# Healthcare representatives' perspectives on hospital travel plans in England


## Abstract

The take-up of travel plans is increasing across the National Health Service (NHS) in the UK, yet their impact on reducing car use is relatively low. Previous studies have investigated the determinants of generic travel plans but lacked an appreciation of the unique context of healthcare settings. This study investigated NHS travel plan co-ordinators' views on hospital travel plans to identify the factors affecting the success of travel plans in changing travel mode choice behaviour. A nationwide survey was conducted among NHS travel plan co-ordinators in England, with a response rate of 51% ($n$ = 47). Findings suggest that despite having the potential for promoting walking as a key travel option among the hospital staff, measures to promote walking were reported as the least effective. Spearman correlation tests show that the effectiveness of measures to promote walking and reduce car use was positively associated with each other – highlighting the significance of designing effective travel measures to promote walking to attain the overall success in changing travel mode choice behaviour. Shift working patterns, personal circumstances, high car use, and staff attitude towards car use were reported as the key barriers to change travel mode choice behaviour among the NHS hospital staff. The use of robust methods and evidence-base to develop and monitor travel plan measures were found to be the key determinants of the success of travel plans. The provision of off-site car parks around 10 to 15 minutes walking distance away from the hospital site will not only encourage the car users to walk, but also provide a realistic solution to the transport issues experienced by the hospitals. This study contributes to the knowledge gap by providing a valuable insight into the factors that may have affected the success of hospital travel plans, and form a basis for future research.



**Key words**: Travel plan, travel behaviour change, walking, hospital staff, determinants, success

# 1 Introduction

The National Health Service (NHS), the largest organisation in Europe, employs approximately 1.3 million staff, and provides healthcare services to over 57 million people (NHS, 2012). The use of cars to access NHS facilities has been a common practice for many years. Around 83% of the journeys associated with the NHS are made by car (NHS SDU, 2007). Alongside general motives such as convenience, independence, and social status; several other factors including shift working pattern, limited accessibility to hospital sites, and the provision of free parking have contributed to the increased car-dependency among hospital staff (Curtis and Headicar, 1997; Rye, 1999; Stokes, 1996). Transport accounts for 13% of the total carbon equivalent emissions by the NHS in 2012, and has been identified as key in meeting its target on carbon emissions reduction, by 34% and 80% by 2020 and 2050 respectively from the 1990 baseline of 15 $MtCO_2e$ (NHS SDU, 2014). Moreover, the NHS, as a health service provider, is expected to demonstrate leadership in promoting the health benefits of walking and cycling, in response to the growing concerns over the lack of physical activity among UK adults (Walness, 2002).

According to Rye (2002), a travel plan provides a strategy for an organisation to reduce its transportation impacts, and to influence the travel behaviour of its employees, suppliers, visitors, and customers. It involves the development of a set of mechanisms, initiatives, and targets tailored to meet the needs of an organisation when promoting the use of sustainable modes of transport, and reducing the reliance on single occupancy cars. All NHS Acute Trusts[1] were required to produce a board-approved travel plan[2] as part of their Sustainable Development Management Plan by December 2010 (Arup, 2009; NHS SDU, 2009a). The take-up of travel plans among the NHS Acute Trusts has increased from 45.5% to 88.5% between 2002 and 2013 (HSCIC, 2014a). Only 5% of the Trusts were found to have fully implemented travel plans in 2008 that could reduce carbon emissions by up to 10% (NHS SDU, 2009a). However, the effective implementation of travel plans by 100% of the Trusts can reduce 0.36 $MtCO_2e$, equivalent to 2.4% of all NHS emissions (NHS SDU, 2009b). Alongside the high policy emphasis on reducing car use; the unique travel context requires the hospitals to accommodate increasing demand for car parking spaces by staff, patients, and visitors; and to provide easy access to their sites for emergency services (Enoch, 2012).

Despite the high policy emphasis on reducing car use (Armitage et al., 2006; NHS SDU, 2013), the impact of hospital travel plans on reducing car use has been relatively low (NHS SDU, 2009a).

[1] NHS Acute Trusts are the healthcare authorities responsible for managing the NHS hospitals.

[2] Travel plans are referred to as a mechanism for delivering a package of transport measures targeted at a specific site by an agent with a strong relationship with the local transport users to deliver transport and wider goals to the organisation, and society as a whole (Enoch, 2012).

Securing the success of a travel plan has become a real challenge for most of the healthcare authorities. Previous studies have investigated the determinants of a travel plan (Cairns et al., 2010; Hosking et al., 2010; Macmillan et al., 2013), but were generic, and lacked an understanding of the unique context of healthcare settings. As a result, the issues affecting the success of hospital travel plan measures remain unclear.

The latest statistics published by the Information Centre for Health and Social Care shows that 77.7% of all NHS staff are female (HSCIC, 2014b, 2014c). Commuting trips are often complex in nature for women with children (Root and Schintler, 1999). Transporting children (i.e. dropping off children at school or nursery) limits the opportunity for cycling. Men with an access to a cycle are more likely to cycle to work if the distance criteria are met, and the cycling conditions are satisfactory (DfT, 2014; Dickinson et al., 2003). Irrespective of age, gender, and health conditions, walking is generally considered as a common form of physical activity for all (Sullivan and O'Fallon, 2006). Maximising the potential of promoting walking as an alternative to car use is thus pivotal for healthcare authorities (Coleman, 2000).

Information available on hospital travel plans on a national scale is limited to NHS Trusts with access to a travel plan. In the absence of readily available data at a national scale on hospital travel plans, the alternative approach is to capture the views of the NHS Trust co-ordinators responsible for developing, and monitoring travel plans. This study was, therefore, aimed at investigating the English NHS Trust coordinators' perspectives on hospital travel plans to identify the factors that may have affected the success of hospital travel plans in changing travel mode choice behaviour. After setting the context of the study in the introduction, the paper identifies the determinants of a successful workplace travel plan based on a review of the state-of-the-art. The methodology used to collect, and analyse the data is discussed. Then, the survey findings are explored. Finally, the implications of the research findings for the design effective travel plan measures to promote walking and reduce care use are discussed.

## 2 Determinants of an effective workplace travel plan

The impact of travel plans on changing travel mode choice in different settings has been an area of active research. A body of literature claims that the adoption of workplace travel plans has reduced peak hour traffic congestion, relieved parking pressure, made sites more accessible, raised awareness about sustainable travel options, improved staff travel, and aided staff retention (Cairns et al., 2010; Enoch, 2012; Rye, 2002). In contrast, based on a review of seventeen travel plans, Hosking et al. (2010) suggested that there is insufficient evidence to draw a conclusion on the effectiveness of travel plans on changing travel mode choice. Cairns et al. (2008) conducted a study among 26 organisations, and found that the impact of travel plans on reducing the proportion of car use varied from 1% to 35%. Only a small proportion of the organisations with comparatively well-developed travel plans

have achieved a relatively high reduction (up to 35%) in car use, and car driver kilometres. In the context of healthcare, Addenbrooke's Hospital reported having reduced car use from 74% to 42% between 1993 and 2003 through the implementation of a travel plan (CUH, 2004). In contrast, a relatively new travel plan by Weston General Hospital reported having a higher car use rate (82%) for commuting trips when it was introduced in 2010 (Transport and Travel Research Ltd, 2010). The varying impacts of travel plans on reducing car use, and promoting alternatives are attributed to several factors including the knowledge and methods used to develop, implement, and monitor travel plans within a given context (Cairns et al., 2010; Macmillan et al., 2013; Marieke van Stralen, 2010; Roby, 2010; Sanko et al., 2013).

The contextual factors include the availability of resources, attitude towards travel plans, and transport issues experienced by the organisation as a whole (Roby, 2010; Rye, 1999, 2002). A well-developed travel plan with long-term programmes generally requires more resources compared to travel plans with simple measures. Employers with a positive attitude towards a travel plan are more likely to allocate sufficient resources required to develop, and maintain a travel plan. However, Cairns et al. (2010) argued that failure to achieve the expected outcomes over a period may deter an employer's interest in funding travel plans. The optimum allocation of resources to ensure the effective design and implementation of travel plan measures within the given context is, therefore, vital to sustain the employer's interest, as well as the success in the long-term.

The implementation of a travel plan is often constrained by several organisational factors, and other associated uncertainties including (Gärling et al., 2002; Rye et al., 2011; Watts and Stephenson, 2000): (a) companies' self-interest; (b) availability of resources; (c) employees' perceptions towards alternatives; (d) the provision of alternatives; and (e) public acceptance. The organisations are often reluctant to disclose such information without the consent of senior management. Collecting information related to the implementation of hospital travel plans was beyond the scope of the study. Future studies should consider carrying out a scoping study to explore the issues that are closely associated with implementing hospital travel plans based on in-depth interviews. Hence, this study places a higher emphasis on examining issues related to measures, and monitoring of travel plans.

### 2.1 Travel plan measures

The impact of travel plan measures on making a prominent and visible change in travel mode choice behaviour is key to determining the overall success of a travel plan (Cairns et al., 2010; Gardner and Abraham, 2008; Petrunoff et al., 2015). The literature emphasises the importance of three interconnected issues in determining the overall success of travel plan measures: (a) context-specific factors; (b) the combination of the measures used; and (c) the robustness of the methods used for the development, and implementation (Cairns et al., 2010; Ogilvie et al., 2007; Petrunoff et al., 2015). An American study evaluated the impacts of a combination of travel plan measures on carpooling

behaviour among students within a university campus (Jacobs et al., 1982). The study found that the impacts of the measures across the two experimental parking lots were varied. The reason for having varied impacts across the parking lots was reported as 'unclear'. However, the study suggests that the availability of lack of parking spaces may have contributed to a higher increase in carpooling behaviour at parking lot A compared to parking lot B. A later study by Cairns et al. (2008) examined 44 case studies using a narrative analysis, and suggested that a comprehensive parking management policy was the key to determining the success of travel plans. However, Möser and Bamberg (2008) applied meta-analysis on the same dataset; and concluded that the organisational factors, and site characteristics were closely associated with the success of travel plans. There is no clear evidence to override the findings of one study over the other. Therefore, it could be suggested that the effectiveness of a travel plan is closely associated with a combination of the context-specific factors and the robustness of the methods used to design, and implement a travel plan. The above study findings are in line with a previous study based on a review of ten travel feedback programmes (i.e. soft measures designed to change travel mode choice behaviour) implemented in Japan between 2000 and 2003 (Fujii and Taniguchi, 2006).

Several studies suggest that travel plans with a combination of positive (e.g. incentives to promote sustainable modes of transport), and restrictive measures (e.g. car parking management strategy) are more effective in reducing single occupancy car use than travel plans with positive measures alone (Cairns et al., 2010; Enoch, 2012). Petrunoff et al. (2015) conducted a longitudinal study to compare the impact of two hospital travel plans located in Perth, Western Australia on reducing single occupancy car use among the staff over a six-year period, between 2006 and 2012. According to the study, the QEII Medical Centre's travel plan with a combination of restrictive, and positive measures had a significantly higher reduction in single occupancy car use (42%) in comparison with the Hollywood Private Hospital's travel plan (5%) with positive measures alone. Positive measures to promote walking are more effective when implemented in conjunction with restrictive measures to reduce the use of cars. However, there is a lack of robust evidence in support of these claims. The use of robust methods and evidence-base is vital to design travel plan measures that are cost-effective, easy to implement, and successful in achieving the targeted outcome (Bartholomew et al., 2006).

### 2.2 Travel plan monitoring

A robust monitoring method plays a key role in determining the overall success of a travel plan, as the measures are modified according to their performance. The methods used to monitor travel plans are largely dominated by a checklist approach guided by organisational motivations towards travel plans. As a result, the evidence emerges from the evaluation of soft policy measures is considered as weak, and further rigorous studies are required to assess their impacts on travel mode choice behaviour (Macmillan et al., 2013). Within the scope of the study, data were collected on the type of indicators used to monitor the travel plan, and the frequency of monitoring the hospital travel plans.

In general, ‘a reduction in car use’ is commonly used in the USA, UK, and Dutch literature to evaluate the effectiveness of a travel plan (Cairns et al., 2004; Organizational Coaching and ESTC, 1996; SDG, 2001). However, Enoch (2012) argued that the use of a single indicator does not provide sufficient information to compare the impacts of travel plans with organisations with similar circumstances. Other commonly used indicators by different studies include (Cairns et al., 2002; Ligtermoet, 1998; SDG, 2001): (a) change in modal share; (b) number of car parking spaces given up or car/employee ratio; (c) reduction in vehicle kilometres; (d) average vehicle occupancy status; (e) cost per employee; and (f) cost reduction per trip. A travel plan is a complex intervention comprising multiple measures that may simultaneously affect more than one determinants of changing travel behaviour within a given context (Alan et al., 2008). The use of such objectively measured indicators alone often fails to separate the impacts of travel plan measures on changing travel behaviour from the change caused as a result of changing circumstances, such as a change in residential location, and/or socio-economic circumstances. Based on the above discussion it can be suggested that careful consideration of the organisational and context-specific factors, and individual travel needs of the staff throughout the life cycle of the travel planning process determine the overall success of the travel plan.

# 3 Methodology

A survey was designed to capture the views of the NHS Acute Trusts’ representatives responsible for designing, and monitoring hospital travel plans. The questions were devised based on a comprehensive review of the literature to reflect the key aspects of a successful workplace travel plan.

First, the respondents with or without a travel plan were asked to identify the key transport issues experienced by their hospital site(s) from a list of transport issues pertinent to hospitals. Second, the respondents were asked a set of general questions relating to their travel plans. Third, a set of questions related to travel plan measures were asked, which were: (a) a multiple-choice question to identify the methods used to collect the data required to design travel plan measures; (b) two five-point Likert-type scale questions to assess the relative importance of factors for designing travel plan measures, and the relative effectiveness of travel plan measures; and (c) an open-ended question to express their views on the key barriers to change travel mode choice behaviour. Finally, there were two questions on the frequency of monitoring the travel plans, and indicators used to evaluate the impacts of the travel plans. Prior to the survey, a pilot survey was administered to eight people. Following the pilot survey, the questionnaire was revised according to the feedback received on the clarity, and organisation of the questionnaire.

There are 397 NHS hospitals in England, managed by170 NHS Acute Trusts. As the survey population is limited to the NHS hospital travel plan co-ordinators, it was decided to employ convenience expert sampling to circulate the questionnaire to all hospital travel plan co-ordinators

(Babbie, 1990). The advantage of convenience sampling is that it is easy to employ and is cost-effective. The key limitation of the technique is that the sample population may not be representative of the target population as the data are collected based on a self-participatory approach or from those who volunteered to take part in the survey. However, this sampling technique can provide accurate results when existing theoretical propositions are tested by examining the relationships between variables. So, the mode of generalisation in such cases is an analytical generalisation.

A cross-referencing of records collected by directly contacting the Acute Trusts, and data published by the Information Centre for Health and Social Care, showed that 115 NHS Acute Trusts (68% of the NHS Acute Trusts) had a travel plan in place in 2011 (HSCIC, 2011). Contact information was collected for 130 representatives from 110 NHS Acute Trusts via telephone enquiries, NHS Acute Trusts' websites, and NHS networks. The participants were contacted individually by email with a cover letter describing the aims of the survey, and a link to the web-based questionnaire in September 2011. A hundred and ten emails were sent successfully. Fifty-six valid responses were received, out of which 47 responses (i.e. representatives from 47 hospitals) were from 39 Acute Trusts with a travel plan; and the remainder were from Trusts with travel initiatives only. The key focus of the study is limited to hospital travel plans, therefore, responses received from Acute Trusts with a travel plan were only included for the main part of the data analysis (i.e. except for Figure 2), which represented an overall 34% of the total number of Acute Trusts with a travel plan.

The internal reliability of the questionnaire was tested using Cronbach's $\alpha$ coefficient (Cronbach, 1951). The Spearman $\rho$ correlation coefficient (Spearman, 1904) is regarded as an appropriate method to evaluate the degree of linear association between two ordinal variables if the data is not collected at regularly spaced intervals and/or sample size is relatively small (Lecomte et al., 2015). This test is valid based on the assumptions that the variables are measured on at least an ordinal scale, and the relationship between two variables can be described using a monotonic function. As the data were ordinal in nature, the Spearman $\rho$ correlation coefficient tests were used to measure the strength of the association between travel plan measures to promote walking, and restrictive measures to reduce the use of cars. If there are no repeated data values, a perfect Spearman correlation of +1 denotes a strong positive correlation and -1 denotes a strong negative correlation.

# 4 Results

The key survey findings are presented in this section. The α coefficient value for the overall questionnaire was above 0.7, indicating acceptable internal consistency of the measurement scale of the questions (George and Mallery, 2003). The same threshold for acceptability of $\alpha$ was also used in other studies on perception of key stakeholders in healthcare settings (Mourshed and Zhao, 2012; Zhao and Mourshed, 2012). The distribution of the survey sample by the three key regions of England

(i.e. South, Midlands and North) and the staff size of the NHS Acute Trusts (i.e. up to 3,000, 3,001 to 6,000, and more than 6,000) in comparison with the survey population of the study is shown in Table 1. The sample distribution for both categories is broadly similar to the population distribution. Sample classification by region shows an over-representation of respondents from the South (62%), and an under-representation from the Midlands (13%). The classification of the sample by staff numbers shows an under-representation of respondents from small Trusts (<=3,000 staff), and an over-representation from large Trusts (>6,000 staff).

The proportion of travel plans introduced by year is presented in Figure 1, suggesting an increase in the take up of travel plans since 2006. The finding is in line with claims by previous studies that the take-up of travel plans has increased following their recognition as a soft policy measure (Cairns et al., 2008). The highest number of the respondents (18) reported having introduced their travel plans between 2009 and 2011. As reported in other studies such as Roby (2010), regulatory requirements for having a travel plan may have accelerated its adoption among the NHS Trusts in recent years.

**Figure 1:** The proportion of the NHS hospital travel plans introduced by year (*n* = 45, missing data = 2).

### 4.1 Transport issues

The respondents were asked to select the transport issues experienced by their NHS Trusts from 13 given options, and the results are presented in Figure 1. Most of the respondents reported having experienced one or more of the following transport issues: (a) high car use (48); (b) a lack of car parking spaces (48); and (c) increasing demand for car parking spaces (44). The evidence found reinforces the claims made by other studies of a high car-dependency among hospital staff in England (NHS SDU, 2007). More than half of the respondents acknowledged the impact of high car use through on-site congestion (40) and/or congestion on local roads (32). Congestion is likely to cause a delay in accessing hospital sites, thereby, significantly affect the delivery of healthcare services. In comparison with other services ensuring easy access to the hospitals sites for staff, patients, and visitors is relatively of higher importance (Enoch, 2012). Moreover, nearly one-third of the respondents (18) said that their hospital sites had limited access by public transport. A small proportion of the respondents reported having limited facilities for walking (10) and/or limited access by walking (11). The results found in this study provide confirmatory evidence that transport issues experienced by the NHS hospital sites call for a significant reduction in car use. Moreover, most of the NHS Trusts reported having facilitated by pedestrian access, and facilities to support walking behaviour among their staff (Armitage, 1997; Rye, 2002).

**Figure 2:** Key transport issues experienced by the NHS hospitals (*n* = 56).

### 4.2 Travel plan preparation

The allocation of organisational resources was measured by the allocation of human resources employed to produce, and implement a travel plan; and data collection methods employed. The results are reported in Table 2. More than half of the respondents (56%) reported that their in-house team was responsible for producing the travel plan. This was followed by more than one-third (40%), who said the travel plan was produced by the in-house team jointly with external consultants.

More than three-quarters of the respondents (75%) reported having used one or more of the following methods to collect the information required to produce the travel plan: (a) staff travel survey (88%); (b) site assessment (78%); and (c) car-parking audit (76%). The evidence found suggests that most of the NHS Trusts used a combination of methods as recommended by the best practice guidance to collect the data to inform the travel planning process (TfL, 2008). Moreover, nearly half of the respondents stated that they collected the required information through staff forum(s) (51%), travel audit (49%), and/or informal staff feedback (46%). Only a small proportion of the respondents (5%) reported not having used any of the listed activities to collect the information required to inform the travel planning decision-making process.

### 4.3 Importance of factors while designing travel plan measures

The key factors considered while designing a travel plan are presented in Table 3. According to the results, most of the NHS Trusts placed a relatively higher importance on the factors associated with car use, public transport, and cycling compared to those related to walking while designing travel plan measures. For example, the lowest proportion of the respondents (42%) reported having considered weather *($\mu$ = 3.35, SD = 0.7)* as either *very important or important* for designing travel plan measures, followed by 68% citing personal commitments of staff *($\mu$ = 3.78, SD = 0.69)*. Bad weather conditions, such as high temperatures, heavy precipitation, and strong winds may discourage people to walk. Time constraints due to personal commitments, such as dropping off children at school are also identified as a key perceived barrier to walking for commuting trips (Clark and Scott, 2016).

### 4.4 Effectiveness of travel plan measures

The survey results on the relative effectiveness of different travel plan measures are presented in Table 4. Measures to promote cycling were rated as either *very effective* or *effective* by a higher proportion of the respondents in comparison with other measures. Besides, more than three-quarters of the respondents cited measures to promote public transport and reduce car use as *very effective and effective*. On average, travel plan measures to promote walking were found to be the least effective, only a quarter of the respondents (25%) stated them as either *very effective or effective.*

The effectiveness of travel plan measures by regions and Trust sizes were found to be varied. Most of the respondents from all three sizes reported having one or more either *very effective* or *effective* measures to promote cycling. One or more measures to promote public transport were cited as either

*very effective* or *effective* by most of the respondents from the small and large size NHS Acute Trusts. More than three-quarters of the respondents from the medium-sized NHS Acute Trusts reported having one or more either *very effective* or *effective* measures to reduce car use.

Moreover, the proportion of the respondents reporting having either *very effective* or *effective* travel plan measures ranged between 36% and 100% across the three English regions. Interestingly all (i.e. four) of the measures to promote cycling were cited as either *very effective* or *effective* by all of the respondents from the North region. The proportion of the respondents reported having effective measures to promote walking was higher from the north and south regions. Except for 'discounts on public transport', the remaining travel plans measures were cited as either *very effective* or *effective* by a higher proportion of the NHS Acute Trusts from the south region.

As at the time of the data collection it was not known which travel plan measures were the least effective, the respondents were asked an open-ended question to express their views on the key barriers to change travel mode choice behaviour. Specific barriers to change travel mode choice were extracted from their responses and classified into four groups according to their characteristics, namely: (a) socio-economic; (b) psychological; (c) situational; and (d) modal attributes. The results are summarised in Table 5. The results show that the highest number of the respondents cited shift working patterns (15) as the key barriers to change travel mode choice behaviour. Other factors that were reported as a key barrier by a relatively high number of respondents include personal circumstances (10), car dependency/high car use/culture of car use (9), staff attitude towards travel (7), and lack of resources to produce travel plans (7).

The Spearman correlation coefficient scores for the associations between measures to promote walking and discourage the use of cars are presented in Table 6. The results show that the effectiveness of measures to promote walking was positively associated with measures designed to change the situational context. For example, the effectiveness of promotional materials and activities was positively associated with incentives for walking ($\rho$= 0.88**), improved pedestrian facilities ($\rho$ = 0.75**), and improved pedestrian access ($\rho$= 0.76**). Promotional materials are designed to reinforce positive attitude towards walking (Anable, 2005); and changing the situational context within the scope of travel plan often involves providing incentives to encourage walking and/or improving the situational constraints to facilitate walking. The effectiveness of measures to discourage the use of cars was found to be positively associated with each other, and the effectiveness of measures to promote walking. For example, the effectiveness of introducing car-parking charges was positively correlated with the effectiveness of restricting car-parking permits ($\rho$= 0.45*) as well as the effectiveness of incentives for walking ($\rho$= 0.35*), and improved pedestrian access ($\rho$ = 0.51*). This study supports claims by other studies that a combination of restrictive and positive measures is more effective in reducing the use of cars and promoting walking (Cairns et al., 2010, 2004, 2002; Enoch, 2012; Petrunoff et al., 2015).

### 4.5 Monitoring travel plans

The frequency of monitoring hospital travel plans was found to vary among the NHS Trusts, as shown in Figure 3. More than two-thirds of the respondents reported having monitored their travel plans at least once a year (20) or every two years (8). Only a small proportion of the respondents reported monitoring the travel plan at least once every three years (3) or every five years (2). The remaining respondents (8) reported not having any fixed time period to monitor their travel plans.

**Figure 3:** The frequency of monitoring travel plans by the NHS Trusts ($n$ = 41, missing data = 6).

The respondents were also asked to identify the key indicators used to monitor the impact of their travel plans as illustrated in Figure 4. The highest proportion of the respondents monitored the impact of their travel plans by a change in modal share (26), closely followed by car parking space and employee ratio (25). Moreover, around one-third of the respondents reported having used employee satisfaction (16) and/or average vehicle occupancy status (14) to monitor their travel plans. The evidence found in this study suggest that although the Strategic Health Authorities require the NHS Trusts to develop hospital travel plans, there is no standard protocol in place to monitor the impact of hospital travel plans.

**Figure 4:** Key indicators used to monitor the hospital travel plans ($n$ = 42, missing data = 5).

## 5 Discussion

This section explores key survey findings to identify the factors that may have constrained or facilitated the success of travel plans in promoting walking as an alternative to car use among the hospital staff, and suggest directions for future research. This study shows that transport issues experienced by most of the hospitals can be characterised as high car use and associated externalities such as congestion on local roads, on-site congestion, and high demand for car parking spaces. High car use is often linked to the provision of free or low-cost car parking spaces, shift-working patterns, a lack of access to the hospital sites by public transport, and the organisational culture to car use (Rye, 1999). Moreover, despite having a high policy emphasis on promoting walking as an alternative, measures to promote walking were cited as the least effective. Shift working patterns, personal circumstances, high car use, and staff attitude towards car use were reported as the key barriers to change travel mode choice behaviour among the NHS hospital staff. The evidence found calls for introducing robust transport strategies to reduce the level of car use, and promote walking among the staff in response to the recurring transport issues experienced by the NHS hospitals.

The effectiveness of travel plan measures depends upon careful consideration of several factors during the travel planning process. Previous research suggests that travel plan measures are more effective in favourable transport conditions (Cairns et al., 2010). Most of the NHS Trusts were facilitated by the provision of satisfactory pedestrian access and infrastructure, suggesting that they can encourage their staff to walk to work without investing additional resources to improve the

pedestrian infrastructure in the near future. The review of hospital travel plans shows that around 16% of the staff (i.e. 800 staff for an NHS Trust with 5,000 employees) live within the two miles walking distance; and a proportion of the staff (e.g. 8% to 15%) were already walking to work (East Cheshire NHS Trust, 2007; Scarborough and North East Yorkshire Healthcare NHS Trust, 2006; Winchester and Eastleigh Healthcare NHS Trust, 2009). The successful implementation of effective travel plans is likely to have a higher impact on changing travel mode choice behaviour, and increase the modal share of walking among the staff (Alfonzo, 2005; Ogilvie et al., 2007).

Moreover, most of the NHS Trusts reported having insufficient on-site parking facilities to meet the peak hour parking demand. Providing on-site car parking facilities for patients and visitors is a priority for hospitals, especially for the ones with limited car parking spaces. For example, at Southampton General Hospital the main car park is allocated to the patients and visitors (University Hospital Southampton NHS Foundation Trust, 2014). This additional parking requirement by hospitals compared to other services is likely to contribute to the shortage of parking spaces at busiest times. Moreover, delays caused due to time spent on looking for a parking space and congestion on local roads are likely to have serious implications on the delivery of healthcare services. Many hospitals already have the provision of off-site car parking facilities to accommodate the demand for additional car parking spaces, such as Glenfield Hospital, and Leicester Royal Infirmary Hospital. So, the provision of off-site car parks around 10 to 15 minutes walking distance away from the hospital site will not only encourage the car users to walk but also provide a realistic solution to the transport issues experienced by the hospitals.

The types of methods used to inform the travel planning process, to a large extent, are influenced by the knowledge and expertise of the travel plan co-ordinators. Most of the NHS Trusts reported having an in-house team, who either worked independently or jointly with external consultants to produce the travel plans. From the strategic perspective, as recommended by previous studies, most of the NHS Trusts used a combination of positive and restrictive travel plan measures to change travel mode choice behaviour (Cairns et al., 2010; Enoch, 2012; Petrunoff et al., 2015). The effectiveness of the measures reported was varied. In particular, the measures to promote walking were perceived as the least effective by most of the NHS Trusts. However, the Spearman correlation tests show that the effectiveness of measures to promote walking and reduce car use was positively associated with each other. In other words, a reduction in car use was positively associated with an increase in walking for commuting trips among the hospital staff. This finding further suggests the importance of designing effective travel measures to promote walking to secure the overall success of the travel plans.

However, the consideration of factors that may constrain walking was evident among a relatively lower proportion of the respondents, which may have affected the effectiveness of travel plan measures to promote walking (Petrunoff et al., 2015). Walking is widely recognised as a cost-effective, environmentally-friendly, reliable, and healthy mode of transport. However, the viability of

walking as a travel option for commuting purposes has been subject to a debate among academics and practitioners. A growing number of studies suggest that people are reluctant to take part in environmentally friendly behaviour such as walking, as it is subject to situational and personal constraints (Clark and Scott, 2016; Gärling et al., 2002; Mackett, 2003). Moreover, walking is a relatively slow travel option especially in comparison with car journeys, and subject to walking distance (i.e. up to two miles for commuting) (DfT, 2014; Frank et al., 2008). The propensity of forming habitual behaviour is higher among commuters, who frequently travel by cars within a stable context (Thøgersen and Møller, 2008). The influence of car use habits among commuters is regarded as a key reason why measures designed based on the concept of deliberate decision-making fail to achieve the targeted outcome (Gardner and Abraham, 2008; Verplanken et al., 2008). It means that despite having walking as a viable travel option for some trips, car user may continue to use cars for non-car dependent trips.

This is why the importance of using robust evidence-base, and methods to inform the travel planning process is key to design effective measures to change travel mode choice behaviour to walking. The Model for Planned Promotion allows the systematic development of interventions with a focus on changing behaviour, which is widely used in public health research (Conner and Norman, 2005). The NHS Trusts should consider training their in-house travel plan team with the knowledge and skills required to design, and implement travel plan measures with a focus on changing travel mode choice behaviour (Enoch, 2012).

The significance of innovative measures to promote walking, such as walking buddies, walking maps, discount on outdoor clothing, discount on car parking permits for walking to work, and robust car parking strategies to reduce car use is widely acknowledged (Cairns et al., 2010; DfT, 2008; Ryley, 2008). However, introducing measures to restrict the use of cars often cause strong emotions and negative reactions among the staff, and may result in unintended consequences, such as illegal parking on local roads (Anable, 2005; Petrunoff et al., 2015). Evidence suggests that issues associated with car parking charges could be resolved through adequate consultation and by determining car parking charges in accordance with the individual circumstances of the staff. Many have suggested that ring-fencing the income generated from car parking charges to improve the provision of facilities to support alternatives help to increase the public acceptance of such measures (Ryley, 2010; Watts and Stephenson, 2000). Moreover, if longer commuting distance limits the scope of walking on its own, the NHS Trusts should consider encouraging as a link with car journeys. Introducing measures, such as flexible car parking permits, discounted car parking charges for using electric and low emissions cars (< 100 $gCO_2$/km) (Nocera et al., 2015) are likely to allow the staff to commute by cars when needed, and at the same time reduce the use of cars during peak hours and overall impact of using cars on the local environment. Following the implementation of travel plans, the impacts of the travel plan should be monitored on a regular basis using a robust method that can distinguish the

actual impacts of the travel plan measures from the changes in travel mode choice due to changing circumstances.

Most of the healthcare authorities reported having monitored their travel plans; however, the use of a standardised protocol or monitoring framework to monitor the impact of the hospital travel plans was not evident from this study (Enoch, 2012; Rye et al., 2011). In recent years, the Transport for London (TfL) introduced an online tool to support the monitoring of travel plans produced for London (TfL, 2016). A robust standardised monitoring framework allows evaluating the true impacts of travel plan measures and making changes to according to their performance, which is key to increasing the impact of travel plans.

Most studies on hospital travel plans have not been published in peer-reviewed publications. Previous research also questioned the reliability of methods used to develop and monitor hospital travel plans (Petrunoff et al., 2015). As a result, despite the acknowledgement of travel plans as an inexpensive, politically acceptable travel demand management tool; the effectiveness of travel plans on changing travel mode choice behaviour has been subject to debate. This study highlights the significance of carrying out further research with a focus on developing robust standardised methods to design and monitor travel plans in practice.

# 6 Conclusion

The transport issues experienced by the NHS hospitals call for a high reduction in car use through the implementation of effective travel plan measures. The take-up of hospital travel plans has been increasing in recent years in response to the regulatory requirement by the NHS to have a travel plan. There was insufficient evidence to make a conclusion on the overall impact of travel plans on changing travel mode choice behaviour. However, the relative effectiveness of the travel plan measures was found to be varied with measures to promote walking cited as the least effective.

By summarising the study findings, it could be suggested that a high proportion of the NHS Trusts prepared their travel plans as recommended by the best-practice guidance and travel plan literature. In line with previous studies, it was also found that the effectiveness of measures to reduce car use was positively associated with the effectiveness of measures to promote walking. The evidence found in this study suggests the importance of designing effective travel measures to promote walking to secure the overall success of the travel plans. Taking the necessary actions to increase the impact of travel plans measures is vital not only to meet the policy targets but also to address the transport issues experienced by the NHS hospitals.

Shift working patterns, personal circumstances, high car use, and staff attitude towards car use were reported as the key barriers to change travel mode choice behaviour among the NHS hospital staff. A lack of consideration to the factors that may constrain walking behaviour may have affected their

effectiveness. The potential of walking as a feasible alternative to car use is yet to be realised by the practitioners. The evidence found calls for the importance of using robust methods and evidence-base to develop travel plan measures to attain the success of travel plan measures in changing travel mode choice behaviour. The type of methods used to produce the travel plans largely depends on the skills and expertise of the travel plan coordinators. Most of the NHS authorities reported having an in-house travel plan team to prepare and monitor the travel plans. Therefore, the NHS Trusts should consider working in collaboration with other organisations (e.g. NHS Trusts, universities, and other charity organisations) to train their staff with the necessary expertise required to design effective travel plan measures.

Providing on-site car parking facilities for patients and visitors is a priority for hospitals, especially for the ones with limited car parking spaces, which is likely to contribute to the shortage of parking spaces at busiest times. The provision of off-site car parks around 10 to 15 minutes walking distance away from the hospital site will not only encourage the car users to walk but also provide a realistic solution to the transport issues experienced by the hospitals. The NHS Trusts should also consider introducing measures to encourage their staff to reside within proximity from the hospital site in the long term.

Moreover, there are no legal and organisational requirements from local governments and the NHS to monitor the impacts of hospital travel plans. Therefore, the methods used to monitor the impacts of hospital travel plan predominantly depend on the organisation's commitment to the travel plan. As suggested by other studies, a legal binding to monitor travel plans based on a standardised protocol is likely to lead to the adoption of a more robust travel plan monitoring system among the healthcare authorities. Finally, the research outlined in this paper sought to contribute to the knowledge gaps by identifying the key factors that may have affected the success of hospital travel plans, and recommending solutions to design effective travel plan measures to change travel mode choice from car to walking on its own or in conjunction with car use.

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Table 1: Sample distribution by NHS Acute Trust size and standard regions.

| **Details** | **Sample size** *(n)* | **Percentage** (%) | **Population** size *(N)* | **Percentage** (%) |
|---|---|---|---|---|
| **Trust size** | | | | |
| Up to 3,000 | 11 | 28 | 45 | 39 |
| 3,000 to 6,000 | 17 | 44 | 49 | 43 |
| More than 6,000 | 11 | 28 | 21 | 18 |
| Total | 39 | 100 | 115 | 100 |
| **Standard region** | | | | |
| South | 11 | 62 | 59 | 51 |
| Midlands | 17 | 13 | 30 | 26 |
| North | 11 | 26 | 26 | 23 |
| Total | 39 | 100 | 115 | 100 |

Table 2: General information on the hospital travel plans.

| **Details** | **Sample size** *(n)* | **Percentage** (%) |
|---|---|---|
| **TP produced by** | | |
| In-house team | 24 | 56 |
| In-house team jointly with external consultants | 17 | 40 |
| External consultants | 2 | 5 |
| Total | 43 | 100 |
| **Data collection methods** | | |
| Staff travel survey | 36 | 88 |
| Car parking audit | 32 | 78 |
| Site assessment | 31 | 76 |
| Staff forum | 21 | 51 |
| Travel audit | 20 | 49 |
| Informal staff feedback | 19 | 46 |
| None | 2 | 5 |

Table 3: Key factors considered during hospital travel planning process.

| **Factor** | **Very unimportant or unimportant** (%) | **Neither important nor Unimportant** (%) | **Very important or important** (%) | **Sample size** *(n)* | **Mean** *(μ)* | **Standard deviation** *(σ)* |
|---|---|---|---|---|---|---|
| **Organisational** | | | | | | |
| Organisational commitment to reduce car use | 0 | 0 | 100 | 40 | 4.58 | 0.501 |
| Organisational culture to car use | 0 | 2 | 98 | 41 | 4.44 | 0.55 |
| Availability of financial resources | 0 | 12 | 88 | 40 | 4.2 | 0.648 |
| Availability of staff time | 0 | 22 | 78 | 41 | 4.07 | 0.721 |
| **Personal** | | | | | | |
| Staff perceptions of the quality of public transport | 0 | 2 | 98 | 40 | 4.4 | 0.545 |
| Staff working pattern (e.g. shift working) | 3 | 12 | 85 | 41 | 4.2 | 0.749 |
| Staff health and fitness | 0 | 15 | 85 | 41 | 4.02 | 0.57 |
| Personal commitments of staff | 3 | 29 | 68 | 41 | 3.78 | 0.69 |
| **Situational** | | | | | | |
| Pedestrian access | 7 | 10 | 83 | 40 | 4.08 | 0.859 |
| Cycle access | 2 | 8 | 90 | 39 | 4.26 | 0.715 |
| Facilities for cycling | 0 | 5 | 95 | 41 | 4.39 | 0.586 |
| Access by public transport | 2 | 5 | 93 | 40 | 4.3 | 0.687 |
| Facilities for public transport | 0 | 2 | 98 | 40 | 4.35 | 0.533 |
| Distance from workplace | 2 | 17 | 81 | 41 | 4.02 | 0.724 |
| Weather | 10 | 48 | 42 | 40 | 3.35 | 0.7 |

Table 4: Relative effectiveness of the travel plan measures in changing travel behaviour of hospital staff.

| **Travel plan measures** | **Very ineffective or ineffective** (%) | **Neither ineffective nor effective** (%) | **Very effective or effective** (%) | **Sample size** *(n)* | **Mean** *( $\mu$ )* | **Standard deviation** *( $\sigma$ )* |
|---|---|---|---|---|---|---|
| Incentives for walking | 30 | 44 | 26 | 34 | 2.91 | 0.87 |
| Improved facilities for walking | 31 | 48 | 21 | 29 | 2.86 | 0.92 |
| Improved pedestrian access | 27 | 53 | 20 | 30 | 2.9 | 0.89 |
| Promotional materials and activities to encourage walking | 19 | 47 | 34 | 32 | 3.16 | 0.85 |
| Incentives for cycling | 2 | 20 | 78 | 40 | 3.93 | 0.8 |
| Improved access by cycling | 3 | 18 | 79 | 33 | 3.91 | 0.81 |
| Improved facilities for cycling | 2 | 18 | 80 | 39 | 4.05 | 0.86 |
| Promotional materials and activities to encourage cycling | 3 | 23 | 74 | 39 | 3.85 | 0.78 |
| Improved access by public transport | 3 | 27 | 70 | 33 | 3.79 | 0.82 |
| Discounts on public transport | 3 | 26 | 71 | 34 | 3.85 | 0.86 |
| Restrictions on parking permits | 6 | 26 | 68 | 31 | 3.84 | 0.97 |
| Car parking charges | 11 | 32 | 57 | 37 | 3.76 | 1.16 |
| Car-sharing scheme(s) | 8 | 38 | 54 | 39 | 3.62 | 0.94 |
| Easy access to information on public transport | 6 | 25 | 69 | 36 | 3.83 | 0.81 |
| Easy access to information on car-sharing | 5 | 45 | 50 | 38 | 3.55 | 0.86 |
| Changing working patterns | 18 | 52 | 30 | 33 | 3.12 | 1.02 |

Table 5: Barriers to change travel mode choice behaviour of the NHS hospital staff.

| Categories | Socio-economic | Psychological | Situational | Modal attributes |
|---|---|---|---|---|
| 0 to 5 | | Travel habit (2)<br>Resistance to change (4)<br>Negative perceptions towards alternatives (3)<br>Safety concerns (2)<br>Lack of environmental awareness (1) | Site visits (5)<br>Free or low car parking charges (5)<br>Lack of communication (1)<br>Lack of management support (3)<br>Location of hospital sites (1)<br>Distance between workplace and home (2)<br>Weather (2)<br>Lack of facilities for pedestrian (1)<br>Designing effective travel plan measures (1) | Convenience (3)<br>Time efficiency (3)<br>Flexibility (2) |
| 6 to 10 | Personal circumstances (10) | Staff attitude towards travel (7)<br>High car use (9) | Lack of resources (7) | |
| 11 to 15 | | | Shift working patterns (15) | |

Table 6: Correlation between measures to promote walking and reduce the use of cars.

| **Measure** | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Incentives for walking | - | | | | | |
| Improved facilities for walking | 0.93** | - | | | | |
| Improved pedestrian access | 0.89** | 0.91** | - | | | |
| Promotional materials and activities to encourage walking | 0.88** | 0.75** | 0.76** | - | | |
| Restrictions on parking permits | 0.15 | 0.002 | 0.16 | 0.04 | - | |
| Car parking charges | 0.35* | 0.32 | 0.51** | 0.28 | 0.45* | - |

** correlation is significant at the 0.01 level (two-tailed)
* correlation is significant at the 0.05 level (two-tailed)