

Can increased walking and cycling really contribute to the reduction of transport-related carbon emissions?

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Context

In Britain, walking and cycling have been increasingly promoted as healthy and environmentally friendly means of everyday travel. This can be seen not only in the material produced by organisations explicitly committed to promoting sustainable travel (for instance Sustrans, Living Streets, Walk 21, Cycling England) but also in policy documents and advice for local authorities produced by the national government. In 2004 the Department for Transport produced 'Walking and Cycling: an action plan' (DfT 2004) and this has been followed up in a range of publications. The message in all these documents is similar. For instance, the 2009 publication 'Delivering sustainable low carbon travel: an essential guide for local authorities' states that walking and cycling are 'the most sustainable forms of local transport', and that the 'potential for greater take up is enormous'. Positive benefits from increased walking and cycling are listed as: reduced congestion, improved health, low cost and reduced air pollution and carbon emissions. (DfT 2009). A similar message is included in the DfT's (2007) advice to 'Act on CO2' (<http://actonco2.direct.gov.uk/home.html>) where walking and cycling are promoted as a key strategy to (amongst other benefits) reduce carbon emissions.

At the same time there has been increased academic interest in the study of walking and cycling, mainly from the perspective of health benefits, safety and the ways in which urban design can encourage more sustainable travel (Saelens et al, 2003; Pikora et al 2003, Pucher and Dijkstra 2003, Timperio et al 2003, Jacobsen, 2003, Ogilvie et al 2004, McMillan, 2007, Lorenc et al 2008, Cervero, et al 2009, Hume et al 2009, Elvik, 2009, Jacobsen et al 2009, Pucher et al 2010). A smaller number of studies directly relate the promotion of walking and cycling to carbon reduction and climate change. These mostly make the (quite reasonable) assumption that increased walking and cycling will contribute to a reduction in

carbon emissions and then focus on strategies for and barriers to increasing walking and cycling (Chapman, 2007, Maibach et al 2009). Higgins and Higgins (2005) are unusual as (in a US context) they attempt to estimate the oil and carbon emissions saved by increased walking and cycling (together with other forms of sustainable transport). However, they deal only briefly with the barriers to achieving such increases. This paper uses data from an on-going EPSRC-funded project to examine the extent to which environmental factors are significant in encouraging people to walk or cycle and the household barriers to increased walking and cycling. It then discusses the potential for increased walking and cycling to make a significant contribution to a reduction in the UK's carbon footprint. It does not attempt to measure precise carbon-reduction scenarios as these are dependent on a range of factors well beyond the scope of the research project on which this paper is based.

Environmental attitudes

The influence of environmental attitudes on walking and cycling behaviours was measured using a questionnaire survey carried out in 2009. Some 15,000 survey schedules were distributed in four study towns (Leeds, Leicester, Worcester, Lancaster) with the sample stratified according to the index of multiple deprivation for lower super output areas (LSOA) in the four study towns. The aim of the survey was to examine both practices of and attitudes towards walking and cycling in a representative population sample with questions designed to be analysed within the framework of the Theory of Planned Behaviour. Separate schedules were used for walking and cycling and a response was sought from one adult (age 18+) in each household. Only questions relating to environmental attitudes with regard to walking and cycling are analysed in this paper. In total we received 1,417 responses giving a response rate of 8.3% from the cycling survey and 9.3% from the walking survey. Although low, this level of response is not unusual in unsolicited postal surveys (Moser and Kalton, 1979). The sample also produced some familiar biases. Responses were highest for females, adults in the middle and older age ranges, and from those with more education and higher status occupations. Non-car owning households were also substantially under-represented in the survey.

Respondents were asked to rank their level of agreement with a series of statements on a scale of 1-5 (where 1=strong agreement, 3=neutral and 5=strong disagreement). Tables 1 and 2 summarise the mean scores for selected statements for the four study towns. In this paper we have chosen to focus on statements that relate to people's engagement with the local environment, their awareness of transport's contribution to environmental pollution and climate change, and personal health and well-being. Responses are remarkably similar for all four study areas suggesting that attitudes vary little across the country and between large cities (such as Leeds) and smaller country towns (such as Worcester or Lancaster). In general most scores were close to neutral with a mild agreement with most statements. Statements that respondents associated most clearly with were that walking and cycling would benefit health and reduce contribution to local air pollution. Respondents to the walking questionnaire quite strongly associated walking with enjoyment but this was less strong for cyclists. In general, most cyclists were less positive than walkers about the enjoyment and well-being associated with the activity, though cyclists and walkers equally recognized the association with health, reduced air pollution and lower carbon emissions. It can be suggested from these data that the main 'environmental' motivations for walking and cycling relate to personal health and concern about local air pollution. Whilst there is some awareness of broader factors these are more muted.

Household constraints and opportunities

Household constraints on using walking and cycling for everyday journeys in the four urban areas are investigated using a range of in-depth qualitative research techniques. In each town we are conducting approximately 20 interviews and will also carry out in-depth ethnographic study of at least five households. This will give a total sample size of approximately 80 interviews and 20 ethnographies. To date data collection is complete in Lancaster and Worcester but is still underway in Leicester and Leeds. The Lancaster data have been most fully analysed and are reported briefly in this paper. Interviews were divided equally between household-based interviews (often with more than one person present) and accompanied journeys or 'go-alongs'. Respondents were selected from the original questionnaire survey and reflect a range of characteristics. The go-along is now a reasonably well-established research tool in mobility research (Kusenbach, 2003; Ricketts et al 2008; Carpiano, 2009) and such interviews can provide real insights into the experience of travelling and the everyday practical barriers to movement that are often neglected in a static interview. Conducting interviews whilst cycling presents particular logistical problems (Fincham et al, 2009) and in this study data collection was adjusted to suit the chosen route and prevailing traffic conditions. Where it was not possible to talk whilst cycling, data were collected via in-depth interviews both before and after the ride, and through a commentary by the researcher. The aim of the investigation was to probe below the (inevitably) superficial responses that are gained through one-off interviews (either static or mobile) and to gain a deeper understanding of how everyday travel decisions are made in a household setting. The ethnographic investigations utilised a number of different techniques which were deployed in ways that suited individual households. These included repeated in-depth interviews, accompanied journeys, mobility inventories within the household (for instance storage of bicycles, ownership of suitable outdoor clothes and foot-ware), mapping exercises, travel diaries and observations. Although not constituting full ethnographies (this would have required a much longer period of interaction with each household and would almost certainly have been deemed too intrusive by respondents) we attempted to utilise a range of ethnographic methods that have been found to be effective in other studies (Wallman, 1984; Silverstone et al, 1991; Descartes et al, 2007). Ethnographic respondents were not meant to be statistically representative but were selected to reflect a range of household types.

Many studies have identified the broad reasons why people do not walk or cycle more frequently. These can be grouped broadly into three groups: issues relating to infrastructure and the physical environment, issues relating to perceptions of risk and personal safety, and issues relating to family and household constraints (Mackett, 2003, Ogilvie et al 2007). We argue that what is especially important is the complex ways in which many of these factors interact to create barriers to walking and cycling in particular circumstances that may make it difficult for even families and individuals committed to sustainable travel to commit fully to walking and cycling for short trips in urban areas. The detailed ethnographies and accompanied interviews allow the relationships between such factors to be explored in detail. Selected examples are used in this paper, focusing especially on household and family constraints.

Walking and cycling, especially with a young family, are activities that require substantial levels of organization and commitment. They require quick and easy access to the right equipment (bikes, helmets, outdoor clothes etc) and the ability to organize all family members to leave in sufficient time to walk or cycle for an everyday journey. For many it is easier to jump in a car and drive even over short distances. Fred emphasised this point with respect to access to a bike: if it requires a substantial amount of time and effort to get a bike out from a back yard or shed then the chances are that it will be rarely used, yet many households do not have the space (or have not thought about creating the space) to allow cycles to be stored in a convenient location.

“ Yes. One of the important things about bikes is having ready access to them I find. I’ve just been fixing up a bike for a friend and I said you have to make it somewhere where you can get at it quickly otherwise you won’t use it. It has to be somewhere where a couple of seconds and it’s ready rather than having to go in the shed and have to do it and have to do this and have to do that, so it’s there.” (Fred, cycling go-along)

Similarly, walking to and from school with young children requires a substantial amount of organization to get them all ready at the same time with the right clothes and shoes. Such organization can, for some, be an enjoyable part of everyday travel, but for many families it creates barriers to walking or, at least, breaks down when time is short or other factors intervene. The following ethnographic observation of a Lancaster family with three small children (aged 8, 5 and 18 months) emphasises the complexities involved.

Extract from Ethnographic go-along (Lancaster)

Linda:	<i>The water bottle is just by your pop-up book, do you want me to carry? Tell me what you want me to carry, tell me what you want to carry....</i>
Mick:	<i>Where’s my book bag dad?</i>
Linda:	<i>Oh I’ve got it underneath the pram do you want me to hold it? Or would you like to hold it?</i>
Mick:	<i>I want to hold it. ...</i>
Linda:	<i>Come on then</i> (puts Rosie in pushchair)
Mick:	<i>I can hold my water bottle actually.</i>
Linda:	<i>No I’ll put it in my bag Jake, it’s going to get wet.</i>
Paul:	<i>You are going to have to walk quickly today.</i>
Liz:	<i>Come on lets put that in your; I’ll remind you of it when we get there</i> (Rosie cries) <i>Jake let me help you. Careful. I’ll give it to you when we get there. Come on.</i>
Paul:	<i>The dog stays here; he helps me work.</i>
Linda:	<i>Right OK guys. Mick do your coat up please its really wet.</i>
Paul:	<i>See you later guys</i>
All	<i>See you</i>
Linda	<i>Do you want to take this umbrella? There’s an umbrella Mick do you want that one?</i>

Some respondents had thought very carefully about how they organized their travel arrangements to enable them to travel sustainably under almost any conditions. But this required very careful planning and a strong commitment. Thus Tom’s family had a carefully planned routine, with necessary clothes and equipment to hand, but even so weather conditions or other commitments might disrupt such intentions and lead to car use.

“J goes to work in Morecambe and endeavours to go on her bike or on the train whenever possible. And that’s often down to weather, or whether there are any jobs to do on the way back or places to go where public transport and the like is not possible ... We both try and walk, J cycles whenever we possibly can, I obviously walk and use public transport, then this again would apply to both of us and the boys of course as well. This is if you are walking or using public transport we need to be equipped so I have set up waterproofs, coat, trousers, waterproof trousers, hats of various varieties depending on cold, sun, rain; shoes”. (Tom, Mobility Inventory)

In general, young children were perceived to make walking (and cycling) more difficult either because they were too tired, or the journey was too complex or it was just too much bother to try to walk or cycle. The following two quotes are typical;

If T (3 year old child) has only just woken up from his afternoon nap, he can't walk straightaway, it takes a while for him to 'come around', you know? So then I'd drive. If he's really tired, too, I sometimes drive. Perhaps I should expect him to walk, but it's hard isn't it? ... And then if we're going to swimming class at the University, obviously we're in the car for that. (reconstructed quote from ethnographic field notes, Lancaster)

Oh we have a daughter, she's six and she goes to D school so yeah she goes to D so the only sort of journeys that we need to do are err taking Isabel to school and we do drive (coughs) mainly, because it's, well you've seen it's a long way. So it's quite far ... yeah. Sometimes in summer, we'll walk with her on the way home, on the way to school it's always a rush. But on the way home we'll, we'll maybe walk into the school and then, um, walk back. K (husband) sometimes um has cycled with her. (Deidre, Lancaster)

However, not all families are deterred by such factors and some find that once they find ways to deal with the inherent complexities of the journey then they obtain real pleasure from the time spent walking with their children. The comments of Deborah are fairly typical of such respondents:

"well I've always enjoyed walking anyway but I think it's basically just the fact that I feel much more refreshed when I get to work when I've walked and don't feel as sluggish, you know, you just feel like it kind of wakes you up on the way. Also the fact that when you've got the kids, you know, you've got the chance to talk to them on the way to school and that type of thing it's er, I mean you know, from here going to Lancaster, going to where I work in town I would have to go all the way round the one way system, it would probably take me just as long and then you'd get there feeling really stressed and harassed."

Respondents did also identify other constraints to walking and cycling including the poor cycling infrastructure, obstructed or uneven pavements, traffic speed and volume, topography and the weather. Whilst the latter two are unavoidable the first three can be tackled through infrastructural interventions and regulation (and increasingly are being improved – especially in towns such as Lancaster which has Cycle Demonstration Town Status). However, we would argue that the greatest barriers to increased walking and cycling are the combined circumstances of contingency and complexity focused upon particular household situations which require substantial organization and commitment to overcome. Such factors cannot readily be addressed through interventions in the built environment or cycle training. They require much more fundamental adjustments to everyday family routines that can only be generated by individuals themselves. Whilst some families do recognize and tackle such issues effectively others are, not surprisingly, deterred.

Reducing carbon emissions through walking and cycling

Research reported in this paper has not attempted to quantitatively model potential reductions in carbon emissions from increased walking and cycling. Indeed, we would argue that the factors involved are so complex that any figures produced could be misleading. Instead, we examine a range of factors that influence potential gains and discuss the potential impacts of current policies to increase walking and cycling for short everyday trips. It is obvious that any increase in walking and cycling brings benefits, not just in terms of reducing carbon emissions but also in relation to personal health and reduced congestion, but we argue that the extent to which increases in walking and cycling could make a substantial impact on UK carbon emissions is limited. This is due to the relatively small proportion of total transport-related carbon emissions generated by short trips that could reasonably be transferred to walking and cycling, and the inherent difficulties in increasing walking and cycling to a level that would have a significant impact on total carbon emissions.

Transport does make a substantial contribution to total UK greenhouse gas emissions. Approximately 25% of all the UK's greenhouse gas emissions can be attributed to the transport sector with road transport accounting for some 70% of transport-related emissions. In turn, cars account for some 63% of road-related emissions (European Commission 2009). Thus approximately 11% of all the UK's carbon emissions can be attributed to car journeys suggesting substantial potential for reduction if travellers switched to alternative modes of transport. However, the potential for walking and cycling to reduce this total is limited. The mean trip length for travel on foot in the UK is just 0.7 miles whilst the mean trip length for bicycle trips is 2.9 miles, with 68% of all cycle trips under two miles (National Travel Survey 2009). It thus seems reasonable to suggest that the greatest opportunities for switching from car use to walking or cycling would be for trips of less than two miles. Some 22% of all car journeys are under two miles in length (NTS, 2009), but such journeys account for only about 5% of all carbon emissions generated by household car journeys (DfT 2009). Car journeys of over two miles account for the vast majority of car-related CO₂ emissions and few of these could realistically be transferred to walking and cycling (though switching to more sustainable public transport is, of course, an option).

It can thus be suggested that to generate significant carbon reduction from increased walking and cycling would require a very large proportion of short trips currently undertaken by car to switch to walking and cycling. Whilst such a level of change is not inconceivable, we suggest that the complex household-related barriers outlined above, together with limited environmental awareness in relation to walking and cycling as revealed in the attitudinal survey, will make large-scale change difficult. In particular, current schemes to promote walking and cycling, focused mainly on improved infrastructure, information and education, though important are unlikely to be sufficient on their own. It would require much more fundamental change in individual attitudes, in the organisation of society (eg more flexible and family-friendly work arrangements) and the physical structure of urban areas (with more facilities closer to residential areas) to achieve large-scale change. The current Government campaign to encourage everyone to drive 5 miles less a week (<http://actonco2.direct.gov.uk/home/campaigns/drive-5-miles-less-a-week.html>) is very worthwhile, but the projected reduction in CO₂ emissions if this was achieved accounts for just 1.5% of all UK transport-related emissions. It can be suggested that there are much greater potential gains to be had in the transport sector by encouraging people to switch to public

transport for car trips of between 2 and 25 miles (many of which are commuting journeys) and which collectively contribute some 60% of car-related CO₂ emissions.

It is argued that the benefits to be gained from increases in walking and cycling that can realistically be achieved by current policies relate more to the health benefits for individuals and the reduction in congestion and air pollution in urban areas. Even a small contribution to a reduced carbon footprint is important, but increased walking and cycling alone is unlikely to have a major impact on predicted climate change scenarios. Paradoxically, campaigns to increase walking and cycling for health reasons can also have a negative impact on carbon emissions. Many people find it more convenient and comfortable to cycle or walk for leisure purposes rather than for everyday utility travel. This is because such activity is undertaken without the usual time constraints of journeys to work or school and can be undertaken in what are perceived to be safe off-road environments. However, such activities also often generate car journeys as people travel by car to walk or cycle in scenic areas. In these circumstances increased walking and cycling for leisure purposes, whilst delivering real health benefits, may increase car travel rather than lead to a reduction in transport-related carbon emissions.

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Table 1: Environmental attitudes towards walking (mean scores)

Statement	Leicester	Lancaster	Leeds	Worcester
If I make or were to make journeys on foot I would find walking enjoyable	1.9	1.9	1.8	1.9
If I make or were to make journeys on foot I would get a sense of freedom	2.0	2.1	2.1	2.0
If I make or were to make journeys on foot I would feel part of my community	2.7	2.7	2.7	2.7
If I make or were to make journeys on foot I would find it relaxing	2.1	2.1	2.0	2.0
If I make or were to make journeys on foot it would benefit my health	1.5	1.5	1.5	1.5
If I make or were to make journeys on foot it would mean I contribute less to climate change	2.1	2.1	2.1	2.0
If I make or were to make journeys on foot it would increase my exposure to air pollution	3.0	3.1	3.0	3.0
If I make or were to make journeys on foot it would contribute less to local air pollution	1.9	2.1	2.0	1.9

1: strongly agree 3: neutral 5: strongly disagree

Source: Questionnaire survey, 2009

Table 2: Environmental attitudes towards cycling (mean scores)

Statement	Leicester	Lancaster	Leeds	Worcester
If I make or were to make journeys by bicycle I would find cycling enjoyable	2.3	2.3	2.5	2.3
If I make or were to make journeys by bicycle I would get a sense of freedom	2.3	2.3	2.4	2.2
If I make or were to make journeys by bicycle I would feel part of my community	3.1	3.1	3.2	3.0
If I make or were to make journeys by bicycle I would find it relaxing	2.6	2.5	2.7	2.6
If I make or were to make journeys by bicycle it would benefit my health	1.6	1.6	1.6	1.7
If I make or were to make journeys by bicycle it would mean I contribute less to climate change	2.0	2.1	2.0	2.0
If I make or were to make journeys by bicycle it would increase my exposure to air pollution	2.7	2.9	2.6	2.7
If I make or were to make journeys by bicycle it would contribute less to local air pollution	1.8	1.9	1.9	1.9

1: strongly agree 3: neutral 5: strongly disagree

Source: Questionnaire survey, 2009