roundabouts (Figure 7.27). Many of the other facilities have some form of preference, however, many of the options still have high counts for never, rarely or sometimes.

Figure 7.24 Results from the focus group infrastructure questionnaire for mid-block
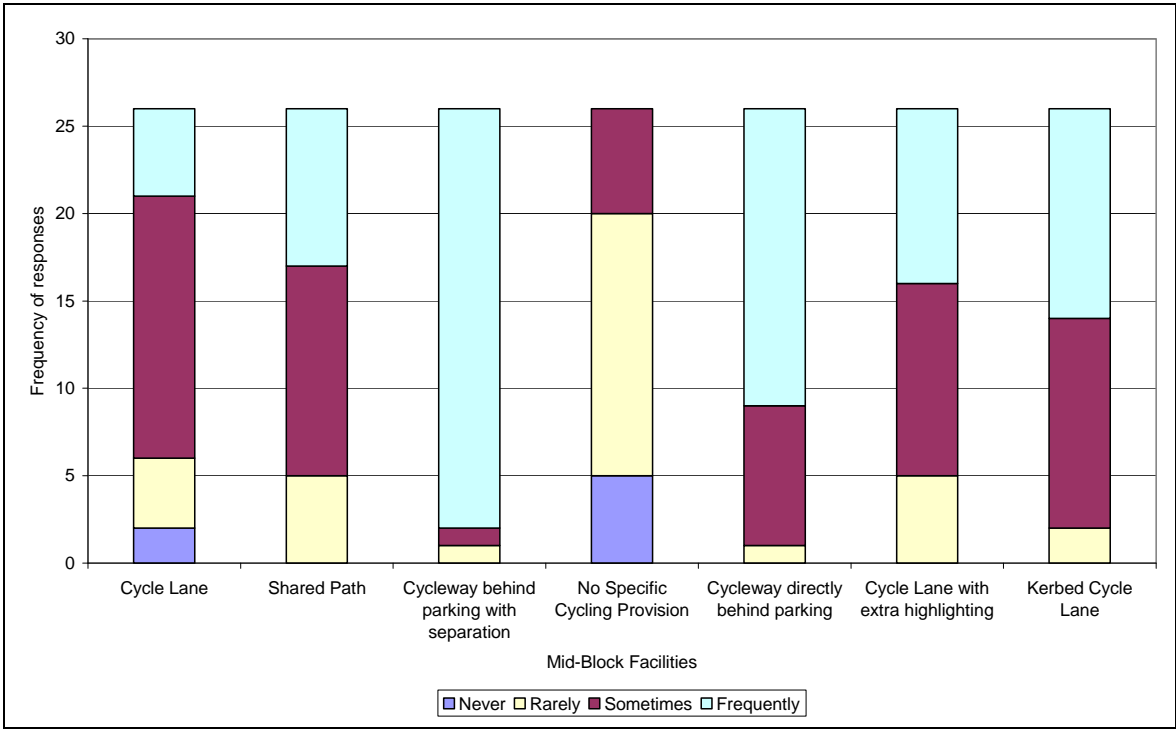
Figure 7.25 Results from the focus group infrastructure questionnaire for intersections
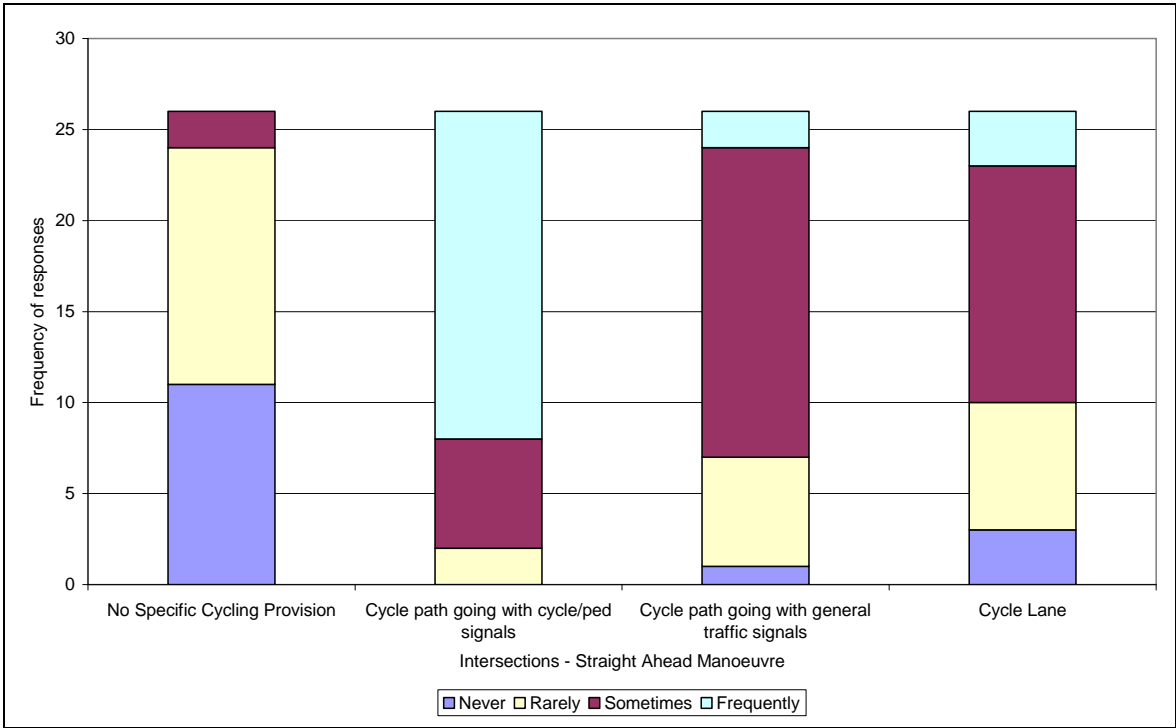
Figure 7.26 Results from the focus group infrastructure questionnaire for right hand turns
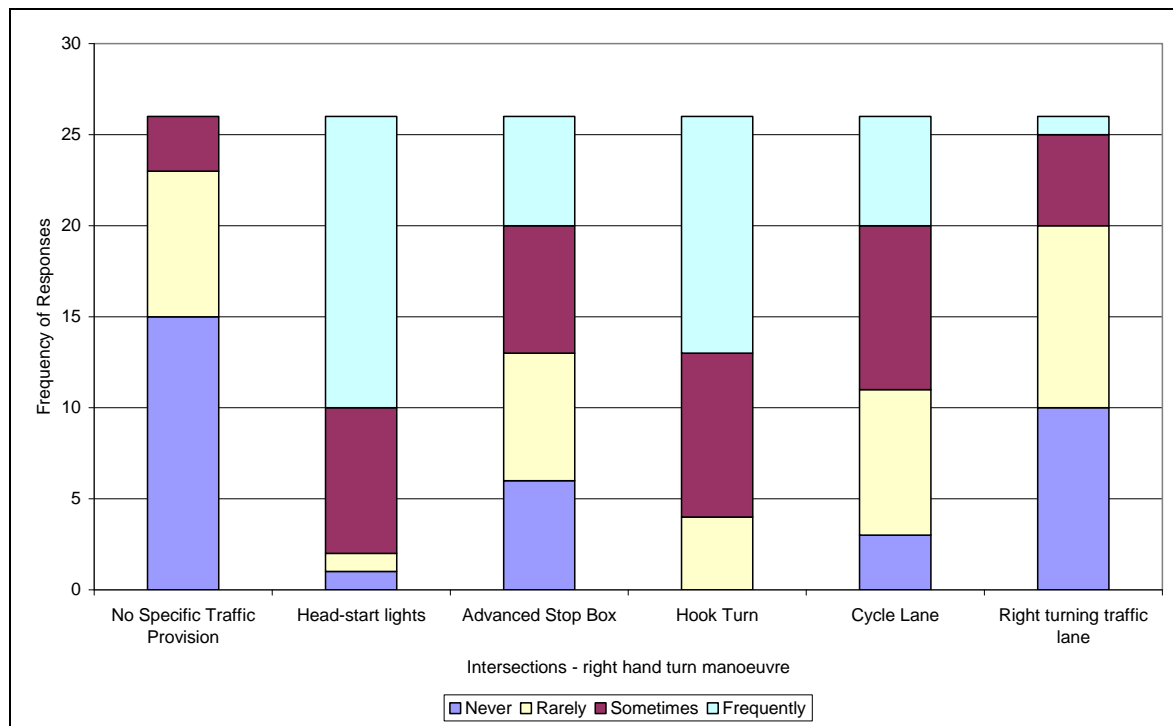
Figure 7.27 Results from the focus group infrastructure questionnaire for roundabouts
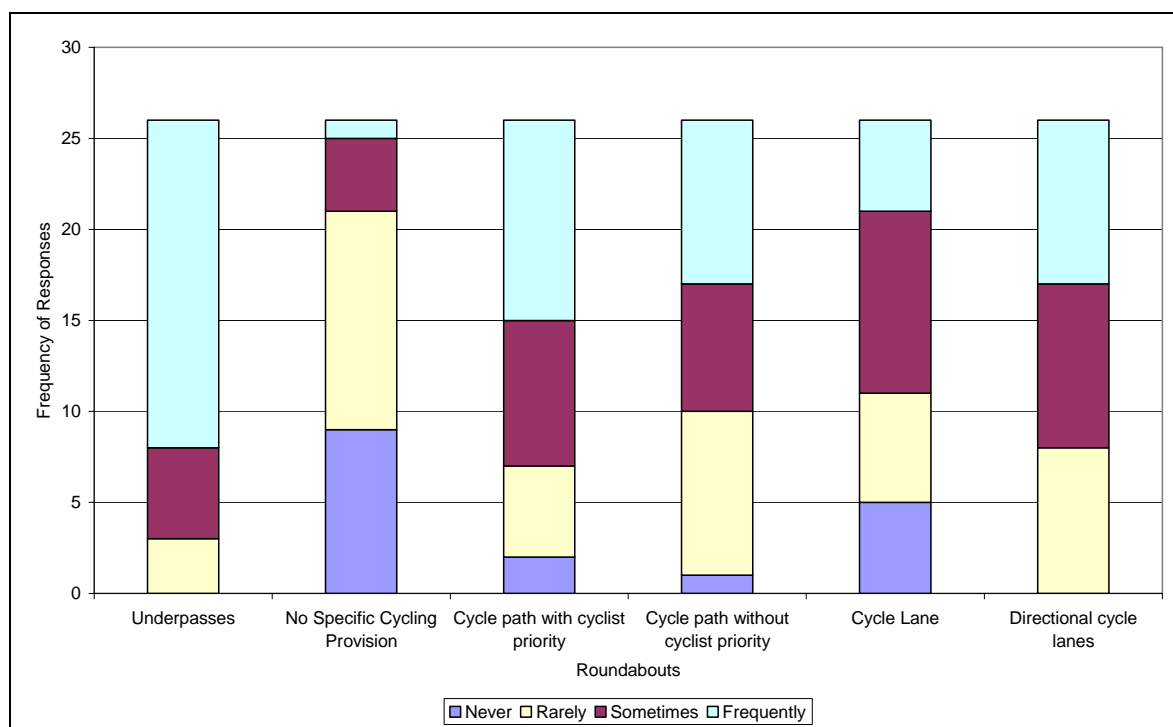
There are of course financial costs relating to building cycle facilities and often one of the difficulties for building off road-cycle facilities is the perceived cost-benefit ratio. While this research investigates what level of infrastructure new and potential cyclists perceive as

most safe, it cannot predict what the uptake of implementing infrastructure would be. Consequently, further research could include studies of new facilities before, during and after building them to understand what proportion of people commence using that facility and whether they are new or current cyclists.

7.7 Conclusion

Overall, safety was a significant issue for potential cyclists, particularly driver behaviour and traffic numbers. There was also recognition that cyclists, as well as vehicles, needed to behave appropriately on the road and this concern stemmed from some participants not knowing how to behave as a cyclist on the road. In general, the solutions suggested were more driver and cyclist education of cycle facilities and how they were to be used by both groups. The other issue that was commonly raised, and was possibly of greater concern to participants than their preferred type of facility, was that the level of cycle infrastructure built across the city should be consistent to facilitate greater comprehension of how to interact with cycle facilities. Providing cycling infrastructure that meant cyclists perceived they were safe on the road was a significant part of feeling safe. The preferred cycle facility for participants suggests that a comprehensive, consistent network of cycle paths would be most successful in attracting new people to cycling for transport.

Addressing the major issue of safety will allow for the other barriers discussed in Chapter Six to be addressed and create a more enjoyable environment for utilitarian cycling. Other minor issues such as confidence and helmets could also be addressed by increasing perceived safety for cycling making the option appear more appealing to a wider range of people.

8.0   Chapter Eight – Discussion and Conclusions

Increasing global concern about the sustainability of our urban centres has resulted in discussions in the literature focusing on transport, particularly how to achieve modal change from motor vehicles to more sustainable modes such as walking, cycling and public transport (Pucher and Dijkstra, 2003; Skinner and Rosen, 2007; Tolley, 2003a). This thesis focused on how to increase utilitarian cycling, cycling for day to day transport rather than recreational purposes, a distinction drawn by Skinner and Rosen (2007) as well as other authors. There is an emphasis on changing commuter patterns as the commute makes up a significant proportion of utilitarian travel and, therefore, there is high potential for change (Stinson and Bhat, 2004). The research aimed to investigate the motivations and barriers for utilitarian cycling as perceived by people interested in cycling. Potential for cycling was seen to exist amongst people who do not currently cycle, or cycle infrequently, for transport but are interested in cycling, or cycling more, for commuter or other trips. There were two objectives: firstly to identify the characteristics of people who currently cycle so as to determine who may potentially be interested in cycling and secondly to investigate the issues raised for cycling as a transport mode. Finally, the data gathered on these two objectives can be used to suggest practical policies for enhancing cycling as a transport mode.

A multi-method approach was undertaken to achieve the research objectives, consisting of quantitative and qualitative research methods. Firstly, New Zealand census data was analysed to understand the current trends in New Zealand commuter transport and to identify the characteristics of current cyclists. Secondly, questionnaires were undertaken at the University of Canterbury and with recreational cyclists. The recreational questionnaires were distributed online and face to face at known recreational sites around Christchurch. Finally, focus groups were held with participants identified as people interested in cycling, who were drawn from the questionnaires based on their responses to specific questions and their willingness to participate in focus groups. The purpose of the focus groups was to investigate the motivations and barriers for cycling, and to complement the results found in the questionnaires and census data about the characteristics of people who currently cycle and the issues cyclists face. Safety was a major theme that arose in the literature and consequently a significant part of the focus groups centred on a discussion of safety and cycle infrastructure. One of the factors in choosing focus group participants was to recruit

people who perceived they lived a reasonable distance to cycle so that a major barrier that is not easily affected by policy (Hopkinson, 1996) was removed from the research process.

This chapter outlines the main findings of the research and draws overall conclusions about how to encourage utilitarian cycling (see Figure 8.1, Table 8.1). Limitations of the research and potential areas for further research are also identified. Firstly, the conceptual context for the research will be outlined, followed by the potential for cycling. This section will cover recreational cyclists, the characteristics of people who cycle and what a reasonable cycling distance is in relation to the findings and the literature. The motivations for cycling will then be outlined and discussed, followed by the major barriers of safety and infrastructure, workplace showering and changing facilities, and enjoyment. Minor barriers for cycling, those raised in Chapters Two, Five and Six and not included in the previous sections, will also be outlined. Finally recommendations for encouraging cycling will be made before the overall conclusions and areas of further research.

8.1 Conceptual context

The research undertaken in this study on cycling is situated within the wider theme of sustainable transport and urban development. Transport has had a major impact on the spatial development of urban areas (Banister and Lichfield, 1995), in particular, allowing for greater distances to be travelled between home and work (Banister and Lichfield, 1995; Gottmann, 1983). Many people took, and continue to take, advantage of transport opportunities to live in dispersed locations with lower density residential areas (Banister and Lichfield, 1995; Docherty, 2003) resulting in increases in motor vehicle numbers. Urban planners, therefore, focused on how to provide for motorised transport through building significant transport infrastructure (Pacione, 2001). In recent years, however, awareness of the social, environmental, health, economic impacts of the unconstrained growth in motorised transport (Banister and Lichfield, 1995), has resulted in a return to focusing on sustainable transport modes; walking, cycling and public transport that have been marginalised in urban centres (Badland and Schofield, 2006; British Medical Association, 1992; Handy et al., 2002; Mathew, 1997; Pucher and Buehler, 2008). New Zealand follows the trend of western cites with increasing rates of people driving to work, over seventy-five percent in 2006, and generally decreasing rates of public transport, walking and cycling (Statistics New Zealand, 2008).

Cycling is the focus of this research as it is an active and sustainable transport mode, both in terms of cost and environmental impacts (NSW Government, 2004). It allows workers

to integrate exercise into their daily schedule, is environmentally friendly and a relatively cheap mode (McClintock, 2002b; Noland and Kunreuther, 1995; Pucher and Dijkstra, 2003). The benefits of cycling affect the wider society through greater social interaction, increases in the population's health, greater mobility for all social groups (Tolley, 2003b) and reduced transport and health costs (Jensen et al., 2000). While three are many benefits and motivations for increasing cycling, there are also many barriers faced by people who cycle (Morris, 2004; Skinner and Rosen, 2007). These issues are where the rationale for this research is based; how to encourage utilitarian cycling, particularly focusing on the people who make up latent demand for cycling.

8.2 Potential for cycling

One of the first research issues was to consider who are the latent demand group for utilitarian cycling. The main factors that result in academics suggesting there is latent demand are the number of urban journeys completed in a reasonable distance for cycling (Davies et al., 1996; O'Fallon and Sullivan, 2005), the increasing numbers of bicycles owned by the population (British Medical Association, 1992; Davies et al., 1996; Lawson, 2002; McClintock, 2002a; Tolley, 1997) and studies that have shown there are people who are interesting in cycling but deterred by the major barriers (de Dios Ortúzar, 2000; Lawson, 2002; Opinions Market Research Ltd, 2005; Sullivan and O'Fallon, 2006). These people include workers as the commute is a significant part of urban congestion. Furthermore, an area of localised congestion occurs around schools from parents transporting children to school in a motor vehicle (Cleary, 2002; O'Fallon, 2007; Thull and Lausterer, 2003). On the other hand, locations with tertiary educations are considered areas of high potential for cycling due to the culture of students (Pucher et al., 1999). Another group of importance are recreational cyclists, who have their own unique motivations and barriers (Howard and Burnes, 2001; Lumsdon, 1997).

There also remains a group who are simply not open to cycling as discussed in the literature (de Dios Ortúzar, 2000; Dickinson et al., 2003; Sullivan and O'Fallon, 2006). These people were also evident in this study with approximately thirty percent of respondents to each questionnaire indicating that nothing would encourage them to cycle to work. The data also showed that these people predominately got to work in a motor vehicle, seventy-five percent of University of Canterbury respondents and eighty-four percent of recreational cyclists. Approximately half of those who stated nothing would encourage them to cycle indicated that they did not live a reasonable distance for cycling to

work, which is possibly one of their main reasons for not cycling for transport. Not owning a bicycle was also possibly an issue for up to twenty-five percent of University of Canterbury respondents.

8.2.1 Recreational cyclists

Theoretically, recreational cyclists are well positioned to cycle for utilitarian reasons (Howard and Burnes, 2001; Lumsdon, 1997). Two reasons for this assumption are that recreational cyclists own a bicycle, even if it is not necessarily set up for commuter cycling, and they also have confidence cycling in general. This research found that recreational cyclists had higher rates of people cycling to work than the national average. On the other hand, recreational cyclists who do not currently cycle to work appeared to have more personal barriers to overcome compared to the general population.

Safety was a relatively minor issue for recreational cyclists in the focus group discussions compared to other people interested in cycling. This difference was particularly noticeable when considering different types of cycle infrastructure, as recreational cyclists commented that they were content to cycle on little or basic infrastructure, such as cycle lanes. In addition, some recreational cyclists shied away from cycle infrastructure that was more removed from the roadway as they were concerned about being removed from the view of motor vehicle drivers. They reasoned that more separated networks resulted in increased danger when they rejoined the general traffic as drivers would be less aware of cyclists. Traffic was of more concern to recreational cyclists than infrastructure as cycling for recreation they often cycled at non-peak traffic periods or on off-road recreational tracks. Consequently, cycling at rush-hour was somewhat intimidating to them, however, as discussed in Chapter Seven they were generally happy to cycle on a cycle lane even when traffic was close by.

The issues that came through most predominantly for recreational cyclists as to why they did not cycle were personal motivation and organisation. Firstly, the distance between their home and workplace is often insignificant compared to the distances they cycle for recreation, particularly for road cyclists, therefore, removing improving fitness as a motivation for this group. While environmental and petrol concerns were also motivators for recreational cyclists, they were not sufficient to overcome the barrier of getting organised to cycle to work, as the time it took to pack clothing, lunch and work materials, retrieve a bicycle, cycle to work, park the bicycle and prepare for the work day was too large a hurdle to overcome. Consequently, it would be difficult for planners to encourage

recreational cyclists to commence cycling for utilitarian reasons as such change must arguably come from the person rather than outside factors. On the other hand, it is easier to encourage people to take up recreational cycling and there is still the possibility that these people may then move to utilitarian cycling (Lumsdon, 1997). Some impact on encouraging recreational cyclists to take up utilitarian cycling could be obtained from policies to streamline bicycle parking and showering facilities, however, the primary issue was the time it took to undertake the activity rather than the location of facilities. Gues et al. (2008) suggest that policies affecting the wider community and the cycling environment may have more impact than those affecting individual barriers. This research also concludes that more benefit for encouraging cycling will be gained from policies aimed at the general population rather than targeting recreational cyclists, however, further research should be undertaken to fully understand links between recreational and utilitarian cycling.

8.2.2 Characteristics of people who cycle

The literature review found that several characteristics have an effect on cycling, including age, ethnicity, gender, location and socioeconomic factors such as income and employment (Pucher and Renne, 2003; Rissel and Garrard, 2006). Ethnicity is a factor that international studies have found affects propensity to cycle (Moudon et al., 2005; Pucher and Buehler, 2007; Sullivan and O'Fallon, 2006).

In general, younger people are more likely to cycle (Stinson and Bhat, 2004; Sullivan and O'Fallon, 2006), although there are also instances of middle aged adults, particularly males, having higher rates of cycling than other age groups (Christchurch City Council, 2001; Pucher and Buehler, 2005a). New Zealand has similar trends to those experienced overseas, with 15-19 year olds having the highest rates of cycling, and rates generally dropping from the twenties. There were small increases in cycling rates for people aged between twenty-five and forty-four in some cases, however, then rates continued to drop in older age groups. Similar trends were seen from the respondents to the questionnaires, with those under twenty or in their late twenties or early thirties having the highest rates of cycling. The analysis of the census data and questionnaires would suggest that the groups that should be targeted for cycling include those aged between their early twenties and mid-late forties. While the lowest rates of cycling are amongst the older age groups, these people are less likely to cycle overall (Stinson and Bhat, 2004; Sullivan and O'Fallon, 2006).

Those on low and high incomes also had higher rates of cycling than the middle income group, and this trend was prevalent in Wellington and Nelson. Deprivation data for Christchurch, however, found that cycling rates and lower socio-economic status had a direct correlation. This finding reinforces the concept that lower socio-economic groups and higher income groups cycle due to economic or lifestyle choices (Dill and Carr, 2003; Hoehner et al., 2005; Plaut, 2005; Pucher and Buehler, 2007; Pucher and Renne, 2003). The University questionnaire had high rates of cycling amongst respondents particularly students. This finding not only supports the income findings, as students usually have low incomes, but also the proposition by Pucher et al. (1999) that tertiary education environments are likely to have higher rates of cycling.

Occupation also has an impact on cycling rates with high rates often occurring amongst professionals (Moritz, 1997) engineers (Skinner and Rosen, 2007) and students (Christchurch City Council, 2001; Pucher et al., 1999). While travel of students could not be analysed as a group through census data, professionals and elementary occupations, skilled and semi-skilled labourers, both had high rates of cycling in New Zealand based on census data as discussed in Chapter Four. The higher rates of commuter cycling in these occupations may reflect the incomes associated with full time employment. Gender also has an impact on cycling, with males having a higher rate of cycling compared to females (Dickinson et al., 2003; Garrad et al., 2008; Stinson and Bhat, 2004).

Literature suggested that males cycle more frequently than females in countries with low utilitarian cycling rates (Lehner-Lierz, 2003) and this correlation was confirmed for all the data analysis undertaken in this research. Discussion was consequently initiated in the focus groups to attempt to understand this disparity between the genders in Christchurch, as countries such as Germany have significantly increased utilitarian cycling by encouraging female cyclists (Lehner-Lierz, 2003). It is possible that targeting females in particular in cycling policies could have a similar effect in New Zealand.

In each focus group participants were asked what reasons they thought caused the disparity between the rates of cycling for each gender. The two principle responses to this question were that females are more likely to be responsible for a household and children, and women are more concerned about their appearance on arrival at work. The first of these suggestions corresponds to findings in the literature (Dickinson et al., 2003; Lehner-Lierz, 2003). Throughout the focus groups, females presented different perspectives on barriers to cycling in comparison to males as will be discussed in Sections 8.4 and 8.5.

8.2.3 Distance

In Chapter Two, a discussion was undertaken considering pervious studies to ascertain what is considered a reasonable distance for cycling. The conclusion reached in the literature review was that between two and eight kilometres was a reasonable cycling distance for the general population (British Medical Association, 1992; Dickinson et al., 2003). Often commuters over less than two kilometres are more likely to walk and those greater than eight typically utilise motorised means of transport. New Zealand Travel Survey data has found that eight percent of cycle trips are less than one kilometre, a quarter are between one and three kilometres and another thirty percent between three and seven kilometres (Ministry of Transport, 2008).

The distance people perceive as reasonable for cycling is highly subjective (Geus et al., 2008; Noland and Kunreuther, 1995), therefore, focus group participants were only invited to participate if they responded in the questionnaire that they lived a reasonable distance for cycling. Nonetheless, while the issue of distance as a barrier was factored out of the methodology, there was still some discussion regarding what participants generally considered was a reasonable distance as well as comments by recreational cyclists in regards to the distances they travelled. Additionally, spatial analysis of University of Canterbury questionnaire data allowed a more quantitative analysis of what distances people considered reasonable to cycle.

In general, focus group participants considered ten kilometres was a reasonable maximum distance with some prepared to cycle up to fifteen kilometres, although this was beginning to push the limits. These comments aligned with the University of Canterbury data with almost all participants whose addresses could be geocoded, approximately fifty-five percent of overall respondents, considering less than five kilometres was a reasonable distance to cycle. Approximately fifty percent of geocoded respondents perceived five to ten kilometres was a reasonable distance and some thought longer distances were acceptable. This spatial analysis of distance did not separate out people by mode and people who do not cycle may not have an accurate perception of what they are capable of cycling. Overall, however, the data are consistent with the literature discussed despite the potential influence by the different perceptions of people who do and do not cycle.

The exception was recreational cyclists as both the qualitative and quantitative data suggested that this group were prepared to cycle much greater distances than people in the general population. One of the reasons for this finding is that if the distance is sufficient,

for example between fifteen and thirty kilometres, then it can be used as part of a recreational cyclist's training regime. Shorter distances, less than three kilometres, were ineffective for recreational cyclists and, while they stated it was a fine distance for commuting, they noted that they would then end up training after work and would consequently prefer to drive to work and then train later in the day. Overall this reinforces the conclusion recreational cyclists are a difficult group to target to encourage utilitarian cycling as often they will not be interested in commuting short distances to work by bicycle. On the other hand, there are many people in the general population who perceive they live a reasonable distance, usually up to ten kilometres, from work and therefore represent substantial potential for utilitarian cycling.

8.3 Motivations for cycling

The focus of the questionnaires and comments made in focus group centred on the barriers for cycling, however, the motivations for utilitarian cycling were also discussed. These motivations were primarily cost of transport, environmental reasons and fitness, and these were compared to the motivations raised in the literature review (Geus et al., 2008; Moritz, 1997). Choice of mode is also affected by motor vehicle numbers, distance and the availability of public transport (Geus et al., 2008). Many participants noted that they did not have a direct bus route to the workplace or that the frequency of public transport meant it was less convenient than driving. Most participants also lived at a distance that was unreasonable to walk regularly, although several discussed walking up to an hour to work one way. Therefore, it could be concluded that despite the discussions about the benefits of walking and public transport compared to cycling, the bicycle is an important alternative to the motor vehicle.

Cost of transport can be a motivator for using sustainable transport and is primarily based on the cost of petrol with higher petrol prices leading to higher levels of cycling (Dill and Carr, 2003; Kennedy and Wallis, 2007; Pucher and Buehler, 2006). Petrol prices peaked in September 2008 (Ministry of Economic Development et al., 2008) after increasing throughout the period when the questionnaires were undertaken, but were falling throughout the period when the focus groups were held. These price drops led to many comments about how the cost of petrol was no longer an issue but had caused participants to consider the cost of travel when it was at its peak. Some participants mentioned having reduced trips or combining activities into one journey to reduce cost, and others mentioned using a different motor vehicle that had less fuel consumption. While some participants

had changed their transport mode due to petrol costs many others mentioned that they had considered it, and this consideration had led them to think about cycling to work. It is possible that participants were more motivated to consider cycling when responding to the questionnaires when petrol was increasing. Therefore, there is potential that as petrol prices and other road costs increase people will be more motivated to consider cycling as a mode of transport.

Petrol prices and use of fossil fuels are related to environmental concerns about the impacts of transport. Environmental reasons for participants, however, were less of a push factor for cycling to work, rather, it was an added benefit that their travel mode would be more sustainable.

One of the benefits of cycling raised in the literature is integrating physical activity into daily transport improving personal health and the overall health of the community (Austroads, 2005; British Medical Association, 1992; Geus et al., 2008; Hillman, 1997a). While cycling as a healthy mode of transport was raised as a reason to start cycling in both the questionnaires and the focus groups, it was not the most important reason and fitness was rarely mentioned as a motivator.

8.4 Major barriers for people interested in cycling

One of the objectives of the research was to investigate the barriers associated with encouraging people to cycle more often for transport. The decision regarding which mode of transport to use for a journey is highly personal and very complicated (Goldsmith, 1992; Moudon et al., 2005; Skinner and Rosen, 2007). Focus group participants, identified because they were part of the latent demand group, were also chosen because they perceived that they lived a reasonable distance from work to cycle. Consequently, the most significant barrier to active transport, distance, was removed from the discussions. Three other major barriers then identified through the research were safety including infrastructure, showering and changing facilities at the workplace and enjoyment. These barriers recognise that while the cycling environment may be highly significant in the decision to cycle, workplace facilities are also important (Geus et al., 2008).

8.4.1 Safety and infrastructure

Pedestrians and people who cycle are sensitive to the characteristics of the built environment (Rodriguez and Joo, 2004). The literature identified safety as one of the most significant barriers for cycling (Noland and Kunreuther, 1995), particularly the safety of cycle routes and driver behaviours affecting levels of cycling (McClintock, 2002c). More courteous vehicle drivers, less traffic on the roads and improved cycle routes were the three factors in encouraging people to cycle (or cycle more) that had the highest proportion of responses in the questionnaire results. Safety was also the most significant barrier for the majority of the focus group participants. While the comments were based on their perception of safety rather than crash statistics, perception of safety can be a more significant factor than actual safety when aiming to encourage cycling (Parkin, 2007). Participants' concerns included fear of an accident, traffic numbers and traffic behaviour. These findings confirm that Christchurch, and most likely New Zealand, have similar barriers for encouraging cycling as found in other western urban centres (Docherty and Shaw, 2003; Pucher and Buehler, 2005a). Safety was also linked to many other issues discussed by participants, including helmets and gender. Females in particular had concerns regarding safety and proposed approaches for how to overcome safety issues, including infrastructure and education.

Quality cycle facilities and the creation of a safe transport environment are recognised by planners and academics as important tools for increasing the cycling mode share (Allen-Munley et al., 2004; Hopkinson, 1996; McClintock and Cleary, 1996; Pucher and Buehler, 2005a). Consequently, consideration of cycle facilities and what type of cycle infrastructure would attract people to cycling was part of the research methodology. Safety was mentioned by participants as well, and always prior to the PowerPoint being shown during focus groups. The issues raised regarding infrastructure included level of service, consistency and comprehension. One of the issues with the various types of cycle facility shown to participants was that they preferred a consistent type of infrastructure across the city, even if it was not their preferred level of infrastructure. It would, therefore, be a sensible idea for councils to aim for greater consistency with the infrastructure type they are planning and focus on building these facilities across as wide an area as possible.

One of the most commonly reported reasons for not cycling linked to the perception of safety and confidence particularly for females. Not only did females raise the issue of being afraid of an accident, particularly collisions with motor vehicles, but they were also

uncertain about how to act on the road as a cyclist. While all were drivers and understood the road rules, the specific infrastructure provided for cyclists appeared confusing to respondents. Commonly, issues of greatest concern surrounded the cycle lanes at intersections, when respondents would not know which cycle lane to place themselves in and whether they were allowed to cycle up alongside stationary traffic to the intersection. Consistent infrastructure would help people, especially females, to understand how to interact with cycle facilities with more confidence. Another possible solution suggested was to include arrows on cycle lanes indicating where straight ahead and turning cyclists positioned themselves.

Finally, participants raised the solution of education. This solution had two purposes, firstly to educate drivers regarding the rights of cyclists and secondly to educate all road users on how to utilise cycling infrastructure correctly. Driver behaviour is a significant issue regarding safety and many participants raised the concern that drivers are unaware of when they should be watching for cyclists on the road and how to respect cycle infrastructure. In part, this concern linked back to the issue of consistency as participants noted that there are many different types of cycle facility in Christchurch and little education to road users about how to use different types and who has priority under different conditions. Consequently, the solutions put forward also included campaigns regarding how cyclists and drivers should use the infrastructure provided so that all road users are more aware.

The level of infrastructure that would be most likely to attract new cyclists is a comprehensive, linked network of cycle ways, preferably removed from the road and parking through separation. This conclusion is similar to international studies suggesting segregation of cyclists and motorised traffic where possible (Ker et al., 2006). A cycleway behind parking with separation was the most preferred level of infrastructure for the mid-block section. Off-road cycle ways that are combined with pedestrians, however, were not preferred due to the incompatibility between wheeled and walking modes of transport. In addition, shared paths are likely to be closer to driveways and difficulties could arise when motor vehicles back out over the spared path. Any type of cycle facility was preferred over the option of no infrastructure, consistent with Stinson and Bhat (2003), or traffic calmed streets, however, cycle lanes with extra marking, preferably coloured paint, were generally preferred to standard cycle lanes. Kerbed cycle lanes were perceived to have extra visual differentiation from the traffic lane, but the disadvantage was that motor vehicles still had

to cross the lane to enter the parking. This disadvantage was not a problem for a cycleway behind parking, but the separation was preferred as it meant there was more space between passenger doors being opened and the person cycling. These findings reflect a study undertaken in the Netherlands that found cycle paths create up to a twenty percent increase in cycle traffic while cycle lanes create a five percent increase in cycle traffic as new cyclists feel more safe on cycle paths (Jensen, 2007).

Intersections and roundabouts create an extra level of difficulty for cyclists, particularly when turning right, creating the need to cross several lanes of traffic. In general, cycle commuters prefer fewer cross streets and red lights (Stinson and Bhat, 2003). Participants, particularly those with cycling experience, were concerned about how a cycle path would cross an intersection as drivers may not be aware of, or be able to see, people cycling on the approach to the intersection. Godefrooij (1997) also argued that a segregated network looses its effectiveness at intersections where conflicting traffic manoeuvres occur. Therefore, there was discussion and agreement that if cycle lanes were the provided type of infrastructure at intersections then cycle lanes would be preferable for mid-block, contrary to the preferred type of cycle facility for mid-block only. For an off-road cycleway approaching an intersection, the preferred method of going straight ahead was specific cycle lights or proceeding on pedestrian lights. If the cycle facility provided was an on-road lane, participants preferred to have a coloured lane at the intersection rather than being taken off road at this point. This preference suggests that participants preferred to remain within sight of traffic where segregated facilities could not be provided, a viewpoint backed by Angenendt et al (1993) and Goodefrooij (1997). Where no cycle facility was provided some participants noted that they would walk their bicycle across the intersection at pedestrian light, highlighting the fact that intersections are a significant barrier for people cycling.

Right hand turns are an even more significant barrier and where no provision was provided the majority of focus group participants would walk their bicycle across at pedestrian lights, even if this required two crossings. It is unsurprising, therefore, that one of the two preferred options was a hook turn, as this manoeuvre is essentially the same technique with the person cycling remaining on their bicycle. The hook-turn was also considered a compromise between cycle and motor vehicle priority, while concerns about the other preferred option, a 'head-start' cycle light that allowed cyclists a phase to travel diagonally across the intersection, were that motorists may be unhappy to wait for a cycle light phase.

On the other hand, cycle lights could be combined at busy intersections to provide a cycle phase where cyclists could proceed through the intersection, either straight or turning, without conflicting with other transport modes. This phase would allow for people cycling to approach the intersection on a cycle path and then proceed through the intersection with little interaction with motor vehicles.

Finally, roundabouts were disliked by most participants and in general people would prefer to travel through an intersection compared to a roundabout. Underpasses were the preferred cycle facility at roundabouts, however, there were concerns regarding personal safety, particularly at night time. Underpasses are also an expensive option for providing for people cycling, although they can be used by walkers and cyclists. No other cycle facility stood out in particular for roundabouts. Cycle lanes still had the difficulty of motorists crossing over cyclists' space and the issue of indicating with one hand while guiding a bicycle with the other. Directional cycle lanes meant that road users had more awareness of where a person cycling was exiting the roundabout but concerns arose over comprehension of this cycle facility. Cycle paths again had the difficulty raised for intersections that people were concerned about where they crossed the traffic lane. Some people preferred the option where motor vehicles had priority as there would be little confusion about give way rules. On the other hand, where motorists had priority there was the disadvantage for people cycling of having to cross several traffic lanes, which could take some time when the roads are congested. While some people preferred cycle priority at crossings without lights, they were concerned that motor vehicle drivers would not give way and not expect a person cycling to cross at that point.

Overall, an off-road network of cycle ways behind parking with separation, connected to cycle paths through parks or areas away from the roadway, is more likely to attract new cyclists. At intersections, people cycling should be accommodated through cycle specific lights for all manoeuvres and by underpasses or cycle paths with priority at roundabouts. If this level of service can not be provided consistently, people would prefer an on-road network of kerbed cycle lanes or lanes with extra markings with cycle lanes and hook-turn facilities at major intersections. At roundabouts, coloured lanes or directional lanes should be provided with adequate signage and education about how road users navigate such infrastructure.

8.4.2 Showering and changing facilities

Showering and changing facilities was another major barrier that was raised by participants, and for some respondents it was more of a barrier than safety. The people more concerned about safety generally were not concerned about showering and changing, either because they had sufficient access or because safety was such a barrier that they had not investigated cycling any further. Showering and changing facilities were raised both in the focus groups and through the questionnaires undertaken, and overall it appears that policies to improve safety should be complemented by campaigns to encourage workplaces to provide showering and changing facilities. In particular, participants noted that their workplaces did not have sufficient or adequate showers and changing facilities. Some participants also had difficulties with lockers or storage space for clothing and showering items, while everyone noted that they also had to carry extra equipment with them for showering, relating to the issue of luggage capacity. University of Canterbury participants raised the issue that showering facilities were not close to office locations and suggested more facilities integrated with bicycle parking sheds to reduce time required to prepare for work once having arrived by bicycle. There are some national policies aimed at encouraging workplaces to support cycling (Sport & Recreation NZ, 2006) but these need to be expanded on and aim specifically at shower and changing facilities in the workplace.

8.4.3 Enjoyment

While enjoyment was not a factor that was mentioned specifically as being a significant issue by participants, it was still a recurring theme in both focus group comments and questionnaire comments, particularly by recreational cyclists. The overall finding gathered from the data was that some people chose to cycle because it was fun and enjoyable rather than because of the other benefits. This concept links back to the motivation factors of fitness, petrol costs and environmental issues, all of which were benefits but not push factors for most participants in regards to utilitarian cycling. Enjoyment also related to safety; if the transport environment is safe for cyclists it will be a more enjoyable journey and utilitarian cycling rates may increase. Discussions regarding walking and cycling reinforced this concept as many participants noted they preferred to walk rather than cycle as there was less stress involved due to reduced interaction with motorised transport. The solution to making cycling a more enjoyable transport mode is to increase perceived safety through infrastructure and education.

8.5 Minor barriers

There were many other barriers raised throughout the research for utilitarian cycling, including bicycle parking, work vehicles, luggage capacity, cycling equipment, helmets, clothing, children, weather, time, organising, trip chaining, night time cycling, confidence, transport culture and punctures. There were varying levels of importance identified for each of these issues but they were classed as minor compared to the larger issues of safety, showering and changing facilities and enjoyment. At the workplace, bicycle parking and work vehicles were generally not significant issues due to the wide access to both. Work vehicles were more of an issue for those University of Canterbury participants situated at sites away from the main campus, as they had to travel from their workplaces to collect a pool motor vehicle and then to their destination.

Luggage capacity was an issue for commuter cycling as well as wider utilitarian cycling and was an issue raised by Welleman (1997). Participants generally utilised a backpack to carry equipment but these bags have limited capacity. Few people had considered purchasing pannier bags, most probably as they were uncertain whether they would commence or continue to cycle for utility reasons. Workers were concerned about carrying work related items such as laptops and folders while others were concerned about carrying unexpected purchases when out shopping. There was also an issue regarding safety of bags at locations where backpacks are not allowed to be taken into shops, such as supermarkets.

Cycling equipment was another issue and encompassed safety equipment such as lights and fluorescent vests as well as owning a bicycle that was adequate for commuting. In general, most participants accepted that the cost of purchasing safety equipment was acceptable if they were cycling on a regular basis. On the other hand, not many participants had investigated or purchased safety equipment as they were still only considering the idea of cycling to work. There were also a few comments regarding the differences between recreational and utility bicycles. When it came to purchasing a commuter bicycle there were both negative and positive comments regarding their availability, however, there is definite potential for increasing availability of commuter bicycles particularly with frames suitable for females.

Helmets were an interesting issue that relates back to safety and enjoyment. A law introduced in 1994 in New Zealand means helmets are now compulsory and it is thought that this has contributed to decreases in cycling, both to school and in general utilitarian cycling (Taylor and Scuffham, 2002; Thull and Lausterer, 2003). While helmets were

disliked for the expected reasons of 'helmet hair', sweat and discomfort, particularly by females, they were still considered a necessary item to wear for safety reasons. Almost every participant agreed that if the cycle helmet law was changed so that helmets were optional they would continue to wear a helmet in the current transport environment. Should perceived safety of cycling be increased through an off-road network, however, participants would generally prefer not to wear a helmet so that the ride was more enjoyable and comfortable. Females were more likely to wish that the cycle environment was sufficiently safe that they could cycle without having to wear their helmet.

Clothing and appearance did not appear to be a significant issue for either gender and linked back to the major barrier of workplace showering and changing facilities. While lycra was definitely not the preferred clothing choice for participants, and was not perceived as a necessity, most agreed that they would wear exercise or casual clothes when cycling to work and change on arrival. There did appear to be some agreement that in New Zealand one would not generally see people cycling while wearing suits or high heels, hence the decision that people would cycle to work in different clothes to those they worked in. This clothing issue then presents a difficulty for utilitarian cycling to other destinations as opposed to commuter cycling as people can not get changed on arrival at shops or community facilities, and participants stated that the clothes they wore to cycle would not necessarily be acceptable for utilitarian cycling. Overall, these comments suggest that there needs to be greater acceptance of cycling in street clothes to encourage utilitarian cycling.

A cultural change may occur naturally overtime, however, as more people take up utilitarian cycling. At the moment, participants noted that there were 'motorists' and 'cyclists' groups but they did not perceive they belonged to either one. Rather the focus group participants belonged to a third group who understood and respected both groups and saw negative behaviour emanating from each group. On the other hand, potential cyclists had a lack of confidence about their ability to cycle on the road and how different cycle facilities were to be used, and were concerned about upsetting motorists by acting incorrectly. These issues could be addressed through cycle training and education of cycle facilities as discussed in Section 8.4.1 under the issue of safety.

Another issue for participants was time and organisation, most likely arising because people feel pressured to get to work on time (Tolley and Hallsworth, 1997). This issue was also linked to the issue of children. While the time that cycling for transport itself takes is

not perceived as a negative factor, the overall issue of getting organised for cycling, packing a bag and getting changed at work, was a difficulty. The added disruption of children made this even more difficult for parents getting ready to work in the morning. Trip chaining was also a problem as many people had stops on the way to or from work but would not undertake these on a bicycle due to some of the other reasons discussed, including distance, clothing, luggage capacity and time.

Children were also a concern in regards to road safety. In particular, mothers were concerned about cycling with children on child seats as they were afraid of an accident while cycling with their child. This aligns with Tolley and Hallsworth's (1997) theory that parental fear of safety results in children being driven to school. A study also found that cyclists had fewer children than people who drive (Dill and Carr, 2003). Another issue identified was child emergencies during the day as well as generally travelling with a child, which is not easy when on a bicycle. Child emergencies could be a specific issue if they arose during they day when a mother had cycled to work. Although participants had access to work vehicles for travel relating to their employment, there was little provision for assisting workers with personal emergencies. Encouraging workplaces to implement plans for emergency personal travel by workers could have an impact on female cycling rates.

Night time cycling was generally perceived with concern by most participants due to personal safety or physical safety. For most participants, particularly females, personal safety was an issue as they were concerned about being in the dark alone, however, most agreed they would cycle during the early hours of darkness in winter if it was around peak travel time, for example up to approximately six pm. The other issue for participants was that cyclists are less visible at night time and they were afraid of increased risks of an accident with a motor vehicle. On the other hand, some participants preferred cycling in the dark, especially those who had previously done so while working shift hours, as there was little traffic on the roads during the middle of the night. Potential solutions to this fear include encouraging safer streets and more people to be more active on the street to increase social safety.

Weather and climate was another issue raised by participants, particularly rain, wind and ice. Rain and ice or cold temperatures have been found to affect cycling internationally, with lower bicycle mode shares during the winter months or on rainy days (Bergstrom and Magnusson, 2003; Jensen et al., 2000; McDonald et al., 2007; Nankervis, 1999; Stinson and Bhat, 2004). Little can be done to counteract these issues, however, there was a

suggestion that having access to reliable weather forecasts would assist in preparation for cycle trips. There were two sub groups amongst participants. One group would not mind cycling in wet or adverse conditions as they were planning to change on arrival at their destination anyway. The other group would simply not contemplate cycling and would drive to work.

Finally, there are future issues that could arise once people commence utilitarian cycling. For example, one that arose in a focus group was punctures. A participant mentioned that they had not seen punctures as an issue prior to cycling and another participant agreed they had not thought of it. Other issues could potentially arise as the cycling network improves and the behaviours of cyclists and drivers change.

8.6 Recommendations for encouraging cycling

Overall, people interested in cycling have several motivations encouraging them to investigate utilitarian cycling and have usually overcome obvious barriers such as distance between their place of residence and their workplace (Figure 8.1). There are then three major barriers identified that they face before starting to cycle: safety, showering and changing facilities at the workplace, and enjoyment. This research found these three barriers should be the primary focus of policies to encourage cycling. There are also many minor barriers for potential cyclists, as outlined in Section 8.5. Finally, there is the possibility of future issues that will arise if more people commence cycling for transport.

Figure 8.1 Issues faced by people interested in utilitarian cycling
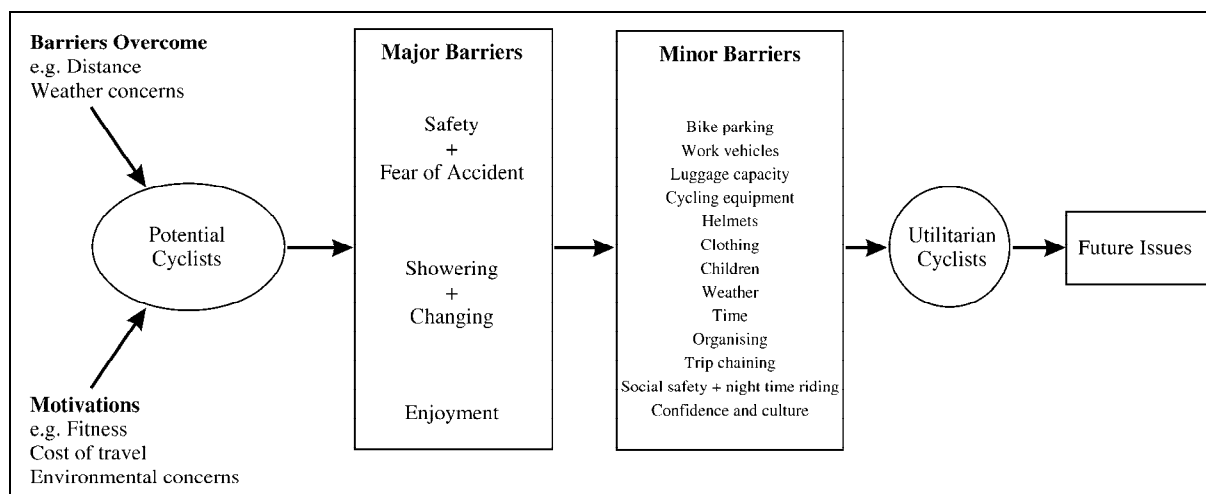
This research would suggest that there are several key policies to encourage utilitarian cycling and access latent demand (Table 8.1). Policies to encourage cycling should work on creating an environment that is more supportive of change (Stone, 2008). Therefore, the policies recommended should be implanted in conjunction with each other. Firstly, a comprehensive and consistent cycle network, preferably of off-road cycle facilities and cycle priority crossing at intersections and roundabouts, should be built. This network should be consistent so that road users, particularly people cycling, know what to expect before arriving at a difficult intersection. It is also important that drivers know what to expect and where to expect cyclists (Davies et al., 1996). Building this network should be accompanied by education for all road users about the rights of each group and how facilities should be used. It would be useful for education to be undertaken in several ways so as to reach different groups of people who learn differently. Advertising campaigns would be useful in reaching a wide audience, including people interested and not interested in cycling. Specific information for people interested in cycling should be available to people through internet sites but also be combined with practical courses for those who prefer kinetic learning. Workplaces should be encouraged to support cycling through providing adequate showering and changing facilities, while being aware of cyclists' other needs such as time to change, access to work vehicles and emergency transport. Finally it is important to remember that it took twenty years for policies implemented in the Netherlands to take effect (Welleman, 1997) and therefore gains in utilitarian cycling mode share in New Zealand may not be seen until some time after significant investment through these policies.

Table 8.1 Summary of policy recommendations for encouraging utilitarian cycling

Policy	Purpose	Target audience	Outcomes
Cycle facility network – preferably off-road	Increase perceived safety of physical environment	Potential cyclists and vulnerable cyclists	People interested in cycling will perceive cycling as safer and more enjoyable
Consistent level of infrastructure	Cyclists and motorists know what to expect at intersections and roundabouts	Cyclists and potential cyclists	People cycling will be more confident about navigating difficult intersections
Education campaigns through advertising, websites and courses	Increase road users understanding and rights of other groups	General road users	Traffic behaviour from both motorists and cyclists will improve and cyclists will be more confident
Develop cycle friendly workplace campaigns	Encourage workplaces to provide for people cycling, particularly showering and changing facilities	Active commuters, especially people cycling	People will have the opportunity to shower and change on arriving at work or after exercise
Emergency travel	Encourage workers to provide contingency travel for family emergencies	Workers – particularly parents	People who have cycled to work will be able to collect children or family members in an emergency

8.7 Final Conclusion

This research contributes to the literature on utilitarian cycling and addressed the research problem by completing an in-depth study of people interesting in cycling for transport, and their motivations and barriers in Christchurch, New Zealand. There is definite evidence from this research for latent demand for cycling in Christchurch especially amongst university and working populations and, to a lesser extent, recreational cyclists. People who live close to work, are professionals or labourers, are young to middle aged, male and have lower or high incomes are more likely to cycle. These people are motivated by the enjoyment of cycling, fitness and to a lesser extent a cheaper and more sustainable transport mode. While recreational cyclists have a higher rate of cycling for transport than the general population, they are discouraged from cycling for utilitarian purposes by personal issues such as self motivation and organisation. Therefore, general policies are likely to have a lesser effect on encouraging them to cycle compared to the general population.

Encouraging latent demand for utilitarian cycling, cycling for everyday transport, will assist transport planners in moving towards a more sustainable urban environment. Push factors for cycling include increasing the health of the population through active transport, social interactions, reducing traffic congestion and the associated negative effects of motorised transport, and increasing the feasibility of sustainable transport modes in the face of increasing petrol prices.

The major barriers to accessing latent demand for utilitarian cycling include safety, showering and changing facilities at work, and enjoyment. As enjoyment of the journey was often affected by the stress caused from traffic numbers, speed and behaviours, both this issue and safety can be addressed by building a comprehensive network of cycle facilities and associated education campaigns. People interested in cycling would prefer a network of cycle facilities that separate them from the traffic, preferably by placing them between parked motor vehicles and pedestrians with some form of separation from both groups. Intersections and roundabouts cause more concern for people interesting in cycling than mid-block and these need to be dealt with specifically with a consistent level of infrastructure that accounts for straight ahead and turning movements.

Another major concern is workplace facilities for showering and changing, and policies should encourage workplaces to implement these facilities, along with looking at more minor issues such as access to work vehicles and emergency transport for workers. Policies should also consider the minor barriers that arose in the research as well as plan for and provide information on the future barriers that new people to cycling are unlikely to consider. The minor barriers raised included bicycle parking, access to work vehicles, luggage capacity, cycling equipment, helmets, clothing, children, weather, time, organising, trip chaining, night time cycling, confidence and transport culture. Finally, planning for cycling should also anticipate future issues that will arise when more people commence cycling.

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