TRANSPORT AND HEALTH

How transport affects the health of New Zealanders

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Presentation to the Transport Knowledge Hub
22 February 2018
1. How does transport affect health?
2. EHI transport indicators: What is the data telling us?
3. What is the overall health impact of road transport in NZ?
How does transport affect health?
How does transport affect health?

- Traffic crashes
- Road safety for vulnerable road users
- Air pollution
- Noise pollution
- Climate change
- Barriers due to lack of transport
- Public transport
Traffic crashes

- Cause many deaths, injuries, disability
- In NZ, a few hundred people die each year in traffic crashes
- Cyclists, pedestrians and motorcyclists are more vulnerable road users
Air pollution from motor vehicles

Transport is a key source of air pollution

- Particulate matter ($\text{PM}_{10}$, $\text{PM}_{2.5}$)
- Nitrogen oxides ($\text{NO}_x$)
- Carbon monoxide (CO)
- Sulphur oxides ($\text{SO}_x$)
- Carbon dioxide ($\text{CO}_2$)
- Ozone (ground-level)
- Volatile organic compounds (VOCs)
- Hydrocarbons (HC)
- Polycyclic aromatic hydrocarbons (PAHs), eg benzo(a)pyrene (BaP)
Health effects from air pollution

Health effects mainly from: particulate matter (PM$_{2.5}$, PM$_{10}$), but also NO$_2$, CO, others

Health effects include:
- Premature death
- Lung (respiratory) diseases
- Heart (cardiovascular) disease
- Some cancers
Air pollution: All cars and roads are not equal

- **Diesel vehicles** produce
  - more particulate matter (PM)
  - but less CO, hydrocarbons

- Diesel exhaust fumes cause lung cancer

- **Busy roads** have higher air pollution levels
  - Higher health risk within 300–500m of state highways
Noise pollution

Physical activity – active and public transport

- Produces no air/noise pollution, greenhouse gases
- Physical activity reduces the risk of many health issues:
  - Cancer
  - Cardiovascular disease
  - Obesity
  - Mental health
  - Diabetes
  - Bone density
Low physical activity – the health burden

- An estimated 1435 deaths were attributable to low physical activity in New Zealand in 2015.

Deaths attributable to low physical activity in NZ, 2015, by cause

<table>
<thead>
<tr>
<th>Cause</th>
<th>Deaths</th>
</tr>
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<tbody>
<tr>
<td>All causes</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td></td>
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<tr>
<td>Ischemic heart disease</td>
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<tr>
<td>Cancer</td>
<td></td>
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<tr>
<td>Colon and rectum cancer</td>
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<tr>
<td>Cerebrovascular disease</td>
<td></td>
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<tr>
<td>Ischemic stroke</td>
<td></td>
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<tr>
<td>Diabetes mellitus</td>
<td></td>
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<tr>
<td>Breast cancer</td>
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</tbody>
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Note: DALY = disability-adjusted life year, and is the sum of years of life lost (YLL) and years lived in disability/ill-health (YLD).
Source: Global Burden of Disease Study 2015
Other health impacts from transport

Lack of transport

- Barriers to accessing services and goods, eg
  - Healthcare services
  - Shops and healthy food
- Social isolation and loneliness
  - Associated with increased mortality, depression, high blood pressure, dementia

Greenhouse gas emissions from transport sector

- 20% of NZ’s total GHG emissions
Environmental Health Indicators for transport:

What is the data telling us?
What is an environmental health indicator?

- Describes the link between the environment and human health
- Provides information for action
EHI transport indicators

• Number of motor vehicles
• Active transport to and from school
• Main mode of transport to work on Census day
• Household travel time by mode of transport

• Unmet need for GP services due to a lack of transport
• Road traffic injury deaths
• Road traffic injury hospitalisations
The number of motor vehicles is increasing

New Zealand's vehicle fleet, 2000-2016

Source: Ministry of Transport
Car ownership rate per capita is also increasing

In 2014, New Zealand had the highest car ownership rate per capita in the OECD.
Diesel vehicle numbers continue to climb
Children’s mode of transport to school

**Figure 1:** Mode of transport used to get to school, children aged 5–12 years, 1989/90 – 2010–14 (unadjusted prevalence)

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<tr>
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<tr>
<td>Walk (only)</td>
<td>42</td>
<td>30</td>
<td>26</td>
<td>29</td>
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<tr>
<td>Passenger (private vehicle)</td>
<td>31</td>
<td>12</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Bicycle</td>
<td>55</td>
<td>55</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Public transport (including with car or walking)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

*Source: New Zealand Household Travel Survey, Ministry of Transport (2014)*
Main mode of transport to work on Census day

**Figure 4:** Use of active or public transport among commuters, by regional council, 2013 (percentage of commuters)

- **Source:** Census 2013
Unmet GP need due to a lack of transport

- Affected 148,000 New Zealanders in 2016/17 (~3%)
- More than 7% of Māori and Pacific adults affected

Source: New Zealand Health Survey
Traffic crash deaths: An increasing road toll since 2013

Annual road toll in New Zealand, by transport mode, 1990-2017

Number of deaths

Year

Source: Ministry of Transport
Age group patterns in mortality rates vary by mode of transport.
Traffic injury death rate is higher for Māori than non-Māori

Road traffic injury deaths, by Māori/non-Māori and mode of transport, 2005–2014

Age-standardised rate per 100,000

- Vehicle occupant injury: Māori 12.4, Non-Māori 4.8
- Motorcyclist injury: Māori 1.2, Non-Māori 0.9
- Pedestrian injury: Māori 1.7, Non-Māori 0.6
- Cyclist injury: Māori 0.2, Non-Māori 0.2
The highest rate of traffic injury deaths is in the most deprived areas.

**Road traffic injury deaths, by NZDep2013 quintiles and mode of transport, 2010-2014**

- **Vehicle occupant injury**
  - NZDep Q1 (least deprived): 3.3
  - Q2: 3.6
  - Q3: 4.4
  - Q4: 5.2
  - Q5 (most deprived): 7.7

- **Motorcyclist injury**
  - NZDep Q1 (least deprived): 0.6
  - Q2: 0.8
  - Q3: 1.1
  - Q4: 1.2
  - Q5 (most deprived): 1.0

- **Pedestrian injury**
  - NZDep Q1 (least deprived): 0.6
  - Q2: 0.6
  - Q3: 0.5
  - Q4: 0.8
  - Q5 (most deprived): 1.0

- **Cyclist injury**
  - NZDep Q1 (least deprived): 0.1
  - Q2: 0.1
  - Q3: 0.2
  - Q4: 0.1
  - Q5 (most deprived): 0.2

The data shows a significant increase in traffic injury deaths in the most deprived areas compared to less deprived areas.
Motorcyclists at more risk of death, per time spent travelling

Mortality risk per ten million hours travelled, by mode of transport, 2011-2013

- All traffic injury: 1.8
- Occupant injury: 1.6
- Pedestrian injury: 1.5
- Motorcyclist injury: 66.7
- Cyclist injury: 3.2

Source: New Zealand Mortality Collection Dataset & New Zealand Household Travel Survey
Transport injury hospitalisations increased from 2014 to 2016.
Higher hospitalisation rates outside of major towns and cities

Road traffic injury hospitalisation rate, by urban/rural classification, 2014-16

- Vehicle occupant injury: Main urban area 35, Secondary urban area 63, Minor urban area 67, Rural 83
- Motorcyclist injury: Main urban area 15, Secondary urban area 24, Minor urban area 26, Rural 29
- Pedestrian injury: Main urban area 9, Secondary urban area 7, Minor urban area 7, Rural 6
- Cyclist injury: Main urban area 4, Secondary urban area 6, Minor urban area 2, Rural 1

Note: Urban/rural classification is for 2013. Main urban areas refer to major towns and cities with a population of 30,000 or more. Secondary urban areas are smaller towns with a population of 10,000–29,999 people. Minor urban areas are towns with a population of 1,000–9,999 people. Rural areas include rural centres, and rural areas outside of these.

Source: National Minimum Dataset
Regional differences in transport injury hospitalisation rate

Road traffic injury hospitalisation rate, by District Health Board, 2016

Age-standardised rate per 100,000

District Health Boards vs New Zealand

District Health Board

Northland: 154
Waitemata: 72
Auckland: 71
Counties Manukau: 73
Waikato: 95
Lakes: 99
Bay of Plenty: 108
Tairawhiti: 145
Hawkes Bay: 92
Taranaki: 90
MidCentral: 72
Whanganui: 60
Capital and Coast: 48
Hutt: 55
Wairarapa: 91
Nelson Marlborough: 74
West Coast: 108
Canterbury: 63
South Canterbury: 71
Southern: 64
New Zealand: 77

EHI TRANSPORT INDICATORS
Children’s road traffic injuries (0-14 years)

Children’s traffic injury deaths (among children aged 0-14 years), 2001-2014, numbers and crude rate per 100,000
Unequal impacts seen for children as well

Children’s traffic injury deaths by ethnic group (2009-2014) and NZDep2013 quintiles (2010-14), (crude rate per 100,000)

By ethnic group

By NZDep2013 quintiles
What is the overall health impact of road transport in New Zealand?
Our approach – a ‘rapid assessment’

- Aims to answer the question: ‘How many deaths in NZ are attributable to road transport?’
- Estimated the health burden from:
  - Motor vehicle traffic crashes
  - Air pollution ($\text{PM}_{10}$, $\text{NO}_2$)
  - Noise pollution
- Used an ‘environmental burden of disease’ method
  - Used by the World Health Organization
- Co-authors of the study: Professor David Briggs and Professor Barry Borman
Conceptual framework

Economic activity
- Cars (V) → Vehicle km travelled
- Motor cycles (V) → Vehicle km travelled
- Light goods vehicles (V) → Vehicle km travelled
- Heavy goods vehicles (V) → Vehicle km travelled
- Buses (V) → Vehicle km travelled

Transport policies
- Fiscal policies
- Environmental policies
- Age structure
- Population distribution
- Socio-economic status
- Public transport
- Urban structure
- Design for mobility

By source type
- Emissions (T) PM$_{10}$ → Concentration (ug/m$^3$) PM$_{10}$ → Exposure (Pug/m$^3$) PM$_{10}$
- Emissions (T) NO$_{2}$ → Concentration (ug/m$^3$) NO$_{2}$ → Exposure (Pug/m$^3$) NO$_{2}$
- Emissions (T) CO → Concentration (ug/m$^3$) CO → Exposure (Pug/m$^3$) CO
- Emissions (T) VOC → Concentration (ug/m$^3$) VOC → Exposure (Pug/m$^3$) VOC
- Concentration (ug/m$^3$) Ozone → Exposure (Pug/m$^3$) Ozone

By activity level
- Exercise (P)
- Exercise (P)

By activity type
- Respiratory disease (P)
- Cancer (P)
- Cardiovascular Disease (P)
- Mortality and Morbidity; Disability Adjusted Life Years
- DALYs (by agent/pathway and source type)

Accidents (P)
Injuries (P)

P = persons; V = vehicles; km = kilometres; T = tonnes; dB = decibels of sound; dBA = perceived noise levels in decibels
Environmental burden of disease method

1. Identify the diseases caused by each exposure
   - PM$_{10}$: All-cause mortality
   - NO$_2$: All-cause mortality
   - Road traffic noise: ischaemic heart disease, stroke, hypertensive diseases

2. Identify % of NZ population exposed to each exposure

3. Calculate % of deaths attributable to exposure (‘population attributable fraction’, PAF)

4. Get the number of deaths for identified diseases

5. Calculate number of attributable deaths

HEALTH BURDEN OF ROAD TRANSPORT
Health burden of road transport in New Zealand

Road transport accounted for an estimated 650 deaths in 2012

Comments from this study

Lack of exposure/monitoring data in New Zealand
  • We estimated:
    • population exposed to high nitrogen dioxide levels
    • population exposed to road traffic noise
  • Our study excluded exposure to ozone, VOC, CO

NZ results were comparable internationally
  • But higher health loss from road traffic crashes

Showed importance of considering health impacts outside of road crashes
Summary:
What does it all mean?
Key messages

- High reliance on cars in New Zealand
- Road transport has a substantial impact on health in NZ
  - Traffic crashes, air pollution, noise pollution, barriers to accessing services
- Unequal impacts of transport on health
  - Motorcyclists, and to a lesser extent, cyclists
  - Māori and Pacific peoples, people living in high deprivation areas
  - People living close to busy roads
Key messages

Evidence supports encouraging more use of active and public transport
  • Move away from reliance on car use and fossil fuels

Active and public transport have multiple benefits
  • less air pollution, noise pollution, greenhouse gases
  • more physical activity

improvement in the health and wellbeing of NZers
To find out more
Monitoring New Zealand’s Environmental Health

Our Environmental Health Indicators give you information and statistics on how the environment affects the health of New Zealanders. Our team is part of the Centre for Public Health Research, Massey University, and offers research, training and consultancy services.

Environmental Health Indicators

AIR QUALITY  RECREATIONAL WATER  DRINKING-WATER QUALITY

INDOOR ENVIRONMENT  TRANSPORT  HAZARDOUS SUBSTANCES
Transport

This section provides data and statistics on transport and health in New Zealand. Find out about how transport affects health, types of transport used by New Zealanders, and how a lack of transport affects people's access to healthcare.

About transport and health
Information about how transport impacts on human health in New Zealand.

Indicators at a glance - Transport
This section summarises the latest Environmental Health Indicators about transport and health in New Zealand.

Motor vehicles
Statistics on motor vehicle numbers and average ages of vehicles in New Zealand.

Main mode of transport to work on Census day
Statistics on the main mode of transport that people used to get to work on Census day.

Household travel time by mode of transport
Statistics on the percentage of household travel time spent travelling by
About transport and health

- Transport can impact on the occurrence of transport-related injuries and deaths, as well as activity. Transport related emissions, a lack of active travel, social interaction and a lack of exercise are important issues.
- New Zealanders are relatively sedentary and have the highest obesity rates in the OECD.
- Road transport was an issue in 2012 (1086) and 2013 (1019) from road accidents.
- Active forms of transport are popular, but vary across age groups and regions of health benefit.

Transport plays an important role in supporting the health of New Zealanders. Traffic injuries are the second highest reason for hospital admissions in New Zealand. A lack of transport can affect health and the ability to access services.

Road traffic injury hospitalisations in New Zealand

- Traffic injury hospitalisations have decreased from 2000 to 2013.
- Motorcyclists are at a higher risk of hospitalisation than pedestrians or cyclists.
- Young people have a higher hospitalisation rate than older age groups.
- People living in the most deprived areas had the highest rates of hospitalisation.

How a lack of transport can affect health

Access to transport is important for accessing health services and community services. A lack of transport can affect health and the ability to access services.

Road traffic injury mortality in New Zealand

- In 2015, there were 1190 traffic deaths. This included 232 vehicle occupant deaths, 54 motorcyclist deaths, 25 pedestrian deaths and 5 cyclist deaths.
- The number of traffic deaths has decreased substantially from 1990 to 2015.
- Motorcyclists and cyclists were at higher risk of traffic injury mortality per person travelling.
- Men have a higher traffic mortality rate than women.
- Young people aged 15-24 had the highest rate of traffic injury mortality.
- People living in the most deprived areas had a higher mortality rate of traffic injury.

The health impact of road transport accidents

Traffic-related deaths and injuries are the main health impact of road transport in New Zealand (Briggs et al 2016). Each year, 200-400 people die on New Zealand roads. Traffic injuries affect all types of road users, however, pedestrians and cyclists are at particular risk. Motorcyclists and motorcyclists are at a higher risk of traffic injury mortality per person travelling.

Data for this indicator

The data for this indicator come from the New Zealand Health Survey defined by having a medical problem but not visiting a GP or ear, nose, and throat doctor. The results are presented for children aged 2-14 years and adults aged 15 years and over.

About 144,000 New Zealanders missed out on a GP visit due to no transport in 2013/14.

In 2013/14 about 3% of New Zealanders had a medical problem but did not visit a GP due to a lack of transport, in the past 12 months (people 2-17 years, 3.8%, 95% confidence interval 3.3%, 4.4%). This is about 144,000 adults and 21,000 children.

There has been no significant change in the proportion of people with severe problems in need of a GP due to a lack of transport between 2012/13 and 2013/14.

Data for this indicator

The data are presented for all transport modes, however, children under 12 years and adults aged 65 years and over are included.
HealthSpace – an online mapping tool for exploring regional health data

Welcome to healthspace

Healthspace provides data and information, in the form of interactive maps, graphs and tables for a wide range of health indicators. New Zealand data is presented at a range of sub-national levels including: Regional Council, District Health Board, Territorial Authority, Local Area Ward and Census Area Unit levels.

View online maps and profiles:

Do I need to log in?
Most healthspace atlases are publicly available to view and access. Some atlases are only available to authorised users and require a login.
Log in here

<table>
<thead>
<tr>
<th>Alcohol Related Harm</th>
<th>Cancer</th>
<th>Child and Youth</th>
<th>How healthy is my DHB?</th>
<th>Education</th>
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<tr>
<td>Environmental Health Indicators</td>
<td>Hauora Online</td>
<td>Hazardous Substance Surveillance</td>
<td>Healthy Families NZ authorised users only</td>
<td>Hospital use</td>
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<td>NZ Census Population Economic Indicators</td>
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<td>NZ Health survey Children</td>
<td>Notifiable diseases</td>
<td>Oral health of children</td>
<td>Pacific Health Statistics</td>
</tr>
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</table>

Risk behaviour | Self-harm statistics

healthspace.ac.nz
HealthSpace example: Using active transport to work, by territorial authority, 2013
Thank-you for your time!

For more info, visit our websites:
www.ehinz.ac.nz
healthspace.ac.nz

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