Cycling Proof Points

The Benefits of Everyday Cycling in Aotearoa New Zealand

A summary of the key benefits of cycling for transport and leisure in Aotearoa New Zealand.
The review includes both local and international research, and highlights local research whereever possible.

Prepared for Waka Kotahi by Dr Kirsty Wild. Thanks to Prof Alistair Woodward, and to Auckland Transport and Mackie Research, for giving us permission to use a previous version of the Cycling Proof Points. You are welcome to share this document. How To Cite This Document: Wild, K. 2023. *Cycling Proof Points*. Ver 1. Auckland: Waka Kotahi.

	Proof points	Study	Detail	Summary of findings
Cycling is good for the climate	**The reduction in carbon emissions achieved by investing in active travel means every 1 dollar invested leads to over 10 dollars in benefits.**	*Chapman R, Keall M, Howden-Chapman P, Grams M, Witten K, Randal E, et al. (2018) A cost benefit analysis of an active travel intervention with health and carbon emission reduction benefits. Int J Environ Res Public Health, 15(5): 962.*	AOTEAROA Health and carbon emission benefits mean that active transport projects have high benefit/cost ratio (over 10:1 - even with conservative valuing of benefits).	**Switching from driving to cycling is an effective way to reduce transport emissions.**
	An average person cycling one trip more and driving one trip less, each day, for 200 days a year, would decrease their CO2 emissions by about half a tonne each year. **Walking and cycling alters overall mobility patterns, encouraging greater use of local services – reducing emissions across all modes.**	*Brand C, Götschi T, Dons E, Gerike R, Anaya-Boig E, Avila-Palencia I, et al. (2021) The climate change mitigation impacts of active travel: Evidence from a longitudinal panel study in seven European cities. Global Environmental Change. 1(67):102224.*	INTERNATIONAL This large multi-country study showed that cycling one trip per day more and driving one trip per day less for 200 days a year will decrease transport emissions by about 0.5 tonnes over a year. In addition, this study showed that people who walk or cycle also tend to have lower overall transport emissions across all modes, most likely because using these modes alters mobility patterns – encouraging greater use of local services. So switching to walking and biking for some trips tends to reduce emissions by all modes, even if not all car trips cannot be substituted.	
	Driving one day less per week could reduce 3.8 million tons of greenhouse gas emissions a year.	*ARUP Group (2016) Cities Alive: Towards a Walking World. London: ARUP.*	INTERNATIONAL In Canada, a study found that if people drove one day less a week, it could reduce 3.8 million tons of greenhouse gas emissions a year.	

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Cycling helps to keep our air and water clean	**Switching from driving to cycling improves air quality.**	*Patel, H., Talbot, N., Salmond, J., Dirks, K., Xie, S., & Davy, P. (2020). Implications for air quality management of changes in air quality during lockdown in Auckland (New Zealand) in response to the 2020 SARS-CoV-2 epidemic.* The Science of the Total Environment, 746: *141129.*	AUCKLAND During the first Covid-19 lockdown of 2020, there was a 60-80% reduction in traffic flows across Auckland. This resulted in a 34-57% percent reduction in Nitrogen Dioxide and a 55-75% reduction in Black Carbon, two harmful air pollutants, primarily created through combustion of fossil fuels by motor vehicles. At the same time as levels of driving reduced, neighbourhood travel surveys showed a significant increase in neighbourhood cycling (from 1.5% to 19% mode share – according to Bike Auckland's Big Backyard Bike Count). This 'natural experiment' in mode shift from driving to cycling shows that harmful air pollution will reduce if New Zealanders cycle more and drive less. Poor air quality (mostly from vehicle emissions) contributes to 1 in 10 deaths in New Zealand; results in 6,500 hospitalisations for respiratory conditions; 13,200 cases of childhood asthma; and approximately 1.745 million restricted activity days (days on which people could not do the things they might otherwise have done if air pollution had not been present). The total social cost of air pollution is currently estimated at $15.6 billion.	**Switching from driving to cycling helps to create cleaner air and improve health**
	With more people cycling and fewer people driving, cities can cut air pollution significantly. On a single car-free day in Paris, the air pollution dropped by 40 percent.	*Mortimer in ARUP Group (2016) Cities Alive: Towards a Walking World. London: ARUP*	INTERNATIONAL Even a single day without car traffic can bring huge benefits. In September 2015, Paris' Journée Sans Voiture / Paris' inaugural "car free day" cut levels of harmful nitrogen dioxide by 40% in parts of the city.	

Riding a bike is a good for physical health	Proof points	Study	Detail	Summary of findings
	People in Aotearoa who cycle to their main activity are 76% more likely to achieve sufficient levels of exercise.	*Shaw C, Keall M, Guiney H. (2017) What modes of transport are associated with higher levels of physical activity? Cross-sectional study of New Zealand adults. Journal of Transport and Health. 7: 125-133.*	AOTEAROA People who walk or cycle to their main activity are 76% more likely to meet physical activity guidelines – for both people in-work and those not in-work (consistent with international literature).	**Riding a bike is a good way to get healthy levels of exercise, prevent disease, and manage chronic illness as we age.**
	In New Zealand, cycling to work reduces the risk of death from all causes by 13 percent for men and women. **A person does not increase their risk of death if they cycle to work, they reduce it.**	*Shaw C, Blakely T, Atkinson J, Woodward A. (2020) Is mode of transport to work associated with mortality in the working-age population? Repeated census-cohort studies in New Zealand 1996, 2001 and 2006. International Journal of Epidemiology. 49(2):477-485.*	AOTEAROA Those who cycled to work had reduced all-cause mortality compared to those who commuted by car. Cycling to work was associated with a 13% reduction in all-cause mortality. The authors found no increase in injury deaths associated with walking and cycling.	
	1. Fitness improves as daily cycling increases and leads to enhanced cardiorespiratory performance. With increased distance, improvements can reach 30 percent. **2. Commuting daily by bike can increase cardiorespiratory fitness by 16 percent and increase good cholesterol by 15 percent.** **3. Cycling for around an hour a day reduces the risk of all-cause**		INTERNATIONAL These studies show a clear, positive relationship between cycling and cardiorespiratory fitness in youths. Strong inverse relationship between commuter cycling and all-cause mortality, cancer mortality, and cancer morbidity among middle-aged to elderly people. Among working-aged participants there were improvements in cardiovascular fitness due to commuting cycling. Increased daily cycling improves fitness, and the risk of all-cause mortality, CVD and colon cancer morbidity and incidence of overweight and obesity decrease with increasing amount of daily cycling. Commuter cycling of a few kms' single trip distance substantially improves the cardiorespiratory performance of low-fitness adults. Compared to non-cyclists there is approximately 20 percent risk reduction in cancer mortality with less than an hour daily moderate intensity cycling and more than a 30 percent risk reduction with about 100 min of daily cycling among women.	

mortality and cancer mortality by about 20 percent amongst women, compared to non-cyclists. **4. Cycling for around an hour a day at moderate intensity can reduce the risk of colon cancer by about 20 percent; and can be reduced by around 40 percent if the time spent cycling increases to 90 minutes a day.** **5. Cycling around three and a half hours a week can reduce cardiovascular risk by about 20 percent.**	*1. Oja, P., Titze, S., Bauman, A., de Geus, B., Krenn, P., Reger-Nash, B. and Kohlberger, T. (2011), Health benefits of cycling: a systematic review. Scandinavian Journal of Medicine & Science in Sports, 21: 496-509.* *2. Tjelta et al 2010 and consistent with other studies* *3. Matthews et al 2007* *4. Hou et al 2004* *5. Hoevenaar-Blom et al 2010* *NB: Results are based on the review of 16 cycling-specific studies. Because of this, some results are from individual studies, rather than the Oja et al synthesis, hence the numbering.*	Risk reduction for cancer mortality is about 20 percent with one-hour daily cycling and more than 40 percent with about 100 min of moderate intensity daily cycling among women. The risk of incident colon cancer becomes smaller by about 20 percent with moderate intensity cycling of less than an hour a day and becomes smaller by 45 percent with 90min of cycling among men and women. Cycling reduces cardiovascular risk by about 20 percent with more than 3.5 hours a week. Assessment of the studies included showed most to be moderate to high quality. Cardiorespiratory benefits is the strongest evidence base, to date.
Cycling helps to improve the muscular strength and physical function amongst people with osteoarthritis.	*Alkatan M, Baker JR, Machin DR, Park W, Akkari AS, Pasha EP, Tanaka H. (2016) Improved Function and Reduced Pain after Swimming and Cycling Training in Patients with Osteoarthritis. J Rheumatol. 43(3):666-72.*	INTERNATIONAL Participants in both the swimming and cycling exercise groups showed reduction in joint pain, stiffness, and functional limitation. Both groups demonstrated significant increases in distance covered during the 6-min walk test, and maximal grip strength, isokinetic knee extensor and flexor strength increased in both groups also. Improvements in muscular strength and physical function were achieved through cycling exercises.

	Proof points	Study	Detail	Summary of findings
Biking is a good way to look after your mental health	**Those who bike to work have the highest transport satisfaction**	*Wild K, Woodward A. (2019) Why are cyclists the happiest commuters? Health, pleasure and the e-bike. Journal of Transport & Health. 14:1-7.*	AUCKLAND Based on existing research and the interview data collected for this study, the authors conclude that there are four reasons for high transport satisfaction amongst those who cycle to work: 1) High levels of commuting control and arrival-time reliability; 2) Enjoyable levels of sensory stimulation, including the benefits of time outside in nature and reduced rumination. 3) The 'feel better' effects of moderate intensity exercise. 4) Greater opportunities for social interaction, including the ability to converse with others biking, to make more eye contact, and gather information about social situations, increasing trust, familiarity, and affection for the neighbourhood.	**Cyclists are the happiest commuters. Switching from driving to cycling improves mental health**
		Gatersleben B, Uzzell D. (2007) Affective Appraisals of the Daily Commute: Comparing Perceptions of Drivers, Cyclists, Walkers, and Users of Public Transport. Environment and Behavior. 39(3):416- 31.	INTERNATIONAL This UK study found that people who bike to work are the most likely to described their commute as 'exciting'. In comparison, people who walk were most likely to describe their commute as 'relaxing'; those who drive as 'stressful'; and those who use public transport as 'boring'.	
		Chatterjee, K., Chng, S., Clark, B., Davis, A., De Vos, J., Ettema, D., . . . Reardon, L. (2019). Commuting and wellbeing: a critical overview of the literature with implications for policy and future research. Transport Reviews, 40(1), 5-34.	INTERNATIONAL This review of studies on wellbeing and transport found that people who bike (and walk) to work are consistently shown to have higher commute satisfaction than those who use a car or public transport.	
		Rissel C, Crane M, Wen LM, Greaves S, Standen C. (2016) Satisfaction with transport and enjoyment	AUSTRALIA This Sydney study found that people who cycle to work enjoy their commute more than those who drive or take public transport. Walkers (49%) and cyclists (52%) reported far higher levels of enjoyment from their commute than car drivers (14%) or public transport users (10%).	

		of the commute by commuting mode in inner Sydney. Health Promot J Austr. Apr;27(1):80-83.		
	People who cycle regularly report feeling more 'energetic' and less 'tired' than those who drive or use public transport. **They also rate their health more positively, and report getting more contact with friends and family.**	*Avila-Palencia I, Int Panis L, Dons E, Gaupp-Berghausen M, Raser E, Götschi T, et al. (2018) The effects of transport mode use on self-perceived health, mental health, and social contact measures: A cross- sectional and longitudinal study. Environment International. Nov;120: 199–206.*	INTERNATIONAL A large study, across seven European cities. People who bike frequently reported better self-perceived health; higher vitality (they feel more energetic and less 'tired'); and greater contact with friends and family.	
	Switching from driving or using public transport to cycling improves mental health.	*Martin A, Goryakin Y, Suhrcke M. (2014)Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. Prev Med; 69: 296–303.*	INTERNATIONAL A large longitudinal study that showed that psychological wellbeing improved when commuters switched from driving to cycling for their commute. This study also showed that people who used car travel were 13% more likely to report being 'constantly under strain or unable to concentrate' compared to those using active travel modes.	
	Proof points	**Study**	**Detail**	**Summary of findings**
Cycling keeps us connected	**People value the social interaction they get when they cycle**	*Wild K, Woodward A. (2019) Why are cyclists the happiest commuters? Health, pleasure and the e-bike. Journal of Transport & Health. 14:1-7.*	AUCKLAND This study which included interviews with local cyclists, as well as a review of international studies on cycling experience, found that opportunities for social interaction and observation are understood to be a key benefit of biking. People who bike report valuing opportunities to talk with other cyclists, and to see what is going on in their neighbourhoods. Cycling is perceived to provide the best opportunities for 'flexible social interaction' – social interaction that you can control – you can be social if you want to, or not, depending on your mood.	**Cycling increases social connection and reduces loneliness.**

People who bike are more familiar with their neighbourhoods, feel safer in them, and like them more than those who travel by car.	*Gatersleben B, Murtagh N, White E. (2013) Hoody, goody or buddy? How travel mode affects social perceptions in urban neighbourhoods . Transportation Research Part F: Traffic Psychology and Behaviour. 21(Supplement C):219-30.*	INTERNATIONAL How we travel through an environment affects our perception of the environment, in turn influencing how we interact with that (physical and social) environment. Measures that promote walking and cycling can have benefits for local communities because they help develop social cohesion. Measures that slow cars down can also help to improve social perceptions.	
Driving acts as a barrier to social interaction within neighbourhoods. Increasing use of active modes can make it easier for people to connect.	*Wiki J, Kingham S, Banwell K. (2018) Re-working Appleyard in a low density environment: An exploration of the impacts of motorised traffic volume on street livability in Christchurch, New Zealand. World Transport Policy and Practice. ;24:60-8.*	(CHRISTCHURCH) This study shows that as motorised traffic volume increases, the proportion of residents who feel a sense of belonging to their street and community reduces. Respondents noted motorised traffic as their primary source of annoyance. Results indicate that residents on light and moderate trafficked streets have more neighbourhood connections and community interactions in addition to perceiving their street to be more liveable.	
Reducing driving in neighbourhods opens up social interaction and makes cycling more feasible.	*Kingham S, Curl A, Banwell, K. (2020) Streets for transport and health: The opportunity of a temporary road closure for neighbourhood connection, activity and wellbeing. Journal of Transport & Health. 18:100872*	NEW ZEALAND With a temporary road closure, the residents suggested active transport (cycling and walking) became more convenient and attractive, and participants expressed a desire for it to continue. Less traffic led to enhanced social connection; the inconveniences of road closure were outweighed by the benefits.	

	Proof points	Study	Detail	Summary of findings
Cycling brings back the birdsong	**Reducing driving and increasing cycling in neighbourhoods reduces harmful noise pollution.**	*Humpheson D, Wareing R. (2019). Evidential basis for community response to land transport noise. Wellington: NZ Transport Agency.*	AUCKLAND This research showed that traffic noise is the most significant source of noise pollution for Aucklanders. A third of urban residents reported that they were 'very' or 'extremely' annoyed by road traffic noise. Chronic traffic noise pollution has been shown to affect sleep; psychological health; child development and learning; and it is a cause of cardiovascular disease. Other New Zealand research has estimated that 59 deaths a year can be	**When more people bike more and drive less, we find it easier to hear the sorts of neighbourhood sounds that they we enjoy: birds and people.**

			attributed to traffic noise pollution (Briggs et al. 2015); and that approximately 600,000 New Zealanders experience road traffic noise at levels that damage health, according to noise guidelines set by the WHO (Allan & Humpheson, 2019).	
		Journée sans voiture à Paris, by Noiseineu. 2015, in ARUP Group (2016) report – Cities Alive: Towards a Walking World. London: ARUP	INTERNATIONAL During the first Paris car-free day, Bruitparif measured an average drop of 3 dB(A) on main roads. On average, car traffic produces 79 decibels of sound, whereas human conversation is 65 (an increase of 10 decibels results in a noise level that is twice as loud).	
	Reducing traffic noise pollution in neighbourhoods allows New Zealanders to hear natural sounds like birdsong and human conversation.	*Wild, K. (2020). Life in a low-traffic neighbourhood. Auckland: Women in Urbanism Aotearoa; 2020.*	AOTEAROA This qualitative survey during the first Covid-19 lockdown showed that a reduction in traffic noise was one of the most valued aspects of reduced traffic volumes during this time. Participants reported that they felt less stressed, and were more able to hear sounds that they enjoy: particularly birdsong and human sounds, as traffic noise levels dropped.	
Cycling supports the economy	**Proof points**	**Study**	**Detail**	**Summary of findings**
	Changes in the Auckland CBD that reduced vehicle volumes and speed, and encouraged walking and cycling, led to 47 percent more visitors and a 429 percent increase in hospitality spending.	*Auckland Council (ND) Share the Wealth: Shared Spaces Make Great Business Places. Auckland .*	AUCKLAND The changes to Fort St reduced vehicle volumes by 25%, with a 2-8km/hour reduction in speed. The number of pedestrians who visit the area has increased by up to 47% during peak hours. 80% of those surveyed felt safer in the area, especially at night. There was a 429% increase in hospitality spending and 47% increase in consumer spending. Walking and cycling connections have been strengthened throughout this area as a result of this project.	**Those who walk or cycle have a positive impact on local shopping areas.**
	Cyclists are more 'loyal' customers. They spend less per visit, but they visit local shops more frequently, and spend more time when they are there, compared to car drivers – spending more overall.	*Fleming T, Turner S, Tarjomi L. (2013) Reallocation of road space. Wellington, NZ: NZ Transport Agency..*	AOTEAROA Survey research with retailers and shoppers in Auckland, Wellington and Christchurch. Sustainable transport users (walk, cycle, skateboard) account for 40% of the total spend in shopping areas. They are likely to visit the areas more frequently and spend more time in the area, compared to car drivers. Shoppers value high-quality pedestrian and urban design features in shopping areas more than they value parking.	

	Blondiau T, van Zeebroeck B, Haubold H. (2016). Economic Benefits of Increased Cycling. Transportation Research Procedia. 14:2306-13.	INTERNATIONAL More cyclists mean more jobs and higher turnover for local retailers. If the percentage of cyclists doubled across the European Union, it could create an additional 400,000 new jobs in the future and an extra EUR 27 billion for local retailers.
Cycle tourism boosts our local economies	Angus and Associates, (2022) 2021 Evaluation of Ngā Haerenga Great Rides of New Zealand. MBIE: Wellington	AOTEAROA Cycle tourists using the Ngā Haerenga trails spend $950mil in local economies; and the trails produced $11mil of health benefits annually.
New cycling and walking infrastructure generally has a positive impact on retail economic wellbeing	*Volker JMB, Handy S. (2021) Economic impacts on local businesses of investments in bicycle and pedestrian infrastructure: a review of the evidence. Transport Reviews. 41(4):1-31.*	INTERNATIONAL Creating or improving active travel facilities generally has positive or non-significant economic impacts on retail and food service businesses next to or within a short distance of the facilities, even when vehicular parking or travel lanes are reduced to make room for active travel facilities.
	Drennen, E. (2003) Economic effects of traffic calming on urban small businesses, Dep artment of Public Administration, San Francisco State University, San Francisco.	INTERNATIONAL 66% of the retailers believe that the bike lanes have had a generally positive impact on their businesses and/or sales and the same percentage would support more traffic calming. Further, 37% reported that the bike lanes have increased their sales, 73% thought that the bike lanes have made the street more attractive. Traffic calming can increase surrounding property values attracting wealthier residents to the area which can increase retail sales. Traffic calming encourages local residents to buy in their own neighbourhoods
The reductions in carbon emissions achieved by investing in active travel means that every 1 dollar invested leads to over 10 dollars in benefits.	*Chapman R, Keall M, Howden-Chapman P, Grams M, Witten K, Randal E, et al. (2018) A cost benefit analysis of an active travel intervention with health and carbon emission reduction benefits. Int J Environ Res Public Health. 2018;15(5).*	AOTEAROA Health and carbon emission benefits fully justify the investment in active travel with a high benefit/cost ratio (over 10:1) (even with conservative valuing of benefits). Reductions in transport-related carbon emissions, using a discount rate of 3.5%, the estimated benefit/cost ratio was 11:1 showing a measurable, positive return on investment.

	Cycling to work improves job performance among middle-aged employees.	*Ma L, Ye R. (2019) Does daily commuting behavior matter to employee productivity? JTRG. 1;76:130–41.*	INTERNATIONAL There is a positive relationship between active commuting (walking or biking to work) and job performance in middle-aged employees. Commuting mode choices and distance influence absenteeism and job performance by affecting commuting satisfaction and personal health. Previous research has shown that workers who commute by walking and cycling are more productive because of the health, cognitive, and psychological benefits of active travel (Handy et al., 2014).	
	Cycling commuters may be more productive due to the physical and cognitive health benefits of cycling.			
	Biking (and walking) provide an estimated return on investment of $11.80 for every $1 invested.	*ARUP Group (2016) Cities Alive: Towards a Walking World. London: ARUP.*	INTERNATIONAL Investing in better streets and spaces for walking cand biking can provide a competitive return compared to other transport projects. Cycling and walking are estimated to provide up to $11.80 return of investment per $1 invested.	
	When more people cycle, it means that potentially fewer people are stuck in traffic, which benefits the economy. Business can lose large sums when employees are stuck in traffic.	*ARUP Group (2016) Cities Alive: Towards a Walking World. London: ARUP.*	INTERNATIONAL The more people who bike, and the fewer people who are stuck in traffic, benefits the economy. Businesses can lose huge sums because employees are stuck in traffic. In the US, Bay Area businesses are estimated to lose $2 billion a year because employees are stuck in gridlock.	
Kids love cycling	**Proof points**	**Study**	**Detail**	**Summary of findings**
	Biking is a preferred travel mode for kids	*Hinckson, E. (2016) Perceived challenges and facilitators of active travel following implementation of the School Travel-Plan programme in New Zealand children and adolescents. Journal of Transport and Health. 3(3): 321-325.*	AUCKLAND A 2016 AUT University study revealed 96 per cent of primary school aged children preferred to bike or walk to school, despite the majority of kids travelling by car to school.	**Children prefer cycling to school, and it helps to boost their cognitive development.**
		Mackie H. 'I want to ride my bike' (2009) Overcoming	AOTEAROA A study based on focus group research and travel surveys with students at six intermediate schools in Auckland, Bay of Plenty and New	

	barriers to cycling to intermediate schools Wellington: NZ Transport Agency.	Plymouth. While the average biking mode share was 8.6%; nearly a quarter of the students (22.2%) said they would like to bike to school.
Kids find biking exciting, and they like that it enables them to 'see stuff' and connect with friends	*Mitchell, H., Kearns, R. A., & Collins, D. C. A. (2007). Nuances of neighbourhood: Children's perceptions of the space between home and school in Auckland, New Zealand. Geoforum, 38(4), 614-627.*	AUCKLAND This research explored primary school children's experiences travelling between school and home in three Auckland neighbourhoods.. They found that nearly half (45%) of children who were driven to school said they would rather use an active mode. Children who biked to school said that they liked it because it is "fun and faster than walking, and less boring than private transport."
	Tranter, P., Pawson, E. (2001) Children's access to local environments: A case-study of Christchurch, New Zealand. Local Environment, 6:1, 27-48.	CHRISTCHURCH Children also articulated a preference for walking and cycling around their neighbourhood rather than being driven. They explained that walking and cycling allowed them to be with their friends and to stop at the dairy.
Cycling means low carbon, independent travel for children, which may help to reduce eco-anxiety and give children a way to engage in climate action.	*Wild K, Woodward A. The bicycle as 'constructive hope': Children, climate and active transport. J Paed Child Health. 57(11):1785-1788.*	AOTEAROA Bicycle and child-centred urban planning are important tools to provide constructive hope for children in response to the global climate crisis. When facing 'eco-anxiety' biking provides a practical opportunity for them to respond, feel engaged, empowered, and hopeful.
Cycling helps children to become familiar with their community and surroundings.	*Maiss R, Handy S. (2011) Bicycling and Spatial Knowledge in Children: An Exploratory Study in Davis, California. Child Youth Environ. 2011;21(2):100-17*	INTERNATIONAL Using both interviews and mental mapping, this study showed that biking supports childhood development in important ways. Children who bike can recall more details about their neighbourhood than those with less bicycling experience, and may progress to higher stages of spatial development at younger ages.
Cycling supports cognitive development amongst children: boosting spatial and navigational skills.	*Ikeda, Erika, Suzanne Mavoa, Erica Hinckson, Karen Witten, Niamh Donnellan, and Melody Smith. (2018). "Differences in Child-Drawn and GIS-Modelled Routes to School: Impact on Space*	AOTEAROA This study used participatory mapping with 1102 children aged 9–12 years, across 19 schools and nine neighbourhoods in Auckland. The research showed that children using active modes were able to produce more accurate maps of their school routes. This is consistent with overseas studies that show that kids who cycle to school have more advanced spatial representational skills.

		and Exposure to the Built Environment in Auckland, New Zealand." Journal of Transport Geography 71 (July): 103–115		
Cycling is a congestion buster	**Proof points**	**Study**	**Detail**	**Summary of findings**
	It is faster to travel into Auckland City from neighbouring areas by bike than by car, train, or bus. **Travel times to bike into Auckland City from neighbouring areas are more consistent with the predicted time on Google Maps, compared to travel by car, train, or bus.**	*Peacock, A. (2018) March Madness: Herald reporters race by car, bus, bicycle and train from New Lynn into Auckland CBD.*	AUCKLAND Four reporters travelled 12km from AKL CBD in New Lynn at 7:45am on a weekday into work, one on a bus, one a train, one in a car, and one on a bike. They each estimated their travel time prior to leaving. The cyclist arrived 25min before the others and was closest to the estimated time predicted by Google maps. NB: Evidence from the New Zealand Herald and based on the experience of four journalists on one particular day.	**In morning rush hour traffic, cycling is often the fastest way to get to work in New Zealand cities – with the most reliable arrival times.**
	Cyclists can maximise opportunities to maintain free-flow conditions, which means arrival times are easier to control/predict.	*Wild K, Woodward A. (2019) Why are cyclists the happiest commuters? Health, pleasure and the e-bike. Journal of Transport & Health. 14:1-7.*	AUCKLAND People who cycle report that a high degree of commuting control and arrival-time reliability are key benefits of commuter cycling. Cyclists can maximise opportunities to maintain free-flow conditions.	
	It is faster to travel into Wellington City from neighbouring areas by bike than by car, train, or bus.	*Wellington Report 2019: The great commuter race - What's the fastest way to the office? Oct 02. Stuff.*	AOTEAROA As above, Stuff reporters in the Wellington office travelled from Petone to the CBD at 7:30am. The cyclist arrived at work first, by approximately 10min and rated his trip as low stress. NB: Evidence from stuff.co.nz and based on the experience of four journalists on one particular day.	

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Cycling can help reduce transport costs	**In Aotearoa, in our smaller towns, people from low-income communities are the most likely to rely on cycling for transport. Overall, people from lower income neighbourhoods cycle as frequently as people from higher income neighbourhoods**	*Shaw, C., Russell, M., van Sparrentak, K., Merrett, A., and Clegg, H. (2016) Benchmarking cycling and walking in six New Zealand cities: Pilot study 2015; New Zealand Centre for Sustainable Cities University of Otago, Wellington.*	AOTEAROA Cycling to work remained stable across age groups and across deprivation quintiles. Smaller cities showed evidence that cycling was more common in people who live in more deprived neighbourhoods. Walking and cycling are low-cost forms of transport that can potentially result in savings for households.	**Cycling is a low-cost form of travel that can help low-income households to access opportunities and manage transport costs.**
	Cycling is a low-cost way to travel which can improve mobility and reduce transport disadvantage amongst low-income New Zealanders	*Canterbury District Health Board (2018) BuyCycles: Evaluation of a novel approach towards alleviating transport disadvantage. CDHB: Christchurch*	CHRISTCHURCH BuyCycles was a Christchurch pilot programme designed to address transport disadvantage and social exclusion amongst low-income clients of mental health services. Participants were provided with a bicycle, lock and safety gear, and supported to pay off the bicycle in very small weekly amounts (average $5 per week). Participants in the programme listed a number of benefits associated with taking part, including 'being active', 'improved sleep', 'having something fun to do when feeling down', 'saving money', 'being able to get around more easily', and 'not having to rely on others for transport'	
	At a cost of about 4 cents per km, a cycle trip is significantly cheaper than a car trip, which costs about 54 cents per km.	*Welch (2021). Why calling ordinary Kiwi cyclists 'elitist' just doesn't add up. The Conversation. 21 July.*	AOTEAROA Cars are costly to own compared to a bicycle. Tracking expenses, including initial purpose, for ten years across 100,000km, the total calculated cost of owning and operating a bike was about 4 cents per km. Taking into account an annual driving distance of 14,000km the cost of car ownership was $21NZD or about 54 cents per km. Even the most expensive e-bike is a fraction of the price of a new car.	
		Martens, K. (2013). Role of the Bicycle in the Limitation of Transport Poverty in the Netherlands. Transportation Research Record, 2387(1), 20-25.	INTERNATIONAL This study from the Netherlands showed that in cities with good cycling infrastructure cycling plays a key role in helping low-income families to reduce their travel costs and limit the negative effects of transport poverty.	