

The Routledge handbook of planning for health and well-being

Part 2: The human experience

Chapter 8. Active travel: its fall and rise

Adrian Davis and John Parkin

1 An introduction to active transport

Transport, by definition, involves movement; and different methods of movement require different levels of physical activity on the part of the traveller. At one extreme, a person who undertakes a journey on foot will engage in a moderate level of physical activity for the whole journey. At the other extreme, a person who is a powered wheel-chair user will not exert themselves to any greater extent than when static. Physical exertion may occur for parts of a journey, and this may be simply a short walk at either end of a motorised journey, or it may involve longer periods at either end of a public transport journey and during interchanges. There may be short or prolonged periods of standing also involved. The parts of the journey when the trip-maker is physically active may vary from very short to quite long periods of time.

The intensity of activity may also vary, for example depending on the speed of cycling. It is commonly found that walking provides physical activity at a largely a moderate level, whereas some cycle users will experience more and longer periods of vigorous activity (Vuori, Oja, Paronen, 1994). Vigorous activity provides significantly greater protection from disease, poor health and wellbeing. As well as walking and cycling (using either conventional bicycles or electrically assisted bicycles), physically active journey making may also include use of the following: roller-blades; skate-boards; scooters.

A useful definition of 'physically active transport' would be one where some outcome from the physically active nature of the transport is manifest. Physical activity has already been dealt with in Chapter 17, but a concise definition here helps to shape the understanding of what it is, and is not. Physical activity is a broad term used to describe 'any force exerted by skeletal muscle that results in energy expenditure above resting level' (Casperson, Powell, Christensen, 1985). Thus the term 'physical activity' includes any form of human movement including walking, cycling, play, active hobbies or manual occupations as well as structured exercise or sport. It is important to understand that sport and exercise are sub-sets of physical activity.

We introduce in Section 2 issues connected with travel decision making behaviour. We follow this in Section 3 with a review of cultural issues which imbues transport, and also note trends in transport behaviour which are currently emerging in developed economies. Section 4 goes on to explore the relationship between transport, health and the environment. Section 5 considers the nature of evidence and contentions around evidenced

based policy. Finally, Section 6 draws the chapter together to provide an holistic understanding of transport and health.

2 Travel decision making behaviour

People travel in order to undertake activity at the end of the journey, sometimes they may engage in activity such as working during a journey, and sometimes they travel for the intrinsic enjoyment of the journey itself. The choices people make about how they travel are varied and complex. Traditionally, transport activity has been modelled, and schemes for infrastructure improvement have been appraised, on the basis principally of an account of the time and cost to the user. Such modelling approaches assume a perfect market with perfect knowledge.

Better appreciation of motivations and choices being made in relation to travel are developing through wider application of a range of social and psychological models of behaviour (e.g. the Theory of planned behaviour, Azjen, 1981). Advances in both theory and application of behaviour change science has led to more sophisticated ways in which motivation towards voluntary behaviour change can be targeted drawing on a taxonomy of possible intervention approaches (Abraham, Michie, 2008; Michie et al, 2009; Bird et al, 2013).

Keeping with an econometric view of the world, the UK government provides monetised values for 'journey ambience' of cycle lanes and tracks of different levels of separation from motor traffic (DfT, 2012). This rather limited methodology for accounting for the nature of the transport system in travel behaviour is contestable and a range of literature is emerging which takes a wider view of the determinants of travel behaviour.

Handy (2005), for example, reviewed studies which considered the relationship between transport, land use and physical activity. This review suggests a strong inverse correlation between active travel and distance between origin and destination and a strong correlation with measures for density of development and population. These relations are clearly explicable and have significant policy implications for spatial planning as a tool for establishing the background against which physically active travel could flourish. Additionally, there are relationships between active travel and a variety of transport system variables including the nature of the network (grid pattern or otherwise), the presence of sidewalks (footways) and bicycle paths, and the availability of parking.

Extending the work, at least for cycling, into a meta-analysis Robertson et al. (2013) suggest significant relationships between bicycle use and measures for distance, land use, the transportation system, safety, and neighbourhood characteristics, with distance having the largest effect size. Hence, overall, it is clear that there are a number of built environment factors which are correlated with levels of walking and cycling.

There remain, however, two broad issues. The first is around causality and whether the presence of cycling and walking has encouraged the development of an environment which is compatible to these activities, or whether the reverse is true, that investment in infrastructure has had the effect of encouraging walking and cycling. It could also be the case that effects are working 'both ways'. The second is around the operationalization of variables, such as journey ambience and feelings of security, which appropriately measure built environment factors, which has been tackled to some extent for walking by Ewing and Handy (2009).

Taking a very pragmatic approach, Pucher et al. (2010) reviewed studies which considered cycling infrastructure amongst other means of promoting cycle use. They generally found positive and significant relationships between cycling levels and infrastructure from aggregate studies, but the picture was more mixed from individual level studies. This is supported by Heinen et al. (2010) who reviewed commuting cycling and found that shorter distances and a greater mix of functions was important, but that more research is required to understand issues connected with the density of the network, density of surrounding land uses, contiguity of infrastructure and the provision of facilities separate from those provided for motor traffic.

3 Cultures and trends in transport

Cultures and transport

The household is the traditional 'unit' generating transport demand. In large land-use and transportation models the production factors are reduced to household size (number of people), household structure (related to numbers in employment), income and car ownership. Decision making about transport is, however, more complex and related not only to the modes available, but, especially in more complex households, to the inter-related needs for transport of the inhabitants. There are general issues about the way households make decisions and there is a growing literature on the specific influences of different role players within the households, including the different contributions of children, mothers and fathers.

This area of household decision making is clearly complex and the mechanisms will be different in different cultures, and particularly pronounced where the position of women is different, often perhaps relating to religious belief. The processes of decision making will likely vary as the household matures, either through natural ageing of children, or through a deeper and hence perhaps different relationships emerging over time.

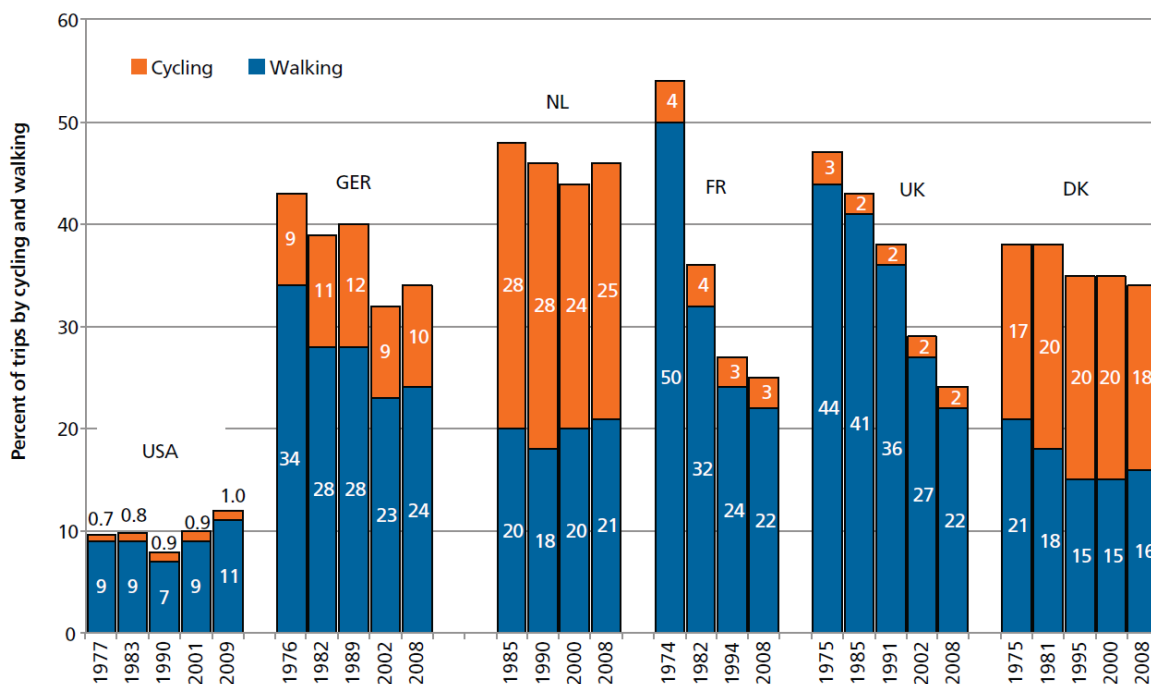
There is also the issue of habit, and this has been examined for example by Bamberg and Schmidt (1994) in the context of choice between cycling and car use as part of a model using the theory of planned behaviour. Fresh choices will not be made every day because of the cognitive load, the time available, and previous experiences. Hence habit will be used to

short-cut to the ‘assumed’ most appropriate option. Again in the context of cycling, Daley and Rissel (2011) considered the image of cyclists and found that respondents did not consider cycling as a mainstream method of transport. They also found that media reporting on cyclists and cycling in locations with low cycling levels portrays it as an extreme activity (e.g. cycling long distances for charity) with cyclists being portrayed as ‘problem’ road users (Rissel et al, 2010; Busse, 2012). Such research suggests that affecting social norms is likely to be an important task in enabling more people to choose cycling. Moreover, it connects understanding about habits with norms and cultural change (Schwanen, Banister, Anable, 2012)

Transport trends

Levels of walking and cycling vary between developed countries, and have generally shown declines over the decades since the 1970s. Figure 1 compares The United States of America with the UK and France, and also three countries in Europe with the highest and most sustained levels of walking and cycling: The Netherlands, Germany and Denmark.

Figure 1 Trends in percentage of trips by cycling and walking in six developed countries



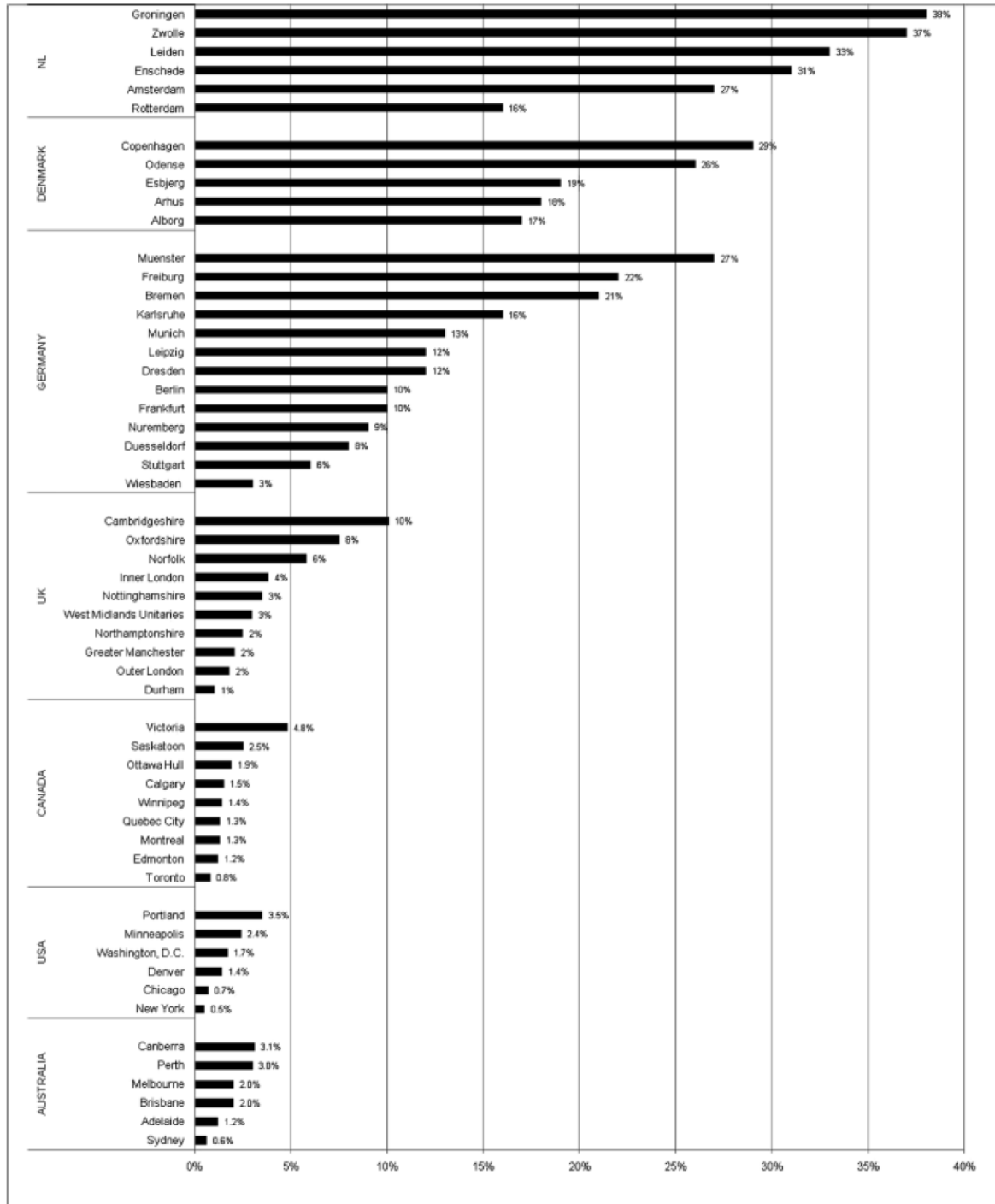
(Source: Pucher and Buehler, 2010.)

Pucher and Buehler (2010), in putting together these data note the disparity of sources and the fact that data collection differences limit the comparability of the data. Combined cycling and walking shares vary from around 10% to approaching 50%. France and the UK show the greatest declines over the three decades, with lesser declines evident in The Netherlands, Denmark and Germany. These latter three countries also have the larger

cycling mode shares. Other developed countries generally fit a pattern somewhere within the extremes as shown in Figure 1.

There is variability in use within countries, with some cities demonstrating much larger modes shares than other areas. Figure 2 provides a picture of that variability for cycling.

Figure 2 Bicycle share of trips in six countries



(Source: Pucher and Buehler, 2008)

Pucher and Buehler conclude that the differences in levels of use of the bicycle relate to the provision of separate facilities for cycle traffic. Policy interventions relating to transport have to forecast the future and they will do so based on observations of behaviour in the present day, coupled with future forecasts of population and other factors such as wealth. Such models have not included a wider range of variables, for example, linked with the built environment or the more subtle decision making processes discussed above. The relationships concerning choice which exist in the present day will be replicated into the future in such models because normally there is no better assumption to make.

There are, however, interesting trends becoming evident, for example, suggesting that average per capita growth of travel has stopped. This may be linked with smaller benefits of even more travel (Metz, 2013), and, so far as car use is concerned, a lower proportion of young people acquiring driving licences (Delbosc and Currie, 2013), and a trend towards population movement in urban rather than suburban areas (Headicar, 2013).

So now, with an understanding of cultures and trends in transport, we move on to explore the relationships between transport, health and the environment in more detail.

4 Transport, health and the environment

In this section we review the relationships between transport and health, and explore the co-benefits of physically active travel on health and the environment. Finally, we discuss health economics and health equity.

Relationship of transport to health

The primary function of transport is in providing the connection between people and the goods and services they require. Transport also provides access to the built and natural environment from which people gain material and non-material wealth, health and wellbeing. When distances are short, as in urban areas, the opportunities for active travel are potentially large. The health benefits of physical activity have been extensively documented since the first studies in the 1950s showed that adults who are physically active during the course of employment suffered less than half the coronary events of those with sedentary occupations, while controlling for lifestyle factors such as smoking and alcohol consumption (Morris et al., 1953).

Early references to the inter-relationship between transport and health focused almost exclusively on the acute impacts of negative outcomes such as air and noise pollution, and traffic casualties (e.g. MoT, 1963), while benefits were viewed in terms of high levels of mobility, principally for car occupants. As scientific understanding of impacts has developed and subtle and chronic impacts are better researched, it has become clear that the relationships between transport and health are substantive and have economic, social and environmental impacts. There are therefore important inter-relationships with a range of areas of public policy.

One of the most significant changes in understanding is transport's potential contribution to total physical activity time in order to reduce the disease burden (WHO, 2000). More recently, this understanding has been extended to include well-being benefits both through the intrinsic physical health benefits of active travel and also through the fact that transport often facilitates social connectivity, which itself has beneficial health impacts (Environment Canterbury, 2010; Betts Adams, Leibrandt, Moon. 2011; Nordbakke, S. and Schwanen, T. 2013). Beyond the physical benefits of activity, active travel-friendly neighbourhood designs facilitate incidental contacts between neighbours and appear to foster social capital (i.e. social networks, norms and trust). Numerous studies show positive associations between social capital and physical and mental health, and health promoting behaviours (Putnam, 1999; Leyden, 2003). Meaningful social activities reduce the harmful effects of stress by enhancing the body's immune response function. Social capital may promote positive social norms while simultaneously controlling anti-social behaviours that can fuel feelings of insecurity.

Changes to neighbourhood design could also produce benefits for the local micro-economy. Increasing population densities and boosting local pedestrian and cycling traffic flows can increase the economic viability of cafes and corner stores, and improve access to jobs and services without increasing congestion or vehicle emissions. For example, researchers report that in Toronto people who bike and walk to Bloor Street, a commercial street, reported they spent more money in the area per month than those who drove there (Clean Air Partnership, 2009). Greener environments, including quality green space including parks, also appear to be important for health (e.g. Sugiyama, et al, 2008; Sallis, J. et al, 2009).

By way of contrast to a focus on active travel, travel by private motorised transport has been seen increasingly as the normative mode of travel in many wealthier societies. There has, however, been a hidden cost to motorisation which has been impacting on individual user's health in a number of ways, and little recognised until recently. This includes the risk of habitual sedentary behaviour, not least because, for the commute, the choice of a private motorised mode reduces the opportunities available elsewhere in the day to be physically active. To this is added strong evidence for weight gain with the attendant risks of ill-health with habitual car use (Frank et al, 2004; Bassett et al, 2008; Sugiyama, T. et al, 2013).

Another negative health consideration is the stress of driving, most especially for the commute. Across the developed world the results indicate that active travellers tend to be less dissatisfied with their commute (Paez, Whalen, 2010), if not in fact actually deriving intrinsic enjoyment from the journey. Car commuters find their journey more stressful than other mode users. The main sources of this stress appear to be delays and other road users. Users of public transport also 'complain' about delays; however, this results in stress as well as boredom. Walking and cycling journeys are the most relaxing and exciting and therefore seem the most optimal form of travel from an affective perspective (Gatersleben, Uzzle, 2007). Explanatory factors include desirable physical exercise from walking and cycling, and

the provision of a psychological 'buffer' between the spheres of work and non-work. Negative feelings during the work commute increase with the length of the commute (Olsson, et al, 2013).

Co-benefits of health and the environment

There is an urgency for moving towards lower carbon futures. The fifth assessment report of the International Panel on Climate Change (IPCC, 2013) states that it is 'extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century', and that 'continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system'. The report suggests that 'substantial and sustained' reductions of greenhouse gas emissions will be required to 'limit' future climate change. Transport is presently a fossil fuel intensive industry and moves towards physically active travel will bring with it benefits for the climate more generally.

Relatively recently, and initially through recognition of the impact of successful climate change mitigation strategies, there is an understanding of what have become termed co-benefits (Woocock et al, 2009). In the case of such strategies applied to road transport, co-benefits occur when carbon reduction measures result in an increase in human energy expenditure.

To this can be added evidence which is sufficiently robust to show a causal relationship between academic attainment and physical activity. Given that increasing academic attainment is a goal sought by educationalists, this finding strengthens the case for education departments and schools in helping promote active travel for the school journey. In 2010 the Centre for Disease Control and Prevention in the USA concluded that there was substantial evidence that physical activity helps improve academic achievement (CDC, 2010). Moreover, their review suggested that physical activity can have an impact on cognitive skills and attitudes and academic behaviour, all of which are important components of improved academic performance. Singh et al (2012) report a systematic review that, although there were few high quality studies, shows evidence that participation in physical activity is positively associated with academic performance in young people.

The above evidence is supported by recent research findings in neurological studies investigating the links between physical activity and cognitive performance. In 2010, in a randomised trial, researchers concluded that there is

“compelling evidence that physical activity between lessons is a valuable component of the school curriculum, for academic as well as physical development.” (Hill, L., et al, 2010)

This finding has been supported by subsequent studies. As a coda, many of the studies conclude that opportunities for physical activity should be made available to students and these should emphasise cardiovascular fitness over body composition. Separately, studies on active travel have demonstrated that children who travel actively have better

cardiovascular profiles than those who do not (Anderson et al, 2011). Consequently, if habituated into the routines of daily living, active travel among school children will help them to perform better at school academically (a key Education objective), and take less time off school through sickness. Following from this there is a good case that there will be a more educated workforce which is fitter and will take less sickness leave, hence also contributing to economic prosperity.

Health economics

The volume of economic literature addressing active travel, especially that addressing health economics, has risen significantly in the first decade of the new millennium. Within this field of research there is also more evidence applying a Cost Benefit Analysis approach, and more so for cycling than walking interventions. More generally the growth of research reveals that the economic justification for investments to facilitate cycling and walking had previously been under-rated or even ignored (Davis, 2010). Much of the benefit is derived from reductions in premature deaths (through the 'value of a statistical life') with large health savings and consequent benefits to the economy. The financial benefits of active travel that result are often large (Cavill et al, 2009) but have mostly been left out of economic assessments. Moreover, the majority of the recorded benefits accrue from health gains despite the fact that morbidity (illness) costs are mostly excluded from studies: the World Health Organization (WHO, 2007) suggests that the economic benefits of active travel attributable to health gains would be even larger than those from reductions in mortality alone. A recent review for the UK Department for Transport found that almost all of the studies (infrastructure and behaviour change) report economic benefits of walking and cycling interventions which are highly significant. In terms of value for money, the UK Department of Transport values 'very highly' any scheme that returns more than £4 for every £1 invested. The mean benefit to cost ratio for all schemes identified in the review was 6.28:1. (DfT, 2014)

In addition to the health benefits accruing from physical activity there are also other benefits. These derive from less congestion, pollution and reductions in road traffic casualties, albeit that so far as cycle users are concerned the latter is dependent often on infrastructure (e.g. road space allocation) and road user behaviour (e.g. speed) (Giles-Corti, et al 2013).

Health and health equity

The World Health Organisation (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 1946). Health equity relates to the social determinants of health, that is the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. Health equity seeks the highest level of health for all people. Health equity entails focused societal

efforts to address avoidable inequalities by equalizing the conditions for health for all groups, especially for those who have experienced socioeconomic disadvantage or historical injustices.

Road transport contributes to health inequity through a number of pathways. In terms of active travel health, inequity is increased not least by the deterrent effect whereby people who would choose active modes, at least for some trips, do not do so due to the perceived road danger. Using an economic word, this is the 'externalisation' of traffic danger by those using motorised transport modes onto other road users. As we noted earlier, distance can also deter active modes, partly due to poor land use such as out of town super-stores and business parks. Cultural norms also influence travel mode choice when potential active travel mode users see that the norm is to drive a car. Cultural norms have strong influences on travel behaviour. Such barriers result in the forfeiture of the health benefits which would have accrued.

Additionally, there are possible amplification effects whereby some of those denied the use of the active travel modes do not have access to alternative modes (e.g. through cost or age) and so have their access opportunities restricted. This can include lack of access to employment, health and other facilities with serious economic and health consequences. Still others may be forced to walk but find the experience unpleasant if not stressful (Bostock, 2001; Ekkekakis, et al 2008). Such outcomes themselves can be seen as products of unequal power relationships and the economic forces in which they originate and unfold. From this viewpoint, health inequities are the result of unequal power relations, both in terms of social structures including, for example, social class, patriarchy and racism, and their manifestations are in terms of car-oriented developments which are beneficial to the wealthy at the expense of the less powerful. We return to this issue when addressing the nature of evidence across professions.

5 Evidence and policy making

In this section we explore the contested nature of evidence and its relation with policy making. The very meaning of evidence is highly contestable and it has repeatedly and cogently been argued that evidence is socially constructed (Krieger, 1992; Chan, Chan, 2000). So, what is accepted as evidence, how much is it valued, and how does this differ across professions and policy makers? What counts as evidence, and the rules and criteria for assessing evidence, and whether evidence is valued at all, are all negotiated phenomena and contested within and across professions. Rychetnik and Wise (2004) note that:

“concepts of evidence vary among professionals, disciplinary and social groups: for example, scientists have traditionally adopted different standards of evidence to lawyers. Since the advent of evidence based medicine in the early 1990s, health professionals, managers and consumers have been debating (and negotiating) what is considered as valuable and

credible evidence to support decisions about health services, public health, health promotion and health policy.”

The supportive role of the built environment for human health is a growing area of interdisciplinary research, evidence-based policy development, and related practice. Nevertheless, despite closely linked origins, the contemporary professions of public health and urban planning largely operate within a neo-liberal framework of academic, political, and policy silos (Kent and Thompson, 2012). A similar dis-connect has been identified between public health and transport planning (Litman, 2003).

Evidence-based public policy is not very old or particularly mature, and many commenters remind us that the rise of evidence-based policy and practice was first attributed to medicine, and that evidence-based medicine became ‘fashionable coinage’ during the 1990s (Pope, 2003; Parsons, 2002). Adherence to the mantra of evidence-based policy and practice has now spread across most, if not all, areas of public policy and across much of the developed world. According to those who adhere to this world-view of an evidence-base future, what the Cochrane Collaboration is perceived to have done is ‘to provide the best source of evidence on the effectiveness of health care and medical treatments’ (Weisburd et al, 2003 cited in Pawson 2006), and what a new movement seeks to do is create the same kind of evidential backbone for other areas of policy-making that are perceived as blighted by rhetoric and ‘woolly’ thinking. However, such an approach is also contestable on a number of counts. Not the least of these is that evidence-base policy often gets turned into policy-based evidence, even for medical advice (Marmot, 2004). For our purpose, the most useful consideration may be to understand better the operationalization of ‘power’ and its interplay with evidence and knowledge.

Juntti et al., (2011) say that the role of power must be addressed in discussion of evidence and policymaking along with two other inter-related issues: the nature of evidence itself; and the normative, moral or ethical ‘politics’ of policy-making. Evidence is clearly contested (often by vested interests), mediated, assessed in terms of alignment of values not least through an ideological lens and what is accepted, adopted and taken for use in public policy making varies considerably from the initial evidence input. This ‘filtering’ means that the logic of championing, financing, and implementing of active travel interventions has most often been blocked before it reaches the decision table of politicians (Davis et al forthcoming).

6 Conclusion: An holistic understanding

The need for movement results from the distance between the places where activities occur. The planning of activity location, that is to say land use planning, is therefore a mechanism which has direct influence on travel. A paradigm of planning with an assumed solution based on the flexibility of the motor car has allowed for the creation of patterns of settlement where distance, so long as the capacity and speed have been appropriately high,

is not a problem. For reasons linked with the finite availability of 'space', it appears as though patterns of land use are intensifying with the natural consequence that, at least for some people and for some journey purposes, distances to undertake activities are not now extending as they once were.

The engineering community has made an excellent job, over post-war generations, of adapting as much space as they have been allowed by policy makers to maximise the capacity and speed of motor traffic. This has, from early days, been assisted by technology, for example in the form of traffic signal control, and more latterly, particularly on inter-urban routes in the form of comprehensive management of the route as a 'system'. This engineering led, systems based approach has however, had little regard for the social, environmental, and health consequences of motorised transport and the unequal distributional impacts on those who may be adversely affected by the movement of others.

The evidence suggests therefore that there are already some indications of movement away from continued growth in motorisation, the need to do so for climate change and public health reasons, and design guidance which supports engineers and urban planners in achieving a better balance between the movement functions and place functions of the urban realm (see for example, DfT, 2007). In addition, since the turn of the millennium there has been a growing literature on transport, health, and the built environment which has resulted in additional and generally complimentary guidance especially focused on the effectiveness of interventions to increase active travel modes (eg NICE 2008, 2012).

Broadband internet is also dramatically changing the way people access goods and services, with the burden of individual travel being replaced by an every expanding logistics industry. Quality of service provision to the end user (for example, in terms of slots for delivery of perishable goods) is a prime issue. Similarly, the internet is having an impact on the daily and weekly patterns of travel activity in terms of commutes and business travel.

We conclude that the tide may well be turning towards a more sustainable transport future. We hope that, if we are correct, the speed of change will be much faster than that which evolved to support a car-based society.

References

- Abraham, C., Michie, S. (2008) A Taxonomy of Behaviour Change Techniques Used in Interventions. *Health Psychology*, 27, 379-387.
- Ajzen, I. (1991) The Theory of Planned Behaviour. *Organisation and human decision processes* 50 (x) pp179-211.
- Anderson, L., Wedderkopp, N., Kristensen, P., Moller, N., Froberg, K., Cooper, A. (2011) Cycling to School and Cardiovascular Risk Factors: A Longitudinal Study, *Journal of Physical Activity and Health*, 8:1025-1033.

Bamberg, S. and Schmidt, P. (1994) Auto oder Fahrrad? Empirischer Test einer Handlungstheorie zur Erklärung der Verkehrsmittelwahl. (Car or bicycle? An empirical test of theory of mode choice.) *Kölner Zeitschrift für soziologie und social psychologie*. Vol. 46, Part 1, pp80-102. March.

Bassett, D., Pucher, J., Buehler, R., Thompson, D., Crouter, S. (2008) Walking, cycling, and obesity rates in Europe, North America and Australia, *Journal of Physical Activity and Health*, 5: 795-814.

Betts Adams., K., Leibbrandt, S., Moon, H. (2011) A critical review of the literature on social and leisure activity and well-being in later life. *Ageing and Society*: 683-712.
doi:10.1017/S0144686X10001091

Bird, E., et al 2013 Behaviour Change Techniques Used to Promote Walking and Cycling: A Systematic Review, *Health Psychology*, 32(8): 829-838.

Bostock, L. (2001) Pathways of disadvantage? Walking as a mode of transport among low-income mothers, *Health Soc and Community Care*, 9(1)11-18.

Busse, H. (2012) Healthy but dangerous: The representation of cycling and cyclists in the print media, *Masters of Health Psychology* Dissertation, University of Bath.

Casperson, C., Powell, K., Christensen, G. (1985) Physical activity, exercise and physical fitness: definitions and distinctions of health-related research, *Public Health Reports*, 100: 126-131.

Cavill, N., Kahlmeier, S., Rutter, H., Racioppi, F., Oja, P. (2008) Economic analysis of transport infrastructure and policies including health effects related to cycling and walking: A systematic review, *Transport Policy*, 15: 291-304.

Chan, J., Chan, J. (2000) Medicine in the millennium: the challenge of postmodernism, *Medical Journal of Australia*, 17: 332-334.

Chatterjee, K., Sherwin, H. and Jain, J. (2013) Triggers for changes in cycling: the role of life events and modifications to the external environment. *Journal of transport geography* **30** (2) pp183-193

Clean Air Partnership: 2009 Bike lanes, on-street parking and business: A study of Bloor Street in Toronto's Annex Neighbourhood, <<http://www.cleanairpartnership.org/pdf/bike-lanes-parking.pdf>.

Daley, M. and Rissel, C. (2011) Perspectives and images of cycling as a barrier or facilitator of cycling. *Transport policy* **18** (1) pp211-216.

Davis et al forthcoming

Davis, A. 2010 *Value for Money: An Economic Assessment of Investment in Walking and Cycling*. Bristol: DH. <http://www.healthyweight4children.org.uk/resource/item.aspx?RID=90422> accessed 2nd December 2013.

Delbosc, A. and Currie, G. (2013) Causes of youth licensing decline: a synthesis of evidence. *Transport reviews* 33(3) pp271-290.

Department of Health and Human Services (2010) *The association between school-based physical activity, including physical education and academic performance*. Atlanta: Centre for Disease Control and Prevention.

DfT (2007) *Manual for Streets*. Department for Transport, Department of Communities and Local Government, Welsh Assembly Government. Thomas Telford: London.

DfT (2012) Claiming the health dividend. A summary and discussion of value for money estimates from studies of investment in walking and cycling, (TITLE to be confirmed. A D is author

DfT (2012) *Guidance on the appraisal of cycling and walking schemes*. Transport Analysis Guidance TAG Unit 3.14.1. Department for Transport
http://www.dft.gov.uk/webtag/documents/expert/pdf/u3_14_1-walking-and-cycling-120723.pdf [Accessed 22/11/13)

Ekkekakis, P., Backhouse, S., Gray, C., Lind, E. (2008) Walking is popular among adults but is it pleasant? A framework for clarifying the link between walking and affect as illustrated in to studies, *Psychology of Sport and Exercise*, 9: 246-264.

Environment Canterbury Regional Council (2010) *Wider health and well-being impacts of transport planning: Literature Review*. Canterbury: Environment Canterbury Regional Council/Canterbury District Council/Christchurch City Council.

Ewing, R. and Handy, S. (2009) Measuring the unmeasurable: urban design qualities related to walkability. *Journal of urban design*, Vol. 14, No.1, pp65-84

Frank, L., Andersen, M., Schmid, T. (2004) Obesity relationships with community design, physical activity, and time spent in cars, *American Journal of Preventive Medicine*, 27(2): 87-96.

Gatersleben, B., Uzzle, D. 2007 Affective Appraisals of the Daily Commute. Comparing Perceptions of Drivers, Cyclists, Walkers, and Users of Public Transport, *Environment and Behaviour*, 39(3): 416-431.

Giles-Corti, B, Foster, S., Shilton, T., Falconer, R. (2010) The co-benefits for health of investing in active transportation, *NSW Public Health Bulletin*, 21(5-6): 122-127.

Handy, S. (2005) *Critical assessment of the literature on the relationships among transportation, land use, and physical activity*. Transport Research Board Special Report 282

Hansson, E., Mattisson, K., Björk, J., Östergren, P., Jakobsson, K. (2011) Relationship between commuting and health outcomes in a cross-sectional population survey in southern Sweden, *BMC Public Health*, 11: 834 <http://www.biomedcentral.com/1471-2458/11/834> (Open Access)

Headicar, P. (2013) The changing spatial distribution of the population in England: its nature and significance for 'peak car'. *Transport reviews* **33** (3) pp310-324

Heinen, E., van Wee, B., Mart, K. (2010) Commuting by Bicycle: An Overview of the Literature. *Transport reviews* **30** (1) pp59-96

Hill, L., Williams, J., Aucott, L., et al (2010) Exercising attention within the classroom, *Developmental Medicine & Child Neurology*, 52 : 929-934.

Juntti, M., Russell, D., Turnpenny, J. (2009) Evidence, politics and power in public policy for the environment, *Environmental Science and Policy*, 12; 207-215.

- Kent, J., Thompson, S. (2012) Health and the built environment: Exploring foundations for new a interdisciplinary profession, *Journal of Environmental and Public Health*, doi:10.1155/2012/958175
- Krieger, N. (1992) The making of public health data: paradigms, politics, and policy. *Journal of Public Health Policy*, 13: 412-427.
- Leyden, K. 2003 Social capital and the built environment: The importance of walkable neighbourhoods, *American Journal of Public Health*, 93(9): 1546-1551.
- Litman, T. (2003) Integrating public health objectives in transportation decision-making, *American Journal of Health Promotion*, 18(1): 103-108.
- Marmot, M. 2004 Evidence based policy or policy based evidence? *British Medical Journal*,
- Metz, D. (2013) Peak car and beyond: the fourth era of travel *Transport reviews* **33** (3) pp255-270.
- Michie, S, et al (2009) Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology*, 28, 690-701. doi@10.1037/a0016136
- Ministry of Transport, (1963) Ministry of Transport, 1963 *Traffic in towns: A study of the long term problems of traffic in urban areas*, London: HMSO
- Morris, J., Heady, J., Raffle, P., Parks, J. (1953) Coronary heart disease and physical activity at work, *The Lancet*, 265: 1111-1120.
- NICE, (2008) Promoting and creating built or natural environments that encourage and support physical activity. PHG 8 www.nice.org.uk/PH008
- NICE, (2012) Walking and cycling: local measures to promote walking and cycling as forms of travel or recreation. PHG 41 <http://guidance.nice.org.uk/PH41>
- Nordbakke, S., Schwanen, T. (2013) [Wellbeing and mobility: a theoretical framework and literature review focusing on older people](#). *Mobilities*. (check vol etc)
- Olsson, et al, 2013 Happiness and Satisfaction with Work Commute, *Social Indicators Research*, 111:255–263.
- Paez, A., Whalen, K. 2010 Enjoyment of commute: A comparison of different transportation modes, *Transportation Part A: Policy and Practice*: 44(7): 537–549.
- Parsons, W. (2002) From muddling through to muddling up – evidence based policy making and the modernisation of British Government, *Public Policy and Administration*, 17: 43-60.
- Pope, C. (2003) Resisting evidence: the study of evidence-based medicine as a contemporary social movement, *Health: An Intersectoral Journal for the social study of health, illness and medicine*, 7(3): 267-282.
- Pucher, J., Dill, J. and Handy, S. (2010) Infrastructure, programs, and policies to promote cycling: an international review. *Preventive Medicine* **50** (Supplement) ppS106-125.
- Pucher, J. and Buehler, R. (2008) Making cycling irresistible: lessons from The Netherlands, Denmark and Germany. *Transport review* 28(4) pp495-528
- Pucher, J. and Buehler, R. (2010) Walking and cycling for healthy cities. *Built environment* **36**(4) pp391-414

- Putnam, R. (1999) *Bowling alone: The collapse and revival of American community*, New York: Simon & Schuster.
- Reardon, L., Abdallah, S., Seaford, C. (2011) *The road to well-being. The relationship between transport and wellbeing: A report on the existing literature*. London: New Economics Foundation.
- Rissel, C., et al, (2010) Representations of cycling in metropolitan newspapers – changes over time and differences between Sydney and Melbourne, Australia, *BMC Public Health*, 10:371.
- Robertson, K., Bamberg, S., Parkin, J., and Fyhri, A. (2013) *Bicycle-friendly cities – the relevance of urban form and infrastructure*. (Swedish with English summary) VTI Report 769. Linköping, Sweden. ISSN 0347-6030.
- Rychetnik, L., Wise, M. (2004) Advocating evidence-based health promotion: reflections and a way forward, *Health Promotion International*, 19(2): 247-257.
- Sallis, J. et al (2009) Neighbourhood environments and physical activity among adults in 11 countries, *American Journal of Preventive Medicine*, 36(6): 484-490.
- Schwanen, T., Banister, D., Anable, J. (2012) Rethinking habits and their role in behaviour change: the case of low carbon mobility, *Journal of Transport Geography*, 24 (2012) 522–532
- Singh, A., Uitdewilligen, U., Twisk, J., van Mechelen, W., Chinapaw, M. (2012) Physical activity and performance at school., *Archives of Pediatric Adolescent Medicine*, 166(1): 49-55.
- Sugiyama, T, Leslie, E., Giles-Corti, B., Owen, N. (2008) Association of neighbourhood greenness with physical and health: do walking, social coherence and local social interaction explain the relationships? *Journal of Epidemiology and Community Health*, 62: e9.
- Suigiyaama, T., Ding, D., Owen, N. 2013 Commuting by car. Weight gain among physically active adults, *American Journal of Preventive Medicine*, 44(2): 169-173.
- Vuori, I., Oja, P., Paronen, O. (1994) Physically active commuting to work – testing its potential for exercise promotion, *Medicine and Science in Sports and Exercise*, 26(7): 844-850.
- Wener, R., Evans, G. 2011 Comparing stress of car and train commuters, *Transportation Research Part F: Psychology and Behaviour*, [Volume 14, Issue 2](#), March 2011, Pages 111–116
- WHO (1946) Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.
- WHO, 2007 *Economic assessment of transport infrastructure and policies: Methodological guidance on the economic appraisal of health effects related to walking and cycling*, Copenhagen: Denmark. <http://www.euro.who.int/en/health-topics/environment-and-health/Transport-and-health/publications/2011/health-economic-assessment-tools-heat-for-walking-and-for-cycling.-methodology-and-user-guide> accessed 2nd December 2013.
- Woodcock, J. et al (2009) Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport, *The Lancet*, [Volume 374, 9705](#), 1930 – 1943.