



Health implications of transport planning, development and operations[☆]



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ABSTRACT

The links between transport and health are well documented, but the extent of these benefits and disbenefits is not widely understood by non-health professionals. Additionally, there are less obvious, indirect ways in which transport and health are linked. This paper provides a broad overview of the literature, compiling empirical evidence that describes, and where possible quantifies, the health effects of transport planning for the reference of transport professionals. The paper makes the case for considering health alongside the environment when assessing a policy or development's sustainability, and provides empirical evidence to assist transport professionals in considering benefits or disbenefits involved.

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1. Introduction: sustainable transport and health

The notion of sustainable transport means that environmental, economic (direct and indirect) and societal factors should be considered when developing schemes and plans. Impacts on health emerge from all three categories. For example, environmental impacts of transport will affect health via climate change, which will increasingly impact directly on health via heatwaves and increased prevalence of infectious diseases such as malaria (Costello et al., 2009; Griffiths et al., 2009). Further, walkable neighbourhoods encourage physical activity and strengthen social support networks, both of which are important for health. Policies that are good for the environment are frequently also good for health, which in turn benefits society and the economy (Mindell et al., 2011). Thus, efforts to promote sustainable policies should not focus only on the environment, but should seek to strengthen support by demonstrating a wider set of benefits.

This paper provides an overview of the literature looking at the ways transport decisions can impact health (Section 2), and the health benefits of sustainable transport interventions (Section 3). Section 4 recommends how this evidence can be used to shape and support healthy transport development. Section 5 concludes by summarising evidence presented in this paper in a quick-reference format for ease of use by transport practitioners. This paper is a revised and abridged version of a book chapter (Chapter 12) from *Health on the Move 2*. The literature overview is not intended to be systematic or exhaustive. Rather, the purpose of this paper is to introduce and illustrate the range of impacts that transport can have on health in order to aid transport planners and policy makers in decision-making. This paper is written primarily from a UK perspective; however, most of the findings will equally apply to any economically similar country, and much will apply globally as countries increasingly adopt a 'Western' lifestyle.

2. Transport impacts on health

This section addresses four ways in which transport is closely linked to health:

1. causing or preventing physical ill-health,
2. causing and treating mental illness and stress,
3. causing, exacerbating, or solving problems of inequality, which shapes health outcomes, and
4. creating or impeding a safe road environment.

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2.1. Physical health

2.1.1. Physical (in)activity

Physical inactivity is responsible for 5.5% of total deaths globally, and 7.7% in high income countries (World Health Organisation, 2009). The World Health Organisation (WHO) estimated that physical inactivity causes 30% of ischaemic heart disease, 21–25% of breast and colon cancers, and 27% of diabetes, as well as contributing to strokes. World Health Organisation, 2009 Inactivity is also associated with increased risks of other chronic diseases such as depression, anxiety and osteoporosis. Physically active adults have a 20–30% reduced risk of premature death (Department of Health, 2004). Taking up physical activity in middle age leads to a reduction in death rate comparable with stopping smoking (Byberg et al., 2009). Among the elderly, long-term physical activity has long been associated with reduced memory loss (Health Education Authority, 1995), reduced risk of osteoporosis (Wolman, 1994), as well as reduced deterioration of physical ability (Shephard, 1995).

'Active travel' refers to modes of transport that incorporate physical activity. This includes walking and cycling as part of a public transport journey. Active travel has the potential to fulfil health requirements for physical activity. The UK government currently recommends that adults should undertake at least 150 minutes of moderate intensity activity a week; this activity can be accrued in bouts of 10 minutes (Department of Health, 2013). Walking two 1-mile journeys or cycling two 3-mile journeys daily satisfies this physical activity recommendation.

Physical activity levels have declined as cars are increasingly used for trips that in the past involved walking, whether for the whole trip or to access public transport. The increase in obesity over the past 30 years is mainly due to a significant decline in calories used (rather than an increase in calorie consumption) (Davis et al., 2007), such that 25% of the British population today do not walk for 20 min or more even once a year (Department for Transport, 2009). Each additional kilometre walked per day is associated with a 4.8% reduction in the likelihood of obesity, whereas each additional hour spent in a car per day is associated with a 6% increase in the likelihood of obesity (Frank et al., 2004). Men who walk or cycle to work have a lower rate of death from heart disease than men who travel to work by car. Public transport users have in-between rates (Fox and Goldblatt, 1982; Andersen et al., 2000). Similarly, a Dutch study found that those who cycle to work take fewer days sickness leave compared with those who do not cycle (Hendriksen et al., 2010).

2.1.2. Air pollution

Particulate air pollution is a major cause of premature death and early or additional hospital admissions from circulatory and respiratory diseases (Brunekreef and Holgate, 2002), particularly among those who may be suffering from existing respiratory condition, the very young, and the very old or frail (Makri and Stilianakis, 2008). Air pollution can trigger asthma attacks, partly because nitrogen oxides act as sensitisers for other allergens such as pollen and also by direct effects of particulates (Mindell and Joffe, 2004). Further, the WHO's International Agency for Research on Cancer recently classified outdoor air pollution as a human carcinogen (Loomis et al., 2013).

It is well-known that traffic contributes to air pollution. Multi-modal comparisons of exposure to air pollution in different modes of transport in the UK have found that exposure to those travelling by surface transport (bicycle, bus and car) was not significantly different, but the levels of fine particulate matter (PM_{2.5}) for those travelling by metro were 3–8 times higher (Adams et al., 2001). However, it has been argued that the composition of particulates in metros is less hazardous (Seaton et al., 2005). Recent research in

the USA has identified inequality in exposure to air pollutants; with those of lower socio-economic position exposed to higher levels (Bell and Ebisu, 2012; Anjum et al., 2013).

2.2. Mental health and stress

Physical activity is as effective an anti-depressant as psychotherapy; exercise, including walking, can reduce depression by half, whether clinical or not (North et al., 1990). Regular exercise is also thought to treat psychological stress, by better preparing the body to be able to cope with the physiological effects (Klaperski et al., 2013). Exercise also provides 'time out' which can tackle the mental effects of stress (Gerber et al., 2010). As such, walking and cycling can be seen as opportunities to manage or treat stress.

Stress-related illnesses are caused by a wide range of life changes, being trapped in an unsatisfactory situation, or by the perception of inequality or being excluded from opportunities (such as jobs) available to others (Lee and Turney, 2012). There is the opportunity for these situations to be caused or exacerbated by transport. Uncertainty and delays, constant traffic noise outside the home, and inability to access social services and support can all contribute to stress.

In addition to causing stress, noise pollution can also directly affect health by causing sleep deprivation and annoyance. A 2006 survey found that half a million Britons move house each year because of noise (Ipsos MORI Poll, 2006), although it is not clear to what extent traffic was the cause of the noise. However, noise effects can to some extent be designed out, with quieter road surfaces such as porous asphalt able to reduce noise by 4–8 db, equivalent to almost halving the volume of traffic.

Urban design incorporating slow traffic speeds, good walking permeability, and an aesthetically pleasing environment can reduce stress by facilitating community support networks and promoting physical activity, creating a pleasant living environment that is conducive to mental health and wellbeing.

2.2.1. Social support

As early as the 1970s it was identified that strength of social support was associated with up to a four-fold difference in all-cause mortality – a difference comparable in magnitude to the effects of poverty (Berkman and Syme, 1979). Classic studies by Appleyard and Lintell (1972) in San Francisco, which were repeated more recently in Bristol in England (Hart and Parkhurst, 2011), have shown that motor traffic levels in streets are a key determinant of the strength of social support. Residents of streets with light traffic had twice as many acquaintances and friends on their street than residents of streets with heavy traffic, and this difference was particularly marked for the youngest and oldest residents (Appleyard and Lintell, 1972). Residents of streets with heavy traffic also felt ownership of less of their street. This suggests the opportunity exists for street design to promote community networks by providing space to interact and play, which in turn will have important implications for health.

2.2.2. Community severance

'Community severance' describes "the divisive effects a major urban road has on the inhabitants on either side of it" (Grigg and Ford, 1983). This definition may also be applied to other community-dividing infrastructure, notably railway lines. Severance results in: "pedestrian delay, trip diversion and suppression, pollution, perceived danger and overall unpleasantness" (Clark and Hutton, 1991). As well as having a negative impact on physical activity, community severance can give rise to stress and isolation, by increasing the effective distance to places of employment

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