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Benchmarking cycling and walking in six New Zealand cities

Pilot study 2015

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Written by Caroline Shaw and Marie Russell. Author contact: caroline.shaw@otago.ac.nz
Additional research by Kim van Sparrentak, Annabel Merrett and Harry Clegg
Peer reviewed by Michael Keall, University of Otago, Alistair Woodward, University of Auckland, Harriette Carr, Ministry of Health, and three reviewers from the Ministry of Transport.
Edited by Lisa Early
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New Zealand Centre for Sustainable Cities
University of Otago, Wellington

August 2016


SHARED
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Executive summary

The benefits of active transport are well-known: cycling and walking for transport are great for health, the environment and the economy. But how well are our cities doing? With guidance from the Alliance for Biking & Walking's benchmarking work in the USA,[1] this pilot study provides a baseline assessment of cycling and walking in Aotearoa/New Zealand's six largest cities.

Main data sources for this pilot study were the Census of Population and Dwellings, the New Zealand Household Travel Survey, the New Zealand Health Survey, Motor Vehicle Crashes in New Zealand and city council websites. We also conducted two bespoke surveys in 2015: one to cycling and walking advocacy groups and one to city councils.

The aim of this report is to provide a tool for officials involved in transport policy, planning and delivery, advocates and researchers to track progress in each city and in comparison to other cities, and to support ongoing investment in cycling and walking. The intention is that the assessment will be improved and repeated periodically to track progress over time.

Levels of cycling and walking

Data from the New Zealand Household Travel Survey (NZHTS) showed walking was the most common form of active transport in New Zealand (16%), with cycling only comprising 1% of trips. (In the NZHTS trips can be part of a journey, or an entire journey, so for example a trip could be a 15 minute walk to work or a 15 metre walk from a parked car to a shop.) Levels differed widely by city, with walking trips ranging from 12% to 27% and cycling from 0.4% to 3.6% of trips. Two thirds of cycling trips were made by men, whereas walking was more common among women (55%). Cycling and walking were more common in younger age groups in most, but not all, of the cities. Data from the Census, which only examined main mode of travel to work on Census Day, show that 3% of commutes to work were by bicycle, and 7% of commutes to work were by walking, but there were large differences between cities. Cycling to work was most common in Christchurch (7%) and least common in Auckland (1.2%). Walking to work was most common in Wellington (21%) and least common in Tauranga (4%). Interestingly, cycling to work remained stable across age groups and across deprivation quintiles, however walking to work was much more common in people who lived in poorer areas.

Both cycling and walking to work declined in New Zealand between 1971 and 2013, although the decline in cycling was not linear, indicating that external events are able to shift cycling rates in a relatively short time-frame.

In general, the proportion of motor-vehicles in a population is an indicator of sustainability, based on the notion that where there are fewer cars, more people use active transport modes. We found that cities with higher levels of car-ownership had lower levels of cycling and walking. Weather often affects active transport choices[2,3] and the claim has been made that cycling infrastructure would remain unused on rainy days. However, in New Zealand cities climate did not appear to be a determinant of overall levels of cycling and walking.

Population health

In cities with higher levels of people cycling and walking for transport, more people had adequate levels of physical activity for health, and fewer had diagnosed diabetes or hypertension or were obese / overweight. The mental health data were slightly unusual, showing higher levels of people with doctor-diagnosed depression, bipolar disorder and anxiety in cities with higher levels of physical activity. Diagnosis, access to primary and secondary care, cultural factors and, possibly, disclosure of diagnosis to survey interviewers may explain this finding. Because of the nature of the ecological-level data we used, we cannot assume that there is a relationship between levels of active transport and health on the individual level. However, other research tells us that this is likely to be the case.[4-6]

Safety

Cycling and pedestrian fatalities declined by 75-80% between 1970 and 2014. When taking into account the time people travelled by each mode, the fatality risk ratio was much higher for cyclists (1.7 times higher) compared to those who were using cars, either as drivers or passengers. Pedestrians' fatality risk ratio was lower: 0.8 times that of car-users. The gender distribution of cyclist deaths was similar to the gender distribution of cycling. However, deaths were more common among male pedestrians compared to females, in contrast to the gender distribution of walking. Cyclist and pedestrian deaths were more common among working-age people than others.

Infrastructure

All of the cities had some basic infrastructure for cyclists and pedestrians, with wide variations between cities. There appeared to be poor connectivity between cycling needs and public transport, even in cities with larger numbers of cyclists (for example, lack of bicycle storage at bus stops). City councils reported that they surveyed cyclists and most surveyed pedestrians about satisfaction with infrastructure for cycling and walking. Feedback on our City Survey indicated some problems with definitions for types of infrastructure; future surveys would need to clarify definitions with words and images.

Policies and funding

All six city councils had policies about supporting cycling and walking. Most of the councils had 'active transport' advisory committees, and all received input from cycling and walking interest groups. Not all cities' policies made the link between increasing active transport and addressing climate change. Only half of the councils required new city developments to include bicycle storage, while requirements for minimum car-parking, at least in developments outside the CBD, were in place in all of the cities except Hamilton. All the cities' current 2015-2025 long-term plans incorporated various plans related to cycling and walking, with many including specific dates and expenditure, and two had measurable goals. Councils reported data that showed them leading by example: providing pool bicycles, showers, cycle training and other practical support for their own staff to encourage active transport.

Education and encouragement

All of the cities had bicycle skills education for children and young people and all supported special programmes such as bike/walk to work days and 'open streets' events, mostly run by the city councils. Public bike-sharing schemes were in place in Christchurch and planned in Dunedin, but not in the other cities. Only Wellington had an online journey planner including active transport, provided by the regional council.

Personnel

In all six cities paid and volunteer workers promoted cycling and walking. All of the councils employed staff dedicated to active transport. Our survey of advocacy groups elicited only six complete responses (two from national organisations); all but one of these groups operated with volunteer labour only. Most of the groups were strongly engaged in working with councils or lobbying central government, and made submissions and press-releases to advocate for their views.

Recommendations for future benchmarking

It is important to measure progress in the use and encouragement of active transport. For future benchmarking work, we propose the following recommendations:

1. Engage with stakeholders to review the benchmarks in this report. Assess whether there are data missing that could be included, or others that could be dropped, and whether more cities could be included.
2. Clarify the questions in future City Surveys, providing both written and visual representations where applicable, and reduce the length of the survey to improve the quality of responses. (The City Survey was reported to be onerous by some councils, for example in obtaining data from disparate sources within the council. Not all councils collected data on the topics requested. Additionally, definitions of some data were unclear, for example 'multi-use and dedicated bicycle paths', or classifications differed from city to city.)
3. Conduct future Advocacy Group Surveys by telephone with email follow-up if needed. The aim is to increase the number of responses from groups that generally have few resources and no staff.
4. Allocate realistic resourcing to report production. This report required running multiple surveys as well as bespoke data extraction from the Census, New Zealand Household Travel Survey, Crash Analysis System and New Zealand Health Survey.
5. Include injury data in the safety chapter. This would require data and analysis from the National Minimum Dataset (NMDS).
6. Consider if and how to include information from regional councils in future benchmarking reports.

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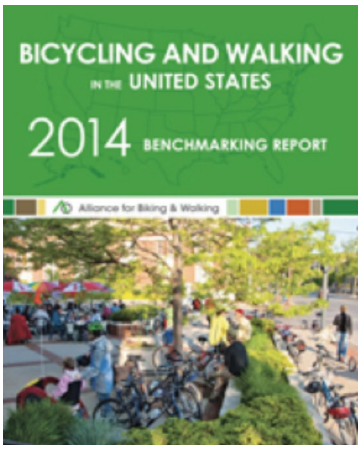
1. Introduction

This pilot report provides a baseline assessment of cycling and walking in the six largest cities in New Zealand. It documents current levels of cycling and walking, and the safety and health outcomes of these activities. In addition, it looks at inputs in each city: the infrastructure, policies, funding and programmes that promote and support cycling and walking. The intention is that this report will be repeated periodically to allow progress to be tracked over time.



The aim of the report is to provide a tool for officials involved in transport policy, planning and delivery, advocates and researchers to track progress in each city over time and in comparison to other cities, and to support ongoing investment in this area.

This report was inspired by a successful benchmarking programme in the United States of America by the Alliance for Biking & Walking. The Alliance produces a biennial report to benchmark bicycling and walking conditions in the 50 states and 52 largest cities.1 We gratefully acknowledge the Alliance's work in identifying relevant benchmarks for cycling and walking and for allowing us to use them.

1.1. Why cycle and walk?

Cycling and walking for transport are beneficial for health, the environment and the economy. Policies that promote cycling and walking have multiple positive health effects over the short and long term. Firstly, for the individuals who take up cycling or walking, the increased physical activity reduces their risk of heart disease,[7] stroke,[7] diabetes,[5] cancer[8] and obesity,[9] and improves mental health.[10] Secondly, increases in cycling and walking in the population may also result in reduced injury burden due to reduced motor traffic volumes and, possibly, a mode shift to public transport and car sharing as a result of decreased car use and/or ownership amongst cyclists and walkers.[11] Thirdly, for the population of a city generally, evidence consistently shows that increased cycling and walking is beneficial for everyone's health due to reductions in transport-generated air pollution.[12 13] Transport-related air pollution is increasingly understood to have significant and wide-ranging detrimental impacts on health, from babies in utero through to old age. In addition, it has become apparent that there is no safe lower limit for air pollution exposure.[14] Finally, reductions in carbon emissions due to increased cycling and walking mode share will have positive health results through amelioration of the health consequences of climate change.[15]

Cycling and walking are good for the environment owing to reduced demand for car trips and potentially for cars more generally (for example, if households reduce from two to one car). A transport system with higher levels of cycling and walking and lower car use would result in environmental benefits through: less wear and tear to existing infrastructure; more efficient land use; reduced need to use resources building, servicing and disposing of cars; and less demand for the expensive and resource-intensive infrastructure that supports cars (roads, car parking spaces etc.).[16] In addition, reduced vehicle use would result in less environmental noise, air and water pollution, and reduced carbon emissions.

Cycling and walking provide substantial economic benefits, both to households and wider society. For individuals and households in New Zealand, transport costs represented the third largest expenditure group (14% or $158/week).[17] Walking and cycling are low-cost forms of transport that can potentially result in savings for households. There are also community economic benefits resulting from: increased local employment (such as in bike shops, bike tourism); increased custom in local businesses by cyclists and walkers; increased value in residential areas as a result of the new infrastructure improving their cycle- and walkability; and reduced council spend

on overall transport infrastructure.[18] [1] Finally, the wider economy may benefit from reduced congestion and increased worker productivity.[1] There is overwhelming agreement that investing in cycling and walking is cost-effective. One review paper looking at 30 studies that examined cost-benefit ratios of cycling and walking projects noted a median ratio of benefits to costs of nine.[11]

Irrespective of the health, economic and environmental benefits of cycling and walking, we know that cities with high levels of cycling and walking are dynamic and desirable places to live. Younger generations are increasingly realising this; children and young people see cycling and walking much more positively than do their parents,[19] and there is an international and local decline in young adults obtaining a driver's licence.[20] [21] Local research shows that many young people in New Zealand want to be able to walk and cycle for transport, instead of driving cars.[21]

1.2. CASE STUDY: The potential for urban cycling

Given that cycling benefits individual wellbeing and public health, and is an environmentally-friendly and cost-effective way to travel, researchers have looked at how to best invest to increase urban cycling. Jean Beetham's research found there was significant latent demand for cycling in Wellington, which would likely be realised if adequate cycling infrastructure were provided. Likewise, Ed Randal found that increased support for recreational cycling would boost cycling numbers, and that recreational cyclists would be very likely to take up commuter cycling if safety concerns were addressed. Both researchers concluded that there were significant health and environmental benefits to increasing uptake of urban cycling, and also potential contributions to the vibrancy and liveability of urban areas.

They found that in Wellington the overwhelming barrier to urban cycling was about safety, actual and perceived. While cycling gives an overall positive health benefit by protecting against cardiovascular and other diseases, cyclists are exposed to risk of accident. Cycling was the second most dangerous form of transport in New Zealand (after motorcycling), and Wellington was the most dangerous city for cycling. Infrastructure to make cycling safer would be the primary driver for increasing cycling in Wellington.

Beetham found strong public support for the reallocation of road space from on-street parking to a cycle route in the Island Bay to City cycleway. On-street parking was found to have a minimal effect on adjacent retail, and the economic effect on adjacent businesses would likely be positive if the cycleway infrastructure was well-designed, as commuter cyclists were likely to stop and shop. This suggests that councils could incorporate cycling investments as part of their overall strategy to increase vibrancy, liveability and economic activity in their towns.

From Jean Beetham, "Re-cycling the streets: Exploring the allocation of public space for transport". Master's Thesis, School of Geography, Environment and Earth Sciences, Victoria University of Wellington, 2014, and Ed Randal, "What makes a commuter cyclist? A mixed methods study of behavioural antecedents and perceptions of commuter cycling in the Wellington Region". Master's Thesis, School of Geography, Environment and Earth Sciences, Victoria University of Wellington, 2014. This case study was first published in L Early, P Howden-Chapman, M Russell eds. *Drivers of Urban Change*, Steele Roberts, 2015.

1.3. What works to promote cycling and walking?

In the last century rapid urbanisation and favouring of the private motor car resulted in a decline in cycling and walking for transport and physical activity.[22] There has been a resurgence of research in this area in the last decade and there are now numerous reviews summarising the literature of what works to increase cycling and walking.[23-30] Broadly speaking, interventions to promote cycling and walking can be categorised into four groups: regulation (for example, laws); economic policy (for example, taxes, subsidies); communication (for example, behavioural programmes, skills training, written information) and physical tools (for example, providing bicycles, infrastructure changes).[30]

An increasing amount of evidence about what is effective to promote cycling and walking has been produced, particularly in the last five years. However, the reviews found that, with some notable exceptions, most studies in this area were of poor quality and it was difficult to determine whether many of the interventions had any impact on cycling and walking.

What is apparent is that isolated interventions alone are insufficient to promote radical change in cycling and walking; rather, suites of policies and programmes are required. The experience of countries with high levels of cycling and walking suggests interventions need to be consistently delivered over long periods of time. In addition, it seems that policies promoted to the wider population probably have a bigger impact than policies targeted at specific groups, although their impact is harder to measure.[30]

New Zealand is currently going through a period of increased investment in urban cycling. Some cities have already started investing in urban cycleways with positive results.[31] The New Zealand Transport Agency is investing $296 million for cycling in 15 urban centres between 2015 and 2018.[32] Baseline research to allow assessment of future changes is timely.

1.4. CASE STUDY: Assessing city interventions to increase cycling and walking

The ACTIVE study, part of the Resilient Urban Futures research programme, found that in an environment in which active travel (in this case cycling and walking) was on a steady decline, government and council-led interventions were effective in arresting that decline and encouraging uptake of active travel.

The long-term trend for active travel use in New Zealand is in decline, though some larger cities (notably Wellington) have experienced recent increases in use of active travel modes for commuting to work.[33] Observations overseas suggest that car use is tending to decline in high-density urban areas, but increase in areas of lower density.[34] This suggests that in New Zealand we might expect to see increased uptake of active travel in higher-density urban areas, but a decline in lower-density urban areas. Assessing the success of efforts to make our smaller cities friendlier to walking and cycling is important to understanding how to arrest this decline in active travel and attain the health, wellbeing and environmental co-benefits.[35]

Figure 1: Separated cycleway on Havelock Road, Hastings, heading towards Havelock North

The ACTIVE study assessed whether government and council-led interventions to encourage active travel were effective by studying two cities that implemented such measures.[36] In New Zealand and internationally there is a lack of analysis about interventions of this kind, so the study will be useful for informing future policy.

New Plymouth and Hastings District Councils each received funding from the NZTA to encourage and facilitate active travel through infrastructure (bike lanes, for example) and outreach programmes. Whanganui and Masterton did not receive funding, but are similar in demographics and have an interest in encouraging active travel, so were chosen as control cities to compare with the two intervention cities. The researchers drew on the New Zealand Household Travel Survey and their own survey over three years, 2011 (pre-intervention), 2012 (mid-intervention) and 2013 (post-intervention). Further measures were to be collected in 2016.

Whilst patterns of active travel decline were apparent in Whanganui and Masterton, the council-led interventions in New Plymouth and Hastings were effective in arresting that decline and encouraging cycling and walking. Such interventions, which facilitate and promote active travel, are therefore important components of resilient and health-aware transport policies.

From Michael Keall, Ralph Chapman, Philippa Howden-Chapman, Karen Witten, Wokje Abrahamse, Alistair Woodward, "Increasing active travel: Results of a quasi-experimental study of an intervention to encourage walking and cycling".[31] This work was prepared as part of the Resilient Urban Futures research programme funded by the Ministry of Business, Innovation & Employment. This case study was first published in L Early, P Howden-Chapman, M Russell eds. *Drivers of Urban Change*, Steele Roberts, 2015.

2. Data sources

For each city we used a range of 'inputs' and 'outcomes' to explore the transport system in relation to cycling and walking, similar to the Alliance for Biking & Walking's Benchmarking Reports.[1] The 'inputs' we report are city policies and funding, infrastructure, education and encouragement, and personnel. The main 'outcomes' of the transport system reported here are levels of cycling and walking, population health and safety.

This report uses data from a number of pre-existing data sources, including the Census of Population and Dwellings, the New Zealand Household Travel Survey, New Zealand Health Survey, and Motor Vehicle Crashes in New Zealand. We also conducted two bespoke surveys: one to cycling and walking advocacy groups and one to city councils. Table 1 summarises the data sources for each benchmark described in this report. Further information on the specific data, surveys and analyses for each benchmark in this report is contained in Appendix I.

The benchmarks are reported for the six largest city councils by population: Auckland, Tauranga, Hamilton, Wellington, Christchurch and Dunedin. The territorial boundaries for each council are shown in Appendix II. Table 2 summarises key demographic, geographic and socio-economic features of these cities.

It is important to note the variation in the geographical areas covered by the city councils. For example, while Hamilton's urban area is virtually contained within the city council boundaries, other city council boundaries, such as those for Dunedin, include extensive rural areas.[37]

Table 1 Information sources for benchmarks contained in this report

Domain	Benchmark reported	Data source
OUTPUT BENCHMARKS		
Mode share	Trips/mode share	NZHTS (New Zealand Household Travel Survey)
	Travelling to work	Census
	Socio-demographics of trips takers and commuters	NZHTS / Census
	Household car numbers	Census
	Weather	NIWA (National Institute for Water and Atmospheric Science)
Health	Population physical activity	NZHS (New Zealand Health Survey)
	Overweight/obese	NZHS
	Mood disorder/anxiety	NZHS
	Hypertension	NZHS
	Diabetes	NZHS
Safety	Pedestrian and cyclist fatalities	Crash Analysis System
	Mean road speed	Speed Survey
INPUT BENCHMARKS		
Infrastructure	Cycling infrastructure	City Survey
	Walking infrastructure	City Survey
	Cycling connections with public transport	City Survey
	Citizen opinion	City Survey
Policies and funding	City policies on cycling and walking	City Survey
	City cycling and walking goals	City Long-Term Plans 2015-25
	Parking requirements	City Survey
	Links between climate change and active modes	City policy / plan documents
	Council staff support	City Survey
	City funding for cycling and walking	City Survey
Education and encouragement	Special city programmes	City Survey / Council websites
Personnel	Numbers of city council staff working on cycling and walking	City Survey
	Cycling and walking advocacy groups	Advocacy Groups Survey

Further information on each benchmark is available in Appendix I.

Table 2 Demographic and socio-economic features of the cities included in this report

City	Population	Area: Km^2	Median age (years)	Median household income ($)	Unemployment rate
Auckland	1,415,600	16,155	31.5	76,500	8.1%
Tauranga	114,800	175	41.0	55,800	7.6%
Hamilton	141,600	99	32.2	64,000	9.5%
Wellington	191,000	290	33.9	91,100	6.5%
Christchurch	341,500	1,608	38.6	65,300	5.1%
Dunedin	120,200	3,350	36.7	54,400	7.5%

Source: Statistics New Zealand, Census of Population and Dwellings 2013

3. Lessons learnt from this pilot study

We initially aimed to use only routinely-collected administrative data and readily-available public information to inform this report. However, it became apparent this would be inadequate owing to disparate boundaries of the survey administrative units, such as district health boards, city and regional councils, and public health units. This meant we needed to undertake specific analyses of national surveys in order to compare health status and transport use for the geographic units (city council areas) we were interested in. There was also wide variability in the quality and type of information in council websites and publications, thus relying solely on these would lead to inconsistencies in the report results. Using routine data sets comes with its own issues as questions might not be entirely appropriate to our main areas of interest. In addition, small numbers were a problem, particularly in the New Zealand Household Travel Survey.

Results from using an online survey of the city councils were mixed. All councils eventually responded to our request for information. But council staff members were very busy and we understood from informal feedback that completing the questionnaire was onerous for some. There are some gaps in our tables where data are inexact or missing. One issue was that our definitions, for example, about types of cycling and walking infrastructure, did not necessarily fit with councils' own definitions. Future survey work should include standardised illustrations to ensure mutual understanding about infrastructure, and also ask fewer questions. We hope that if the report is useful to stakeholders and established as an important tool for ongoing monitoring of cycling and walking in New Zealand, the quality and quantity of responses to the City Survey will increase.

The online survey of advocacy groups elicited only a small number of responses; however those that replied gave fairly full information. A reasonable assumption is that few advocacy groups have the resources, people or time to respond to a long questionnaire. Future surveys of advocacy groups could use telephone interviews with a key person in each group, followed up by email queries, to obtain information, or look at other ways to support volunteer organisations to contribute to this report.

It is important to note that city councils are not the only agencies having an effect on cycling and walking. We did not consider the New Zealand Transport Agency's activities for state highways. We did not survey regional councils for this pilot study, yet they also have plans and programmes supporting active transport. Any future benchmark report could consider expanding to include regional as well as city councils. This would bring more challenges owing to their different geographical boundaries from local councils.

In the safety section, we examined fatalities only, as this benchmark seemed less likely to be prone to reporting bias compared to injuries. This meant we were unable to confidently report risks by mode for each city. This decision could be revisited in future reports, although it would require considerably more work.

4. Levels of cycling and walking

This chapter summarises current patterns of cycling and walking in the six cities. The data reported in the first section 'Who walks and cycles in New Zealand?' are from the New Zealand Household Travel Survey (2010-2013 data). The second section 'Travelling to work' uses data from the 2013 Census. The final section examines some of the factors that are thought to contribute to choices around transport mode, such as weather and number of cars.

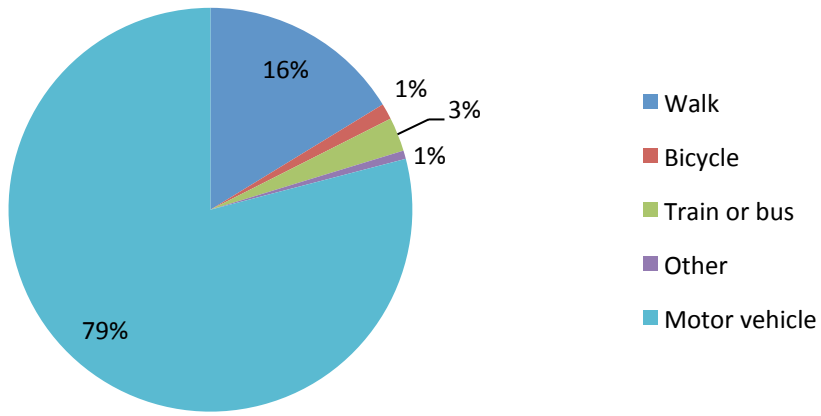
The details of the content of the Census and New Zealand Household Travel Survey and the analysis of each survey for this report are contained in Appendix I. The Census only collected information on the method of travel to work on Census Day for those people who went to work. In contrast, the New Zealand Household Travel Survey collected information about all trips over a 2-day period. A 'trip' may be substantial or relatively inconsequential (for example, a walking trip could involve several kilometres or 20 metres crossing the road from a parked car to a shop).

As well as city-specific data, each section also presents national data for comparison. We examine patterns in cycling and walking by a number of different socio-demographic factors, such as gender, ethnicity, age and socio-economic position. It is important to document and monitor inequalities in these areas, as they point to problems with how cycling and walking is promoted, or to structural barriers to uptake of active transport. Entrenched differences in cycling and walking uptake by different groups may also contribute to differential health and economic outcomes for those groups.

4.1. Who walks and cycles in New Zealand?

Figure 2 shows the proportion of all trips taken using different modes in New Zealand. Overall trips were dominated by motor vehicle travel (79%), with cycling and walking comprising 17% of all trips taken in New Zealand. Walking was the most common form of sustainable travel in New Zealand, making up 16% of all trips.

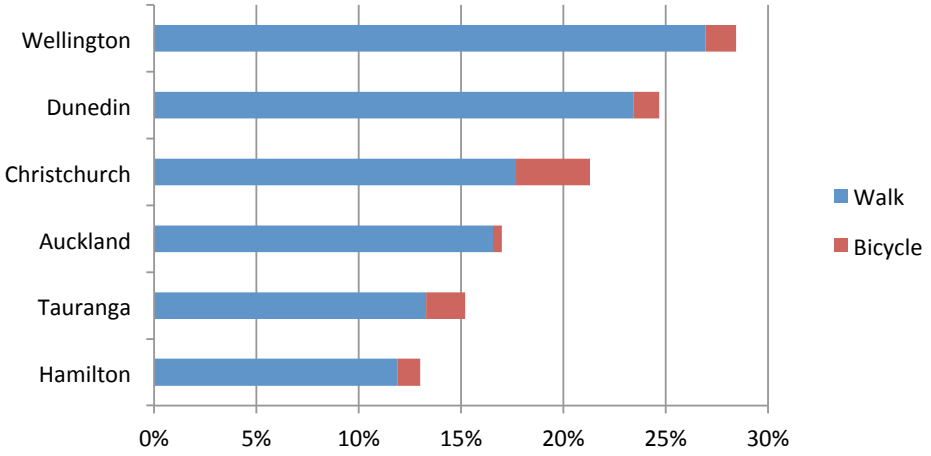
Figure 2 Proportion of trips taken by mode, all New Zealand



Motor vehicle category includes car drivers and passengers and motorcycles.
Source: New Zealand Household Travel Survey 2010-2013

Figure 3 and Table 3 show considerable variation in the proportion of trips taken by cycling and walking in the six cities. For example, cycling ranged from 0.4% of total trips in Auckland to 3.6% in Christchurch. Walking ranged from 12% of total trips in Hamilton to 27% in Wellington. Conversely, use of a car ranged from 64% of total trips in Wellington to 85% in Hamilton.

Figure 3 Proportion of trips taken by cycling and walking, six cities



Source: New Zealand Household Travel Survey 2010-2013

Table 3 Trip number and proportion by mode, six cities

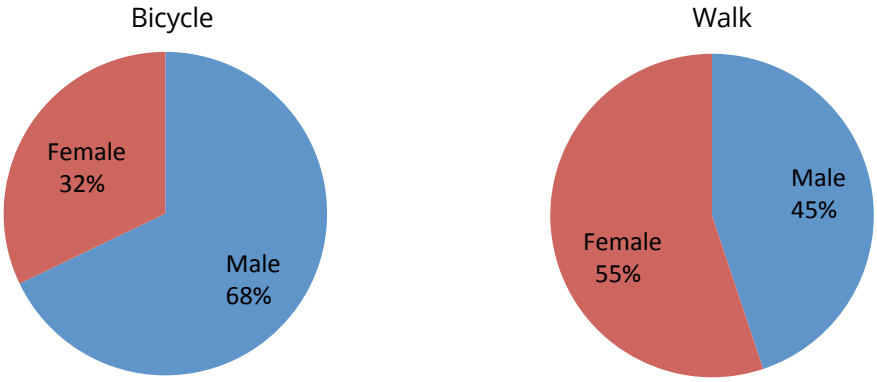
	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Motor vehicle	4026.95 (79%)	350.87 (83%)	623.99 (85%)	492.59 (64%)	1250.68 (75%)	374.38 (73%)
Walking	848.41 (17%)	56.39 (13%)	87.35 (12%)	208.03 (27%)	294.16 (18%)	119.65 (23%)
Bicycle	21.68 (0.4%)	8.11 (1.9%)	7.9 (1.1%)	11.43 (1.5%)	60.15 (3.6%)	6.44 (1.3%)
Train / Bus	182.83 (4%)	7 (2%)	10.29 (1%)	53.36 (7%)	46.43 (3%)	6.17 (1%)
Other	42.07 (1%)	2.08 (0%)	3.76 (1%)	6.75 (1%)	12.25 (1%)	4 (1%)

Trip number: annual number of trips in millions.
Motor vehicle category includes car drivers and passengers and motorcycles.
Source: New Zealand Household Travel Survey 2010-2013

4.1.1. Mode share by gender

Figure 4 shows the gender distribution of cycling and walking trips in New Zealand. Of trips taken by bicycle, 68% were undertaken by men. In contrast, of walking trips, 55% were taken by women.

Figure 4 Gender differences in cycling and walking trips, all New Zealand



Source: New Zealand Household Travel Survey 2010-2013

Table 4 shows gender differences in trips taken by cycling or walking in the six cities. In all cities apart from Wellington, a higher proportion of walking trips were taken by women than by men (ranging from 53% in Christchurch and Auckland to 63% in Hamilton). In Wellington walking trip proportions were evenly balanced between men and women. Unfortunately, as cycling trips were relatively rare in survey data, the only city with enough cycle trips to examine gender differences was Christchurch. This showed a similar pattern to the overall New Zealand numbers, with 70% of cycle trips being taken by men and 30% by women.

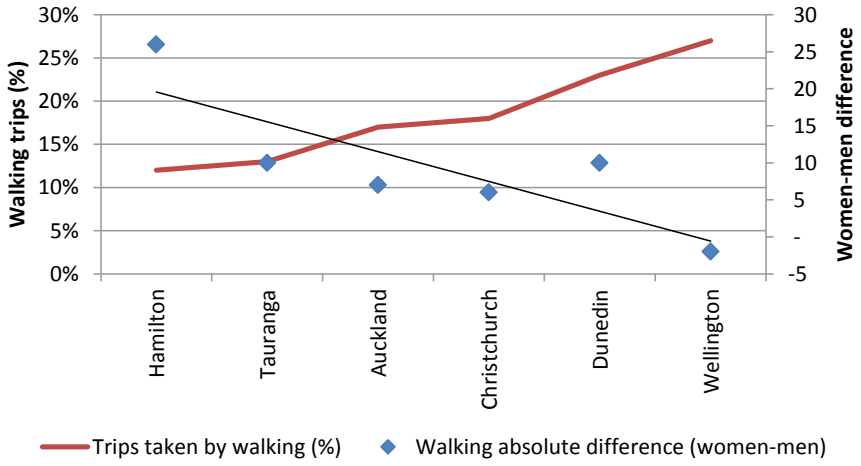
Table 4 Gender differences in cycling and walking trips, six cities

	Bicycle			Walk		
	Overall % cycling	% male	% female	Overall % walking	% male	% female
Auckland	0.4%	-	-	17%	46%	53%
Tauranga	1.9%	-	-	13%	45%	55%
Hamilton	1.1%	-	-	12%	37%	63%
Wellington	1.4%	-	-	27%	51%	49%
Christchurch	3.6%	70%	30%	18%	47%	53%
Dunedin	1.3%	-	-	23%	45%	55%

Some cells are suppressed due to small trip numbers for either males, females or both.
Source: New Zealand Household Travel Survey 2010-2013

Figure 5 examines the patterns in gender differences in walking more closely. There is an association between how common walking trips were in a city and the gender differences. That is, as walking became more common, there were fewer absolute gender differences in walking trips between men and women.

Figure 5 Walking trips and gender differences in walking, six cities

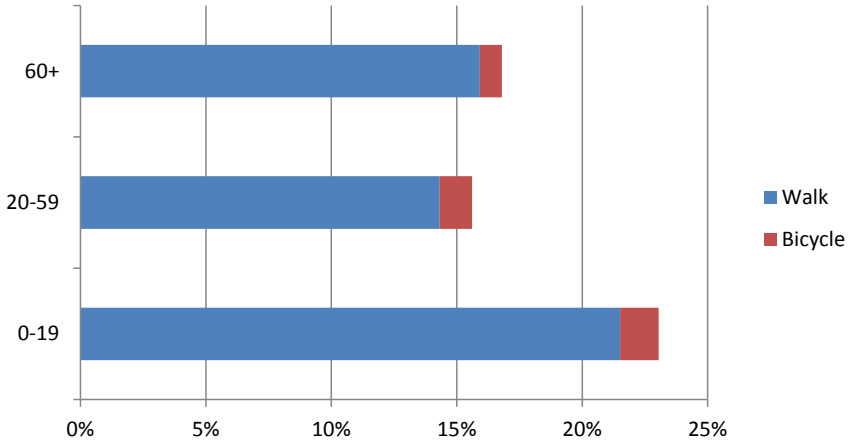


The absolute difference was calculated by subtracting the percentage of walking trips done by men from the percentage of walking trips done by women in each city.
Source: New Zealand Household Travel Survey 2010-2013

4.1.2. Mode share by age

Figure 6 shows the proportion of trips taken by cycling or walking in different age groups in all New Zealand. This shows that cycling and walking were more common in younger age groups (<20) than older. However, a decline in New Zealand children's active transport over time has been noted, particularly in main urban areas.[38] There appears to be a slightly lower proportion of cycling and walking in the 20-59 age range compared to over-60s. Most of the differences between the age groups reflected differences in walking rather than cycling.

Figure 6 Walking and cycling trips by age group, all New Zealand



Source: New Zealand Household Travel Survey 2010-2013

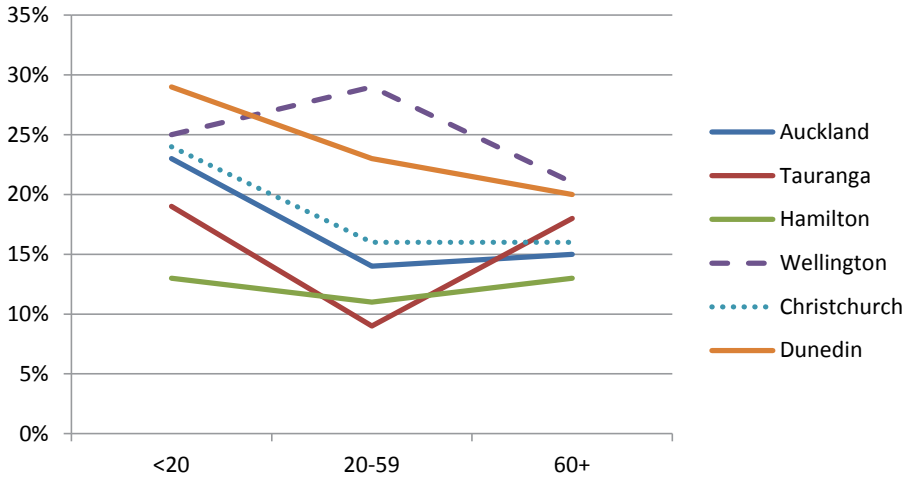
Table 5 shows age differences in cycling and walking in the six cities. For walking, several different patterns are seen, which are better illustrated in Figure 7. Christchurch, Auckland and Dunedin all showed highest rates of walking in the under-20 group, which then declined in a linear fashion with age in Dunedin, and to a plateau for the other two cities. Hamilton appeared to have a broadly similar proportion of people walking in all age groups. In contrast to the other cities, the proportion of people walking in Wellington was highest in people aged 20-59. Only Christchurch had enough data to be able to report cycling trips by age. This showed that cycling was higher in working-age people compared to younger and older age groups (although numbers of trips on which these data are based remained quite small in the under-20 and over-60 age group, so this may be a chance finding).

Table 5 Age differences in cycling and walking trips, six cities

	0-19		20-59		60+	
	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk
Auckland	0.5%	23%	0.4%	14%	-	15%
Tauranga	-	19%	2.2%	9%	-	18%
Hamilton	-	13%	1.2%	11%	-	13%
Wellington	-	25%	2.0%	29%	-	21%
Christchurch	2.0%	24%	4.5%	16%	2.3%	16%
Dunedin	-	29%	1.2%	23%	-	20%
All New Zealand	1.5%	22%	1.3%	14%	0.9%	16%

Some cells suppressed due to small trip numbers in specific age groups.
Source: New Zealand Household Travel Survey 2010-2013

Figure 7 Walking by age group, six cities

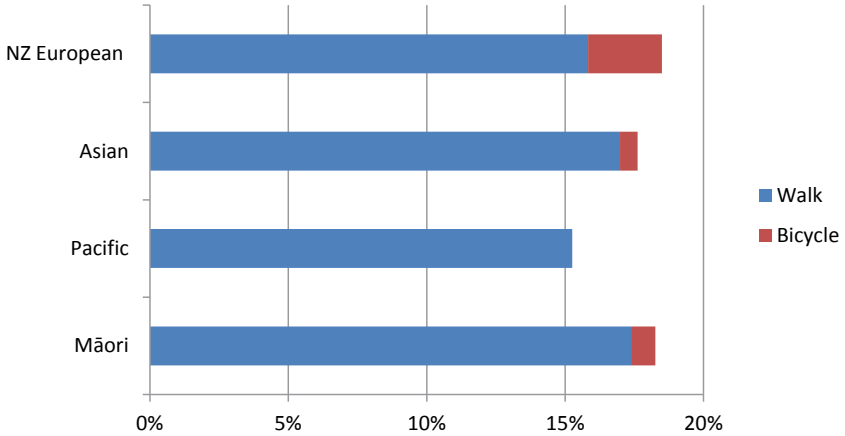


Source: New Zealand Household Travel Survey 2010-2013

4.1.3. Mode share by ethnic group

Figure 8 shows cycling and walking trips by ethnic group in all of New Zealand. There did not appear to be any difference in the overall level of active transport trips between Māori and European (18% and 19% respectively). However, cycling for transport appeared to be more common among people of European ethnicity (2.7%) compared to Māori (0.9%). Pacific people had lower levels of cycling and walking compared to the other ethnic groups reported.

Figure 8 Walking and cycling by ethnic groups, all New Zealand



Prioritised ethnicity used. Pacific cycling not reported due to small numbers.
Source: New Zealand Household Travel Survey 2010-2013

Table 6 shows the differences in cycling and walking trips by ethnic group in the six cities. Much information is missing due to small numbers.

Table 6 Walking and cycling by ethnic group, six cities

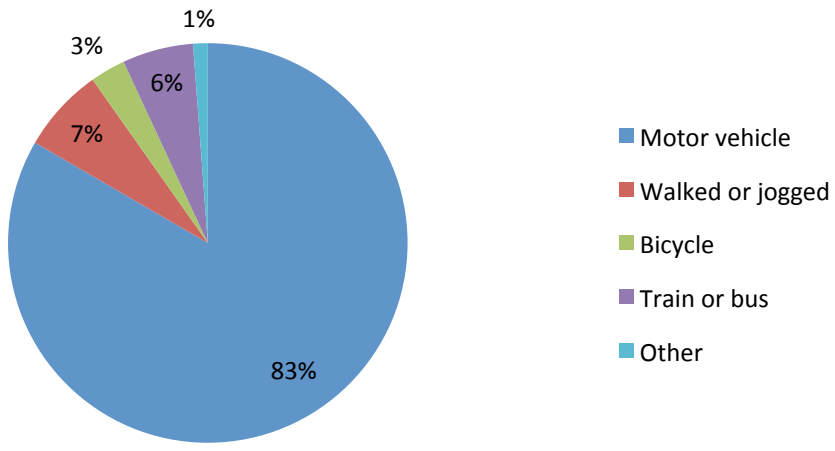
	Auckland		Tauranga		Hamilton		Wellington		Christchurch		Dunedin		All NZ	
Ethnic group	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk
Māori	-	20%	-	10%	-	10%	-	20%	-	23%	-	27%	0.9%	17%
Asian	-	-	-	-	-	-	-	34%	2.2%	-	-	-	0.6%	17%
NZ European	5.4%	16%	2.1%	13%	1.3%	13%	2%	26%	4.0%	17%	1.4%	24%	2.7%	16%
Pacific	-	15%	-	-	-	-	-	26%	-	23%	-	20%	-	15%

Some cells suppressed due to small trip numbers in specific ethnic groups.
Source: New Zealand Household Travel Survey 2010-2013

4.2. Travelling to work on Census Day

Figure 9 shows the main means of travel to work for the approximately 1.5 million people who worked away from home on Census Day in 2013. The majority of people (83%) either drove a motor vehicle or were a passenger in one. Just over 100,000 people walked or jogged to work, and smaller numbers (44,184) cycled. About 6% of working people commuted by public buses or trains. These patterns are slightly different from those described in Figure 2 (which looks at overall transport mode patterns), with a slightly higher proportion of people cycling to work and using public transport and a lower proportion walking to work.

Figure 9 Main means of travel to work on Census Day, all New Zealand



Motor vehicle category includes car drivers and passengers and motorcycles.
Source: Statistics New Zealand, Census of Population and Dwellings 2013

Table 7 shows the main means of commuting to work in the six cities in 2013. Walking or jogging as a means of transport to work ranged from 4% in Tauranga to 21% in Wellington. Christchurch had the highest rate of cycling at 7% and Auckland the lowest at 1%. Other modes also varied considerably by city: public transport (bus and train) use ranged from 2% in Tauranga to 20% in Wellington. Using a motor vehicle was the most common method of getting to work in all cities, however this ranged from 53% of people in Wellington to 90% in Tauranga.

Table 7 Main means of commuting to work on Census Day, six cities

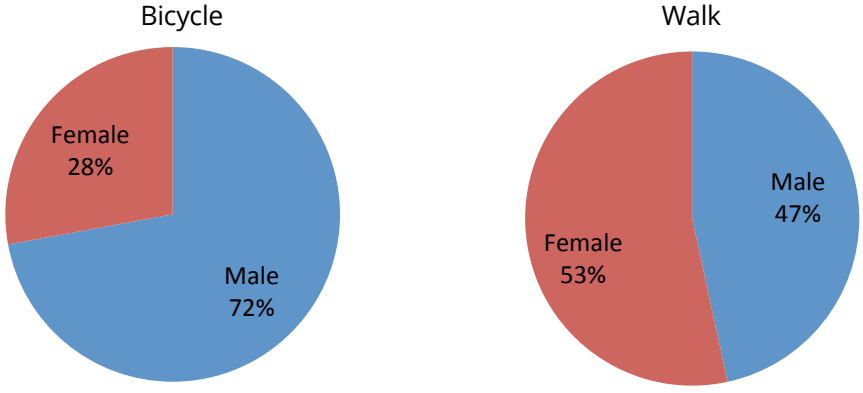
	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Motor vehicle*	435,789 (84%)	35,532 (90%)	45,228 (86%)	45,711 (53%)	116,382 (84%)	36,246 (82%)
Walked or jogged	26,529 (5%)	1,656 (4%)	3,450 (7%)	18,183 (21%)	6,396 (5%)	5,085 (11%)
Bicycle	6,342 (1.2%)	1,263 (3.2%)	2,016 (3.8%)	3,729 (4.3%)	9,801 (7.0%)	1,224 (2.8%)
Train or bus	43,395 (8%)	699 (2%)	1,536 (3%)	17,709 (20%)	5,199 (4%)	1,482 (3%)
Other	7,989 (2%)	330 (1%)	423 (1%)	1,353 (2%)	1,383 (1%)	411 (1%)

*As a driver or passenger and includes motorcycles
Source: Statistics New Zealand, Census of Population and Dwellings 2013

4.2.1. Gender differences in travel to work on Census Day

Figure 10 shows cycling and walking to work by gender. Between 2011 and 2013 47% of the New Zealand labour force was female and 53% was male.[39] In contrast, of people who walked to work, slightly more were women (53%) compared to men (47%). Men were, however, almost three times more likely to cycle to work than women.

Figure 10 Gender differences in cycling and walking to work on Census Day, all New Zealand



Source: Statistics New Zealand, Census of Population and Dwellings 2013

Table 8 shows the gender breakdown of cycling and walking to work by city. In all cities women were more likely to walk and men were more likely to cycle. Christchurch had the highest proportion of women cycling (31%), as well as the highest overall commuting by cycling (7%).

Table 8 Gender differences in cycling and walking to work on Census Day, six cities

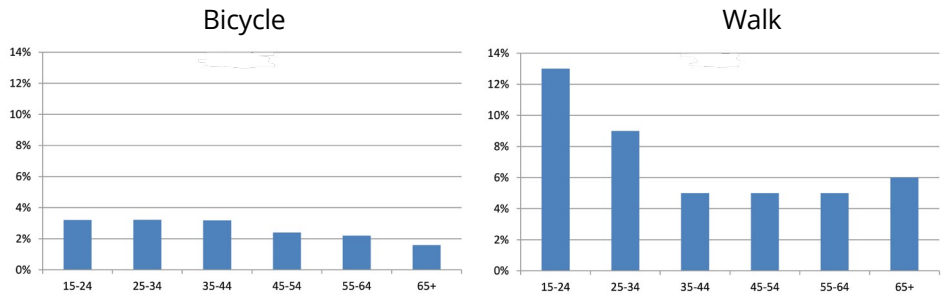
	Bicycle			Walk		
	Overall % bicycle	% male	% female	Overall % walking	% male	% female
Auckland	1.2%	78%	22%	5%	48%	52%
Tauranga	3.2%	71%	29%	4%	40%	60%
Hamilton	3.8%	77%	23%	7%	44%	56%
Wellington	4.4%	74%	26%	21%	48%	52%
Christchurch	7.0%	69%	31%	5%	45%	55%
Dunedin	2.8%	72%	28%	11%	47%	53%

Source: Statistics New Zealand, Census of Population and Dwellings 2013

4.2.2. Age differences in travel to work on Census Day

Figure 11 shows age differences in cycling and walking to work in all of New Zealand. These show that walking was most common in working people aged under 25 years (13%), and declined to a trough of about 5% between 35-64. There appeared to be a slight increase in the over-65 age group. Cycling appeared to be relatively constant up to age 44, at about 3%, and then declined gradually after that age.

Figure 11 Age differences in cycling and walking to work on Census Day, all New Zealand



Source: Statistics New Zealand, Census of Population and Dwellings 2013

The overall patterns by age seen nationally in cycling and walking to work were mirrored in the cities (see Table 9), although the absolute numbers varied. For example, walking to work in Auckland was 9% in the under-25 age group and declined to 3-4% from 35 years and over. In Christchurch cycling showed a slightly different age-related pattern, with a more gradual decline from 8% in the under-25 age group to 3% in the over-65 age group.

Table 9 Age differences in cycling and walking to work on Census Day, six cities

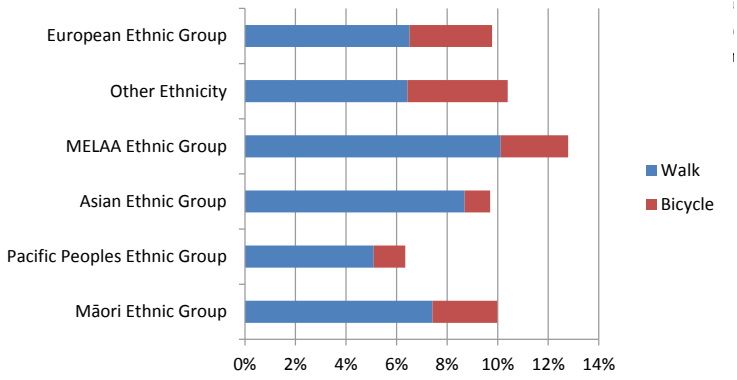
	15-24			25-34			35-44			45-54			55-64			65+		
	Total working away from home	% Bicycle	% Walking	Total working away from home	% Bicycle	% Walking	Total working away from home	% Bicycle	% Walking	Total working away from home	% Bicycle	% Walking	Total working away from home	% Bicycle	% Walking	Total working away from home	% Bicycle	% Walking
Auckland	65,649	1.2	9	117,225	1.4	7	121,422	1.4	4	120,918	1.0	3	74,310	0.8	4	20,502	0.6	4
Tauranga	4,515	3.7	7	6,861	4.1	5	9,069	3.4	3	9,741	2.7	3	7,239	2.4	4	2,067	1.9	4
Hamilton	8,232	4.0	10	11,781	4.2	8	11,508	4.2	5	11,163	3.3	5	7,821	3.1	6	2,160	1.6	5
Wellington	13,047	2.8	38	21,858	4.9	29	19,515	6.1	14	18,531	3.7	11	10,941	2.0	14	2,805	1.2	13
Christchurch	20,310	7.7	8	27,993	8.1	5	29,730	7.9	4	32,337	6.0	3	22,947	5.2	4	5,838	3.1	4
Dunedin	6,801	3.3	29	7,527	4.3	12	9,219	2.8	8	10,896	2.1	6	8,139	1.4	8	1,875	1.1	7
All New Zealand	198,867	3.2	13	299,061	3.2	9	346,800	3.2	5	374,127	2.4	5	259,008	2.2	5	71,556	1.6	6

Source: Statistics New Zealand, Census of Population and Dwellings 2013

4.2.3. Ethnic differences in travel to work on Census Day

Figure 12 shows ethnic group differences in cycling and walking to work in all of New Zealand. This showed differences in walking to work by ethnicity, with people of MELAA ethnic group (Middle Eastern, Latin American or African) having the highest rates of walking to work (10%) and Pacific people the lowest (5%). Cycling ranged from 4% of people in 'other ethnicity' cycling to work to less than 1% in the Asian ethnic group.

Figure 12 Ethnic differences in cycling and walking to work on Census Day, all New Zealand



Prioritised ethnicity used. MELAA= Middle Eastern, Latin America or African. Only included people who stated their ethnicity.
Source: Statistics New Zealand, Census of Population and Dwellings 2013

Table 10 shows the ethnic differences in cycling and walking to work in the six cities. In most cities, with the exception of Tauranga, there appeared to be slightly higher rates of cycling to work among New Zealand European people compared to Māori. For example, 4.3% of NZ European people cycled to work in Hamilton, compared to 3.6% of Māori. Walking to work was either slightly higher or the same for Māori compared to NZ European.

Table 10 Ethnic differences in cycling and walking to work on Census Day, six cities

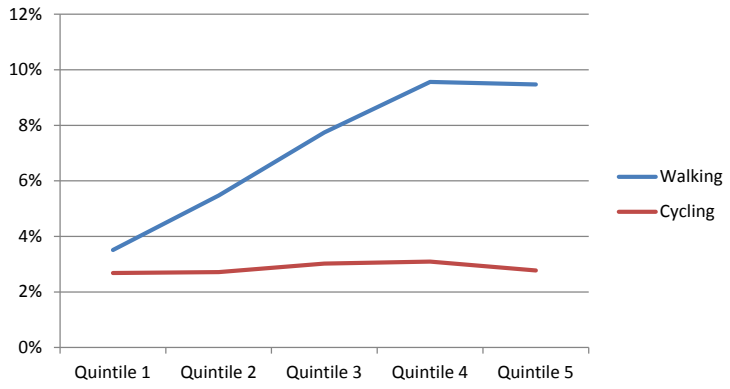
	Auckland		Tauranga		Hamilton		Wellington		Christchurch		Dunedin		All NZ	
Ethnic group	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk
Māori	1.2%	5%	3.5%	5%	3.6%	7%	3.1%	21%	5.4%	5%	2.2%	13%	2.6%	7%
Pacific Peoples	0.7%	4%	-	-	-	7%	1.4%	14%	4.2%	6%	-	15%	1.3%	5%
Asian	0.4%	6%	2.1%	9%	1.9%	10%	1.1%	21%	3.9%	7%	-	25%	1.0%	9%
MELAA	1.4%	8%	-	-	-	9%	-	21%	6.5%	5%	-	18%	2.7%	10%
Other Ethnicity	1.7%	4%	-	-	5.8%	6%	4.9%	21%	8.6%	4%	3.8%	12%	4.0%	6%
European	1.6%	5%	3.1%	4%	4.3%	6%	5.2%	21%	7.5%	4%	2.8%	11%	3.3%	7%

Prioritised ethnicity used. MELAA= Middle Eastern, Latin America or African. Only included people who stated their ethnicity. Some results not reported due to small numbers.
Source: Statistics New Zealand, Census of Population and Dwellings 2013

4.2.4. Socio-economic differences in travel to work on Census Day

Figure 13 shows cycling and walking by deprivation quintile of residence on Census Day for all of New Zealand. Deprivation quintiles are a neighbourhood-based measure of deprivation, with quintile 5 being the most deprived 20% of neighbourhoods in the country and quintile 1 being the least deprived 20% of neighbourhoods in the country. Cycling to work was similar across all deprivation quintiles. Walking showed a definite gradient, with people who resided in more deprived quintiles being much more likely to walk to work (9%) than people from the least deprived quintile (3%).

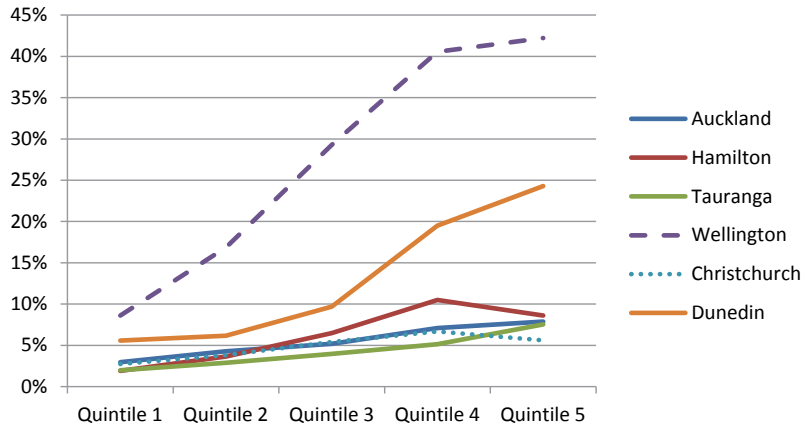
Figure 13 Walking and cycling to work by deprivation quintile on Census Day, all New Zealand



Source: Statistics New Zealand, Census of Population and Dwellings 2013

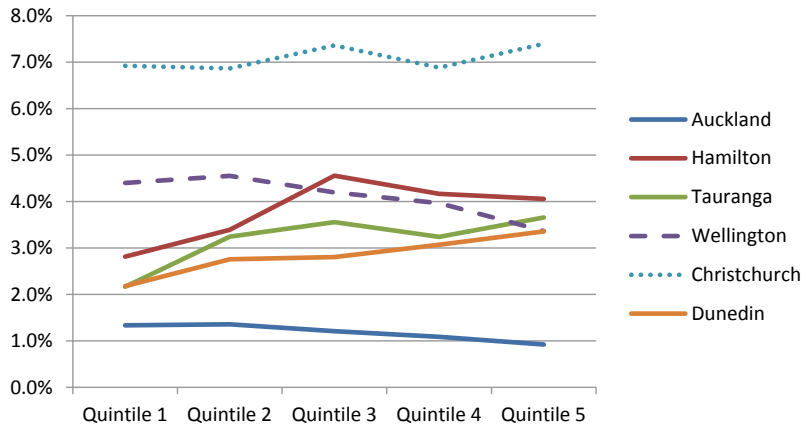
Figure 14 and Figure 15 show walking and cycling to work by deprivation quintile for the six cities. In every city people living in higher deprivation areas were more likely to walk to work. In Wellington and Dunedin the magnitude of that pattern was amplified considerably. For example, in Dunedin 6% of people in the least deprived neighbourhoods walked to work, whereas 24% of people in the most deprived neighbourhoods walked to work. For cycling the pattern was more mixed, with some cities showing evidence that cycling was more common in people who lived in more deprived neighbourhoods (Dunedin, Tauranga, Hamilton) and some that cycling was more common among the less deprived neighbourhoods (Wellington, Auckland). Christchurch showed no obvious association.

Figure 14 Walking to work by deprivation quintile on Census Day, six cities



Source: Statistics New Zealand, Census of Population and Dwellings 2013

Figure 15 Cycling to work by deprivation quintile on Census Day, six cities



Source: Statistics New Zealand, Census of Population and Dwellings 2013

Table 11 Walking and cycling by deprivation quintile on Census Day, six cities

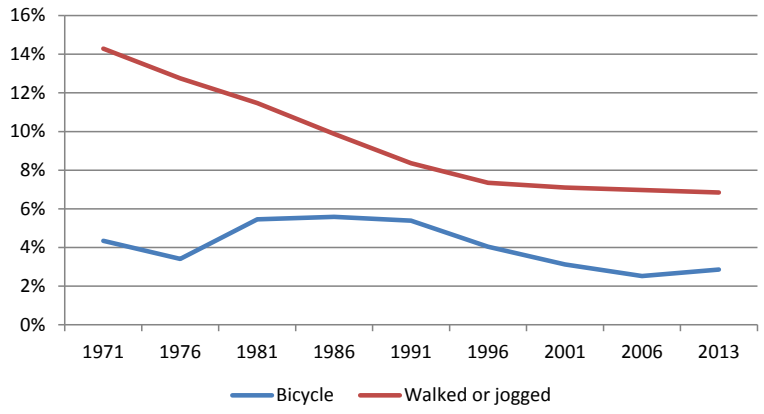
	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk	% Bicycle	% Walk
Auckland	1.3	3	1.4	4	1.2	5	1.1	7	0.9	8
Tauranga	2.2	2	3.2	4	3.6	6	3.2	10	3.7	9
Hamilton	2.8	2	3.4	3	4.6	4	4.2	5	4.1	8
Wellington	4.4	9	4.6	17	4.2	29	4.0	41	3.4	42
Christchurch	6.9	3	6.9	4	7.4	5	6.9	7	7.4	6
Dunedin	2.2	6	2.8	6	2.8	10	3.1	19	3.4	24
All New Zealand	2.7	4	2.7	5	3.0	8	3.1	10	2.8	9

Source: Statistics New Zealand, Census of Population and Dwellings 2013

4.2.5. Long-term trends in cycling and walking to work on Census Day

Questions have been asked about travel to work in the New Zealand Census since 1971. This long time series allows us to examine trends in cycling and walking to work nationally (Figure 16). Walking declined from 14% of trips to work in 1971 to 7% in 2013, with the decline plateauing from 1996 to 2013. Cycling declined from 4% in 1971 to 3% in 2013, but in a non-linear fashion, as rates increased to almost 6% in the 1980s and then declined to current rates. There was a slight increase in cycling between 2006 and 2013 nationally, from 2.5 to 2.9% (see Table 12).

Figure 16 Walking and cycling to work in New Zealand on Census Day 1971-2013



The Census question changed between 1986 and 1991 (from 'what is your usual means of travel to work' to 'how did you travel to work today') meaning they are not directly comparable, however for the purposes of this report the information is adequate.
Source: Census 1971-2013

Table 12 Trends in mode of travel to work in New Zealand, 1971-2013

	1971	1976	1981	1986	1991	1996	2001	2006	2013
Motor vehicle	602,004 (62%)	739,611 (66%)	765,696 (67%)	777,942 (69%)	875,811 (77%)	1,017,786 (81%)	1,073,250 (82%)	1,254,762 (83%)	1,265,571 (82%)
Walked or jogged	138,530 (14%)	142,516 (13%)	131,064 (11%)	110,586 (10%)	94,683 (8%)	92,469 (7%)	92,541 (7%)	105,462 (7%)	106,119 (7%)
Bicycle	42,097 (4.3%)	38,030 (3.4%)	62,367 (5.5%)	62,532 (5.6%)	61,014 (5.4%)	50,811 (4.0%)	40,668 (3.1%)	38,091 (2.5%)	44,184 (2.9%)
Train or bus	158,191 (16%)	142,539 (13%)	118,488 (10%)	112,467 (10%)	58,164 (5%)	60,027 (5%)	67,278 (5%)	79,188 (5%)	89,016 (6%)
Motor cycle or power cycle	23,056 (2%)	47,931 (4%)	57,957 (5%)	46,932 (4%)	29,949 (3%)	21,117 (2%)	17,304 (1%)	19,695 (1%)	26,205 (2%)
Other	5,815 (1%)	6,957 (1%)	6,714 (1%)	8,958 (1%)	12,780 (1%)	16,257 (1%)	12,627 (1%)	14,535 (1%)	18,333 (1%)

The Census question changed between 1986 and 1991 (from 'what is your usual means of travel to work' to 'how did you travel to work today') meaning they are not directly comparable, however for the purposes of this report the information is adequate.
Source: Census 1971-2013

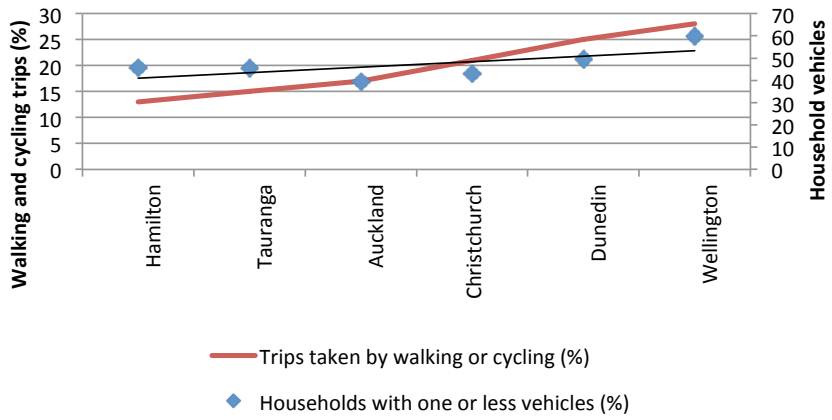
4.3. Other contributing factors

This section looks at some of the other factors that can contribute to choice of transport, such as the climate of a city and the 'car environment'. Climate is thought to have only a weak relationship with cycling and walking levels, although day-to-day weather may still be important.[40 41] The relationship between car-ownership and levels of cycling and walking is likely to be bi-directional. That is, people who walk and cycle have less requirement for cars, but people without cars also are more likely to need to walk and cycle.[1] Those who use public transport generally walk to and from bus and train stops. Recent research in the Wellington region concluded that 'access to, and frequency of, public transport in the neighbourhood can act as a facilitator for a more active lifestyle among its residents'.[42]

4.3.1. Number of cars

Figure 17 and Table 13 show the association between households with low car-ownership and the proportion of trips taken by cycling and walking in a city. There was a moderate association (R^2 0.43) between having no or one car in a household and the proportion of trips taken by walking and cycling in a city. That is, cities with lower levels of household car-ownership, such as Wellington and Dunedin, had higher levels of cycling and walking.

Figure 17 Household vehicles and mode share of cycling and walking, six cities



Sources: Statistics New Zealand, Census of Population and Dwellings 2013.
New Zealand Household Travel Survey 2010-2013

Table 13 Proportion of households with no, one or two or more vehicles, six cities

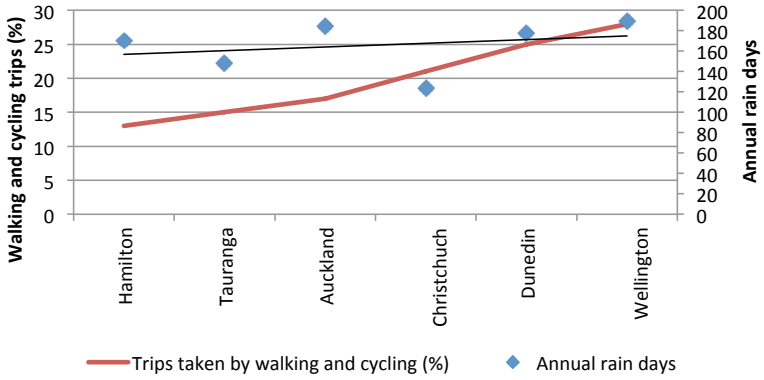
	% of trips walking or cycling	No vehicle	One vehicle	Two or more vehicles
Auckland	17%	7%	32%	55%
Tauranga	15%	6%	39%	51%
Hamilton	13%	8%	37%	49%
Wellington	28%	15%	45%	36%
Christchurch	21%	8%	36%	53%
Dunedin	25%	11%	39%	46%
All New Zealand	17%	8%	36%	52%

Percentages do not add up to 100 as there were some households where vehicle information was not available.
Sources: Household car access: Statistics New Zealand, Census of Population and Dwellings 2013.
Walking and cycling trips: New Zealand Household Travel Survey 2010-2013

4.3.2. Climate

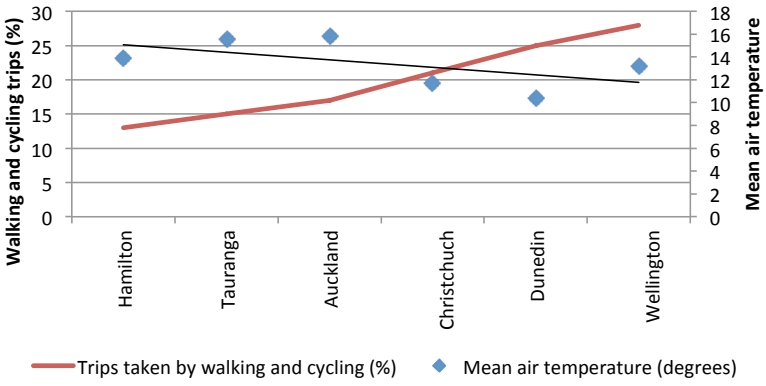
The next series of figures examines the association between cycling and walking and climate in the six cities, including number of annual rain days (Figure 18), average temperature (Figure 19) and wind speed (Figure 20). These figures suggest there were no strong associations between cycling and walking and the number of annual rain days, mean air temperature or mean wind speed in a city. Frequency of cycling and walking was not noticeably affected by whether a city's climate was inclement or not.

Figure 18 Walking and cycling trips and rain, six cities



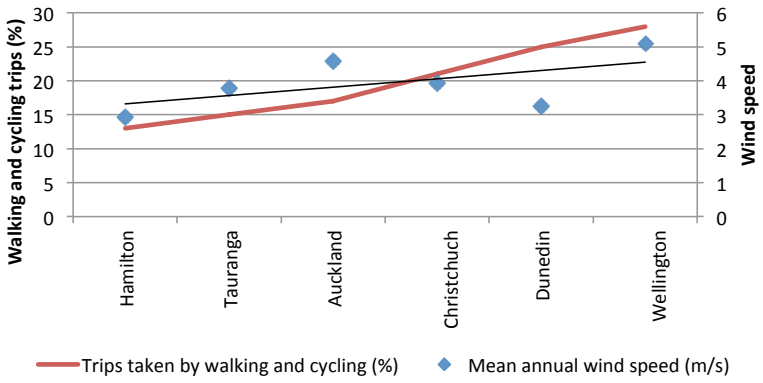
Sources: New Zealand Household Travel Survey 2010-2013 and NIWA

Figure 19 Walking and cycling trips and temperature, six cities



Sources: New Zealand Household Travel Survey 2010-2013 and NIWA

Figure 20 Walking and cycling trips and wind, six cities



Sources: New Zealand Household Travel Survey 2010-2013 and NIWA

4.4. Counting cycling and walking

In this chapter we reported travel data from the Census and New Zealand Household Travel Survey; however councils also conduct their own counts of cyclists and walkers (see Table 14). All six cities assessed the numbers of trips taken by bicycle, typically through household or intercept surveys. Auckland, Tauranga, Wellington and Dunedin also counted walking trips by the same means. Hamilton and Christchurch did not count walking trips.

Table 14 Counting cycling and walking in six cities

City	Cyclist counts	Pedestrian counts
Auckland	Household survey; intercept survey; electronic counter; manual count	Household survey; intercept survey; manual count; camera count
Tauranga	Household survey; electronic counter	Household survey
Hamilton	Yes (method not specified)	None
Wellington	Intercept survey	Intercept survey
Christchurch	Household survey; manual (project specific)	None
Dunedin	Household survey; intercept survey; electronic counter	Household survey; intercept survey; electronic counter

Source: City survey Q10 & 13

4.5. Summary

Walking was the most common form of active transport in New Zealand (16%) with cycling only comprising 1% of trips. There were substantial differences in the proportions of trips taken by cycling and walking in the different cities, with walking ranging from 12% to 27% and cycling from 0.4% to 3.6% of trips. Two thirds of cycling trips were made by men, whereas walking was more common in women (55%). In cities with higher levels of walking the gender differences may have been slightly less. Cycling and walking were more common in younger age groups in most, but not all, cities. There were ethnic differences in cycling and walking for transport, although small numbers made it difficult to determine if there were any patterns by city.

Using data from the Census shows 3% of people cycled to work and 7% walked to work on Census Day in 2013. However, there were large differences by city. Cycling to work was most common in Christchurch (7%) and least common in Auckland (1.2%). Walking was most common in Wellington (21%) and least common in Tauranga (4%). Interestingly, cycling to work remained stable across age groups. Cycling to work was stable across deprivation quintiles, but walking to work was much more common in people living in higher deprivation quintiles.

Both cycling and walking to work declined in New Zealand between 1971 and 2013. The decline in cycling was not linear, indicating external events were able to shift cycling rates in a relatively short time-frame.

There was a clear association between cities having lower levels of household car-ownership and higher levels of cycling and walking. Poorer climate did not appear associated with lower levels of cycling and walking.

All councils collected data on cycling and most collected it on walking as well.

5. Population health

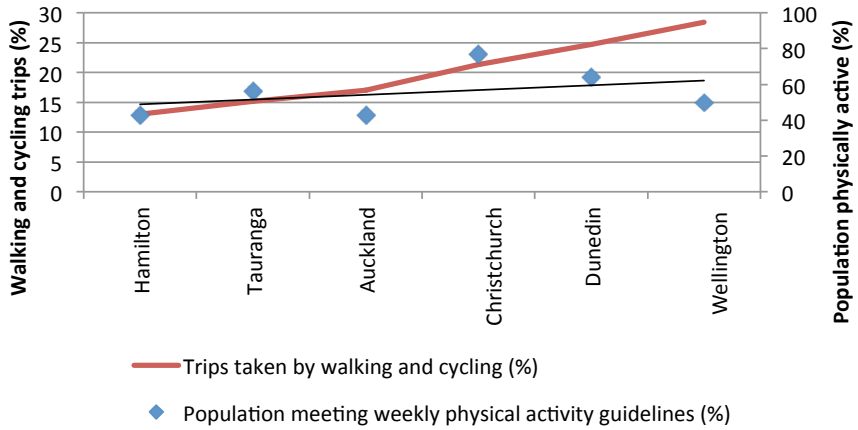
This section looks at the levels of cycling and walking in the six cities, alongside key population health indicators. The population health indicators are primarily related to physical activity, either directly or indirectly through health outcomes associated with insufficient physical activity, such as poorer mental health or diabetes diagnosis.

These data are all from the New Zealand Health Survey, a continuous nationally-representative survey of health risk factors, outcomes and health service use in the New Zealand population. These data are ecological-level data (aggregate) rather than applying to specific individuals, and thus should be regarded as indicative only. That is, while we can say that in a specific city there may be an association, for example, between a lower percentage of people with obesity and overweight and a higher percentage of people who walk or cycle for transport, we do not know from these data whether those individuals who walk or cycle for transport have a lower body mass index.

The data are presented here in graphs. A table with all the numbers contained in each graph is available in online supplementary information (http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/).

Figure 21 shows, in each of the six cities, the percentage of the population meeting the recommended physical activity guidelines at the time of the survey (30 minutes of moderate physical activity such as brisk walking on at least five days a week)[1] and the proportion of trips that were undertaken by cycling and walking in the New Zealand Household Travel Survey. This graph shows that cities with fewer people cycling and walking for transport also tended to have fewer people meeting the weekly recommended physical activity levels. While this relationship was not seen in every city, the trend line shown suggests that there was an overall association, although it is weak (R^2 0.14).[2]

Figure 21 Comparing cycling and walking levels and physical activity, six cities

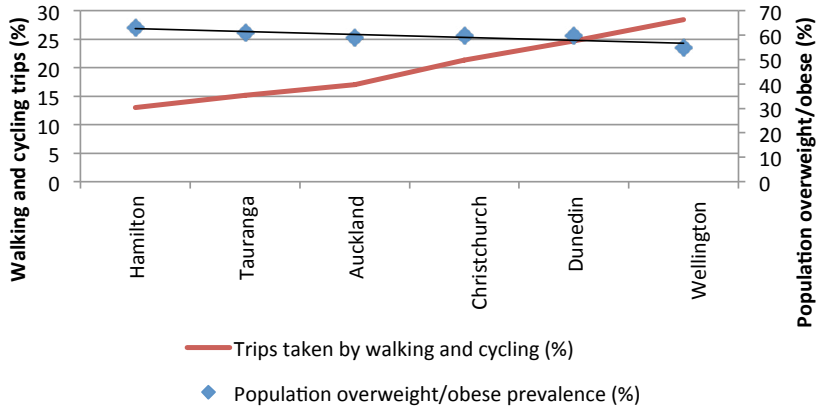


Sources: New Zealand Household Travel Survey 2010-2013. New Zealand Health Survey 2011-2014

1 Physical activity recommendations were updated and amended subsequent to the work on this report.
2 The R^2 value is a measure of how well the data points fit to the trend line: the closer the value is to 1, the better the fit, and thus there is a stronger association. Conversely, the closer the value is to 0, the worse the fit of the data to the trend line, and the weaker the association.

Figure 22 looks at levels of cycling and walking and the percentage of the population who were overweight or obese. This shows a relatively clear, and statistically strong (R^2 0.71), linear association between increasing levels of the population who walked and cycled for transport and a lower percentage of the population who were overweight or obese.

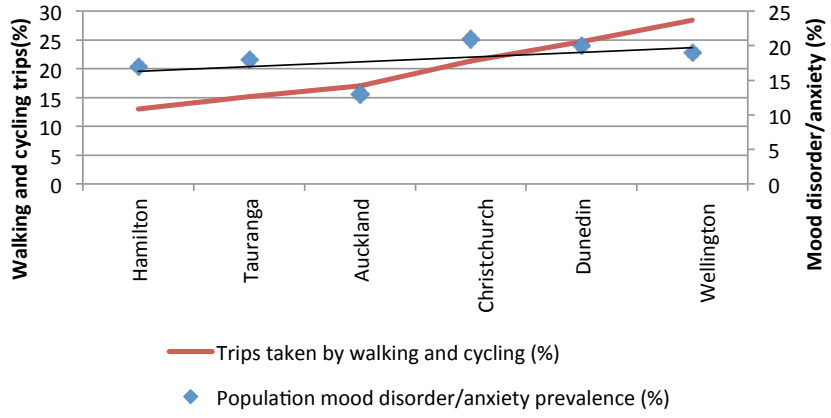
Figure 22 Comparing cycling and walking levels and overweight / obese, six cities



Sources: New Zealand Household Travel Survey 2010-2013. New Zealand Health Survey 2011-2014

Figure 23 examines the prevalence of diagnosed depression, bipolar disorder or anxiety. This graph shows that in cities with higher levels of cycling and walking there were higher levels of diagnosed depression, bipolar disorder or anxiety. This is a not a particularly strong statistical relationship (R^2 0.20).

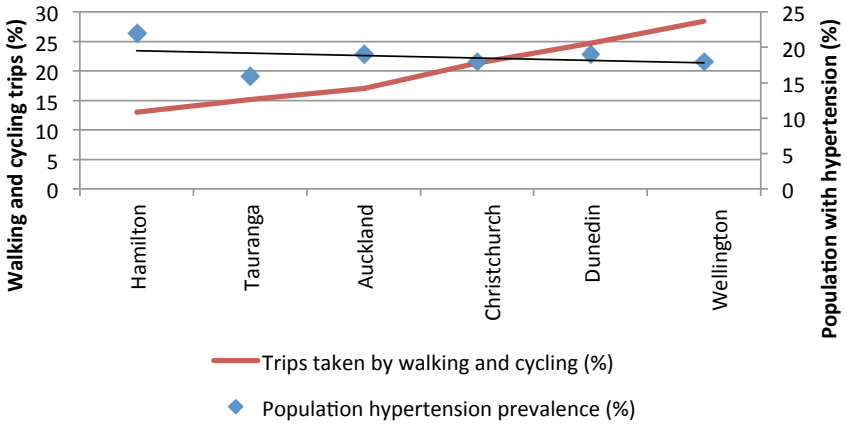
Figure 23 Comparing cycling and walking levels and mood disorder / anxiety, six cities



Sources: New Zealand Household Travel Survey 2010-2013. New Zealand Health Survey 2011-2014

Figure 24 examines the prevalence of diagnosed hypertension. This suggests a weak association (R^2 0.1) between lower levels of diagnosed hypertension in cities with higher levels of cycling and walking for transport.

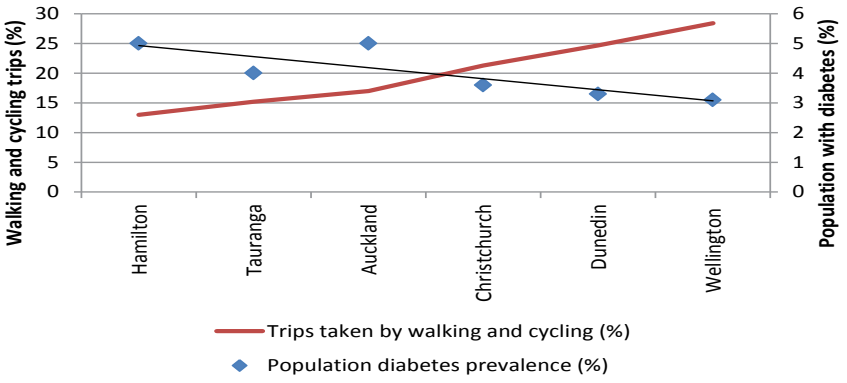
Figure 24 Comparing cycling and walking levels and hypertension, six cities



Sources: New Zealand Household Travel Survey 2010-2013. New Zealand Health Survey 2011-2014

Figure 25 examines the prevalence of diagnosed diabetes. There is a fairly strong association seen between higher levels of cycling and walking for transport and lower levels of diabetes diagnosed in a city (R^2 0.70).

Figure 25 Comparing cycling and walking levels and diabetes, six cities



Sources: New Zealand Household Travel Survey 2010-2013. New Zealand Health Survey 2011-2014

5.1. Summary

While these data are indicative only, they show relationships that are mostly in the direction that research evidence would suggest. In cities with higher levels of people cycling and walking for transport, higher proportions of the population had adequate levels of physical activity for health, and fewer had diagnosed diabetes or hypertension or were obese / overweight. The mental health data were slightly unusual, showing higher levels of people with doctor-diagnosed depression, bipolar disorder and anxiety in cities with higher levels walking and cycling. Likelihood of diagnosis, access to primary and secondary care, cultural factors and possibly disclosure of diagnosis to survey interviewers may explain this finding. The strength of the ecological association between the levels of cycling and walking in cities and health indicators varied considerably.

The nature of ecological-level data means that for all of the findings in this chapter we cannot assume that there is a relationship on the individual level. For example, we cannot be sure from the information above that the specific people who were sufficiently physically active were the same people who were cycling and walking for transport. However, other research tells us that this is likely to be the case.[4-6]

6. Safety

This chapter examines safety issues for cycling and walking. Cyclist and pedestrian safety, both perceived and experienced, is an important factor for active transport in cities.[43] The data used on fatalities were obtained from the Ministry of Transport annual series *Motor Vehicle Crashes in New Zealand* and the New Zealand Transport Agency Crash Analysis System. Data on speed were obtained from Ministry of Transport annual surveys.

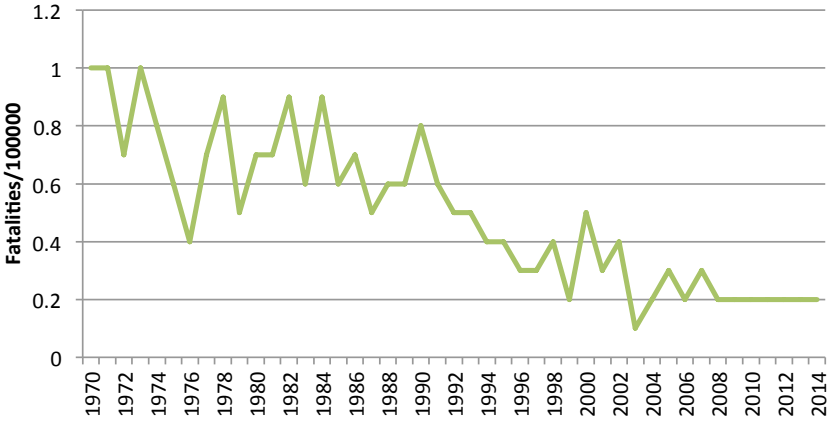
These data report fatalities for all people, not just those who were cycling or walking for transport. It was not possible to obtain information on trip purpose for fatalities. Additionally, as we only included fatality data, rather than fatalities and injuries, patterns of risk may be slightly different from those that consider fatalities and injuries together.[44] [45]

6.1. Fatalities

6.1.1. Trends in fatalities

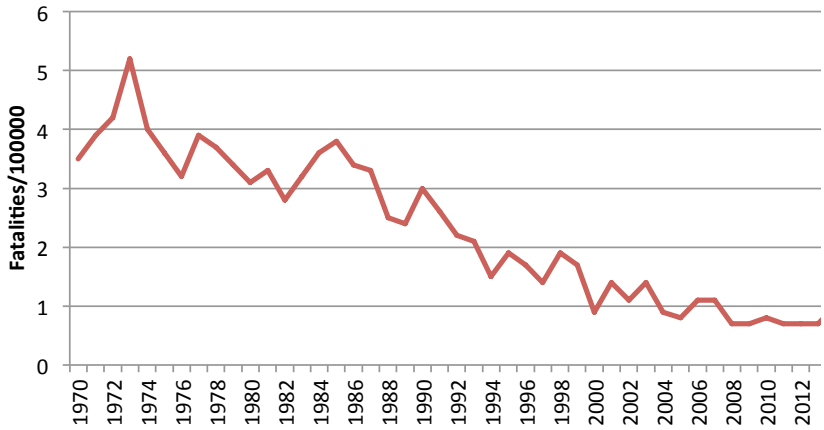
Figure 26 and Figure 27 show fatalities of cyclists and pedestrians in New Zealand per 100,000 population between 1970 and 2014. They show that overall cyclist and pedestrian fatalities per 100,000 population have been declining, although declines appear to have plateaued in recent years. Cycling fatalities declined 80% from about 1 per 100,000 in 1970 to around 0.2 per 100,000 between 2010 and 2014. Fatality rates for pedestrians per 100,000 population decreased 75% from about 4 per 100,000 in the early 1970s to about 1 per 100,000 in the most recent period.

Figure 26 Cyclist fatalities per 100,000 population, New Zealand 1970-2014



Source: Motor Vehicle Crashes in New Zealand 2014

Figure 27 Pedestrian fatalities per 100,000 population, New Zealand 1970-2014



Source: Motor Vehicle Crashes in New Zealand 2014

6.1.2. Fatality risk by mode

Table 15 looks at risk of fatality for cyclists, pedestrians and people using motor vehicles (including motorbikes) between 2010 and 2013. This table uses hours travelled by mode as the denominator for the risks, so it takes into account how much time people spend cycling, walking and driving. Numbers of fatalities were small in the cyclist and pedestrian modes, so we have not presented these data on risk by city.[3] Table 15 shows that in New Zealand cycling was the least safe mode with fatality risk of 11.9 per million cycling hours and walking was the safest with fatality risk of 5.3 per million walking hours.

Table 15 Risk of fatalities per million hours travelled by mode 2010-2013

	Bicycle			Pedestrian			Motor vehicle	
	Fatalities	Risk of fatality *	Risk ratio #	Fatalities	Risk of fatality *	Risk ratio #	Fatalities	Risk of fatality *
All New Zealand	35	11.9	1.7	129	5.3	0.8	1053	7.0

*The denominator is annual duration travelled by car/walking/cycle in millions of hours, obtained from the New Zealand Household Travel Survey 2010-2013.
Using motor vehicle as the reference category.
Motor vehicle category includes car drivers and passengers and motorcycles.
Source: Motor Vehicle Crashes in New Zealand 2010-2013.

3 To do this would require further work determining the location of residence of people who died compared to location of fatality and ideally the inclusion of injury data to increase the sample to allow valid comparisons between cities.

6.1.3. Fatalities by city

Table 16 shows the number of cyclist and pedestrian fatalities in the six cities between 2010 and 2013. These represent only a subset of the total cyclist and pedestrian fatalities in New Zealand.

Table 16 Number of cyclist and pedestrian fatalities by city 2010-2013

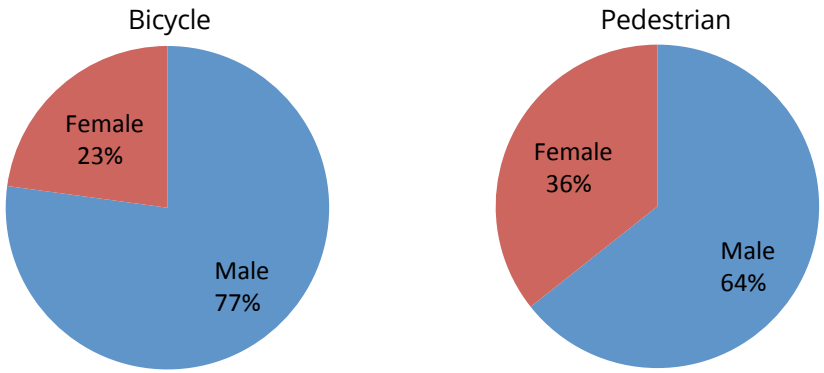
	Cyclist	Pedestrian
Auckland	5	37
Hamilton	1	5
Tauranga	0	2
Wellington	3	2
Christchurch	7	8
Dunedin	3	2
All New Zealand	35	129

Source: Motor Vehicle Crashes in New Zealand 2010-2013

6.1.4. Fatalities by gender

Figure 28 shows the gender breakdown of cyclist and pedestrian fatalities in New Zealand from 2010 to 2013. These data cannot be broken down by city meaningfully because of too small numbers. Cyclist fatalities largely mirrored the gender distribution of cyclists, with about a quarter of deaths being female and the remainder male. Pedestrian fatalities were also more likely to be male (about two thirds), which was slightly different from the gender breakdown of people walking for transport in New Zealand (see Figure 4).

Figure 28 Cyclist and pedestrian deaths by gender, all New Zealand 2010-2013

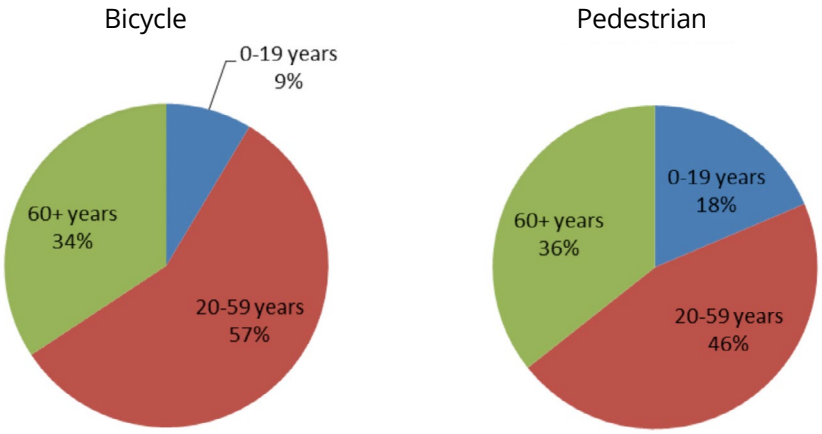


Source: Crash Analysis System

6.1.5. Fatalities by age

About half of cyclist and pedestrian deaths between 2010 and 2013 were in working-age people (see Figure 29) with the majority of other deaths in the over-60 age group. Again, small numbers of deaths preclude breaking these data down by city.

Figure 29 Cyclist and pedestrian deaths by age, all New Zealand 2010-2013



Source: Motor Vehicle Crashes in New Zealand 2010-2013

6.2. CASE STUDY: Safe and healthy pedestrian walkways

Urban walkways are important for enabling travel and creating connections in the city. Pedestrian-only, or shared cycle and pedestrian routes, can help to encourage commuter walking by offering short-cuts and more safe and pleasurable routes than alongside traffic-heavy roads.

Researchers Nick Wilson, Bill Brander, Osman Mansoor and Amber Pearson piloted a study of 118 street-connecting urban walkways in Wellington to assess quality and make recommendations for improvement. They found positive aspects, for example most stairs had handrails. They also found that Wellington City Council could make some low-cost improvements, including better signage and lighting. For improved monitoring systems, the researchers recommended development of a crowdsourcing approach to quality assessment. Indeed, the council recently adopted the approach of a FIX IT smartphone app for citizens to report faults. A further pilot study was conducted on walkways at night, which found that simple measures could be taken to improve after-dark walking, including better positioning of street lights and painting white lines on steps.

From Nick Wilson, Bill Brander, Osman D Mansoor, Amber L Pearson, "Building a reliable measure for unobtrusive observations of street-connecting pedestrian walkways", *Journal of Urban Health*, 91:6, Dec 2014, and "Infrastructure for supporting physical activity: A pilot survey of the quality of street-connecting walkways at night", letter to *New Zealand Medical Journal*, 13 March 2015. This work was prepared by researchers affiliated with the New Zealand Centre for Sustainable Cities within the Department of Public Health, University of Otago, Wellington, and private researchers. This case study was first published in L Early, P Howden-Chapman, M Russell eds. *Drivers of Urban Change*, Steele Roberts, 2015.

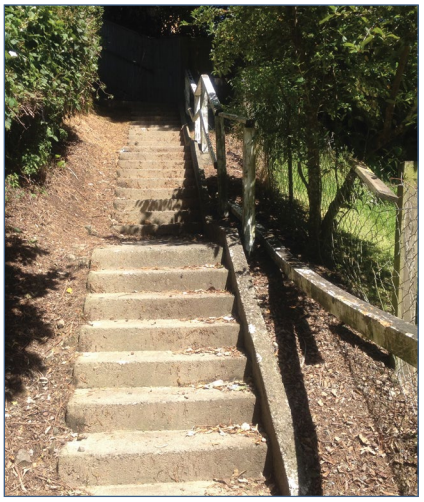


Figure 30 Walkway between Hazelwood Ave and South Karori Rd, broken railing, December 2013

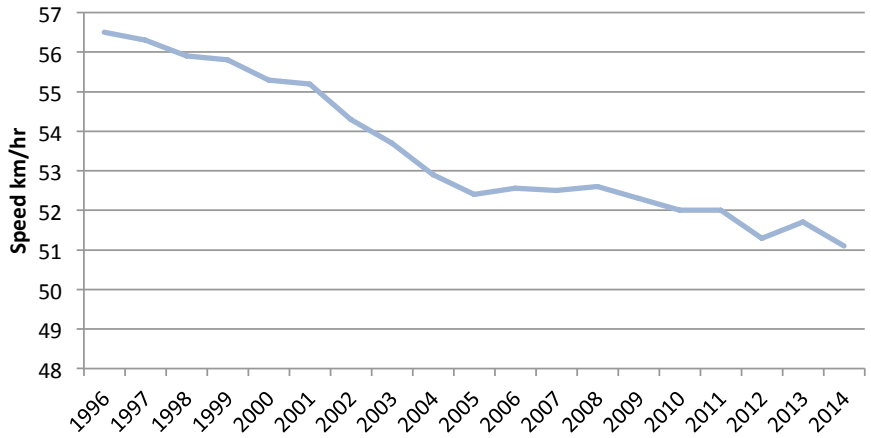
Figure 31 Walkway with lighting and metal rails, part of Drummond St, Mt Cook, November 2013

6.3. Speed

This section examines one further aspect that contributes to cyclist and pedestrian safety. This is a measure of preferred speed of driving in urban areas. This is important for perceived safety of the environment and for survivability after a crash; the chances of a cyclist or pedestrian dying after a car crash increase significantly with increased speed of vehicle.[46]

Figure 32 shows the mean unimpeded urban speed in New Zealand between 1996 and 2014. This shows the speed at which drivers elected to drive in a 50km/hr zone, assuming there was no congestion etc. The mean speed gradually reduced over the time period studied, but remained above the actual urban speed limit of 50 km/hour.

Figure 32 Mean unimpeded speed (km/hr) in urban centres, all New Zealand 1996-2014



Source: Ministry of Transport annual speed survey

Figure 17 shows the mean unimpeded speed in the urban areas in New Zealand. These urban areas are not exactly the same as the cities we looked at in this report, but did contain data from those areas and are probably a reasonable representation of them. This shows that in all urban areas mean unimpeded speed dropped in the last 20 years, but remained at about, or just above, the 50 km/hr speed limit.

Table 17 Mean unimpeded vehicle speed, urban centres of New Zealand 1996-2014 (km/hr)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Auckland	59.3	59.2	57.9	58.2	57.7	57.5	56.3	55.9	54.5	54.5	55.4	55.3	55.1	54.8	54.1	54.0	52.7	54.1	52.9
Waikato	55.8	56.2	57.3	57.6	56.7	55.8	55.2	55.8	54.4	53.7	53.9	52.2	52.5	51.5	52.3	51.8	51.9	51.5	50.3
Bay of Plenty	58.6	57.1	56.7	57.3	57.5	57.6	57.0	56.6	56.0	55.6	55.7	55.2	55.8	55.0	55.3	55.2	54.5	54.6	53.9
Wellington	53.0	55.1	54.9	53.6	53.7	53.2	52.3	51.5	50.8	49.9	49.1	49.4	49.7	49.3	49.1	49.1	49.3	49.0	48.5
Canterbury	55.1	54.7	54.4	54.0	54.2	54.8	53.8	53.2	52.1	52.3	52.5	52.5	52.1	52.5	52.3	51.4	50.4	51.3	50.9
Otago	55.2	53.4	54.2	55.4	53.1	54.0	53.2	52.7	52.3	-	53.1	52.4	51.4	51.4	51.0	50.9	50.9	50.6	51.3
New Zealand	56.5	56.3	55.9	55.8	55.3	55.2	54.3	53.7	52.9	52.4	52.6	52.5	52.6	52.3	52.0	52.0	51.3	51.7	51.1

These are not the same geographic areas as the rest of the report as it was not possible to obtain those specific ones.
Source: Ministry of Transport annual speed survey

6.4. Summary

Cycling and pedestrian fatalities declined by 75-80% between 1970 and 2014. However, when taking into account the amount of time people travelled by each mode, most recent data show that the fatality risk ratio was much higher for cyclists (1.7) compared to those in motor vehicles, but lower for pedestrians (0.8) compared to those in motor vehicles.

The gender distribution of deaths in cyclists was similar to the gender distribution of cycling. However, deaths were more common in male pedestrians compared to female, which was in contrast to the gender distribution of walking. Cyclist and pedestrian deaths were more common in working-age people.

7. Infrastructure

This chapter reports on the types of infrastructure supporting active transport in the six cities. Dedicated cycling and walking infrastructure in cities provides the fundamental basis for people to walk or cycle.[23 47-49] Both the infrastructure itself, and perceptions of it, are crucial for people's choice of active modes. This chapter gives results from our 2015 City Survey, which asked for information on the types of infrastructure in place in the cities. Responses applied to measurements taken in 2015 for most cities, but Christchurch's road length assessment was from 2012. Note that Dunedin City Council boundaries extend far beyond the city's urban area and include a large hinterland with rural roads (see map in Appendix II), making it not entirely comparable with the other cities.

7.1. Infrastructure for cycling

Table 18 describes the different types of cycling infrastructure reported from the six cities. All the cities reported that they had cycling infrastructure, however levels varied considerably.

Table 18 Types of bicycling infrastructure, six cities

Protected bicycle lanes

(lanes with bollards, curbs or other barriers that physically separate the bicycle lane from vehicle lanes)

	Kilometres	Percentage of total roading
Auckland	1.3	0.02
Tauranga	0	0
Hamilton	0	0
Wellington	0	0
Christchurch	5	0.2
Dunedin	1	0.05

On-street cycle lanes

(bicycle lanes separated by road markings but no physical barriers)

	Kilometres	Percentage of total roading
Auckland	96.6	1.3
Tauranga	100	18.2
Hamilton	100	15.6
Wellington	9.4	2.7
Christchurch	231	10.3
Dunedin	45	2.3

Multi-use and dedicated bicycle paths

(paths that are next to, but physically separated from roads)

	Kilometres	Percentage of total roading
Auckland	14.8	0.2
Tauranga	10	1.8
Hamilton	21	3.3
Wellington	19.5	2.8
Christchurch	125	5.6
Dunedin	23	1.2

Combined lanes for buses and bicycles

	Kilometres	Percentage of total roading
Auckland	No data available	-
Tauranga	4	0.7
Hamilton	0	0
Wellington	8.6	1.2
Christchurch	6	0.3
Dunedin	0	0

On-road bicycle routes

(routes with bicycle signage, for example sharrows, but not separate lanes)

	Kilometres	Percentage of total roading
Auckland	No data available	-
Tauranga	10	1.8
Hamilton	0	0
Wellington	1.2	0.2
Christchurch	0	0
Dunedin	1.6	0.1

Off-road cycle trails

	Kilometres
Auckland	100.3
Tauranga	10
Hamilton	30
Wellington	95.5
Christchurch	>150
Dunedin	70

Intersections with bicycle traffic lights

	Number of intersections with bicycle traffic lights
Auckland	18
Tauranga	0
Hamilton	0
Wellington	2
Christchurch	20
Dunedin	1

Bicycle boxes

(specific zones for cyclists at front of intersections)

	Number of intersections with bicycle boxes
Auckland	644
Tauranga	10
Hamilton	20
Wellington	10
Christchurch	100
Dunedin	4

On-street bicycle parking

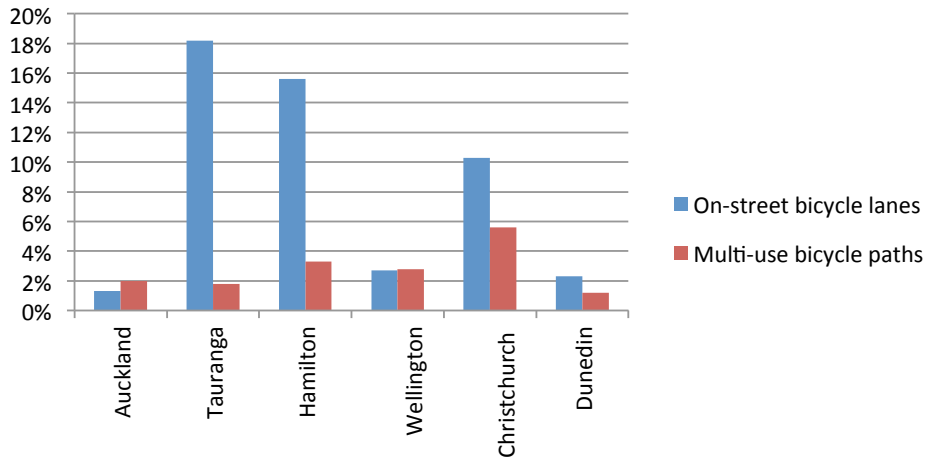
	Number of on-street bicycle park spaces
Auckland	2860
Tauranga	0
Hamilton	200
Wellington	hundreds
Christchurch	1200
Dunedin	101

Public bicycle repair / tool stands

	Number of stands
Auckland	5
Tauranga	70
Hamilton	0
Wellington	2
Christchurch	3
Dunedin	0

Figure 33 shows the percentage of roads with on-street cycle lanes and multi-use and dedicated bicycle paths in the cities. On-street cycle lanes varied considerably in percentage of total roading from 1.3% in Auckland to 18.2% in Tauranga. Multi-use and dedicated bicycle path percentages were lower. Only Auckland, Christchurch and Dunedin reported having protected cycle lanes (1.3km, 5km and 1km respectively), so we did not include that information in this figure.

Figure 33 Percentage of total city roads with on-street cycle lanes and multi-use / dedicated bicycle paths, six cities



Source: City Survey Q18-19

7.2. Infrastructure for walking

Table 19 reports the different types of walking infrastructure available in the six cities. Walking infrastructure was extensive in comparison with cycling infrastructure.

Table 19 Types of walking infrastructure, six cities

Streets with footpaths on both sides

	Kilometres	Percentage of total roading
Auckland	No data available	-
Tauranga	150	27.2
Hamilton	500	78.1
Wellington	No data available	-
Christchurch	1400	62.5
Dunedin	783	39.8

Streets with footpaths on one side

	Kilometres	Percentage of total roading
Auckland	No data available	-
Tauranga	Conflicting data supplied: kilometres of streets with footpaths exceeded total kilometres of public roads	
Hamilton	85	13.3
Wellington	No data available	-
Christchurch	225	10.0
Dunedin	135	6.9

Traffic calming zones

(reduced speed limits around schools, shopping centres, hospitals etc.)

	Number of traffic-calming zones
Auckland	No data available
Tauranga	10
Hamilton	67
Wellington	15
Christchurch	50
Dunedin	5

Off-road walking trails

	Kilometres of trails
Auckland	No data available
Tauranga	100
Hamilton	21
Wellington	Many
Christchurch	Many
Dunedin	519

Shared spaces with pedestrian preference

	Kilometres of shared spaces with pedestrian preference
Auckland	No data available
Tauranga	0
Hamilton	1
Wellington	2
Christchurch	1
Dunedin	0

Traffic lights with a dedicated sequence for pedestrians to cross free of turning vehicles

	Number of traffic lights with dedicated sequence
Auckland	643
Tauranga	50
Hamilton	26
Wellington	50
Christchurch	200
Dunedin	4

Courtesy crossings

(raised crossing area where cars are encouraged but not required to stop)

	Number of courtesy crossings
Auckland	No data available
Tauranga	30
Hamilton	25
Wellington	25
Christchurch	200
Dunedin	41

Pedestrian crossings

	Number of pedestrian crossings
Auckland	No data available
Tauranga	50
Hamilton	25
Wellington	250
Christchurch	170
Dunedin	43

Source: City Survey Q30-31

7.3. Connections with public transport

As cyclists also use buses and trains, we asked about the extent of city public transport infrastructure that supported cycling. Table 20 and Table 21 show overall poor connectivity between cycling and public transport infrastructure. Not all cities provided information, but those that did showed low levels of accommodation for bicycles at bus stops or on board buses. Dunedin was the only city to indicate that buses had bicycle racks (42 buses accommodating 84 bicycles). Only two of the cities (Auckland and Wellington) had rail services and, again, there was little accommodation for bicycles, either at stations or on trains.

Table 20 Bus infrastructure and connection to cycling, six cities

	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Bus stops with bicycle storage	10	Did not respond	2	0	1	0
Number of bicycles able to be accommodated in bus stop storage	20	Did not respond	8	N/A	10 *	N/A
Bicycle roll-on access to buses: hours per week	0	Don't know	0	0	0	0

*Christchurch had 10 but plans 150 and has other expansion plans.
Source: City Survey Q38-45

Table 21 Train infrastructure and connection to cycling, two cities

	Auckland	Wellington
Train stations with bike storage	25	1
Number of bicycles able to be accommodated in train station storage	250	32
Bicycle roll-on access to trains: hours per week	168	168
Number of bicycles permitted on a train	Did not respond	First come, first served
Number of trains with bike racks / for total number of bikes	Did not respond	Don't know

Source: City Survey Q48-55

7.4. Citizen opinion

All six cities reported that they conducted surveys of citizens about their satisfaction with cycling infrastructure. All cities, apart from Auckland, responded that the city conducted surveys of satisfaction with pedestrian infrastructure (Auckland's response was 'don't know'). Most were reported to be through annual surveys specifically of walkers or cyclists, but in Christchurch the survey of cyclists was biennial, and the survey about satisfaction with pedestrian infrastructure was a survey of citizens in general in the annual resident survey. Similarly, in Dunedin there was no survey specifically of cyclists and pedestrians, but the annual residents' opinion survey asked about satisfaction with cycling and pedestrian infrastructure.

Table 22 Surveys of cyclist and pedestrian satisfaction with infrastructure

	Survey of cyclist satisfaction	Frequency	Survey of pedestrian satisfaction	Frequency
Auckland	√	Annual	Don't know	-
Tauranga	√	Annual, plus regular feedback via cycle safe programmes	√	Annual
Hamilton	√	Annual	√	Annual
Wellington	√	Annual	√	Annual
Christchurch	√	Biennial	√	As part of annual resident survey
Dunedin	√	Satisfaction with cycle infrastructure queried as part of annual residents' opinion survey (asked of all respondents, not just cyclists)	√	A general question about satisfaction with footpaths asked as part of an annual resident survey

Source: City Survey Q27 & 34

7.5 CASE STUDY: Barriers to implementing cycling infrastructure

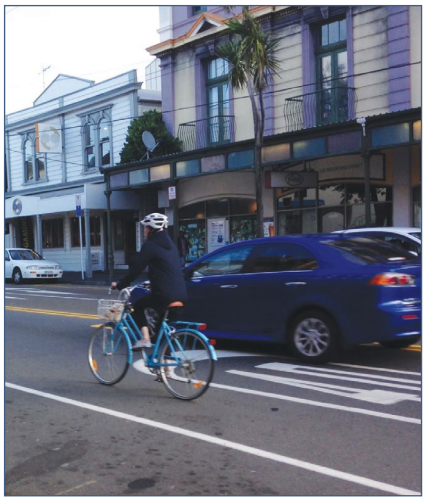
Why do some suburban business owners oppose new cycleways? In 2014 a group of fourth-year medical students from the University of Otago interviewed 19 small business owners in Newtown, Wellington, about a proposed cycle route in the suburb. This research was to explore reasons for the opposition to a cycleway, as one business owner had collected 75 signatures for a petition opposing any cycleway in the area.

The issue most commonly mentioned was safety. Business owners were divided in their views of the safety impact of a cycleway. Some believed that cycleways would increase safety: "they can cycle without fear of being scraped by a car or bus". Others thought that it would reduce safety as drivers drove more aggressively due to increased congestion: "[cycleways will cause] more congestion, more aggressive driving because there will be traffic jams and probably more bikers getting hurt because of that".

Overwhelmingly, the business owners thought the impact of cycleways on business would be negative. In particular, the removal of parking spaces was thought to act as a hindrance to businesses: "if it goes ahead, I could lose quite a bit of business". There were also perceptions that it would be difficult to implement cycleways, as roads in New Zealand were not like roads in "Europe [that were] built with bikes in mind". In addition, concerns were expressed that expensive bike lanes could be built but remain empty: "they not gonna get healthy because you put the bike road, you know. It can be empty as well".

The medical students also noted that usual methods of communication and consultation were not effective for this group. Many of the business owners spoke English as a second language, and the majority did not use the internet to access information. This suggests that councils wishing to implement cycleways need to plan carefully how to communicate the potential benefits of change.

Authors: Shaheen Ahamat, Chelsea Allen-Brough, Yousr Al-Sheibani, Aliya Arslanova, Xavier Bergantino-Mitu, Tyler Campbell, Jared Corbett, Emily Deacon, Oliver Evison, Sean Gerlach, Anderley Gordon, Adibah Haji Sarbini, Claudia Harrison, Carla Hodgkinson, Phoebe Hunt, Juliet Kane, Dalice Keogh, Rosie Kool (fourth-year medical students 2014, University of Otago, Wellington). Further information on this work is available here: http://sustainablecities.org.nz/2014/08/island-bay-cycleway-discussion/



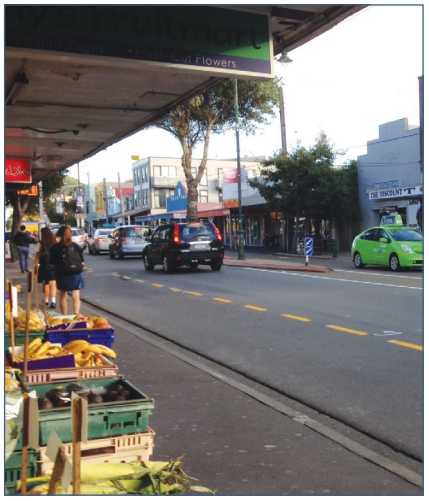


Figure 34 Retail areas near proposed cycle route, Wellington

7.6. Summary

All cities had some basic infrastructure for cyclists and for pedestrians, with wide variations between cities. Feedback on our City Survey indicated some problems with definitions for types of infrastructure; future surveys would need to clarify definitions with words, images or diagrams.

There appeared to be poor connectivity between cycling needs and public transport (for example, provision of bicycle storage at bus stops), even in cities with larger numbers of cyclists.

City councils reported that they surveyed cyclists and most surveyed pedestrians about satisfaction with infrastructure for cycling and walking.

8. Policies and funding

This section reports on cities' policies about cycling and walking, and cities' funding to support active travel. Cities are required by legislation to have a current 10-year plan; most also publish other strategies, policies and action plans about a range of transport and health matters. We examined these to identify cities' plans and actions. For further notes on national strategies and policies, see online supplementary information (http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/).

8.1. City policies

8.1.1. Strategies

A 'Walking and cycling strategy stocktake' in 2008 noted a strong tendency for councils to embed their cycling and walking strategies in their broader transport strategies.[50] This was the case in 2015 with most of the cities we studied (see Table 23). Some regional councils also had specific strategies for cycling and walking, such as Environment Bay of Plenty.[51] However, we have not included these here.

Table 23 Cycling and pedestrian strategies and policies, six cities

	Embedded in general strategies	Specific cycling strategy	Specific walking strategy
Auckland	√[52 53]		
Tauranga	√[54]		
Hamilton	√[55 56]		
Wellington		√[57]	√[58]
Christchurch		√[59]	√[60]
Dunedin	√[61]		√[62]

Source: Council websites

8.1.2. Cycling and walking goals

The Local Government Act 2002 s. 93 requires councils to have a long-term plan. In 2015 councils renewed their 10-year plans. We searched the cities' mandated long-term plans to identify specific goals – with stated dates and expenditure or measurable outcomes – for increasing cycling and walking in the cities. Key results are shown in Table 24. Note that in some long-term plans, cycling and walking goals and expenditure are combined. Full details are given in the online supplementary information (http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/).

Table 24 Key policies and targets on cycling and walking in councils' long-term plans, six cities

	Policies to increase biking, walking, physical activity *	Policies to reduce bicyclist and pedestrian fatalities*	Long-Term Plan 2015-25: Measurable targets for increasing cycling's mode share	Long-Term Plan 2015-25: Measurable targets for increasing walking's mode share	Long-Term Plan 2015-25: Goals re safety for cycling and walking
Auckland ^	√	√	20% of trips made by walking and cycling in 2046. Funding by decade to 2045.		Change from the previous financial year in the number of deaths and serious injuries on the local road network, expressed as a number, 2015/16 onwards: reduce by at least 9.
Tauranga	√	√			Of residents who cycle, walk or drive around the city, the percentage that feel safe when doing so on the cycleways, footpaths or roads: Increasing from 2013/14 results; Injuries and fatalities: decreasing from 2013/14 results.
Hamilton	√	√			Footpaths meet a standard of less than 5 faults per 100m. Making biking safer: deaths and serious injuries: decreasing trend.
Wellington	√	√			Footpath condition rating over the 10 years: 97%. Pedestrian improvement, safer routes to schools: $2m over 10 years.
Christchurch	√	√	Increase overall % of trips made by cycling from 2013/14 baseline result: 2015/16 increase by ≥ 3.3%; 2016/17 increase by ≥ 3.4%; 2017/18 increase by ≥ 3.5%; 2018/25 increase by ≥ 5%.	Increase overall % of trips made by walking from 2013/14 baseline result: 2015/16 increase by ≥ 16.8%; 2016/17 increase by ≥ 17.1%; 2017/18 increase by ≥ 17.4%; 2018/25 increase by ≥ 20%.	Pedestrian safety initiatives: $2.203m over 10 years. Reduce fatal and serious crashes involving cyclists: ≥5% reduction per year over the 10 years. School 'Cycle Safe' education programme: ≥ 3,000 students per year over the 10 years.
Dunedin	√	√			Footpaths standard rating: ≤ 15% rated poor or very poor.

*City Survey Q56
^10-year Budget 2015-2025 and Long-term Plan 2015-2025 Supporting Information Pack

8.1.3. Parking policies

As noted in section 4.3.1 the level of car availability is relevant to citizens' choice of transport. Cities where cars have priority over other transport modes require extensive roading and motorways to accommodate them. Parking space for cars is a further necessary part of car-focussed cities.[63] Car use can be discouraged by car park policies and pricing. We asked about city policies on car and bicycle parking. Table 25 shows that Auckland was the only city with minimum car parking requirements in and outside the CBD, maximum car parking requirements and bicycle storage requirements for new developments. Hamilton had no parking requirements for new developments. All of the cities reported that they gave infringement notices for vehicles parking on footpaths.

Table 25 Policies on parking requirements for new developments, six cities

	New developments *in CBD* have minimum number of car parks	New developments *outside CBD* have minimum number of car parks	New developments have a maximum number of car parks	New developments must have bicycle storage
Auckland	Yes	Yes	Yes	Yes
Tauranga	No	Yes	No	Yes
Hamilton	No	No	No	No
Wellington	No	Yes	Yes	No
Christchurch	No	Yes	Yes	Yes
Dunedin	Yes	Yes	No	No

Source: City Survey 2015 Q58-60

8.1.4. Linking climate change and active transport

We identified the cities' most recent climate change plans or policies to see if or how cycling and walking were understood in the context of climate change issues. We also searched cities' transport policies to see how climate change was considered there. Table 26 shows that some councils made the link explicit in policies. See online supplementary information (http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/) for fuller details.

Table 26 Climate change and transport policies, six cities

	Reference to active travel in city climate change policy	Reference to climate change / greenhouse gas emissions in city transport policy
Auckland	√√	√√√
Tauranga	No specific climate change policy	-
Hamilton	√	√
Wellington	√√√	√√
Christchurch	√√√	√√
Dunedin	-	√√

- = no reference, √= slight reference, √√= reference, √√√= direct reference
Source: City council websites

8.1.5. Engagement and advice

All six cities responded that council staff and/or senior managers met formally with representatives of cycling / walking groups in 2013/14. Four of the city councils had some sort of sustainable transport advisory group that met regularly (Tauranga, Hamilton, Wellington, Christchurch). Auckland, Hamilton and Dunedin each had a standalone bicycle-focused advisory group, Tauranga had a standalone pedestrian-focused advisory group, and Tauranga and Christchurch had a combined bicycle / pedestrian advisory group.

8.1.6. Leading by example

Cities provided infrastructure and services for council employees to support staff bicycling and walking. For example, all of the city councils provided bicycle parking and showers for employees and staff pool bikes (electric and/or pedal). All councils except Dunedin provided cycle skills training for staff (see Table 27).

Table 27 Internal council staff support for active modes, six cities

	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Bicycle parking	√	√	√	√	√	√
Showers	√	√	√	√	√	√
Lockers	√		√	√		
Cycle training	√	√	√	√	√	
Pool bicycles	√	√		√	√	√
Electric pool bicycles		√	√			√
Bicycle users group	√					
Online resources	√					
Cycling accessories						√
Activities and competitions around cycling						√
Reducing number of private car parks		√				

Source: City Survey Q17

8.2. Funding

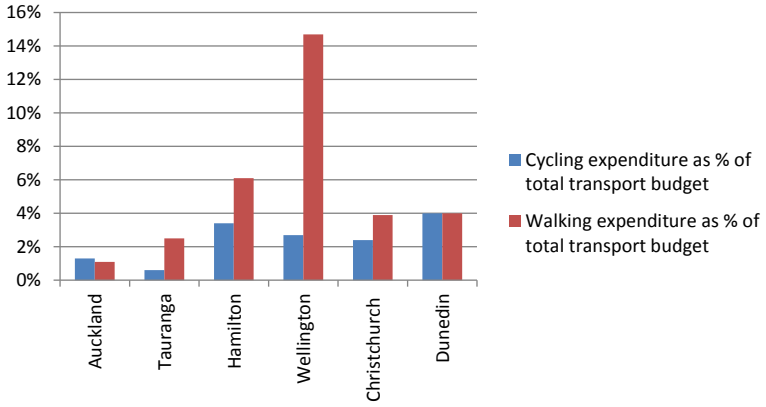
Table 28 shows the cities' total transport budgets in the financial year 2013/14 and the amounts dedicated by each council to cycling and walking facilities, and operational and capital expenditure on cycling and walking. The highest proportions of city expenditure on cycling were in Dunedin and Hamilton. Wellington and Hamilton dedicated the highest proportions to walking (see Figure 35).

Table 28 Cities' expenditure on transport, six cities 2013/14

	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Total transport budget ($m)	909	20	44.4	74.7	355	65
Cycling facilities budget ($m)	12	0.11	1.5	2	8.5	3
Operational expenditure cycling ($m)	2	0.1	0.2	0.5	2.5	0
Capital expenditure cycling ($m)	10	0.01	1.3	1.5	6	2
Cycling expenditure as % of total transport budget	1.3	0.6	3.4	2.7	2.4	4.0
Cycling expenditure per capita ($)	8.48	0.96	10.59	10.47	24.89	24.96
Walking facilities budget ($m)	10	0.49	2.7	11	14	2
Operational expenditure walking ($m)	2	0.49	0.7	6.2	10	0
Capital expenditure walking ($m)	8	0	2	4.8	4	1
Walking expenditure as % of total transport budget	1.1	2.5	6.1	14.7	3.9	4.0
Walking expenditure per capita ($)	7.06	4.27	19.07	57.59	41.00	16.64

Source: City Survey Q1-9

Figure 35 Expenditure on cycling and walking as a percentage of total transport budget, six cities



Source: City Survey Q1-9

8.3. Summary

All six city councils had policies about supporting cycling and walking. Most of the councils had 'active transport' advisory committees, and all received input from cycling and walking interest groups. All cities' current 2015-2025 long-term plans incorporated various plans related to cycling and walking, with many including specific dates and expenditure and measurable goals. Not all cities' policies made the link between increasing active transport and addressing climate change.

Only half of the councils required new city developments to include bicycle storage, while requirements for minimum car-parking, at least in developments outside the CBD, were in place in all of the cities except Hamilton.

Councils provided pool bicycles, showers, cycle training and other practical support for their own staff to encourage active transport.

9. Education and encouragement

This section documents the programmes run by the six city councils to promote cycling and walking. Sources and programmes of education and promotion for cycling and walking run locally or nationally by other organisations are listed in online supplementary information at http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/).

Programmes and activities to promote and support residents' bicycling and walking operated in all of the cities. All had a bike / walk to work day, a bike / walk to school event, youth bicycle education courses and bike-ride or walking / running events (see Table 29). In most cases the city council was directly responsible for these programmes, but in others they were run by the regional council or, in Auckland, by Auckland Transport.

Table 29 City public programmes to encourage bicycling and walking, six cities

	Auckland	Tauranga	Hamilton	Wellington	Christchurch	Dunedin
Bike / Walk to work day	√	√	√	√	√	√
Bike / Walk to school event	√	√	√	√	√	√
Youth bicycle education courses (<18 years)	√	√	√	√	√	√
Adult bicycle education courses	√	√		√	√	
Bike-ride or walking / running event	√	√	√	√	√	√
Open Streets initiatives: Number of events in 2013/14 year; Number of participants	1 5,000		2 5,000	1 4,100	1 4,000	

Source: City Survey, Q.65-6

Of the six cities, only Wellington had an online journey planner including active transport, funded and operated by the Greater Wellington Regional Council.

Only Christchurch reported having a public bike-sharing programme. Dunedin reported that it did not have such a scheme but one was being developed – a 'community bike library'. The other cities reported that they had no plans to develop a public bike-sharing programme.

Other city bicycling or pedestrian education and encouragement efforts specifically identified by councils in their survey responses included:

- Auckland – Cycle training; cycling and walking promotions in local communities; cycling at events.
- Tauranga – Travelsafe programme working with schools and community groups on road safety education, cycling and walking initiatives for all ages; workshops and seminars on safe cycling and walking.
- Hamilton – Biking plan forthcoming.
- Wellington – School travel planning with New Zealand Transport Agency.
- Christchurch – ICE Cycles (Inner City East) for fixing old bikes; Travel Expo at community events encouraging sustainable travel; Spokes; Living Streets; Gap Filler; Ministry of Awesome.
- Dunedin – Be Bright campaign for cyclists, bike and helmet loans to schools, and training for staff in schools as cycle coaches.

9.1. Summary

All of the cities had bicycle skills education for children and young people and all supported special programmes such as bike / walk to work days and 'open streets' events, mostly run by the city councils. Public bike-sharing schemes were in place in Christchurch and planned in Dunedin, but not in the other cities. Only Wellington had an online journey planner including active transport, provided by the regional council.

10. Personnel

10.1. Councils

All of the cities employed staff or contractors dedicated to working on active transport issues. Councils' full-time equivalent workers with active transport issues as part of their job description are listed in Table 30. Per capita, Dunedin and Tauranga devoted the most staff resources to active travel.

Table 30 City council FTE staff working on bicycle or pedestrian issues, six cities

	FTE staff working on active transport 2015	Usually resident population 2013	FTE per 100,000 people (approximate)
Auckland	30	1,415,550	2.1
Tauranga	4	114,789	3.5
Hamilton	2.8	141,615	2.0
Wellington	4	190,956	2.1
Christchurch	5	341,469	1.5
Dunedin	4.5	120,246	3.7

Sources: City Survey Q16. Statistics New Zealand, Census of population and dwellings 2013

10.2. Cycling and walking advocacy groups

Numerous national and local advocacy groups promote cycling and walking in New Zealand. We surveyed 20 advocacy groups in the six cities, identified through internet searches. Six completed surveys were returned: two from national advocacy groups and four from local groups in three cities.

Features of the groups are presented in Table 31 below. These Incorporated Societies and one Charitable Trust operated with a small or no budget and were reliant on volunteers. Only one of these groups had a regular paid staff member. Several had networks with both individual members and other groups. They were politically active, some advocating for their views with both local and central government and in the mainstream and social media.

Table 31 Features of cycling and walking advocacy groups, 2013/14 financial year

	Cycle Action Waikato	Cycle Aware Wellington	Frocks on Bikes Wellington	Spokes Dunedin	CAN Cycling Action Network	Living Streets Aotearoa
Legal status	Founded 1995	Incorporated Society	Charitable Trust Founded 2009	Incorporated Society Founded 1996	Incorporated Society Founded 1997	Incorporated Society Founded 2004
Purpose	Encourage support for biking	Vision: Cycling is used as a means of transport by most people for some trips each month	Encourage more people to ride bikes in their everyday lives. Targeted specifically at woman and trying to break down the idea that cycling is a sport	Advocates for better cycling conditions in Dunedin and New Zealand, with a particular focus on infrastructure	More people on bikes, more often	More people walking and enjoying public spaces, be they young or old, fast or slow, whether walking, sitting, commuting, shopping, between appointments or out on the streets for exercise, for leisure or for pleasure
Which groups organisation represents	All cyclists	All people who ride bikes in Wellington, but primarily commuting and utility cyclists	Women, LBGTQI, families, people who ride bikes and people who want to	Cyclists	All local and regional cycling advocacy groups	All who walk and use paths in the city
Membership	No response	Individuals: 70 financial, 1200 online via Facebook etc. Monthly meeting	Not membership -based	Approximately 800 individuals. Monthly meeting.	5000+ individual and 30 institutional members Yearly meeting	Individuals: 120, institutions: 10. Yearly meeting
Governance meetings	Yearly	Yearly	Quarterly	Fortnightly	Monthly	Monthly
Liaison with other organisations	Living Streets Hamilton, CCS Disability Action, Generation Zero Hamilton, Urban blog, Hamilton Bicycle Network	Wellington City Council, Greater Wellington Regional Council, NZTA, Living Streets Aotearoa, Frocks on Bikes, Revolve (women cycling)	Cycle Aware Wellington, Pedal Ready, Great Harbour Way, Generation Zero, Wellington City Council, Greater Wellington Regional Council	Cycle Action Auckland, Cycle Aware Wellington, Generation Zero, Cycling Advocates Network, The Crooked Spoke, engaged with Automobile Association Otago	30 local and regional cycling groups, NZTA, Living Streets Aotearoa, Bike NZ	CAN, 2Walk and Cycle, Walk Auckland

	Cycle Action Waikato	Cycle Aware Wellington	Frocks on Bikes Wellington	Spokes Dunedin	CAN Cycling Action Network	Living Streets Aotearoa
Budget	Not stated (100% from member fees)	Approximately $5,000 (20% member fees, 70% local or central government grants, 10% donations)	0	"A piece of string and some chewing gum"	$60,000 (12.5% member fees, 71% donations)	$5,000 (80% member fees, 20% donations)
Workers	No paid staff Lots of volunteer hours but too hard to measure	No permanent staff, but have employed people part-time for specific projects Approximately 100 volunteer hours per month	No paid staff 3-4 volunteer hours per month	No paid staff 60 volunteer hours per month	1 FTE staff member 108 volunteer hours per month	No paid staff 20 volunteer hours per month
Communications		Twitter: 100 followers. Facebook group: 1100. Cycling in Wellington blog site. Mail Chimp list: approximately 800	Twitter: 836 followers. Facebook page: 350 followers. Facebook group: 500 members. Newsletter: 350	Twitter: inactive. Facebook page: approximately 840. Newsletter: approximately 800	Twitter: 40. Facebook group: 800 members. Newsletter: 2000	Twitter: 60. Facebook group: 280. Newsletter: 5000
Influencing policy (press releases, campaigns, meetings with politicians and officials, submissions)	6-weekly meetings with Hamilton City Council officials	2 press releases. 2-3 campaigns reaching maybe 2000 people. 10 meetings with city council officials. 10 meetings with city councillors including oral submissions. 5 meetings with regional council officials. 5 meetings with regional councillors. 3 meetings with central government officials. 2 meetings with MPs. 10 submissions (Figures given are approximate)		2-3 press releases. 4-5 campaigns. Weekly phone / email contact with city council. Meetings with city councillors every few months Meetings with central government officials "often" Meetings with MPs "a few times" Approximately 10 submissions	15 press releases. More than 5 campaigns. Approximately 20 meetings with central government officials. Approximately 3 meetings with MPs. Approximately 9 submissions	3 press releases. 4-5 campaigns. 2 meetings with central government officials. 2 meetings with MPs. 4 submissions

Source: Advocacy group survey

Advocacy groups varied in their assessment of their ability to affect cycling and walking policy. Cycle Aware Wellington considered that they:

> have been reasonably effective. We've achieved an increased budget for cycling, a good quality cycling framework, and approval of the Island Bay Cycleway. Also events such as Go by Bike Day and Ciclovia have raised the profile of cycling, and encouraged more people to cycle.

CAN Cycling Action Network said: "We have provided a 'nudge' for many government decisions and policies. We have assisted and encouraged local groups to push for changes at local level." Conversely, Living Streets Aotearoa felt they had not been instrumental in changing policies and practices.

10.3. Summary

In all six cities, both paid and volunteer workers promoted cycling and walking. All of the councils employed staff dedicated to active transport. Our survey of advocacy groups elicited only six complete responses; all but one of these groups worked with volunteer labour only. Most of the groups were strongly engaged in working with councils or lobbying central government, made submissions and press releases about their views and used social media.

11. Conclusion

Benchmarking the largest New Zealand cities for cycling and walking inputs and outcomes showed a wide variation between the six cities.

Walking and cycling trips for transport varied considerably between cities, with the lowest rates in Hamilton and Auckland (respectively) and the highest in Wellington and Christchurch (respectively). There were gender, ethnic and socio-economic inequalities in use of active transport, for example cycling trips were predominantly undertaken by men. These need to be considered in future policy and promotion to ensure benefits are equitably spread in the population.

The long-term trends in cycling and walking to work showed an overall decline since 1971, with stabilisation in walking from the early 2000s at about 7% for all New Zealand, and a slight increase in cycling to work between 2006 and 2013 from 2.5% to 2.9%. The decline in cycling has not been linear, and shows that increases in cycling can occur over a short period.

Health outcomes also varied. The data suggest that cities with higher levels of cycling and walking had better health risk factor profiles and outcomes, such as reduced diabetes diagnoses and lower levels of obesity. The findings on mental health need further consideration. These results need to be treated with some caution. Because of the nature of the ecological-level data we used, we cannot assume a relationship between levels of active transport and health on the individual level.

Cycling and pedestrian fatalities declined by 75-80% between 1970 and 2014. However, when taking into account the time people travelled by each mode, the fatality risk ratio was much higher for cyclists (1.7 times higher) compared to those who were using cars, either as drivers or passengers. Pedestrians' fatality risk ratio was lower: 0.8 times that of car-users. Further work to include cyclist and pedestrian injuries in the safety chapter would be useful.

The gender distribution of deaths in cyclists was similar to the gender distribution of cycling: more men. Deaths were more common in male pedestrians compared to female, which was in contrast to the gender distribution of walking. Both cyclist and pedestrian deaths were more common in working-age people.

All cities had infrastructure for walking and cycling, although urban cycling infrastructure was fairly limited. Connections with public transport for cyclists were very limited in most cities. Policies for walking and cycling were present and supported by funding in all cities. However, only a few cities had articulated measurable modal goals for walking and cycling.

Improvements to walking and cycling are a long-term project for New Zealand. It will take time and effort to reverse decades of policy prioritising cars. But equally, we know from local and international data that increases in walking and cycling over short time periods are entirely possible with sufficient environmental motivation. We need to continue to benchmark our cities to monitor their achievements and continue to provide support for their endeavours in this area.

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Appendix I. Further details on data sources

This appendix gives further details on the data used in the different sections of this report.

Census

The Census of Population and Dwellings occurs every 5 years (except in exceptional circumstances). It aims to sample the entire population of New Zealand on Census night (visitors to New Zealand also fill out forms). Coverage of the 2013 Census was estimated to be 97.6% +/- 0.5%.

Individuals each fill out a Census form (or have one filled out for them) which asks for a variety of socio-demographic and health information. There are also household forms for every household. One of the questions asks about method of travel to work on Census Day (see Figure 36).

Figure 36 2013 Census travel to work question

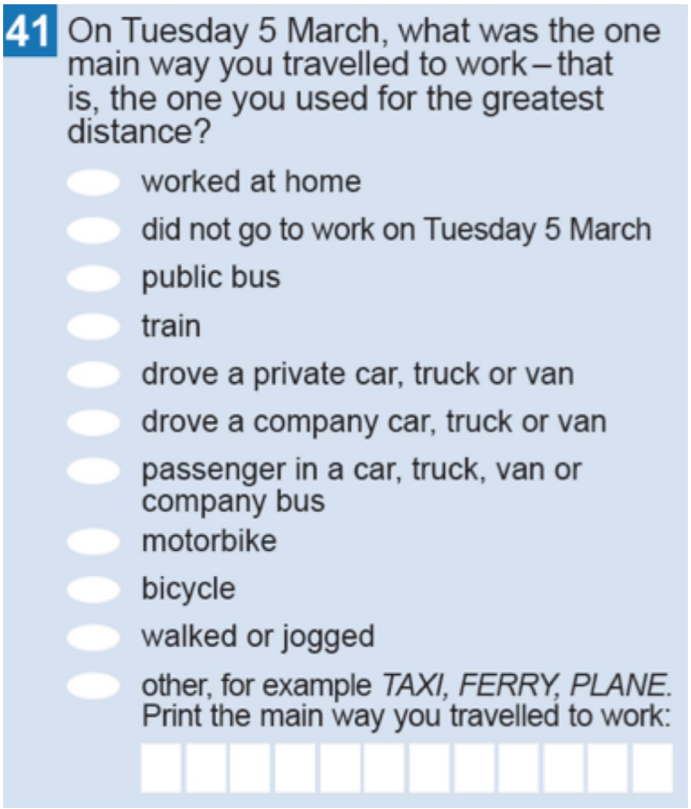


Table 32 shows the metadata for responses to the question on travel to work. Of the people who could have provided information on the question, some elected not to, and a further group did not leave home either because they worked at home or did not go to work that day.

Table 32 Population of 2013 Census used in this data analysis

	Total possible responses (employed, usually resident population over age 15)	Did not respond to travel to work question	Worked at home or didn't go to work on Census Day	Commuted to work
All New Zealand	2,001,003	74,757	376,818	1,549,428
Auckland	650,616	24,489	106,083	520,044
Tauranga	50,907	1,587	9,840	39,480
Hamilton	64,599	2,250	9,696	52,653
Wellington	105,249	2,763	15,801	86,685
Christchurch	173,607	5,388	29,058	139,161
Dunedin	56,022	1,779	9,795	44,448

We also used information on ethnicity (we report prioritised ethnicity to avoid double counting), deprivation quintile of residence, age and gender. Despite having a total population survey, we had small numbers in some of the breakdowns; cells were suppressed if there were fewer than 40 people in an ethnic group who cycled or walked in a specific city.

A question about travel to work has been asked in the New Zealand Census since 1971, although the question has not been consistent through every Census. Questions prior to 1991 asked about usual mode of travel to work rather than travel to work specifically on Census Day, and prior to 1991 this question was explicitly for people who worked full-time.

For further information on the Census see: http://www.stats.govt.nz/Census.aspx

New Zealand Household Travel Survey

The New Zealand Household Travel Survey is an ongoing survey commissioned by the Ministry of Transport that records travel information for randomly selected households. It has been running since 2003, however prior to this there were two one-off surveys in 1989/90 and 1997/98 that had comparable methodology. From 2008/09 the sample size has been 4,600 households, although between 2008 and 2013/14, there was an increase in the sample size in the Canterbury region. A complex stratified sampling strategy is used to ensure that the sample is representative of the New Zealand population.

The survey involves all household members recording all of their travel over a two-day period (these two-day periods are randomly allocated to ensure a spread over the week). This includes the origin and destination of every trip, the purpose of it, and the method of transport, amongst other questions. This information is obtained by face-to-face interview with each household member as soon as possible after the two-day period. Each household member is asked about alcohol consumption, other travel-related information and demographic information for each inhabitant. Information is also gathered about the household itself, including type of dwelling and vehicles available.

For the data used in this report we excluded recreational trips such as cycling for pleasure or jogging for exercise. Ethnicity was prioritised. If data were based on fewer than 40 trips, then the cell was suppressed. All members of the household participating in the Travel Survey are reported.

Further information on the New Zealand Household Travel Survey can be found here:
http://www.transport.govt.nz/research/travelsurvey/

New Zealand Health Survey

The New Zealand Health Survey is an ongoing survey commissioned by the Ministry of Health that collects information on health risk factors and conditions. The continuous survey has been running since 2011, however prior to this there were individual surveys performed in 1992/93, 1996/97, 2002/03 and 2006/07. The most recent survey (2013/14) collected data from about 13,000 adults and 4,700 children. Household sampling strategy for the survey is complex and multi-stage to ensure adequate geographic representation and ethnic explanatory power. For households that are selected for the survey, one adult and one child (if there are children) are randomly selected from the household occupants.

Survey participants are interviewed using standardised interview techniques. Child and adult participants are asked about core domains such as self-reported long-term conditions, health status, health behaviours, health service utilisation and socio-demographics. A small number of objective measurements are also obtained, such as blood pressure, height and weight. Each survey also has additional modules focusing on other aspects of health.

This report used data from questions on physical activity (self-reported levels of physical activity in the last week), obesity (using height and weight measured as part of the survey), hypertension (self-reported diagnosed by a doctor), mental health (self-reported depression, bipolar disorder and/or anxiety disorder diagnosed by doctor) and diabetes (self-reported diagnosed by a doctor). The data used in this report are age standardised population prevalences, both sexes combined. The data are not ethnicity standardised.

More information about the New Zealand Health Survey can be found here:
http://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/surveys/current-recent-surveys/new-zealand-health-survey

Crash Analysis System

Data on cycling and walking fatalities in this report were obtained from the New Zealand Transport Agency Crash Analysis System (CAS), either directly from the database or from the annual reports produced by the Ministry of Transport from the data: Motor Vehicle Crashes in New Zealand Reports.[64] The Crash Analysis System is based on Traffic Crash Reports, which are completed by police officers attending fatal and non-fatal crashes. As well as statistics on crashes, the reports contain information on other areas related to vehicle safety, such as alcohol levels and environmental factors that impacted on a crash. There are also basic demographic data available on individuals involved in crashes.

As many non-fatal crashes in cities are not attended by police officers, these data might not be representative of total crashes and injuries. In addition, there have been recent changes with how cyclist crashes were reported (for example, historically if a cyclist crash did not involve a car, it was not included in the reports), hence only fatal crashes have been included in our report.

The information in the safety chapter of this report is taken directly from the relevant Motor Vehicle Crashes in New Zealand Reports or the CAS system. Crash risks by mode for each city were calculated using a 'time-at-risk' denominator (the annual distance travelled by that mode in each city) from the New Zealand Household Travel Survey.

Further information on CAS can be obtained here:
https://www.nzta.govt.nz/resources/crash-analysis-system/

Speed Survey

The Ministry of Transport conducts an annual speed survey in urban areas. This survey measures car speed in an unimpeded 50km zone to monitor driver choice of speed. The speed surveys are conducted annually by a surveyor at anonymous sites which were randomly selected in 1995 during the first speed survey in New Zealand. The regions are not identical to the city boundaries used in the remainder of the report, however we thought they provided useful information on the transport environment and are probably representative of the six cities.

Further information is available here:
http://www.transport.govt.nz/research/roadsafetysurveys/speedsurveys/

NIWA

The climate information used in this report was obtained from the national climate database (CLIFLO) run by NIWA. Meteorological sites used were Auckland Airport, Tauranga Airport, Hamilton Airport, Kelburn weather station in Wellington, Christchurch Airport and Dunedin Airport.

Further information on CLIFLO is available here: http://cliflo.niwa.co.nz/

City Council websites

City Council websites were used to obtain information on the long-term plans, climate change and transport plans. These websites vary in terms of what information is available, and the accessibility of information. As an illustration, all council websites provide an online copy of their long-term plan, but not all provide it as a full document in searchable form.

City Survey

The USA's Alliance for Biking & Walking surveys members and other collaborators for its two-yearly Benchmarking Report.[1] Inspired by the Alliance's questions, we created our own survey of the six city councils in 2015, adapted to New Zealand conditions, and using Qualtrics software. Topics covered included: council funding for transport, cycling and walking; council counts of cycling and walking trips; staff numbers working on active transport; council support for its own staff to walk and cycle; extent of transport infrastructure in the city; details of cycling and walking infrastructure; connectivity with public transport; council policies on car-parking, cycling and walking; council advisory groups on cycling and walking; council relations with community cycling and walking groups; council involvement with special events such as Ciclovia; and other issues. We asked for information relating to the 2013/2014 financial year.

All but one of the councils responded using the Qualtrics form. For one council, our researcher visited a senior staff member by arrangement and worked through the questions in person. As not all councils responded to some of the key questions about cycling and walking infrastructure, we emailed councils again in 2016 to ask for responses or clarifications on these specific questions. Follow-up in Auckland was with Auckland Transport.

The City Survey questions are available here:
http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/

Advocacy Groups Survey

Twenty cycling and/or walking advocacy groups in the six cities were identified via internet searches. A Qualtrics survey was sent to each organisation, asking about: the nature and identity of the organisation; membership; governance; staffing / volunteers; collaboration with other organisations; communications including social media presence; campaigns; budget; relations with city and regional councils and central government; and impact.

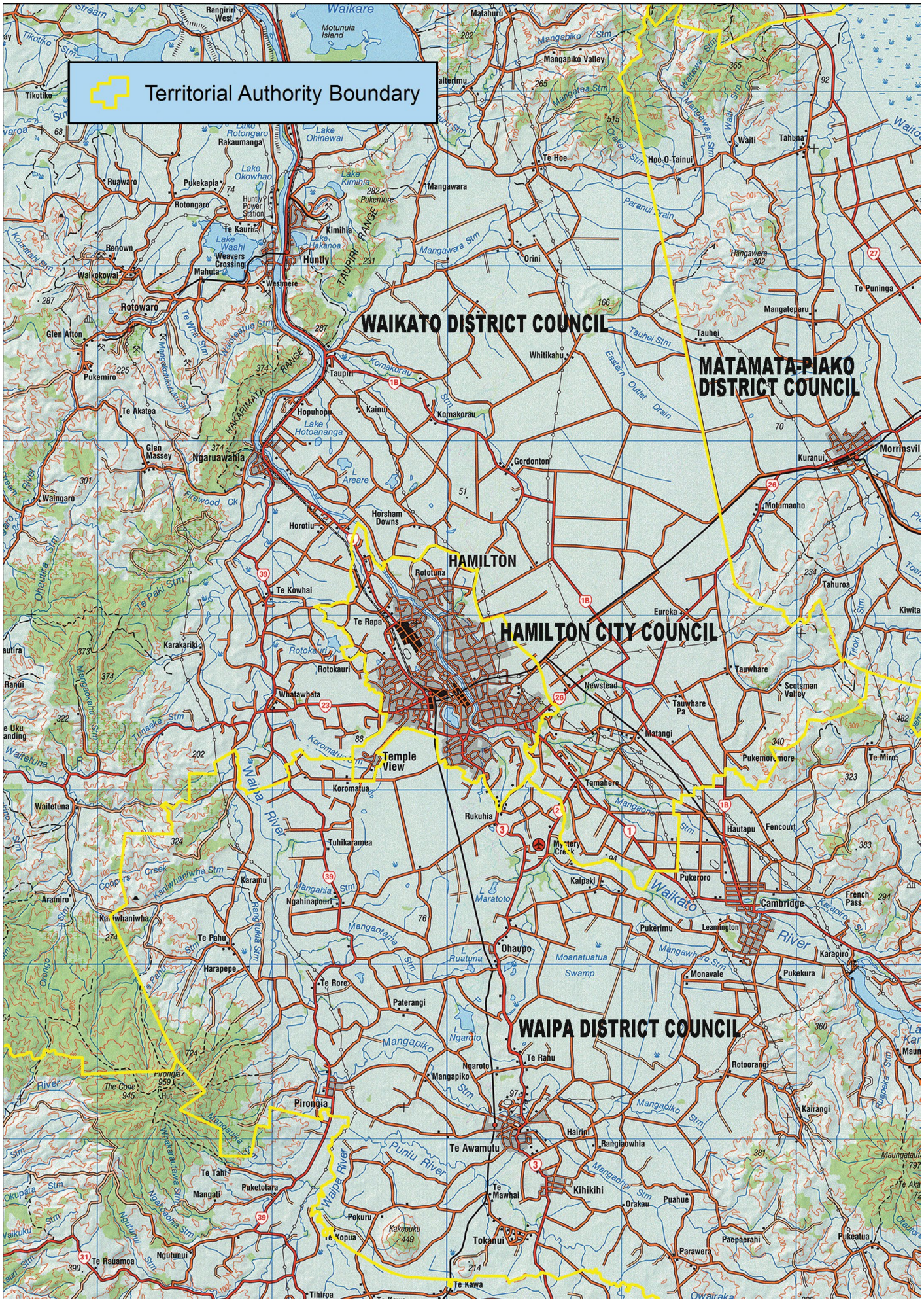
Six completed surveys were returned: two from national advocacy groups and four from local groups in three cities.

The Advocacy Group Survey questions are available here:
http://sustainablecities.org.nz/resilient-urban-futures/benchmarking/

Appendix II. City boundaries

Auckland

Hamilton

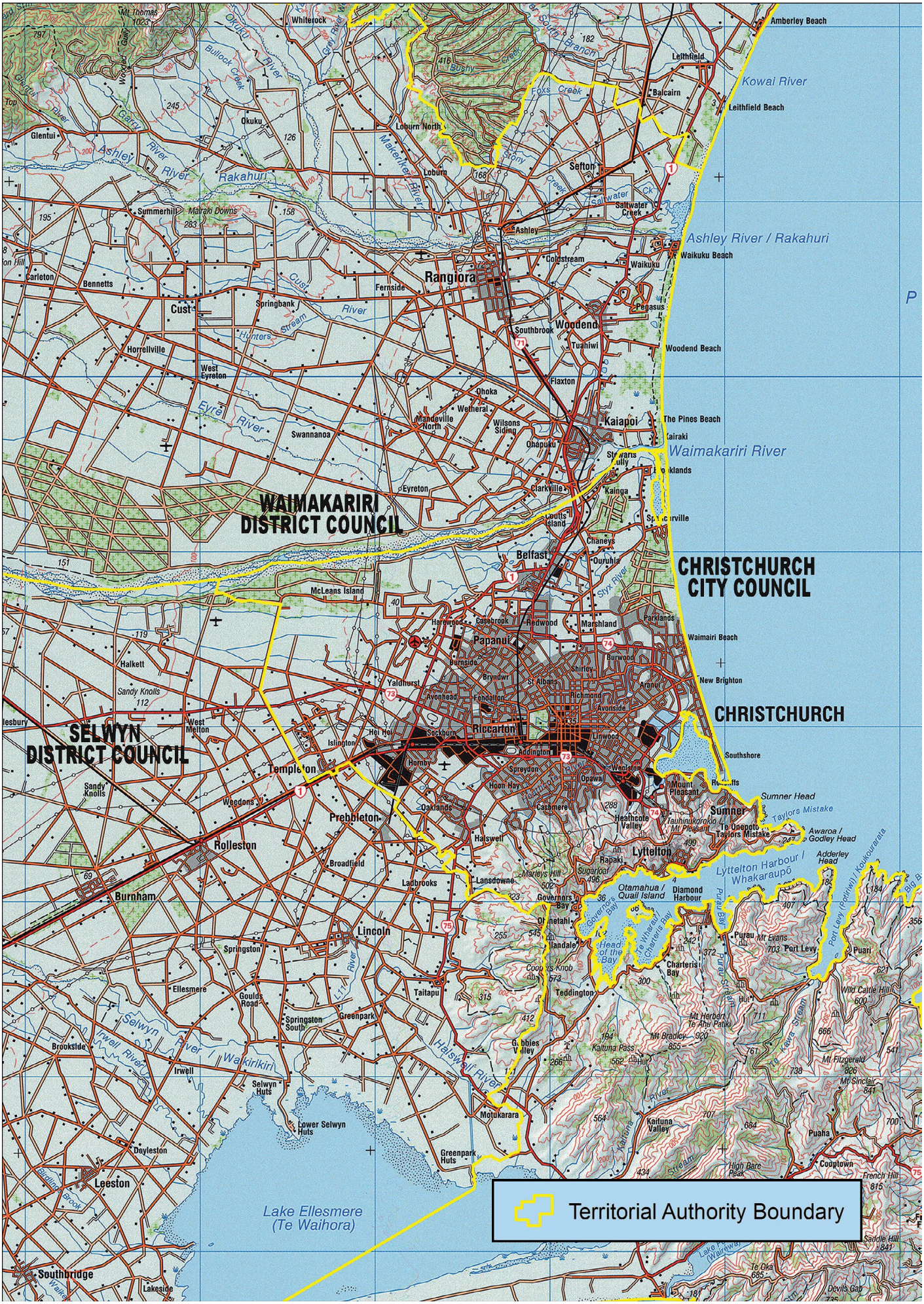

Territorial Authority Boundary
WAIKATO DISTRICT COUNCIL
MATAMATA-PIAKO DISTRICT COUNCIL
HAMILTON
HAMILTON CITY COUNCIL
WAIPA DISTRICT COUNCIL
Walkare
Motunuia Island
Rangiriri West
Tikotiko
Matahuru
Mangapiko Valley
Waiterimu
Lake Rotongaro
Rakaumanga
Lake Ohinewai
Lake Okowhao
Ruawaro
Pukekapia
Rotongaro
Huntly Power Station
Te Kauri
Lake Waahi
Renown
Weavers Crossing
Waikokowai
Mahuta
Westmere
Huntly
Kimihia
Lake Kimihia
Pukemore
Lake Hakanoa
TAUPIRI RANGE
Mangawara
Mangawara Stm
Te Hoe
Hoe-O-Tainui
Waiti
Tahuna
Orini
Hangawera
Te Puninga
Mangateparu
Tauhei
Tauhei Stm
Whitikahu
Eastern Outlet Drain
Paranui Drain
Rotowaro
Glen Afton
Pukemiro
Te Wiwi Stm
Waikeatua Stm
HAKARIMATA RANGE
Taupiri
Komakorau
Komakorau Stm
Te Akatea
Hopuhopu
Kainui
Lake Hotoananga
Glen Massey
Ngaruawahia
Gordonton
Kuranui
Morrinsville
Motumaoho
Waingaro
Firewood Ck
L Areare
Horsham Downs
Horotiu
Rototuna
Te Kowhai
Te Rapa
Eureka
Tauwhare
Scotsman Valley
Tauwhare Pa
Newstead
Tahuroa
Kiwitahi
Karakariki
Rotokauri
Rotokauri Stm
Whatawhata
Matangi
Pukemore more
Te Miro
Tamahere
Mangaone Stm
Temple View
Koromatua
Koromatua Stm
Waitetuna
Waitetuna Stm
Waikato River
Rukuhia
Hautapu
Fencourt
Tuhikaramea
Mystery Creek
Kaipaki
Pukeroro
Cambridge
French Pass
Karapiro
Karapiro Stm
Pukerimu
Leamington
Karamu
Ngahinapouri
Mangahia Stm
Maratoto
Aramiro
Kaniwhaniwha
Kaniwhaniwha Stm
Cooper's Creek
Te Pahu
Harapepe
Mangaotama Stm
Ohaupo
L Ruatuna
Moanatuatua Swamp
Mangawhero Stm
Monavale
Pukekura
Te Rore
Paterangi
Ngardo
Mangapiko
Ngaroto
Te Rahu
Rotoorangi
Pirongia
The Cone 959
Pirongia Hut
Mangauika
Pirongia
Mangapiko Stm
Hairini
Rangiaowhia
Kairangi
Te Awamutu
Punui River
Waipa River
Te Tahi
Puketotara
Mangati
Te Mawhai
Kihikihi
Orakau
Puahue
Pokuru
Kakepuku 449
Te Kopua
Tokanui
Paepaerahi
Pukeatua
Parawera
Te Rauamoa
Ngutunui
Te Kawa
Tihiroa
Owairaka

Tauranga


Karewa Island
Matakana Island
Tauranga Entrance
Moturiki Island
Motuotau Island
MOUNT MAUNGANUI
Motuhoa Island
Rangiwaea Island
Tilby Pt
Omanu
Omanu Beach
Taumaihi Island
TAURANGA
TAURANGA CITY COUNCIL
Judea
Bethlehem
Matapihi
Rangataua Bay
Maungatapu
Kairua
Waitao
Papamoa Beach
Wairoa
Gate Pa
Barkes Corner
Greerton
Ngapeke
265
Papamoa
224
Tauriko
Te Ranga
Waimapu
Welcome Bay
Kaitemako
Kopuaroa Canal
Raparapahoe Canal
Ohauiti
Kaiate Falls
Kirikiri Stm
Te Puke
Rangiuru
Te Tumu
Manoeka
Te Matai
Otawa
564
Omanawa
478
Pyes Pa
Omanawa Falls
Oropi
Waiari
Raparapahoe Stm
Tautau Stm
246
Douglas
Territorial Authority Boundary


WELLINGTON CITY COUNCIL
PORIRUA
TAWA
WELLINGTON
Petone
Titahi Bay
Green Point
Open Bay
Rock Point
Pipinui Point
Elsdon
Paremata
Porirua
Redwood
Glenside
Johnsonville
Newlands
Paparangi
Khandallah
Ngauranga
Kaiwharawhara
Crofton Downs
Wadestown
Wilton
Karori
Makara
Makara Beach
Ohau Pt
Ohau Hill
Quartz Hill
Terawhiti Hill
Mt Misery
Outlook Hill
Karori Rock
Thoms Rock
Sinclair Head
Te Kopahou
Hawkins Hill
Brooklyn
Island Bay
Lyall Bay
Owhiro Bay
Palmer Head
Pencarrow Head
Seatoun
Worser Bay
Evans Bay
Pt Halswell
Makaro / Ward I
Matiu / Somes I
Pt Howard
Mahina Bay
Days Bay
Mt Cameron
Pt Dorset
Normandale
Maungaraki
Belmont
Linden
Colonial Knob
Mill Ck
Ohariu Stm
Makara Stm
Karori Stm
Owhiro Stm
Kaukau
Ngaio
Hataitai
Kilbirnie
Miramar
Territorial Authority Boundary

Christchurch



Dunedin


DUNEDIN CITY COUNCIL
DUNEDIN
MOSGIEL
Territorial Authority Boundary

Benchmarking cycling and walking in six New Zealand cities

Pilot study 2015

Caroline Shaw, Marie Russell, Kim van Sparrentak,
Annabel Merrett and Harry Clegg

University of Otago
Te Whare Wānanga o Otāgo
New Zealand

new zealand centre for
Sustainable Cities
te pokapū rōnaki tāone-nui