

Transport is a health issue

Transport is an influence on many determinants of health. Injuries and air pollution are often thought to be the major impacts, but the indirect effects, especially on physical activity, have an enormous influence on population health.

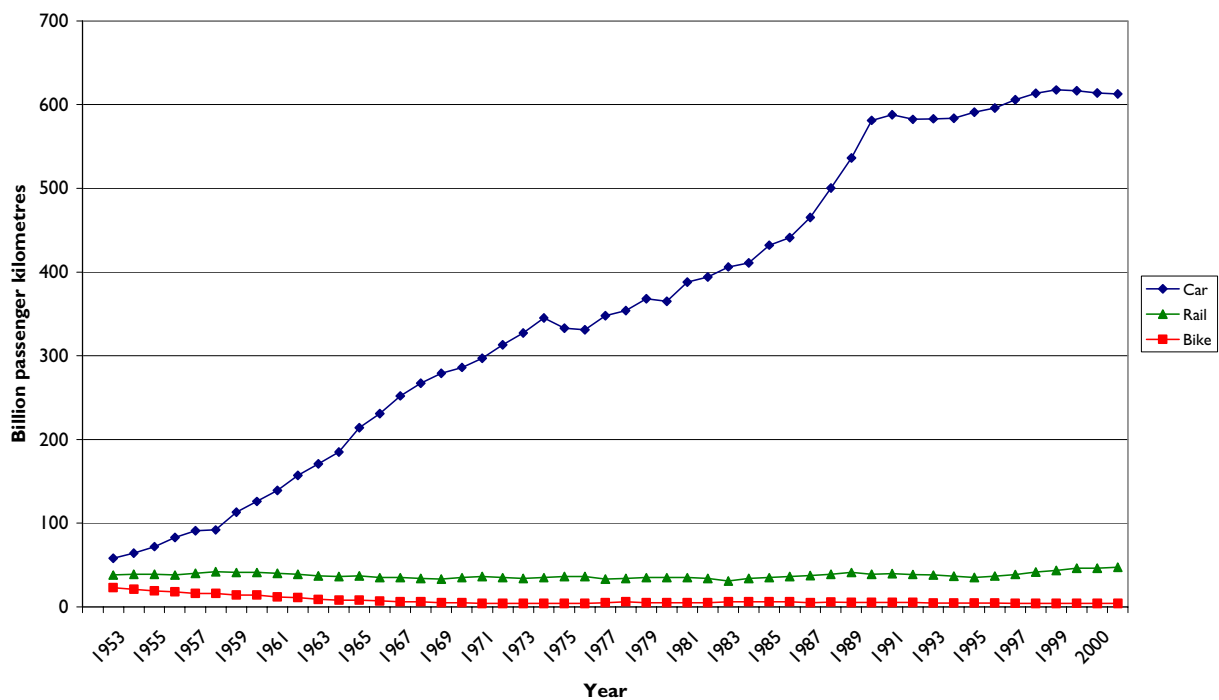
This paper reviews trends in transport patterns, then considers the health impacts in terms of the effects on individuals, communities and the environment. It concentrates on land-based transport for the sake of brevity, but there are many important impacts, especially on the environment, from air and sea transport; these should not be ignored.

Transport patterns

There has been a massive shift in personal transport in the last 50 years, with people moving away from walking and cycling in favour of driving. Car traffic has increased over ten fold in the last 50 years, while cycling has fallen by over 80% (see figure 1).¹

As average disposable income has grown over the last 20 years, so the overall cost of motoring has remained at or below its 1980 level in real terms. But public transport fares have risen in real terms over the last 20 years. In 2001, bus and coach fares were 31% higher and rail fares 37% higher than in 1980.²

Figure 1: GB passenger transport by mode 1952-2000 (Source: DfT)



The number of trips made by car continues to grow, while rail travel remains constant and walking, cycling and bus use decline (see table 1). Around 80% of journeys under one mile are made on foot, with an average walking journey distance of 0.6 miles.³ Cycling accounts for 0.6% of total distance travelled, an average of 39 miles per person per year.⁴ 63% of all trips are made by car, with an average trip length of 8.7 miles; cars are used for 18% of trips under 1 mile and 61% of trips between 1 and 2 miles.⁵

Table 1: Average number of trips made per year by different modes of travel 1985/86-1999/01 – categorised by main mode (Source: DfT)⁶

	<i>Car</i>	<i>Walk</i>	<i>Local bus</i>	<i>Rail/tube</i>	<i>Bicycle/motorcycle</i>	<i>Other</i>
1985/86	517	350	83	18	34	24
1989/91	619	328	73	18	27	25
1992/94	618	306	67	17	23	23
1995/97	637	293	62	17	20	23
1999/01	638	263	57	20	19	22
1998/00	639	271	58	19	19	24

Impacts of transport on individuals

The main impacts of transport on individuals are through physical activity, injuries, air pollution, and access. These are dealt with in turn below:

Physical activity

Evidence for the health benefits of physical activity has been accumulating since Morris showed in 1953 that bus conductors had lower rates of heart attacks than bus drivers.⁷ There is now an extensive and reliable body of evidence on the health benefits of physical activity⁸, ranging from reductions in heart disease⁹, high blood pressure¹⁰, stroke¹¹, cancer¹² and diabetes¹³, to improved mental health and well-being¹⁴, and improved cognitive function¹⁵ and independence among older people¹⁶.

There are 236,000 deaths a year from cardiovascular disease in the UK; this is 39% of all deaths, and 36% of premature deaths in men, 28% in women. Over 36% of deaths from coronary heart disease (CHD) are attributable to sedentary lifestyle¹⁷ - ie around 85,000 deaths a year. Cardiovascular disease is a major source of health inequalities, with 58% higher mortality in male manual than male non-manual workers.¹⁸

It has been estimated that 14% of UK CHD deaths could be avoided by increasing activity by one 'level' – ie from inactive to minimally active, or moderately active to very active.¹⁹

Regular physical activity produces a 20-40% reduction in all-cause mortality²⁰ and adds one to two+ years of healthy life.²¹ There is a dose-response relationship between physical activity and CHD - even very low levels of activity are better than none at all, but the more one does the greater the health benefit.

The National Audit Office has recently highlighted the continuing increase in obesity in England. Obesity has trebled in the last 20 years and now affects 20% of adults. Obesity shortens life by an average of 9 years, and creates £0.5 billion direct costs to the NHS, and £2.0 billion to the economy, each year.²²

Recent evidence of a specific link between car use and health comes from a Chinese study: 14% of Chinese households acquired a car between 1989 and 1997, with men who acquired a car gaining 1.8kg and doubling their risk of obesity relative to those without cars.²³

Injuries

In 2001 there were 3,450 deaths, 40,560 people killed or seriously injured, and 313,000 injuries on UK roads. Cyclists made up 3.9% of the total mortality, with 136 deaths.²⁴

The perception that cycling is a dangerous activity is not borne out by the facts: in the UK there is one cyclist death per 29,000,000 km cycled.²⁵ If one stratifies deaths and serious injury by age for drivers and cyclists (and removes data relating to motorway injuries in order to compare journeys on equivalent roads) it becomes apparent that among young men driving is far more hazardous than cycling, as shown in table 2.

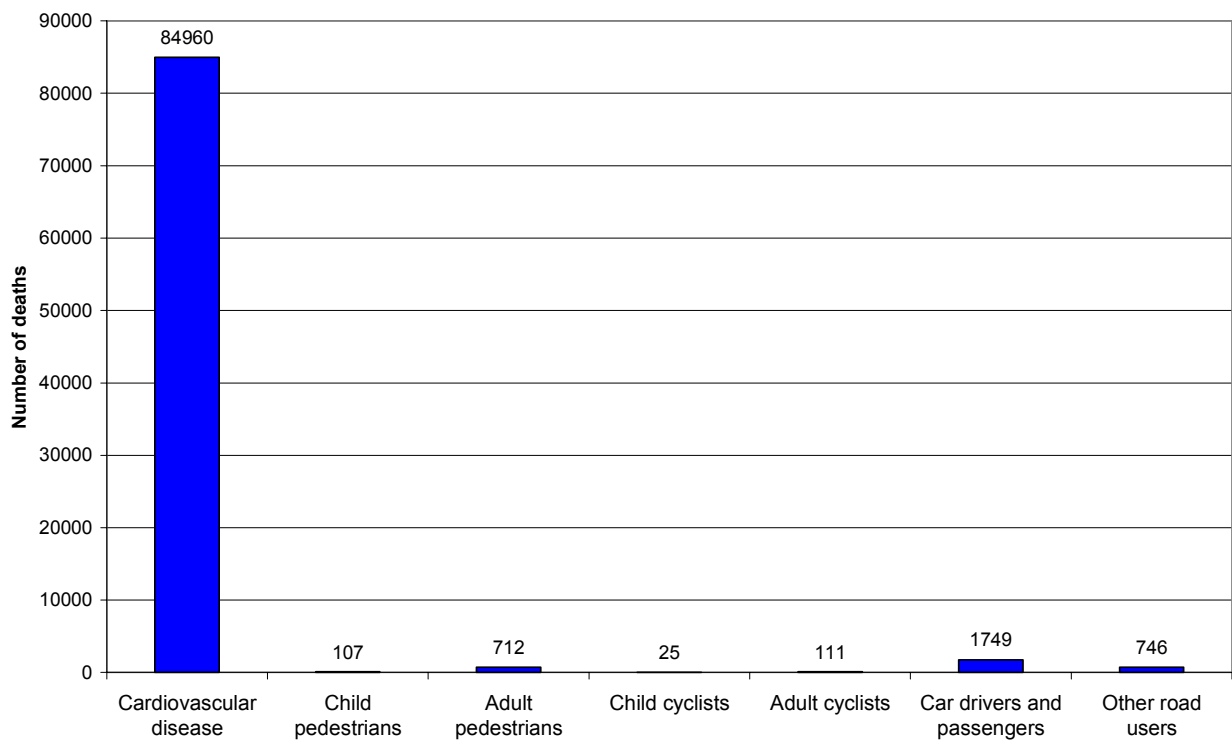
Table 2: Risk of injury per million kilometres travelled (Source: EU data)²⁶

Age	Drivers	Cyclists
12-14	-	16.8
15-17	-	18.2
18-24	33.5	7.7
25-29	17.0	8.2
30-39	9.7	7.0
40-49	9.7	9.2
50-59	5.9	17.2
60-64	10.4	32.1
>64	39.9	79.1
Total	20.8	21.0

Hillman’s work in the early 1990s showed that the number of life years gained as a result of the health benefits of regular cycling outweighed those lost through road deaths by at least 20:1.²⁷ One of the difficulties with getting this message across is that the costs of sedentary lifestyle are much more abstract and harder to visualise than the immediately apparent risks of cycling death or injury – communicating risks in this area of public health, as in others, is often more of a challenge than obtaining the evidence.

Figure 2 places deaths from traffic injury in context by relating them to the 36% of CHD deaths that are attributable to sedentary lifestyle; this demonstrates the magnitude of the difference between the impacts of CHD and road traffic deaths in the UK.

Figure 2: Mortality from cardiovascular disease due to sedentary lifestyle and from traffic injury, UK, 2001



Any data on traffic-related deaths or injuries should take account of exposure if they are to be meaningful: most people withdraw from situations they perceive as dangerous. Using injury data as a measure of the level of danger inherent in a road or junction is very misleading – the most dangerous roads may well have a very low or non-existent injury rate as a result of people’s risk avoidance. The most extreme example of this is that pedestrian precincts and motorways both have very low pedestrian injury rates, but clearly pose very different levels of danger.

Another important factor is risk compensation, the process whereby people tend to maintain what they perceive as a constant level of risk. As a result things designed as safety enhancements (such as ABS brakes in cars) merely allow people to drive faster and

more dangerously as they feel better able to deal with the consequences. As a result safety improvements to cars tend to make the road environment more dangerous for vulnerable road users such as walkers and cyclists.²⁸

Air pollution

Transport produces 70% of CO emissions, 48 per cent of all nitrogen oxide emissions, and 22% of particulates in Great Britain.²⁹

In urban areas, where most people live, diesel vehicles remain an important source of oxides of nitrogen (NO_x) and particulate emissions. Petrol cars fitted with catalytic converters are an important source of emissions of nitrogen oxides, carbon monoxide (CO), and volatile organic compounds (VOCs). For petrol cars, this is primarily due to the predominance of short journeys in urban areas, often from cold starts, conditions under which the catalyst is much less effective at controlling pollutants. Both vehicle types produce carcinogenic substances in differing proportions, such as polycyclic aromatic hydrocarbon compounds (PAHs), benzene and 1,3-butadiene.³⁰

Air pollution is associated with increased mortality and morbidity in both hot and cold weather. Evidence regarding the effects of particles, sulphur dioxide and ozone is sufficiently developed to allow quantification of health effects - it has been estimated that there are 8,100 premature deaths every year as a result of exposure to PM₁₀^{*}, and 3,500 due to SO₂.³¹ For nitrogen dioxide and carbon monoxide there is evidence that exposure to current levels of these pollutants affects health, but there is insufficient evidence to allow quantification of these effects.³²

Access

People travel in order to gain access to goods, services, employment, friends and family, leisure pursuits, and health care. Policy and planning trends over the last 40 years, since the publication of the Buchanan report³³ in 1963, have favoured the private car over all other modes. Most motoring expenses (such as depreciation, tax and insurance) are paid up front, so the marginal costs of car use are low, and drivers don't pay for the externalities they impose (ie the health, environmental and social costs imposed by drivers on others). The increasing cheapness and accessibility of driving, in conjunction with planning decisions based around expectations of car use, have driven societal changes that have resulted in the need for many people to travel much greater distances than they previously would have done.

The downside of this cheap and easy access for drivers is that the 28% of households without access to a car find it very hard to travel about. While only 7% of those in the highest income quintile have no access to a car, 62% of those in the lowest income quintile are without such access.³⁴ The very young, the poor and the elderly are thus disproportionately excluded from many employment, shopping and leisure opportunities as a result; they may also find it difficult to obtain health services.

* PM₁₀: particulate matter generally less than 10 µg in diameter

Traffic may also directly influence access – if there is a busy road in front of a school or hospital, it may be unpleasant and hazardous to get there from the other side of that road.

Access is a particular issue for health services, which are required the most by the young and the old - groups that have restricted car access. This is an issue for primary as well as secondary care facilities, and may be a particular problem in rural areas.

Impacts on communities

Social networks

The Alameda county study³⁵ and others³⁶ have demonstrated the links between social networks and health. Busy roads may disrupt such networks, thus harming health. Widespread car use also results in fewer people interacting on the streets in the ways that pedestrians and cyclists do.

Aside from any direct influence on health, social networks are also important for the support mechanisms they can offer people, as well as their rôle in creating opportunities for advice and informal care

Community severance

Busy roads sever communities. Appleyard and Lintell's 1972 study on three streets in San Francisco elegantly demonstrated this by showing that the busier the traffic on a street the more fragmented the social networks, and the lower the satisfaction of residents.³⁷ One aspect of this study, the number of neighbours known to residents in each street, is illustrated graphically in figure 3 (below) using lines to indicate social links between people in different properties.

Health inequalities

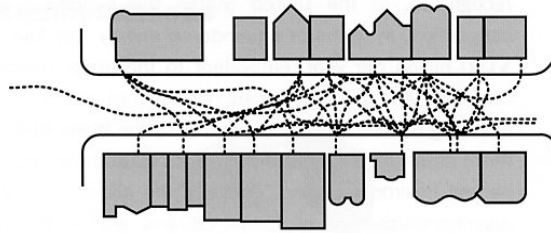
Some groups of people are disproportionately affected by the health impacts of traffic, especially children, the elderly, the poor and those who are otherwise marginalised.³⁸ At the same time these groups are the least likely to have access to a car or bicycle.

There are socioeconomic gradients for injuries, with children in social class V five times more likely to die as pedestrians than those in social class I.

Figure 3: social networks in three San Francisco streets with differing traffic flows[†]

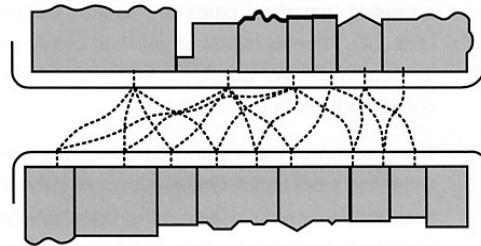
Light Traffic

3.0 friends per person
6.3 acquaintances



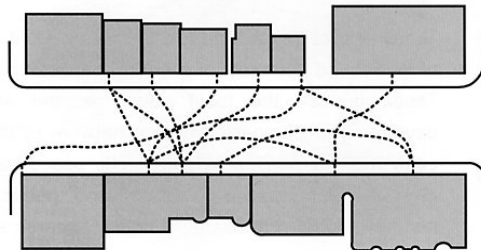
Moderate Traffic

1.3 friends per person
4.1 acquaintances



Heavy Traffic

0.9 friends per person
3.1 acquaintances



Impacts on the environment

The impacts of transport on the environment include:

• *Greenhouse gases*

Emissions of CO₂ from transport in Great Britain increased from 28 to 37 million tonnes of carbon between 1980 and 1990. The share of total emissions attributable to transport increased from 17% in 1980 to 26% in 1997.³⁹ The conclusions of the Expert Group on Climate Change and Health in the UK are that the likely effects of climate change on health in the UK include:⁴⁰

- cold-related deaths are likely to decline by perhaps 20 000 cases/year
- heat-related deaths are likely to increase by about 2000 cases/year
- cases of food poisoning are likely to increase by perhaps 10 000 cases/year

[†] Reproduced from *Cities for a Small Planet* by Richard Rogers, Faber and Faber, London, 1997, and in turn based on Appleyard D, Lintell M. The environmental quality of city streets: the residents' viewpoint. *American Inst of Planners Journal* 1972;38:84-101

- vector-borne diseases may present local problems
- water-borne diseases may increase
- the risk of major disasters caused by severe winter gales and coastal flooding is likely to increase significantly
- the effects of air pollutants on health are likely to decline but the effects of ozone during the summer are likely to increase: several thousand extra deaths and a similar number of hospital admissions may occur each year
- cases of skin cancer are likely to increase by perhaps 5000 cases per year and cataracts by 2000 cases per year
- measures taken to reduce the rate of climate change by reducing greenhouse gas emissions could produce secondary beneficial effects on health
- *Particulates and local air pollutants*
The health impact of these substances is covered in 'Air pollution above.
- *Noise*
Cars produce road noise, engine noise, and other noise, such as slamming doors or loud car stereos at night.
- *Visual pollution*
There is a substantial loss of amenity from road building across attractive countryside, road signs in urban and rural areas, and the appearance of vehicles themselves.
- *Land take*
Over the period 1985-1998, a total of about 31,000 hectares of land in England was changed to transport use; 63% of this was previously undeveloped land. Over the whole period, the land changed to transport use from previously undeveloped land was roughly equivalent to an area three times the size of the urban area of Nottingham.⁴¹
- *Construction and maintenance*
In addition to the loss of land, and the danger and disruption caused by construction itself, this also affects health through quarrying and other methods of extracting the raw materials
- *Energy*
Transport is a potent user of energy. There are many complex issues around global equity, especially conflicts with the needs of the developing world around use of limited fossil fuel resources.

Although motor manufacturers (and the Government⁴²) are often keen to promote the benefits of apparently 'clean' forms of transport, such as electric cars, these vehicles generally have little if any advantage over others apart from moving the production of polluting by-products away from the vehicle to the power station. While this is of course beneficial in urban environments such as Los Angeles, it is by no means a long-term solution. And moving to cleaner fuel does not, of course, reduce any of the other impacts of cars on individuals, communities or the environment.

Conclusions

Transport has a wide range of impacts on health. Travel patterns and planning decisions over the last 50 years have resulted in the dominance of the motor car over other forms of transport. This dominance is harmful to health in many ways: directly through injuries, pollution, and other environmental consequences; and indirectly by reducing opportunities for, and the appeal of, sustainable and healthy travel through walking or cycling. A modal shift away from cars towards walking and cycling would have significant public health benefits.

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