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New walking and cycling infrastructure and modal shift in the UK: A quasi-experimental panel study

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ABSTRACT

Heavy dependency on car use leads to traffic congestion, pollution, and physical inactivity, which impose high direct and indirect costs on society. Promoting walking and cycling has been recognised as one of the means of mitigating such negative effects. Various approaches have been taken to enhance walking and cycling levels and to reduce the use of automobiles. This paper examines the effectiveness of infrastructure interventions in promoting walking and cycling for transport. Two related sets of panel data, covering elapsed time periods of one and two years, were analysed to track changes in travel behaviour following provision of new walking and cycling infrastructure so that modal shift from private car use to walking and cycling can be investigated. Two types of exposure measures were tested: distance from the infrastructure (a measure of potential usage), and actual usage of the infrastructure. Only the latter measure was statistically significantly associated with modal shift. This in turn suggested that infrastructure provision was not a sufficient condition for modal shift, but may have been a necessary condition. Along with the use of new infrastructure, the loss of employment, higher education, being male and being part of the ethnic majority were consistently found to be significantly and positively associated with modal shift towards walking and cycling. The findings of this study support the construction of walking and cycling routes, but also suggest that such infrastructure alone may not be enough to promote active travel.
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1. Introduction

Increasing auto dependency has resulted in serious environmental and societal repercussions, but such negative effects can be alleviated by reducing car use and stimulating the use of more environmentally friendly transport modes (Cools et al., 2009; Marshall and Banister, 2000). A modal shift towards active travel modes such as walking and cycling has various potential positive impacts. It could reduce air pollution from burning fossil fuels, mitigate traffic congestion, increase levels of physical activity and lead to more sustainable communities (Banister, 2008; Rissel, 2009; Giles-Corti et al., 2010).

In order to suppress car use and, at the same time, to promote active travel, various transport policies and strategies have been implemented through a wide range of structural, infrastructural or behavioural interventions (Graham-Rowe et al.,

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2011). Many studies have found a positive association between such transport interventions and active travel (Brownson et al., 2000; Moudon et al., 2005; Mutrie et al., 2002; Ogilvie et al., 2007; Parkin et al., 2008; Pucher et al., 2011; Rietveld and Daniel, 2004; Wen et al., 2005; Yang et al., 2010). Furthermore, recent cost-benefit studies of walking and cycling infrastructure report high benefit-cost ratios, implying that construction of such infrastructure can be beneficial to society (Cavill et al., 2008; Davids, 2010; Gotschl, 2011; Sælensminde, 2004; Wang et al., 2005). However, most empirical studies in this field have been based on cross-sectional data and/or did not include control groups in their study design, which limits their capacity to support causal inference about the effectiveness of the interventions (Powell et al., 2010). Therefore, although there has been much research on active travel and infrastructural interventions, more rigorous longitudinal studies are needed (Graham-Rowe et al., 2011; Krizek et al., 2009). A panel study offers a useful way of evaluating a transport intervention and of investigating dynamic aspects of travel behaviour (Kitamura, 1990).

In the last few years, substantial investments in walking and cycling infrastructure have been made across the UK (Davids, 2010; Powell et al., 2010; Redfern et al., 2011). This study aims to contribute to the empirical evidence base by exploring and analysing panel data obtained in a quasi-experimental study of three selected sites of a national programme of constructing new walking and cycling routes. In this paper we evaluate the effectiveness of this infrastructure in promoting a modal shift. More specifically, we examine the travel behaviour change that can be stimulated by infrastructural interventions to improve walking and cycling facilities by addressing two research questions: (1) Does exposure to transport infrastructure interventions encourage a modal shift towards walking and cycling? and (2) Which groups of people are more likely to incorporate active travel in their journeys once such an intervention is implemented?

2. Methods

2.1. Interventions

We used the data collected as part of the iConnect (Impact of Constructing Non-motorised Networks and Evaluating Changes in Travel) study, which aimed to evaluate the impact of a walking and cycling infrastructure programme called Connect2. This programme initially comprised 84 transport infrastructure projects across the UK that built and/or improved walking and cycling routes and thereby aimed to promote active travel in the general population. Of the initial 84 sites, three – in Cardiff, Kenilworth and Southampton – were selected for the core evaluation study after considering the heterogeneity of local contexts, likely impacts, construction timetables and accessibility to researchers of the available sites (Ogilvie et al., 2012).

In the three study sites, new walking and cycling infrastructure has been constructed and existing routes have been improved. Connect2 in Cardiff includes construction of a traffic-free pedestrian/cyclist bridge over the River Ely, called The Peoples' Bridge, connecting the suburb of Penarth to the city centre and involving development of feeder routes to and from the bridge. Southampton's intervention involved building a raised boardwalk linking the city centre and nearby residential areas along the shore of the River Itchen, where an informal footpath and feeder routes had existed before (Fig. 1). The core element of Kenilworth's intervention was a walking and cycling bridge crossing a busy dual carriageway. Other elements in Kenilworth entailed improving the existing greenway between Balsall Common and Kenilworth town centre and building a cycle route between Warwick University and Kenilworth town centre. The Peoples' Bridge in Cardiff and the boardwalk in Southampton have been in use since July 2010. The core element of the Kenilworth scheme was implemented in September 2011, but the link between Kenilworth and the University was implemented after the iConnect data collection was completed.

2.2. Study design

We collected travel behaviour data as well as personal and household information during late spring/early summer in 2010, 2011 and 2012 from the populations living around the case study sites. The aim was to study changes in travel behaviour before and after the construction of the new walking and cycling infrastructure.

7500 adults living within 5 km by road of the core of each intervention site were randomly selected from the edited electoral register and mailed a baseline survey package including a questionnaire, consent form and participant information sheet in April 2010[1]. The questionnaire collected data on personal and household characteristics and the weekly travel and physical activity of each respondent, the latter being shown to have comparable reliability and validity with that of more established postal survey instruments (Adams et al., 2014).

In total, 3516 people returned completed or partially completed baseline questionnaires, which made for a 15.6% response rate. At the same time of year in 2011 and 2012, all the baseline survey respondents were sent follow-up surveys that asked the same questions along with one additional section related to their awareness and use of the new infrastructure in their local area. In the 2011 follow-up, 1906 completed questionnaires were returned, a 54.2% retention rate. In 2012, 1564 people responded to the second follow-up survey, a 44.5% retention rate from baseline.

[1] More detailed information on the content and conduct of the survey as well as the full questionnaire can be found in Ogilvie et al. (2012).

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