Ministry of Transport
TE MANATŪ WAKA

# *Projecting Health Outcomes of Active Mode Use in New Zealand*


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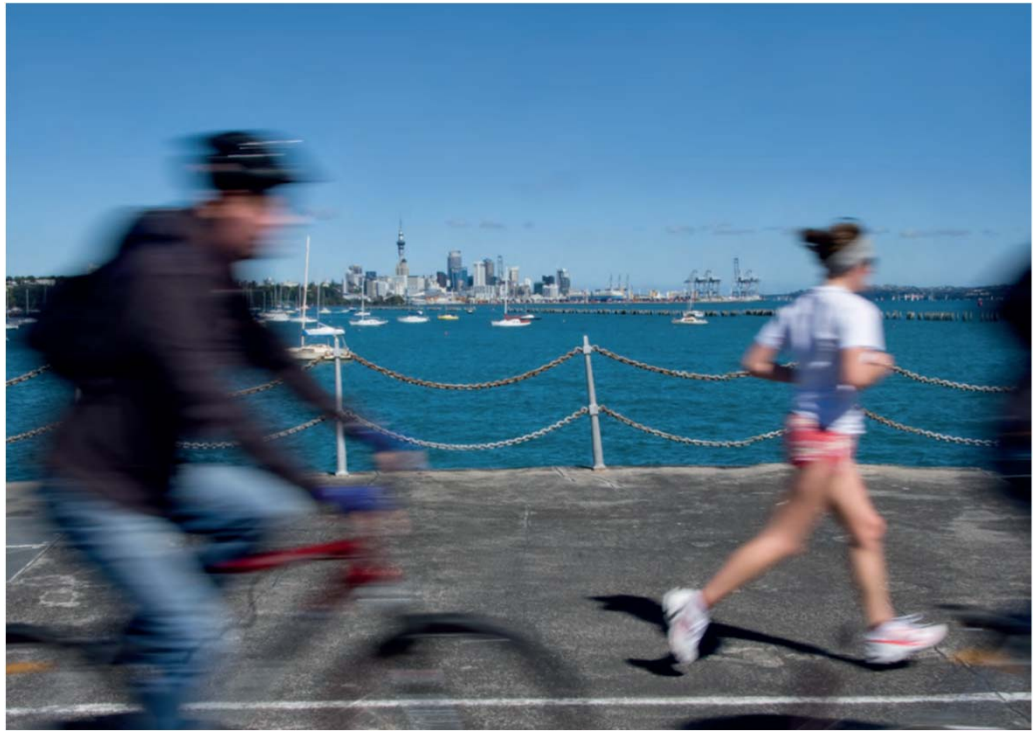


**Presentation to the 2WalkandCycle Conference**

**31 July 2018**

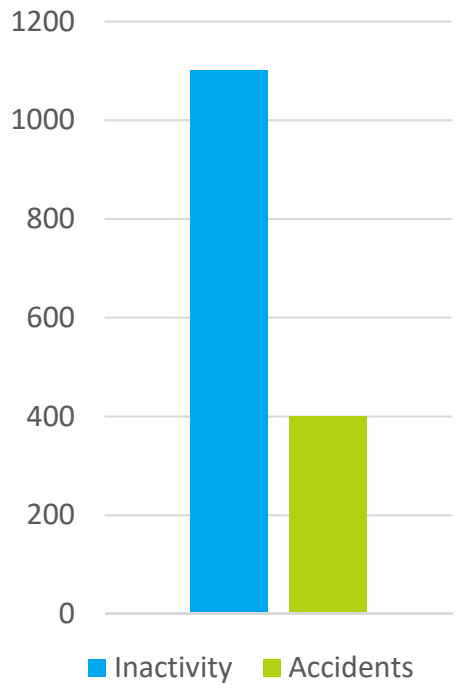
# Introduction

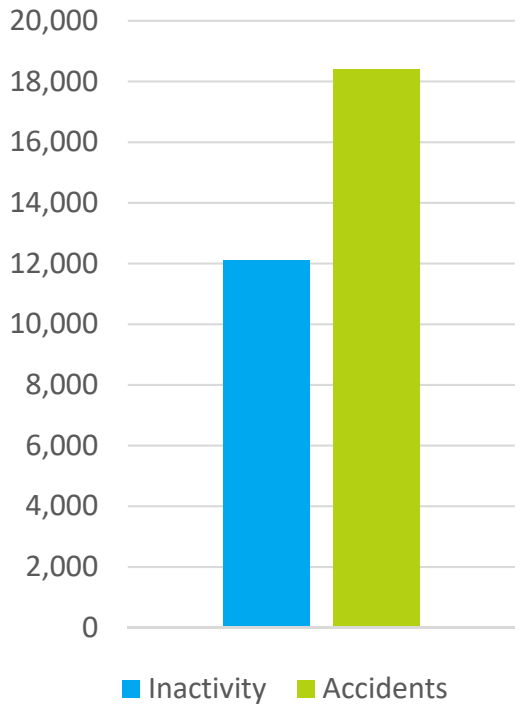
- Low physical activity is associated with increased risk for a range of diseases, including cardiovascular disease (such as heart attacks and strokes), diabetes, dementia, breast and colon cancer, and depression
- Use of motorised transport is associated with declining levels of physical activity; however, active modes—such as walking and cycling—can help reduce the risks of diseases associated with low physical activity
- Pedestrians and cyclists are, however, more vulnerable to transport accidents than other transport users, so there is some trade-off between their disease-reducing benefits and their accident risks
- Can we get a quantitative understanding of the health benefits and risks that increases in walking and cycling in New Zealand might have?

# Setting the Scene: Diseases of Low Physical Activity vs. Transport Accidents

- Overall, in terms of simple number of deaths, diseases of low physical activity far outweigh transport accidents by all modes
- However, those who die of diseases of low physical activity tend to be considerably older than those who die in transport accidents
- Therefore, measured in terms of years of life lost (compared to a normal life expectancy), transport accidents outweigh diseases of low physical activity, but both represent significant health burdens

# Comparative 2016 Impacts of Diseases of Low Physical Activity vs. Transport Accidents (All Modes) in New Zealand



# Can We Model How to Improve This Situation?

- This Ministry of Transport's *New Zealand Transport Outlook: Future State* (2017) projected the change to 2042/43 in the number of deaths and years of life lost due to diseases of low physical activity, as well as those due to pedestrian and cyclist collisions with motor vehicles, for five alternative scenarios
- Outcomes were based on a model of the health impacts of active modes adapted by the University of Otago, Department of Public Health (Keall, et al)
- The model is based on the Integrated Transport and Health Impact Modelling Tool (ITHIM) produced at the Centre for Diet and Activity Research at the University of Cambridge, United Kingdom (Woodcock, et al)
- ITHIM has been applied in a number of academic and government projects in many cities, regions, and countries around the world

# What Is New in the Work Presented Here?

- A limitation of the *Transport Outlook: Future State* work was that each scenario examined combinations of modest changes in walking and cycling, along with other changes in the location and size of the population, which made it hard to estimate the impacts of the changes in walking and cycling alone
- The work presented here seeks to remedy this limitation by using the same model to examine changes in walking and cycling activity alone, with other assumptions held the same

# Method: The Assumed Scenarios

| | Average minutes per day per person | | Average kilometres per day per person | |
|---|---|---|---|---|
| | Walking | Cycling | Walking | Cycling |
| **Baseline (2012/13)** | 7.6 | 0.9 | 0.5 | 0.2 |
| **Scenarios** | | | | |
| **Scenario A: Double Walking (+7.6 minutes/day)** | 15.2 | 0.9 | 1.0 | 0.2 |
| **Scenario B: Double Cycling (+0.9 minutes/day)** | 7.6 | 1.8 | 0.5 | 0.4 |
| **Scenario C: Increase Cycling +7.6 minutes/day** | 7.6 | 8.5 | 0.5 | 1.6 |
| **Scenario D: Increase both Walking and Cycling +7.6 minutes/day** | 15.2 | 8.5 | 1.0 | 1.6 |

# Why These Scenarios?

- The Baseline 2012/13 times spent walking and cycling are based on data from the New Zealand Household Travel Survey
- Data comes from travel diaries kept by survey participants, and would, therefore, not include walking inside homes or other buildings
- In Scenarios A and B, we double the baseline times spent walking and cycling, respectively
- However, the baseline time spent cycling is quite small (0.9 minutes/day), so a doubling of cycling time has far less impact than a doubling of walking time
- Scenario C, therefore, adds the same number of minutes of cycling that a doubling of walking time would add to walking minutes (7.6 minutes/day)
- Scenario D combines Scenarios B and C

# Are These Scenarios Achievable?

- In the Netherlands in the year 2014, walking time averaged about 9.8 minutes per day per person, a bit above the baseline New Zealand figure of 7.6 minutes/day, but below the 15.2 minutes per day we assume in Scenarios A and D.
- However, cycling in the Netherlands averaged about 13.3 minutes/day per person, almost double the 7.6 minutes we assume in even our Scenarios C and D
- These figures suggest that the walking and cycling times assumed in our scenarios are potentially achievable for New Zealand and, in the case of cycling, may even be conservative

# Findings: 2042/43 Outcomes Compared to 2012/13 Baseline Due to Changes in Diseases of Low Physical Activity

| | (A) Assuming same population as in 2012/13 | | (B) Assuming projected population of 2042/43 | |
|---|---|---|---|---|
| | Change in number of deaths | Change in number of years of life lost | Change in number of deaths | Change in number of years of life lost |
| **Scenario A: Double Walking (+7.6 minutes/day)** | -470 | -5856 | -1221 | -12,373 |
| **Scenario B: Double Cycling (+0.9 minutes/day)** | -40 | -914 | -76 | -1500 |
| **Scenario C: Increase Cycling (+7.6 minutes/day)** | -171 | -4051 | -314 | -6437 |
| **Scenario D: Increase Walking and Cycling (+7.6 minutes/day)** | -626 | -9227 | -1525 | -17,661 |

# Key Insights from These Outcomes for Diseases of Low Physical Activity

- Despite the modest increases in walking and cycling times, the reduction in deaths and years of life lost are quite large and significant; recall that accidents for all modes of transport amount to about 400 deaths and 18,400 years of life lost in 2016
- The benefits of increased walking and cycling grow much faster than the projected population growth from 4.4 million in 2012/13 to about 5.9 million in 2042/43; the reason is that the population in 2042/43 is not only larger than in 2012/13, but also older, and therefore more at risk from diseases of low physical activity
- Doubling the time spent walking has quite a large impact, while doubling the time spent cycling has a much smaller impact; this is mainly because in 2012/13, time spent cycling was so much smaller than time spent walking

## Outcomes Suggest Higher Apparent Disease Reduction Impacts of Walking Compared to Cycling..

- However, even if both walking and cycling are increased by the same 7.6 minutes per day, as in Scenarios A and C, the model outcomes suggest that the increase in walking has a much larger impact
- This outcome is despite the fact that the model assumes cycling to be the more physically intense activity.
- This outcome reflects a modelling assumption that increases in walking and cycling by sex/age group are positively related to Baseline walking and cycling by sex/age group
- Since cycling in the Baseline is more concentrated among younger age groups, while walking is more evenly spread across all age groups, increases in walking lead to larger increases in physical activity by older age groups than increases in cycling; it is these older age groups that are most at risk from diseases of low physical activity

# But This May Be a Modelling Anomaly

- Contrary to the model assumption, it is not hard to imagine that if cycling were to become a more accepted ‘mainstream’ mode of transport, as envisioned in these scenarios, it would attract people of all ages
- In the Netherlands, for example, the number of cycle trips per day made by 65-75 year olds actually exceeds that of 25-30 year olds for both men and women

# The Disease Reduction vs. Accidents Trade-Off

- Would these reductions in deaths and years of life lost from diseases of low physical activity be offset by increases in deaths and years of life lost due to motor vehicle collisions involving pedestrians and cyclists?
- Deaths from collisions with motor vehicles generally rise with increases in walking and cycling; however, the relationship is not a simple proportionate one, as the rate of collisions tends to decline as there are more cyclists and pedestrians on the streets relative to cars: the ‘safety in numbers’ effect
- Our model calculates deaths and years of life lost due to motor vehicle collisions involving pedestrians and cyclists, taking into account a ‘safety in numbers’ effect

# Findings: 2042/43 Outcomes Compared to 2012/13 Baseline Due to Pedestrian/Cyclist Collisions with Motor Vehicles

| | (A) Assuming same population as in 2012/13 | | (B) Assuming projected population in 2042/43 | |
|---|---|---|---|---|
| | Change in the number of deaths | Change in the number of years of life lost | Change in the number of deaths | Change in the number of years of life lost |
| **Scenario A: Double Walking (+7.6 minutes/day)** | +21 | +772 | +28 | +1029 |
| **Scenario B: Double Cycling (+0.9 minutes/day)** | +5 | +247 | +7 | +329 |
| **Scenario C: Increase Cycling +7.6 minutes/day** | +25 | +1214 | +34 | +1619 |
| **Scenario D: Increase Walking and Cycling +7.6 minutes/day** | +46 | +1986 | +61 | +2648 |

## Key Insights from These Outcomes for Collisions with Motor Vehicles

- The increases in deaths and years of life lost as a result of collisions with motor vehicles are small relative to the decrease in deaths and years of life lost as a result of diseases of low physical activity
- Growth in deaths and years of life lost from collisions with motor vehicles is generally proportional to the increase in population; this means the decrease in deaths and years of life lost as a result of diseases of low physical activity grows over time relative to the increase in deaths and years of life lost as a result of collisions with motor vehicles

# For Increases in Walking, the Reduction in Disease Risk Far Outweighs the Increase in Motor Vehicle Collision Risk

- For increases in walking, the ratio of reduced deaths from diseases of low physical activity to increased deaths from collisions with motor vehicles is about 20 to 1, while the same ratio for years of life lost is about 8 to 1
- The ratio for deaths is larger than the ratio for years of life lost because deaths from diseases of low physical activity tend to be concentrated among older people, who have less years of life remaining to lose, while deaths from collisions with motor vehicles tend to affect all age groups

# For Increases in Cycling, the Reduction in Disease Risk Still Outweighs the Increase in Motor Vehicle Collision Risk

- For increases in cycling, the ratio is about 7 to 1 for deaths and about 3 to 1 for years of life lost
- Although these ratios are still quite favourable, there is no denying that cyclists are at greater risk of collisions with motor vehicles than pedestrians
- None of these figures take into account the fact that, to the extent people shift from travelling by motor vehicle to travel by active modes, motor vehicle fatalities should decline.

# Conclusions

- The outcomes presented here suggest that increases in walking and cycling are likely to lead to significant favourable overall health impacts, even with allowance for some increase in deaths from collisions with motor vehicles
- They also suggest that the favourable health impacts of increased walking and cycling are likely to grow significantly in the future as the population ages.
- The story may be even more favourable than these outcomes suggest; in particular, the health benefits of increased cycling would be even greater were it not for the model assumption that increases in cycling by sex/age group are proportional to baseline cycling by sex/age group
- If older people, who are most at risk from diseases of inactivity, were to cycle more, as they actually do in the Netherlands, the health benefits of cycling would be considerably larger.
- The outcomes, therefore, also suggest the importance of a policy focus on creating a cycling environment that encourages older people to cycle.

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- References for the statistics quoted are cited in the accompanying conference paper
- The authors appreciate the advice and modelling assistance of Ed Randal and Michael Keall of the University of Otago, School of Public Health, but take full responsibility for any errors or omissions.

## Thank you