Big Data, Small Changes: Evaluating the Impact of the Local Sustainable Transport Fund on Travel Behaviour and Awareness

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Abstract

A common question asked in current travel behaviour research is whether investment in sustainable travel leads to significant changes in travel behaviour and awareness? In this large-scale study, we looked at the preliminary impact of UK Central Government funding to encourage sustainable modes of transport as implemented by three regional transport authorities and local councils through the Local Sustainable Transport Fund (LSTF). The evaluation method was predominantly quantitative, the main component being a longitudinal postal cohort survey. The survey was conducted in five treatment areas that were the subject of local LSTF-funded transport interventions, which included physical infrastructure upgrades as well as softer measures: a town in Leicestershire; two districts in South Hampshire, and two districts of Greater Manchester. In addition, in each of the three regions, surveys were undertaken in control (or comparison) areas that had not received such interventions. The survey tool comprised a self-completion questionnaire covering respondents' awareness and usage of various land-based transport modes, including a seven-day travel diary. The initial survey was conducted in December 2013/Spring 2014 (with the after survey a year later - to follow), and the results compared against identical surveys in the three similar demographic control areas in the three regions. Over 64,000 questionnaires were distributed, which gave rise to a response rate of over 13%, from which nearly 6,800 completed or partially completed records were obtained and analysed. An age-weighting was applied to the travel diary data, to account for the variation in the sample versus the demography of the local populations, and the results analysed according to five different travel purposes, using guidance from the UK's Department for Transport, the project sponsor. The data from this 2013/14 survey suggests there are already small effects arising from the LSTF interventions, particularly from public transport interchange improvements, bus priority measures, demand responsive transport and improved cycling infrastructure. The level of awareness for these schemes is higher in the treatment areas than the control areas, and this is reflected in the travel diary data, which suggests respondents from the treatment areas tend to travel shorter distances per round trip on average, with a significant greater proportion being conducted by bus, and less as car driver. This study also shows the potential of collecting large datasets across different sources for travel behaviour analysis; however further research, including comparisons with cordon counts and results from the follow-on survey, need to be conducted before more substantive conclusions can be drawn.

Keywords:

Data collection methodologies, sustainable travel, longitudinal survey, encouraging walking and cycling, public transport, travel behaviour research, transport monitoring and evaluation.

1. Introduction

A common question asked in current travel behaviour research is whether investment in sustainable travel leads to significant changes in travel behaviour and attitudes, and mode-shifts to sustainable travel-modes? This paper presents the early findings of a large-scale two-year study to monitor and evaluate the impact of UK Central Government funding to encourage sustainable modes of transport, as implemented by three regional transport authorities and/or their associated local councils through the Local Sustainable Transport Fund (LSTF). The approach taken for monitoring and evaluation is informed by work previously undertaken by the University of Southampton as part of the five-year iConnect project (Ogilvie et al., 2011), which took a broadly experimental method using a socio-ecological model to determine the mediating and moderating factors that led to behaviour change as a result of physical interventions to improve walking and cycling facilities. The iConnect methodology was in turn informed by the realist evaluation approach associated with Ray Pawson (see, for example, Pawson and Tilley, 1997) which sets up a framework to determine what policy interventions work, where, for whom and why. This study was also informed by monitoring and evaluation studies undertaken by others, in particular the Sustainable Travel Towns study (Sloman et al., 2010) and the guidance developed for the Passenger Transport Executive Group (AECOM, 2012), as well as that published by the Department for Transport (DfT, 2012). The research is also influenced by review studies of interventions such as workplace travel plans, personalised travel plans and school travel plans (e.g. Möser and Bamberg, 2008, Chatterjee, 2009 and Bonsall, 2009), as such studies have highlighted potential weaknesses in evaluation methodologies, including a preponderance towards one-group studies, the risks of survey response bias, inadequate sample sizes and lack of independence. The deployed research design and methodology therefore attempts to address some of these weaknesses, while at the same time provide large scale travel behaviour data for ongoing analysis to inform whether investment in sustainable transport leads to significant changes in travel behaviour across different regions of the UK.

2. Method

The evaluation method is predominantly quantitative, the main component being a longitudinal postal cohort survey tool, which will subsequently be supported by the collection of on-road cordon data with respect to traffic volumes and journey times (to be presented at conference). The study comprised a comparative assessment of a purposive sample of three different regions and eight different areas. Postal surveys were conducted in five treatment areas that were the subject of local LSTF-funded transport interventions: a town in Leicestershire (Coalville), two districts in South Hampshire (Eastleigh and Gosport), and two districts of Greater Manchester (Rochdale and Tameside). These treatment case studies were compared against postal surveys in three similar demographic areas for the three respective regions, which acted as controls/comparisons.

2.1 Evaluation Approach and Design

Leicestershire provides the hinterland for a monocentric urban structure based on Leicester, and the LSTF interventions had been focused on two secondary centres, Coalville and Loughborough. This study therefore focused on Coalville, with the nearby town of Hinckley acting as a comparison. South Hampshire is a duo-centric conurbation based around Southampton and Portsmouth. The LSTF interventions were based on nine corridors, six focused on Southampton and three on Portsmouth. This study focused on two adjacent corridors in the Southampton area (Eastleigh/Chandler's Ford) and one in the Portsmouth area (Gosport), with west Fareham (Locks Heath) acting as a comparison. Greater Manchester provides a polycentric conurbation, centred on Manchester/Salford but with numerous other centres, including Altrincham, Bolton, Bury, Oldham and Stockport, with LSTF interventions broadly distributed across the 10 districts. This study focused on the two districts of Rochdale and Tameside (Hyde/Hattersley), with a third (Wigan) used for comparison. The transport interventions applied included physical upgrades to the cycling infrastructure, improved public transport interchanges and bus priority corridors, as well as softer measures such as school and workplace travel plans, and personalised travel plans (see Table 1).

Table 1: List of Case Studies, Interventions and Controls

Case Study	Primary Intervention	Secondary Interventions	Control Area
Coalville (Pop. 45,000)	Cycling Infrastructure	Car Sharing; Personalised Travel Planning; School Travel Plan; Wheels to Work, Business Surveys.	Hinckley (Pop. 43,000)
Eastleigh (Pop. 126,000)	Interchange	Area Travel Plan (Valley Park); College Travel Plans; Station Travel Plans; Bus Priority; Smart Cards.	Locks Heath/west Fareham (Pop. 56,000)
Gosport (Pop. 83,000)	Bus Priority	Area Travel Plan (HMS Daedalus); Cycle Links; Interchange; Personalised Journey Planning; Smart Cards.	

Hyde/Hattersley (Pop. 46,000)[1]	Demand Responsive Transport/Station Access	Workplace Travel Plans; Smart Cards[2]	Wigan (Pop. 82,000)
Rochdale (Pop. 96,000)	Sustainable Access to Metrolink/Rail	Cycle Hub; Demand Responsive Transport; Personalised Travel Planning; Workplace Travel Plans; Smart Cards	

This study therefore focused on the case studies and interventions as listed in Table 1. The primary interventions are purposely focused on physical measures. However, the impacts of secondary interventions were also assessed, with a focus on Personalised Journey Plans and Workplace Travel Plans. The sampling frame is provided by individuals drawn from the electoral register. Primary data collection focussed on specific wards in each District, as recommended by the local transport authorities and councils. In total 67 wards were sampled (Eastleigh 9, Gosport 17, Lock's Heath 8, Coalville 8, Hinckley 6, Rochdale 9, Hyde 4 and Wigan 6). The postal questionnaire was issued to a random sample of the local adult population who were 16 years old or over, as presented in the edited electoral register. Ward-level maps showing the primary intervention sites are given in Figures 1a to 1e.

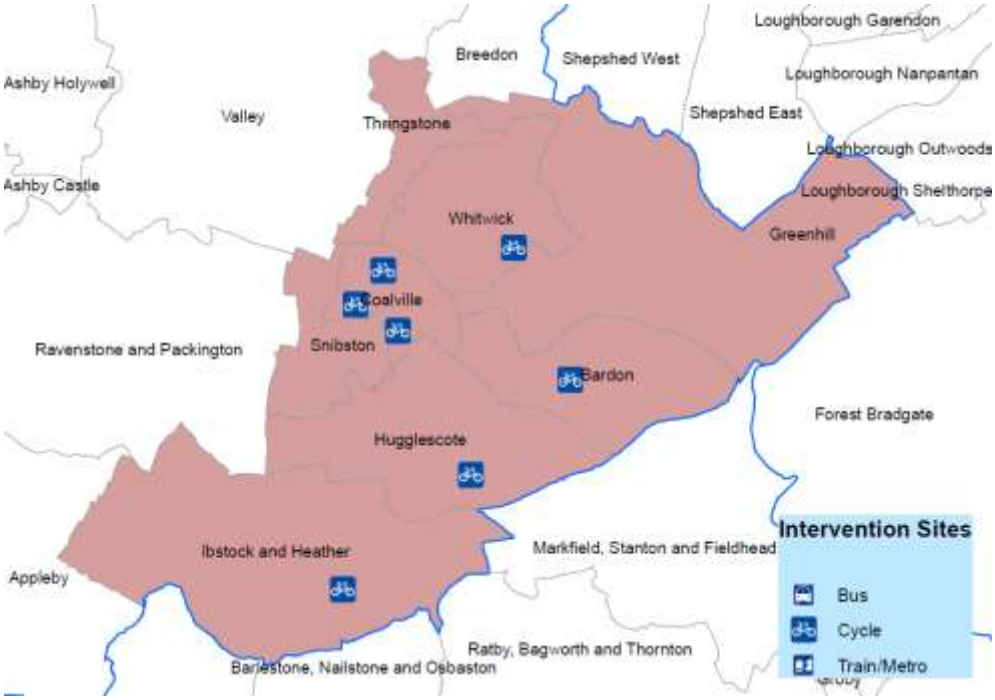

Figure 1a: Coalville wards (Leicestershire) showing Primary Intervention sites

[1] Based on the population of the Longendale Ward and the Hyde Godley, Newton and Werneth Wards. The Hattersley Estate is covered by the first two of these wards. Tameside's 2011 population was 219,324.

[2] Personalised Travel Planning has been undertaken in Audenshaw (Tameside).

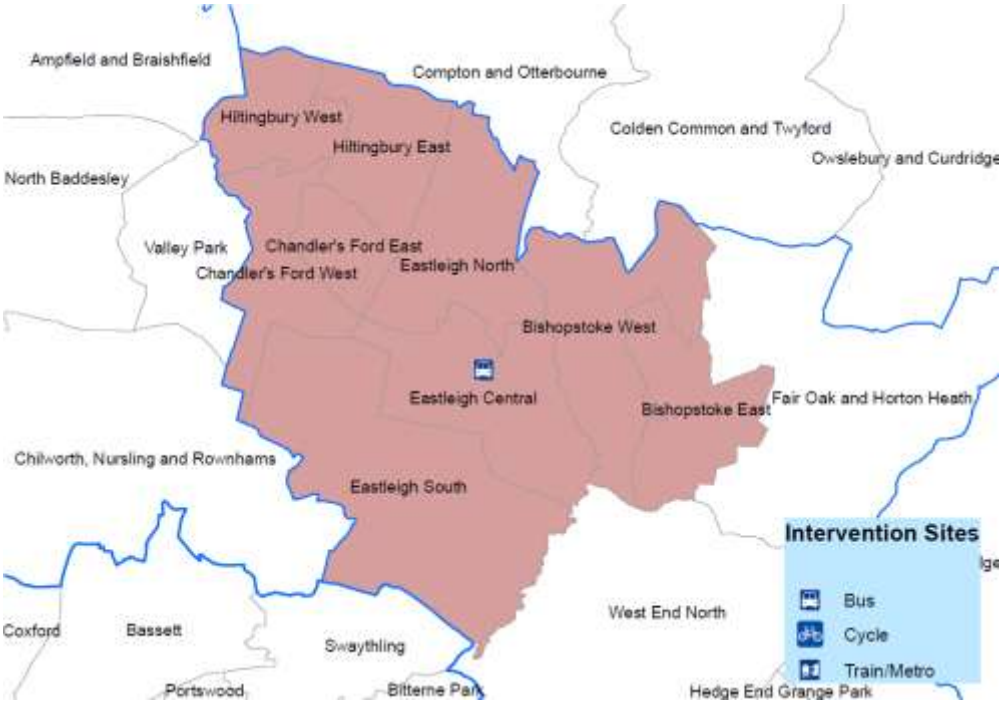

Figure 1b: Eastleigh wards (Hampshire) showing Primary Intervention sites

Figure 1c: Gosport wards (Hampshire) showing Primary Intervention sites

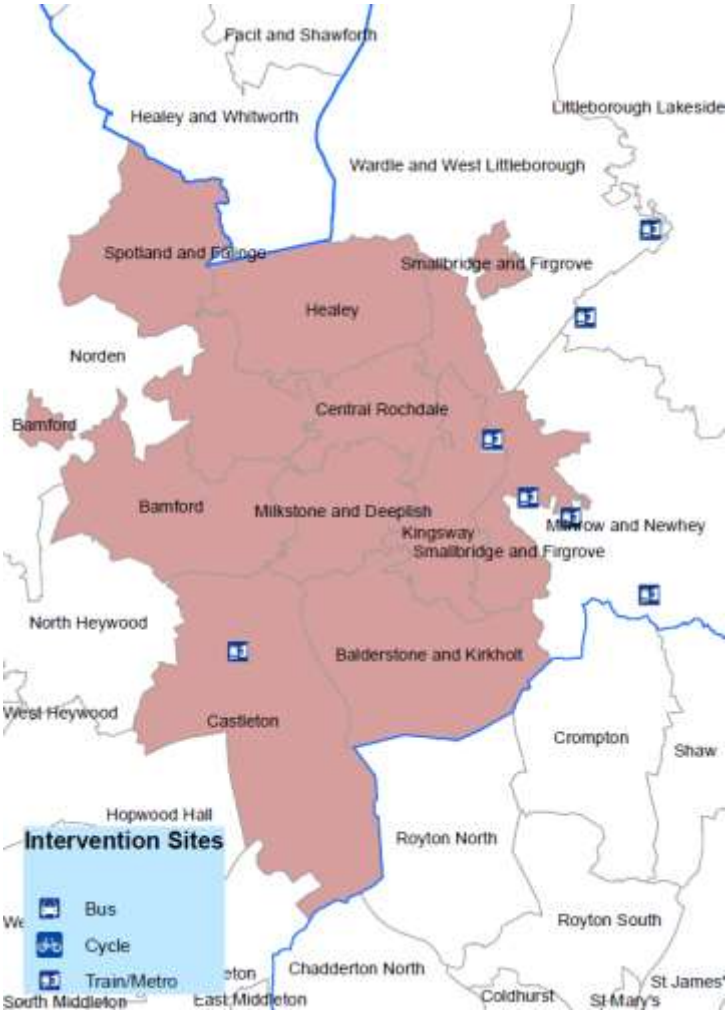

Figure 1d: Rochdale wards (Greater Manchester) showing Primary Intervention sites

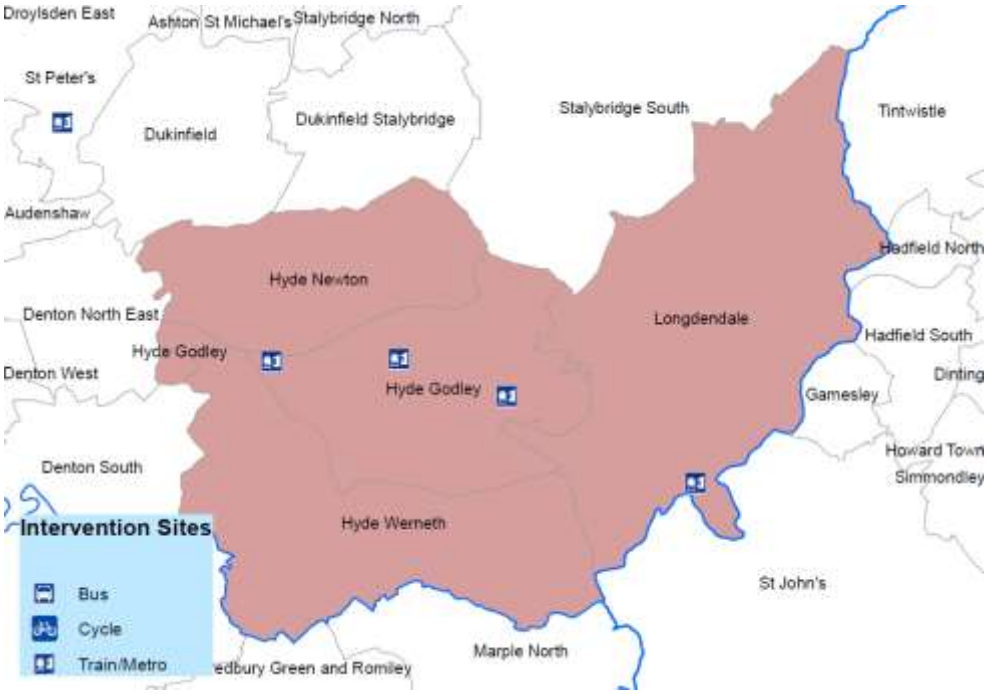

Figure 1e: Tameside wards (Greater Manchester) showing Primary Intervention sites

The postal survey tool involved a self-completion questionnaire covering respondents' perceptions and usage of various land-based transport modes, including a seven-day travel diary and their awareness of the LSTF transport schemes, travel attitudes, and individual and household characteristics. The survey tool was an amended version of that produced for the iConnect project (Ogilvie et al., 2012), which had undergone extensive piloting (Sahlqvist et al., 2011) and testing for reliability and validity (Adams et al., 2014). The initial survey was conducted from November 2013 to May 2014, while an after survey is being repeated from November 2014 to date. The quantitative data from the surveys and cordon counts were supplemented by qualitative information provided by focus groups conducted in the five treatment areas in July 2014, and the overall methodology was informed by an expert group workshop conducted in May 2014. The research conducted in this study was also approved by the University of Southampton's Research Ethics Committee (approval number 7625), and the initial findings are being presented through this paper.

2.2 Data Collection

Following a small pilot trial, 64,000 questionnaires were distributed for the initial survey in November 2013, with reminders issued in early spring 2014. This gave rise to a returned response rate of 13.2%, with over 8,460 surveys received (see Table 2). However, upon processing, a significant proportion of these returns (2.6%) were found to be either incomplete or invalid, which left nearly 6,800 completed or largely completed questionnaires available for the initial analysis (10.6%). There was also wide variation in the completed response rates across the survey areas, with the highest in Fareham (15.2%), and lowest in Wigan (7.3%), despite the use of targeted reminders.

Table 2: Data Collected by Survey Area

	Distributed	Completed / Largely Completed	Return to Sender	Not Completed / Invalid	Total Returned	Response Rate: Completed %
Rochdale	8,000	755	196	38	989	9.4%
Tameside	8,000	824	135	56	1,015	10.3%
Wigan	8,000	587	203	20	810	7.3%
Greater Manchester	**24,000**	**2,166**	**534**	**114**	**2,814**	**9.0%**
Coalville	8,000	794	183	31	1,008	9.9%
Hinckley	8,000	834	90	11	935	10.4%
Leicestershire	**16,000**	**1,628**	**273**	**42**	**1,943**	**10.2%**
Eastleigh	8,000	900	150	166	1,216	11.3%
Fareham	8,000	1,219	115	52	1,386	15.2%
Gosport	8,000	884	154	64	1,102	11.1%
South Hampshire	**24,000**	**3,003**	**419**	**282**	**3,704**	**12.5%**
Total	64,000	6,797	1,226	438	8,461	10.6%
% of surveys sent out		10.6%	1.9%	0.7%	13.2%	

The completed or largely completed questionnaires were transcribed, and this survey data extensively cleaned and assessed for representativeness, with guidance from the UK's Department for Transport (DfT), the project sponsor

The resultant collected dataset (N=6,797) was found to be broadly representative of the local population in terms of gender. However it was not representative in terms of age, with those aged from 17 to 29 being particularly under-represented, while those aged 45 to 74 were over-represented. A number of variables to re-weight the collected dataset were considered, including income and economic activity status, but age was determined to be the most appropriate for the analysis of the travel diary records. However, this weighting removed some records (n=401), where the age of the respondent was unknown and could not be determined retrospectively through the electoral register or other means. This reduced the maximum possible sample size for the weekly travel diary data to 6,397 respondents, and the results discussed further below are weighted. It should also be noted that the size of the active dataset also varies according to the metric being reported, as not all participants answered every question or necessarily the same questions across the survey, with n ranging from 4,194 to 6,385, including true zero values, depending on the question in the weighted dataset. In addition, a follow-on survey has almost been completed, and has provided a completed or largely completed response rate of over 52% of the initial survey respondents[3], which is similar to the experience from iConnect. Hence, a smaller subset of the collected data will be used to provide a year-on-year comparison of travel behaviour between the treatment and control areas. Nonetheless, the number of completed responses received to the questions in the initial survey across all areas is still noteworthy.

3. Results

Although monitoring and evaluation is on-going, results from the initial survey suggests there are many similarities and several differences between the travel diaries for the respondents from the five treatment and three control areas. These were analysed across five journey purposes as suggested by the DfT (2012), i.e. for journeys to/from work, those in the course of business, for education and study, personal business and shopping, and social and visiting.

3.1 Seven-Day Travel Diary

Overall, respondents in both the treatment and control areas made an average of 10 round-trips per week, across all journey purposes (see Table 3, weighted, n=4,899). Table 3 shows that almost 30,000 round trips are made in the treatment areas, with 36% for work, 30% for personal business and shopping, 17% social and visiting, 10% in the course of business and 7% for education and study purposes, which compares with 20,000 round trips

[3] Based on after-survey responses of 3,550 from before-survey respondent invitations of 6,745 (52 declined)

made in the control areas, with 33% for work, 31% for personal business/shopping, 17% social/visiting, 12% in the course of business and 7% for education/study. From Table 3, it can be seen that the distribution in the percentage of journeys across different purposes are broadly similar between the treatment and control areas, and where small differences do exist, the variation in the mean number of journeys conducted for each purpose is relatively small.

Table 3: Frequency of Journeys by Purpose across the Treatment and Control Areas (Weighted)

Frequency of Journeys*	All Areas		Treatment Areas		Control Areas		Difference	
To/from Work								
Number of journeys=	17,176	35%	10,661	36%	6,515	33%		2.6%
Mean	3.3		3.3		3.2		0.2	
Standard deviation	4.5		4.8		4.0			
In the Course of Business								
Number of journeys=	5,252	11%	2,992	10%	2,260	12%		-1.5%
Mean	1.0		0.9		1.1		**-0.1**	
Standard deviation	6.3		6.0		6.8			
For Education/Study								
Number of journeys=	3,452	7%	2,169	7%	1,283	7%		0.7%
Mean	0.6		0.7		0.6		0.1	
Standard deviation	2.7		3.0		2.2			
For Personal Business/Shopping								
Number of journeys=	15,002	31%	8,864	30%	6,138	31%		-1.6%
Mean	3.5		3.4		3.7		**-0.2**	
Standard deviation	3.7		3.7		3.6			
For Social/Leisure/Visiting								
Number of journeys=	8,268	17%	4,955	17%	3,313	17%		-0.3%
Mean	2.0		2.0		2.0		0.0	
Standard deviation	3.2		3.4		2.9			
Across All Purposes								
Total number of journeys=	49,150	100%	29,642	100%	19,508	100%		
Mean	10.0		10.0		10.1		**-0.1**	
Standard deviation	11.6		12.1		10.7			
n**=	4,899		2,966		1,933			

* Age weighting applied, with travel frequencies rounded to nearest integer. Includes cases where the journey frequency is zero, but not where the travel diary section has been left blank or the respondent's age is unknown.

** Cases where at least one return journey is stated, i.e. excludes where the frequency across all journey purposes are either zero, unknown or not stated.

Table 4 shows the breakdown of journeys by mode across all purposes in the eight treatment and control areas, including the mean travel time and distance by mode (weighted, n=6,350). Note that the size of each time or distance dataset varies across the different journey purposes, and more people responded to the time/distance travelled questions than the frequency of journeys conducted for each purpose (cf. Table 3). Overall, from Table 4, the total mean time and distance travelled across all modes is 10 hours and 200 miles respectively per week. Of the mean distances travelled by mode (a key metric), 63% is by Car Driver, 12% by Car Passenger, 12% by Other modes (including aviation), 8% by Train, 2% Bus, 2% Walking and 1% Cycling. If sustainable transport is defined as active travel (walking and cycling) and public transport, then only 13% of all travel is by sustainable modes in the initial survey.

However, there is wide variation in the distances travelled by mode across the different treatment and control areas, with the highest Car Driver share being in Coalville (69%), Car Passenger share in Rochdale (13%), Fareham and Tameside (both 12%), Other modes share in Gosport (17% - which includes Ferry), Train share in Eastleigh, Wigan and Rochdale (all 11%), Bus share in Rochdale (5%), Walking in Wigan (4%) and Cycling in Gosport (2%).

Table 4: Journeys by Mode (across all Purposes) in the Treatment/Control Areas (Weighted)

	Rochdale		Tameside		Wigan		Coalville		Hinckley		Eastleigh		Fareham		Gosport		All Areas		
																			Hours
Mean Walking Time (mins)	104	20%	103	17%	129	23%	88	15%	95	16%	97	16%	73	12%	102	15%	96	16%	1.6
Mean Cycling Time (mins)	4	1%	6	1%	12	2%	8	1%	10	2%	14	2%	14	2%	34	5%	13	2%	0.2
Mean Bus Time (mins)	56	11%	59	10%	41	7%	32	6%	19	3%	30	5%	15	3%	30	4%	33	6%	0.6
Mean Train Time (mins)	23	4%	31	5%	29	5%	5	1%	26	4%	33	5%	35	6%	20	3%	26	4%	0.4
Mean Drive Time (mins)	249	47%	313	53%	275	48%	347	61%	358	60%	335	56%	382	63%	391	58%	338	57%	5.6
Mean Passenger Time (mins)	70	13%	64	11%	53	9%	60	11%	67	11%	60	10%	65	11%	56	8%	62	10%	1.0
Mean Other Time (mins)	23	4%	18	3%	33	6%	28	5%	22	4%	30	5%	19	3%	36	5%	26	4%	0.4
Total Mean Times (mins) (All Modes)	530	100%	594	100%	572	100%	569	100%	599	100%	598	100%	603	100%	669	100%	594	100%	9.9 **Speed**
Mean Walking Distance (miles)	4	3%	4	2%	6	4%	4	2%	4	2%	4	2%	4	2%	4	2%	4	2%	2.6
Mean Cycling Distance (miles)	0	0%	1	1%	1	1%	2	1%	1	0%	2	1%	2	1%	5	2%	2	1%	8.9
Mean Bus Distance (miles)	7	5%	6	4%	5	4%	5	3%	4	1%	4	2%	3	1%	4	2%	5	2%	8.3
Mean Train Distance (miles)	15	11%	14	8%	17	11%	4	2%	22	9%	22	11%	19	8%	12	6%	16	8%	37.2
Mean Drive Distance (miles)	79	57%	103	58%	93	62%	133	69%	158	62%	126	63%	155	65%	127	62%	125	63%	22.3
Mean Passenger Distance (miles)	18	13%	21	12%	14	9%	22	11%	30	12%	23	11%	30	12%	20	10%	23	12%	22.2
Mean Other Distance (miles)	14	10%	26	15%	14	9%	22	12%	38	15%	18	9%	25	10%	35	17%	24	12%	57.3
Total Mean Distances (miles)	138	100%	176	100%	151	100%	191	100%	256	100%	199	100%	238	100%	207	100%	199	100%	20.2
Data from initial survey respondents, where the travel time/distance by mode is specified as zero or greater for at least one journey purpose (n=6,350), weighted by age.																			(mph)
% Sustainble Travel (by Distance)	**19.4%**		**14.7%**		**19.7%**		**7.7%**		**12.1%**		**16.3%**		**11.8%**		**11.9%**		**13.4%**		
% Non-sustainable (by Distance)	80.6%		85.3%		80.3%		92.3%		87.9%		83.7%		88.2%		88.1%		86.6%		

From the collected travel distances and times (which includes waiting time for public transport), mean travel speeds were also computed, which in the case of sustainable transport, range from 3 miles per hour (walking) to 37 miles per hour (train).

Overall, Table 5 shows the comparison of average travel times and distances by mode across all purposes between the treatment and control areas (weighted, n=6,350). From Table 5, it can be seen that there are some significant differences in terms of both travel time and distance between the treatment and control areas, in particular for bus travel and driving, as well as for 'Other' modes, which includes ferry and aviation. For example, the average driving time per week in the treatment areas is 22 minutes less than in the control areas, while bus use is almost correspondingly 19 minutes more.

Table 5: Journey Time and Distance by Mode in the Treatment and Control Areas (Weighted)

	Treatment Areas		Control Areas		Difference	
Mean Walking Time (mins)	99	17%	92	15%	6.6	1.1%
Mean Cycling Time (mins)	14	2%	13	2%	1.4	0.2%
Mean Bus Time (mins)	41	7%	22	4%	**18.7**	3.1%
Mean Train Time (mins)	23	4%	31	5%	-8.1	-1.4%
Mean Drive Time (mins)	330	55%	352	59%	**-22.0**	-3.7%
Mean Passenger Time (mins)	62	10%	63	11%	-1.3	-0.2%
Mean Other Time (mins)	27	5%	23	4%	**4.6**	0.8%
Total Mean Times (mins) (All Modes)	595	100%	595	100%	**-0.2**	
Mean Number of Journeys (from Table 3)	10.0		10.1			
Average Mean Time per Mean Journey (mins)	60		59		0.6	
Mean Walking Distance (miles)	4	2%	4	2%	-0.4	0.2%
Mean Cycling Distance (miles)	2	1%	2	1%	0.3	0.3%
Mean Bus Distance (miles)	5	3%	4	2%	**1.8**	1.3%
Mean Train Distance (miles)	14	7%	19	9%	-5.9	-1.3%
Mean Drive Distance (miles)	115	62%	143	63%	**-28.1**	-1.1%
Mean Passenger Distance (miles)	21	11%	26	12%	-5.5	-0.4%
Mean Other Distance (miles)	23	13%	26	12%	**-3.2**	0.9%
Total Mean Distances (miles)	184	100%	225	100%	**-41.1**	
Average Mean Distance per Mean Journey (miles)	18		22		-3.9	
n =	3874		2476			

Table 5 also shows the calculated 'average mean time/distance per mean journey', as derived from the travel times and distances given in this table, and the 'mean number of journeys' for all purposes as shown in Table 3. It should be noted that the number of observations used to calculate the latter differs from that of the former, i.e. n=4,899 versus 6,350, although this measure provides a broad estimation for the average time and distance travelled per round trip taken. On this measure, the mean distance travelled per round trip is 4 miles less in the treatment areas than for the control areas, whereas the mean travel time taken is broadly similar overall across the two groups. This reflects the variations across the different areas, with the longest round trips being taken in Hinckley and the shortest ones in Rochdale, although the round trip distance travelled overall is 20 miles on average.

3.2 Awareness of Transport Schemes

Table 6 shows the local awareness of different transport improvements by respondents from the treatment and control areas, as well as overall (un-weighted, n=6,596). Their awareness was rated on a scale from 1 to 4, where 1 = 'Not aware at all', 2 = 'Partly aware', 3 = 'Fully aware and not directly affected', and 4 = 'Fully aware and directly affected'.

Table 6: Awareness of LSTF Transport Improvements (Un-weighted)

	Rochdale	Tameside	Wigan	Coalville	Hinckley	Eastleigh	Fareham	Gosport	All Areas	Treatment	Control
a) Awareness of Public Transport Interchange Improvements											
Mean	2.4	1.6	1.5	1.3	1.3	1.3	1.4	1.8	1.5	1.7	1.4
b) Awareness of Bus Priority Measures											
Mean	1.6	1.4	1.5	1.3	1.3	1.3	1.6	2.0	1.5	1.5	1.5
c) Awareness of Demand Responsive Transport / Community Transport											
Mean	1.5	1.4	1.4	1.3	1.2	1.4	1.2	1.4	1.3	1.4	1.3
d) Awareness of Cycling Infrastructure Schemes											
Mean	1.4	1.3	1.4	1.8	1.3	1.5	1.4	1.8	1.5	1.5	1.4
e) Awareness of Car Sharing Schemes											
Mean	1.4	1.4	1.4	1.5	1.4	1.6	1.4	1.4	1.4	1.5	1.4
f) Awareness of College Travel Plans											
Mean	1.3	1.2	1.3	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.2
g) Awareness of Personalised Travel Plans											
Mean	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.2	1.2	1.3	1.2
h) Awareness of Workplace Travel Plan											
Mean	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.3
i) Awareness of Station Travel Plans											
Mean	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.2	1.2	1.3	1.2
j) Awareness of School Travel Plans											
Mean	1.3	1.2	1.3	1.3	1.2	1.3	1.2	1.2	1.2	1.3	1.2
k) Awareness of Area Travel Plans											
Mean	1.4	1.3	1.3	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.2

From Table 6, it can be seen that there was generally little or no awareness of the different local transport improvements in the survey areas across the treatment and control areas. However, there was a slightly higher mean (partial) awareness of public transport interchange improvements in Rochdale compared to overall, and the same for bus priority improvements in Gosport, and the cycling infrastructure schemes in Coalville. Also, the awareness of transport improvements seems to be slightly higher in the treatment areas compared to the control areas, for the primary interventions such as cycling infrastructure, interchange improvements, bus priority, and demand-responsive transport. These awareness ratings will be used in future to assess whether people's perceptions will have changed over time, and in conjunction with the travel diary data, to evaluate whether respondents have consciously made changes to their travel patterns as a consequence of being more aware of local transport improvements.

4. Discussion

From the results, the level of trip-making seen in the initial survey sample is broadly comparable with the 2013 National Travel Survey (NTS), for example, in 10 return trips being undertaken per person per week. However, there are some notable differences in terms of the breakdown by journey purpose and modal splits. A greater percentage of the journeys in this study are for work commuting purposes than in the NTS (35% compared to 16%) and for

business (11% compared to 3%). Conversely, there is a lower percentage of education trips in the sample (7% compared to 12%), and for personal business/shopping trips (31% compared to 39%) and for social purposes (17% compared to 30%). Similar differences exist when comparing the total distances travelled by purpose. This could be because the age group between 17 and 29 years are under-represented in the sample, across all areas. As discussed previously in the Introduction, this type of age bias is not unusual, i.e. the propensity of different age groups to respond to various survey tools, and this may in part explain why the mean number of journeys for education (Table 3) is relatively low compared to the NTS, as well as the low proportions of cycling distances seen generally (Table 4), since younger people would be expected to conduct more education trips, and they would typically cycle for longer distances. However, these results would not necessarily mirror those as reported by the NTS in any case, due to other factors such as definitional differences. For example, it should be noted that this study excludes children aged 16 or below, although these are included in the NTS, whilst there are also important differences in the treatment of business trips and international travel. Furthermore, this sample is not designed specifically to be representative at a national level, so some care needs to be applied in using this data and the results.

The initial survey (Table 4) shows the proportions of sustainable travel already varies across the different areas, ranging from 8% in Coalville and 12% in west Fareham, Gosport and Hinckley, to 15% in Tameside, 16% in Eastleigh, 19% in Rochdale and 20% in Wigan. Although this could ostensibly point to the LSTF-funded interventions potentially having an effect in some areas when the initial surveys were conducted, it has already been argued (Graham, 2014) that such purposive treatment areas are unlikely to be random, and adjustments will need to be made to account for existing confounding effects to determine if there is a marginal cause from the interventions. The differences in sustainable travel could simply be due to cumulative variations in local infrastructure and travel usage. For example, Rochdale residents have been served by Metrolink since 2013, which may have invoked travel patterns that are different to other areas; and Wigan was the subject of extensive personalised travel planning undertaken in 2008/9 - although this was the main reason why Wigan was chosen as a control area (since it is relatively unaffected by the latest LSTF initiatives), there may already exists a strong embedded propensity for sustainable travel locally. Therefore the effects of the LSTF schemes cannot be assessed fully until the follow-up survey has been conducted, and before- and after- travel patterns of the respondents have been analysed. Nonetheless, overall, the survey (Table 5) shows that respondents in the treatment areas tend to travel 4 miles less per round trip on average per week than those in the control areas and, significantly, they travel more on the bus and drive less. They also seem to cycle more, which collectively suggest that some of the LSTF interventions could be having an effect, and this is supported by evidence from the travel awareness assessments (Table 6), which show that awareness of the LSTF primary transport interventions is slightly higher in the treatment areas than the control ones.

However, the inherent variations in travel distances (Table 5) and proportion of sustainable travel (Table 4) between different treatment and control areas show there are potentially a number of features of the LSTF programme that make monitoring and evaluation particularly problematic. The LSTF programmes consist of a number of small scale, targeted interventions, introduced over a period of time and a range of places, rather than the more traditional single large intervention introduced at a single point of time and place. As a result, even with the relatively large sample sizes obtained, determining population-scale behaviour change from the results of interventions targeted at sub-populations can be difficult. Determination of causation is made even more difficult given the multiple treatments and the possibility of strong external or systemic effects, such as changes in income, employment, population and price of fuel.

In addition, it is also recognised that a less desirable by-product of weighting the travel diary data is that it can, where the variance of weights is large, result in standard errors that are larger than they would be for un-weighted estimates, although the variance of weights applied in this case is not suggested to be material. However, there is scope in future work for investigating these design effects, e.g. the difference in the precision of estimates produced by a complex design (in this case a weighted sample) relative to a simple random sample, particularly in any year-on-year comparison with the follow-on survey.

Similarly, corollary with the secondary data from traffic cordon counts, as well as any prevalent external effects, need to be investigated. For example, surveys of Personalised Journey Plan (PJP) recipients in Gosport suggest that they have achieved reductions in car driver trips of 10-19% for different journey purposes (Sloman et al., 2015), and therefore a 0.3% reduction in the overall annual car mileage for Gosport residents could be attributed to the effect of the PJPs, i.e. a very small decrease. This also compares with AADT count data which indicate there was a 2.7% traffic reduction in the Gosport area between 2012 and 2013. In other words, only 11% of the observed traffic reduction is attributable to the PJPs, while the remainder could be attributed to many other factors, including sustainable transport schemes that are external to the LSTF (such as the launch of the Eclipse bus rapid transit service in 2012), other LSTF interventions (such as area travel plans); and non-domain transport and other systematic factors, including price of fuel and demographic changes. Nonetheless, this example from Gosport shows the potential for meta-analysis (Sloman et al., 2015), when large datasets such as those collected through this study are combined with other sources of travel information. In any case, the analysis of the initial surveys provides some useful insights into the existing sustainable travel behaviour and variations across different areas of the UK.

5. Conclusion

Although monitoring and evaluation of this large scale project is still ongoing, preliminary results indicate there are already some effects arising from the LSTF-funded improvements, as shown by increased awareness of the local primary transport interventions, specifically in public transport interchange improvements, bus priority measures, demand responsive transport and improved cycling infrastructure. This is reflected in a higher proportion of sustainable travel in most of the treatment areas as compared to the control areas, although the overall level is still very low. The initial survey from late 2013/Spring 2014 also indicates that respondents from the treatment areas tend to travel shorter distances per round trip on average, with a significantly greater proportion being conducted by bus, and less as car driver. However, the purposive nature of this study needs to be recognised, and it may not be possible to make direct comparisons with, for example, the National Travel Survey. Other external factors may also play a part, and comparisons with recorded traffic counts need to be made before any firm conclusions on whether LSTF investments in sustainable transport do lead to any significant changes in travel behaviour.

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