Quantifying the potential of active transport for health

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Burden of Disease Epidemiology, Equity and Cost-Effectiveness Programme
Background

• High car dependency

• Low physical activity

• High transport-related GHG emissions

• Reducing car use and increasing active transport shown to improve health from city-level to internationally
Modelling health impacts

• Common metric:
  Quality Adjusted Life Year (QALY)

• Longitudinal

• Necessity of comparison
Aims

• To estimate the health impact (in QALYs) of switching short trips to walking and cycling

• To estimate health system costs associated with modelled changes in transport patterns

• To estimate change in transport-related carbon emissions associated with changes in transport patterns
Model Structure

INTERVENTION

Switching car trips to walking and cycling

RISK FACTOR

Δ Physical activity (MVPA-METmins/week)

Δ Air pollution (PM2.5)

Δ Distance travelled (by mode)

DISEASE

Colorectal cancer

Breast cancer

Stroke

CHD

Diabetes

Lung cancer

COPD

LRTI

Road injuries

OUTPUTS

Δ Transport-related emissions

Δ Health system costs

Δ Quality adjusted life years
There-and-back

Home 0.9km Work 0.9km Home

Home 3km Work 3km Home

Home 2km Work 0.5km Shop 1.5km Home

No change
Physical activity increases

- First scenario: Home - 0.9km, Work - 0.9km
  - Home - Work - Home
  - Time change: +24.5mins

- Second scenario: Home - 3km, Work - 3km
  - Home - Work - Home
  - Time change: +34.2mins

- Third scenario: Home - 2km, Work - 0.5km, Shop - 1.5km
  - Home - Work - Shop - Home
  - No change
## Proportion of trips by mode

*100% uptake*

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Walking scenario*</th>
<th>Walking and cycling scenario*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pedestrian</strong></td>
<td>16</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td><strong>Cyclist</strong></td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td><strong>Motorbike</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Motor vehicle</strong></td>
<td>82</td>
<td>79</td>
<td>64</td>
</tr>
</tbody>
</table>
Health impact

(a) Under 1km to walking

(b) Under 5km switched to walking and cycling

Total QALYs gained

Percentage uptake

100% 50% 25% 100% 50% 25%
Comparison of health gains

(b) Under 5km switched to walking and cycling (100% uptake)
- UK salt reduction package
- Tobacco-free generation

(b) Under 5km switched to walking and cycling (50% uptake)
- Tobacco tax increases (annual 10% increase)

(b) Under 5km switched to walking and cycling (25% uptake)
- UK salt reduction mass media campaign

(a) Under 1km to walking (100% uptake)

(a) Under 1km to walking (50% uptake)
- Reducing tobacco outlets by 95%

(a) Under 1km to walking (25% uptake)

Total QALYs gained

Salt
Tobacco control
Transport
Risk factor contribution

(a) Under 1km to walking
(b) Under 5km switched to walking and cycling
Timing of health gains

(a) Under 1km to walking
(b) Under 5km to walking and cycling

Total QALYs gained

Year

2011-2020
2021-2030
2031-2040
2041-2050
2051-2060
2061-2070
2071-2080
2081-2090
2091-2100
2101-2110
2111-2120

Age group
- 80+ years
- 60-79 years
- 40-59 years
- <40 years

100%
Health system cost savings

(a) Under 1km to walking
(b) Under 5km switched to walking and cycling

Health system costs (NZ$millions)

Percentage uptake

100% 50% 25%

100% 50% 25%
# Emissions impacts

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Percentage uptake</th>
<th>Vehicular</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) switching car trips ≤1km to walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>-22.5 (-32.0 to -13.5)</td>
</tr>
<tr>
<td>50%</td>
<td>100%</td>
<td>-11.3 (-15.8 to -6.9)</td>
</tr>
<tr>
<td>25%</td>
<td>100%</td>
<td>-5.6 (-7.8 to -3.4)</td>
</tr>
<tr>
<td>(b) switching car trips ≤1km to walking and those 1-5km to cycling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>-436.4 (-607.2 to -267.6)</td>
</tr>
<tr>
<td>50%</td>
<td>100%</td>
<td>-218.0 (-302.5 to -136.0)</td>
</tr>
<tr>
<td>25%</td>
<td>100%</td>
<td>-108.1 (-153.3 to -65.7)</td>
</tr>
</tbody>
</table>
## Emissions impacts

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Percentage uptake</th>
<th>Vehicular</th>
<th>Dietary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) switching car trips ≤1km to walking</td>
<td>100%</td>
<td>-22.5 (-32.0 to -13.5)</td>
<td>24.8 (15.4 to 34.5)</td>
<td>2.4 (-11.1 to 15.3)</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>-11.3 (-15.8 to -6.9)</td>
<td>12.4 (7.6 to 17.5)</td>
<td>1.1 (-5.3 to 7.6)</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>-5.6 (-7.8 to -3.4)</td>
<td>6.1 (3.7 to 8.5)</td>
<td>0.5 (-2.7 to 3.8)</td>
</tr>
<tr>
<td>(b) switching car trips ≤1km to walking and those 1-5km to cycling</td>
<td>100%</td>
<td>-436.4 (-607.2 to -267.6)</td>
<td>241.3 (156.6 to 330.2)</td>
<td>-194.4 (-377.2 to -3.1)</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>-218.0 (-302.5 to -136.0)</td>
<td>121.3 (79.0 to 163.8)</td>
<td>-97.5 (-192.5 to -2.7)</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>-108.1 (-153.3 to -65.7)</td>
<td>60.3 (39.6 to 81.8)</td>
<td>-47.2 (-96.9 to -1.9)</td>
</tr>
</tbody>
</table>
Strengths and limitations

• Value of comparison

• Individual level trip switches

• Active transport → BMI association
Obesity impact?
Policy options

- Reduce speeds
- Cycle lanes
- Urban space allocation
- Enforcement
Urban space allocation
Urban space allocation
Next steps?

- Total burden of transport
- Zero Carbon Act
- Dissaggregation
- Intersection with other health issues
Summary

• Switching short trips to walking and cycling would have positive health impacts, reduce healthcare costs, and may also reduce greenhouse gas emissions

• Modelling allows us to compare the health gains from different policy options
Thank you!

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