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The factors influencing car use in a cycle-friendly city: the case of Cambridge

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ABSTRACT

Encouraging people out of their cars and into other modes of transport, which has major advantages for health, the environment and urban development, has proved difficult. Greater understanding of the influences that lead people to use the car, particularly for shorter journeys, may help to achieve this. This paper examines the predictors of car use compared with the bicycle to explore how it may be possible to persuade more people to use the bicycle instead of the car. Multivariable logistic regression was used to examine the socio-demographic, transport and health-related correlates of mode choice for work, shopping and leisure trips in Cambridge, a city with high levels of cycling by UK standards. The key findings are that commuting distance and free workplace parking were strongly associated with use of the car for work trips, and car availability and lower levels of education were associated with car use for leisure, shopping and short-distanced commuting trips. The case of Cambridge shows that more policies could be adopted, particularly a reduction in free car parking, to increase cycling and reduce the use of the car, especially over short distances.

1. Introduction

In transport research, considerable attention has been devoted to the question of how to get people out of their cars (Hensher, 1998; Stradling, 2003). It is, however, difficult to turn this aspiration into practice. A reduction in short trips by car is important for the future of cities (Monzon et al., 2011) and could also bring benefits for health, the environment and quality of life (Grabow et al., 2012; Mackett, 2003; Maibach et al., 2009). This paper examines the predictors of car use compared to bicycle use in a city with a traditional cycling culture (Aldred, 2010) in order to explore the possible implications for other areas. Attention is paid to the bicycle because it can provide a genuine sustainable alternative to the car for many trip purposes. For short trips there are really only three alternatives to the car in most areas; the bus, walking and cycling. While bus travel and walking provide alternatives in some settings, in others inadequate timetables and poor network coverage limit how effectively buses can compete with the car, and there is a limit to how far people can be expected to walk. In other parts of Europe, cycling accounts for a much higher modal share, up to 26% of all trips in the Netherlands and 16% in Denmark (Cycling Embassy of Denmark, 2010, Ministry of Transport Public works and Water Management, 2009). In the UK, however, as in all western countries, the car is the dominant mode of transport: data from the National Travel Survey (Department for Transport, 2010) shows that 63% of all trips are made by car compared to just 2% by bicycle. The car is the main mode for commuting and business (69%), shopping (64%) and leisure trips (69%), whereas for the bicycle the equivalent proportions are 3%, 1% and 2% respectively. It is not clear whether the bicycle can effectively compete with the car in the UK, given that cars have become an integral part of everyday life for many households (Katz, 1999). It was comparable in the 1950s however, with more traffic by vehicle for bicycles than cars in 1949 (Department for Transport, 2011b). Since then car use has continued to grow and cycling declined. The car has certain advantages over other modes in terms of speed, flexibility, safety and personal space. But car travel can have negative aspects for the user, such as being a very stressful experience (Novaco et al., 1990; Rasmussen et al., 2000), whilst cycling can be pleasant and exciting (Gatersleben and Uzzell, 2007). There are also health benefits of travelling by bicycle. Studies have shown that cycling can reduce the risk of cardiovascular disease and premature mortality (Andersen et al., 2000; Bauman and Rissel, 2009) and that the health benefits of a shift towards walking and cycling (sometimes known as active travel) are likely to strongly outweigh the harms (de Hartog et al., 2010). For car users to change their travel behaviour, however, a desire for change, clear benefits and the availability of a viable alternative are likely to be required (Stradling et al., 2000).

In the UK there has been an increased focus on cycling following a shift in policy direction dating from the White Paper ‘A New Deal

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for Transport' (DETR, 1998). The government of the time subsequently introduced a long-term strategy to encourage people to use more sustainable modes of travel (Cairns et al., 2004). The first part of the strategy included the Cycling Demonstration Town programme that started in October 2005 and provided investment for six towns. Each town received funding that equated to £10 per head of population per year, sourced equally from central and local government (Sloman et al., 2009). The Department for Transport and the Department of Health followed this with a further £43 m invested in a second phase known as the Cycling City and Towns (CCTs) programme involving one city and 11 towns. The aim was to explore whether increased investment in cycling as part of a whole-town strategy could lead to a significant and sustained increase in the number of cyclists and the frequency of cycling (Department for Transport, 2011a). Evaluation of the Cycling Demonstration Towns reported an average 27% increase in cycling relative to levels in 2005 before the introduction of the programme (Sloman et al., 2009). The aim of this study is to identify which characteristics are significantly associated with the choice of the car versus the bicycle for work, shopping and leisure trips. The study takes place in one of the Cycling Towns, Cambridge. This is a location with a history of high levels of cycle use compared to other urban areas in the UK. Indeed, Cambridge has the UK's highest modal share for cycling to work (25%), substantially higher than that for the locations with the next highest modal shares (Oxford, 14% and York, 14%) (ONS, 2001). Investigating why people continue to use the car in an area with a high prevalence of cycling may help inform strategies that could increase cycling in other towns and cities in order to bring about improvements for traffic congestion and public health. Kingham et al. (2001) have found that many factors are discouraging people to move out of their car and onto their bicycle, including distance, cycle infrastructure and because there is too much traffic on the roads. However in Cambridge, which has been described as a city representing a cycling culture, there are factors that encourage cycling, including having a favourable flat environment (of with parts of the city centre closed to motor traffic), a generally temperate climate (the region's mean temperatures are higher than the UK average and has lower rainfall and wind levels (Met Office, 2012)), prominent cycling activism and extensive infrastructure (Aldred, 2010). Therefore if predictors of car use can be identified, these may help inform actions that could be introduced to increase cycling in other locations. The study also examines the specific correlates of modal choice for short work trips (those of less than 5 km) to examine whether there are policies that might help to promote modal shift for these trips (Mackett, 2001).

2. Methods

This analysis uses data collected as part of the Commuting and Health in Cambridge study, which is being conducted in Cambridge, UK and has been described in more detail elsewhere (Ogilvie et al., 2010). In summary, a questionnaire survey of working adults (aged 16 and over) was conducted between May and October 2009. Participants were recruited through workplaces in Cambridge to which they commuted from within an approximate radius of 30 km of the city centre. The questionnaire included a 1-day travel record of all trips made on the previous day (Panter et al., 2011). This had been used in a previous study in Glasgow (Ogilvie et al., 2008) and adapted from the UK National Travel Survey (Stratford et al., 2003). For each trip, respondents specified the purpose and elapsed time spent using each travel mode. The trips were classified using the National Travel Survey categories for trip purpose and main mode (Department for Transport, 2010). Of the eight trip purposes, work, shopping and leisure trips were used in the analysis because they were the most frequently reported categories. *Factors affecting modal choice* To characterise those who used the car (compared to the bicycle) for different trip purposes, three main groups of explanatory variables were considered: socio-demographic, transport and health-related indicators, all of which were taken from the relevant sections of the questionnaire (Panter et al., 2011). Socio-demographic indicators included sex, age, presence of children in the household, education, housing tenure and urban–rural status. Binary indicators were created for having children aged under 5 years or between 5 and 15 years, whether the participant's home was rented or owned, and whether the participant lived in an urban or rural location. This last variable was determined according to the Urban and Rural Classification of the participants' residential Census Output Area (Bibby and Shepherd, 2004). Age was categorised into five bands and education was classified into four groups of highest level of attainment – degree level, 'A' Level or equivalent, GCSE or equivalent and other. Transport indicators included having a driving licence, having access to cars and bicycles and the frequency of walking for pleasure. Binary indicators were produced for holding a driving licence and for bicycle access. Three categories were derived for the number of cars per adult in the household: none, less than one (which included households with one or more cars available but fewer cars than adults in the household) and one or more. Time spent walking for pleasure was included in order to identify any association between recreational walking and modal choice. This variable was derived from the total reported duration of walking for pleasure in the past week (in minutes) and categorised into four groups. Finally two additional transport variables were used in the analysis of work trips (but not shopping and leisure trips): parking provision at work (categorised as free parking, paid parking or no parking) and network distance from home to work, which was computed in a Geographical Information System (GIS) (ArcGIS 9.3) using home and work postcodes provided in the questionnaire and categorised as less than 3 km, 3–5 km, 5–10 km or greater than 10 km.

The health-related indicators were body mass index (BMI) and the physical and mental health summary scores of the SF-8 (Ware et al., 2001). BMI was calculated by dividing weight in kilograms by height in metres squared and categorised into one of three groups (World Health Organisation, 2000): underweight/normal weight, overweight and obese. The SF-8 physical (PCS-8) and mental (MCS-8) health summary scores provide a reliable measure of physical and mental health based on eight questions on general health, physical functioning, and limitations over the past 4 weeks due to physical health problems, bodily pain, energy, social functioning, mental health and emotional problems (Ware et al., 2001). Responses were given on Likert scales. PCS-8 and MCS-8 summary scores were then calculated using the method and coefficients given in the SF-8 manual (Ware et al., 2001).

Univariable and multivariable logistic regression analyses were conducted for the individual trip purposes to provide separate models for work, shopping and leisure trips. In all cases the outcome measure was modal choice (0 = bicycle and 1 = car). Trips made for other purposes, and trips made using a main mode other than the bicycle or the car, were excluded from analysis. Univariable associations were identified for each explanatory indicator to estimate the odds ratio (OR) for using a car instead of cycling for each trip purpose. As suggested by Hosmer and Lemeshow (2000), only variables for which a significance level of less than 0.25 was obtained in univariable analysis were included in the multivariable logistic regression models. Multivariable modelling began with the entry of socio-demographic variables, followed by transport variables and finally health variables. This sequential model building was designed to explore the relative importance of the three domains of explanatory variables and how these varied