Transport, Health, and Inequalities

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How does transport affect health?

• Benefits
• Problems
• Synergies with other policies
• Inequalities
Landmark publications

- *Journal of Transport and Health* 2014 - [www.elsevier.com/locate/jth](http://www.elsevier.com/locate/jth)
Access to good, services, and people

- Employment
- Education
- Shops
- Health and other services
- Social support networks
- Recreation

- Access vs Mobility
• Mobility – ability to travel greater distances
• Longer distances the norm but beneficial?
Physical activity, trends in walking and cycling & the obesity epidemic

- In England, obesity:
  - causes c.9,000 premature deaths annually,
  - each losing nine years of life on average,
  - and costs > £5bn per year
Child obesity & overweight (aged 2-15y)

Year (mid year of moving average)

Percent

Boys obese
Boys overweight incl obese
Girls obese
Girls overweight incl obese

1995 - 2013, by sex
Trends in obesity and overweight in adults (aged 16+) in England, HSE 1993 – 2013

- Men raised WC
- Women raised WC
- Men obese
- Women obese

Year (3yr moving average)
Prevalence of doctor-diagnosed diabetes, 1994-2012, by sex, aged 16+
Health benefits of walking and cycling

• 41% of the adult population in England are insufficiently active
  – (HSE 2012: 35% men, 46% women)
• Walking and cycling:
  – can provide the same health benefits as sports or other exercise
  – can increase cardiorespiratory fitness
  – to work is as effective as a training programme and can fulfil the recommendations for physical activity.
Active travel

• Even in men from households with cars, men who walk or cycle to work have a lower rate of death from ischaemic heart disease than men who travel to work by car - with public transport users having in-between rates.

• Studies in Denmark, China, and the UK have found substantial mortality benefits of regular cycling.
Active travel

- Physically active men and women (including cyclists) have the explosive muscle power of someone 10 years younger

- 55-year-old cyclists had the aerobic fitness of people 30 years younger.
Obesity

- Walking uses 4kJ (1kcal) /km/kg bodyweight, almost independent of pace.

- Obesity risk:
  - increases by 6% for each hour spent in a car per day
  - falls by 4.8% for each km walked per day

- Pedestrian-permeable street designs are associated with 6lb lower mean population weight than pedestrian-impermeable environments.

Even in active people

- Car commuters in Adelaide, Australia gained more weight over a 4yr study than non-car commuters. The effect was particularly pronounced when comparing those who had sufficient leisure time PA.

Changes in mode of travel & BMI

• Switching from car to active travel or public transport: BMI fell 0.32kg/m\(^2\) (95% CI 0.05-0.60)
• Switching from car to active travel: BMI fell 0.45kg/m\(^2\) (95% CI 0.11-0.78)
• Switching from active travel or public transport to car: BMI rose 0.34kg/m\(^2\) (95% CI 0.05-0.64)

Benefits of walking and cycling

- Activity
- Age-independent
- Affordable
- Access
- Air quality
- Flexibility
- Mental health
- Less sick leave
- Longevity
- Safety in numbers
Risks and benefits of travel - cycling

• Compared with car users, the estimated annual change in mortality of the Barcelona residents using Bicing (n=181 982)
  – 0.03 deaths from road traffic incidents
  – 0.13 deaths from air pollution.
  – 12.46 deaths avoided by physical activity

  – 12.28 deaths avoided pa: Benefit:Risk ratio 77
  – Annual CO$_2$ emissions reduced by >9m kg

Rojas-Rueda D et al. The health risks and benefits of cycling in urban environments compared with car use: health impact assessment study. *BMJ* 2011;343:d4521 [http://dx.doi.org/10.1136/bmj.d4521](http://dx.doi.org/10.1136/bmj.d4521)
Importance of location

• Warsaw:
  – Air pollution, noise and injuries: health risk of 58,000 DALYs pa
  – Physical activity: health benefit of 17,000 DALYs pa


Air Pollution, and Climate Change
Every breath we take: the lifelong impact of air pollution. RCP & RCPCH, 2016.

- Around 40,000 deaths pa attributable to exposure to outdoor air pollution:
  - cancer, asthma, stroke and heart disease, diabetes, obesity, and changes linked to dementia
- In the UK, costs for individuals, NHS, and to business is more than £20 billion every year.

https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution
Air Pollution, and Climate Change

• Motor transport a major source of emissions of pollutants:
  – CO, PM, NOx,
  – VOCs: e.g. benzene, 1,3-butadiene, polycyclic aromatic hydrocarbons (PAHs)
• Photochemical reaction in sunlight between NOx and VOCs to form ozone
• Cardio-respiratory effects
What is the greenest mode of transport?

CO₂ emissions per travelers kilometer

Source: Milieucentraal
Injuries – Great Britain 2015

- 186,209 road traffic casualties (4% fall since 2014)
- 22,137 serious injuries (3% fall since 2014)
- 1,732 fatalities

- 2005-07, 4.2% YOLL <75y

- Fatality rates second lowest on record (lowest was 2013)
  - but 5 deaths and 61 serious injuries per day
  - Car occupants 755 deaths
  - Pedestrians 409
  - Cyclists 100
  - Motorcyclists 365
Comparative risks

• Lifetime risk
  – Road traffic fatality: one in 240
  – Cycling one hour every day for 50y: one in 140
    (~ average European driver)
  – Smoking 20 cigarettes/d: one in two
    Motorcyclists’ risk >10 times greater than other classes of road user

• Risk per year, All ages
  – UK Cyclists: 1 in 23,000
  – UK Drivers: 1 in 30,000
  – French drivers: 1 in 10,000
Aim:

To make like-for-like comparisons across travel mode by age and sex
Comparative fatality risk for different travel modes by age, sex, and deprivation

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ABSTRACT

\textbf{Background:} Cycling is perceived as an unsafe travel mode in many countries. However, road deaths in England have fallen sharply since 2007. We explored whether differences in fatality rates by age, gender and mode persist, and the associations of deprivation with these.

\textbf{Methods:} Using ONS (cycling, pedestrian) and Stats19 (driving) 2007–2012 data for travel-related deaths, including pedestrian falls, and National Travel Surveys 2007–2012 travel data, we calculated fatality rates for England by distance (f/bnkm) and time travelled (million hours’ use, f/mhu) by age, travel mode, and gender or residential Index of Multiple Deprivation.

\textbf{Results:} Fatality rates fell significantly 2007–2009 to 2010–2012: male f/bnkm from 2.8 (95\%CI 2.7–2.9) to 2.0 (1.9–2.1) for driving; 32.1 (28.5–36.0) to 20.8 (18.1–23.9) for cycling; and 51.4 (48.5–54.4) to 36.7 (34.3–39.3) for walking. Fatality rates varied by age, gender, and mode. Driving and walking fatality rate ratios were generally higher for males than females. For males 17–20y, fatality rates were 0.76 (0.69–0.83)/mhu for driving and 0.28 (0.18–0.42)/mhu for cycling but were similar by distance. Age-specific rates were J-shape for cycling, U-shape for driving, and increased exponentially with age for walking. Fatality rates aged 80+ were an order of magnitude higher in each mode than the all-age mean. Compared with those aged 17–20, rate ratios were significantly lower for male drivers 21+ and female drivers 21–74, but were higher for male cyclists aged 55+ and pedestrians 45+ (male) and 65+ (female). People living in the most deprived quintile generally had higher fatality rates than those in the least deprived quintile overall (three modes combined) and for walking but not for cycling; Rate ratios were highest for pedestrians 35–64 and drivers 35–54.

\textbf{Conclusions:} Fatality rates for walking, cycling and driving are higher for males than females at almost every age and vary more by age than by travel mode. Deprivation exacerbates walking
Fatalities per billion km by mode and sex, aged 17-69, 2007-2012

- 95% CI

- Cyclist
- Driver
- Pedestrian
Fatalities per million hours by mode
Aged 17-69, 2007-2012
Fatalities per million hours by mode
Aged 70+, 2007-2012
Health inequalities from busy roads
Noise pollution

- Raised blood pressure
- Interference with concentration and with sleep
- Disruption of education
Spatial planning

- Urban sprawl increases distances to be travelled
- Mixed development reduces them
- Pedestrian permeability
- Roads vs streets
- Parks and green space ↑ walking
- Green streets ↑ walking
- ‘Complete streets’
Other impacts on health

• Loss of land e.g. Los Angeles:
  – 1/3 of LA area is roads
  – 1/3 of LA land is car parking.

• Planning blight

• Tarmac replacing greenery

• Effects on heat islands, run-off, water contamination, mental wellbeing, physical activity
Parking

• Parking distorts the value of land, property and services in favour of car owners.
• It enforces the dominance of the car in our built and social environment.
• It creates an inhospitable environment for pedestrians.
• Parked cars can provide a hazard to everyone and especially to older people, children and visually impaired people.
Inequalities in access to transport modes

- Inequalities in BENEFITS as well as HARMS of transport

- Affordability
- Accessibility
- Availability
- Acceptability
- Appropriateness
Population vehicle ownership rates globally by per capital GDP
Inequalities and transport

- Age
- Sex
- Social
  - within countries
  - between countries
Inequalities and social exclusion

• Access
  – Poverty
  – Gender
  – Age
  – Rurality

• Air pollution
• Noise pollution
• Injuries & fatalities
• *SEU report Making the Connection*
Transport and inequalities in adverse effects

• Age:
  – young & old disproportionately in poorer groups
  – Less car access
  – more exposure & more susceptibility

• Sex: Women less car access than men

• Socio-economic
  – within countries
  – between countries (eg effects of climate change)
Asher L, Aresu M, Falaschetti E, Mindell JS. Most older pedestrians are unable to cross the road in time: a cross sectional study. *Age Ageing*. 2012;41:690-4
Living Streets Campaign

Used HSE 2005 timed walk data to show road crossings are set too quickly for more than 3 in 4 older people.

Currently
1.2 m/s

Men 65+
0.9 m/s

Women 65+
0.8 m/s
Living Streets Campaign

Currently 1.2 m/s

Men 65+ 0.9 m/s

Women 65+ 0.8 m/s
Living Streets Campaign

Reduce the assumed walking speed to 0.8 m/s, so most older people could cross comfortably.

Currently 1.2 m/s

- Men 65+: 0.9 m/s
- Women 65+: 0.8 m/s
“I have arthritis and use a walking stick. Many of the pavements are cracked and I have fallen on several occasions.” (S1 survey participant)
1. Proportion reporting noise and air pollution as a problem was highest for those who lived within the closest distance of the busiest road.

2. People also reported that the pavement conditions are not adequate for people with disability. 22% reported that they did not visit Finchley Road as conditions were not adequate or felt there was nothing there to attract them.
Recent publications

  – Large differences exist in the volumes of travel by various groups in society.
  – These differences are decreasing over time.
  – There are large differences in access between urban and rural areas.
  – Cultural factors contribute to differences in access.
  – Casualty rates and vehicle emissions impact more on the poor than the rich.


- Lack of access to transport can lead to social exclusion and poor social capital, which impact on health.
- Walkable built environments promote social capital and social cohesion, both of which benefit health.
- Traffic can lead to smaller social networks, which impacts on physical and mental health.

Figure 4.6 Proportion reporting any cycling in a typical week in the previous year, by social grade, 2006 and 2009

Source: Department for Transport

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Pedestrian casualty rate by deprivation

Almost four-fold difference in child pedestrian casualties
WHAT ARE THE POTENTIAL IMPACTS OF BUSY ROADS ON HEALTH INEQUALITIES?
Mobility and destinations

% at least occasionally affected by volume of traffic (own road): P=0.002

- 500-799m
- 250-499m
- 0-249m

0 10 20 30 40 50 60 70
Health inequalities from busy roads
Air pollution

• Poorer people:
  – More exposed to air pollution from motor traffic
  – More susceptible to health impacts of pollution
Noise / air pollution
(% problem on road): P=0.002

- 500-799m
- 250-499m
- 0-249m

All
Health inequalities from busy roads

Injuries

Rate of fatality (all modes) per billion km by IMD quintile, persons, England, 2007-12

- Injury rates higher in more deprived areas
- More deprived people more likely to be killed in road traffic crash
Health inequalities from busy roads
Social isolation

• Poor - worse health
  – less able to walk or cycle
  – Less likely to own a car
  – Less likely to afford public transport

• Frail, elderly, disabled: less able to cross the road (bus stops)

• Fewer other options for safe spaces to meet and socialise (old, young)
Policy Objective E
Create and develop healthy & sustainable places & communities

1. Develop common policies to reduce the scale & impact of climate change and health inequalities
Recommendation E.2.1

- Prioritise policies & interventions that reduce both health inequalities & mitigate climate change by:
  - Improving active travel across the social gradient
  - Improving good quality spaces across the social gradient
  - Food environment
  - Energy efficiency of housing
Policy

• Reducing social exclusion
• Promoting walking and cycling
  – Better networks
  – Cycle facilities
  – Train/Cycle combination
• New approaches to congestion
• 30kph in residential streets; 50kph elsewhere in towns
• Revitalising public transport
  – Networks not journeys
  – Affordability
Sustainability and congestion

- Sustainability
  - Synergy with healthy transport policies

- Congestion - the case for:
  - a National Integrated Transport Web
  - active travel,
  - road charging, and
  - working at home
Sir Liam Donaldson
Chief Medical Officer

• “The potential benefits of physical activity to health are huge. If a medication existed which had a similar effect, it would be regarded as a ‘wonder drug’ or ‘miracle cure’.”

(Annual Report of the Chief Medical Officer 2009, DH, March 2010)
Community severance?

“the separation of residents from facilities and services they use within their community, from friends and relations, and, perhaps, from place of work as a result of changes in road patterns and traffic levels” DoT, 1983 (in relation to trunk roads)

“the sum of the divisive effects a road has on those in the locality” Clark et al, TRL, 1991
Community severance?

- Transport-related community severance is the variable and cumulative negative impact of the presence of transport infrastructure or motorised traffic on the perceptions, behaviour, and wellbeing of people who use the surrounding areas or need to make trips along or across that infrastructure or traffic.
Stress, social support, and community severance

**Stress** adversely affects health
  - Transport and stress (e.g. noise, driving, lack of transport options)
  - Perceived danger

**Community severance**
  - Social networks
  - Use of streets as social spaces
  - Children’s independence
Community severance

- Appleyard and Lintell,
- San Francisco