

A SURVEY OF TRAVEL BEHAVIOUR IN EDINBURGH

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1. Introduction

Sustainable modes of transport have been promoted in response to problems associated with the motor car, primarily congestion and pollution. It is therefore important to understand the perceptions people have of sustainable transport as alternatives to the motor car, and how they respond to sustainable transport policy measures. Such travel behaviour decisions were the focus of the data collection exercise reported in this paper. The survey was part-funded by the Scottish Transport Studies Group (STSG).

An extensive travel behaviour survey of 997 households was conducted in July 2003 along a transport corridor in West Edinburgh. The survey was part of a PhD study assessing the propensity of individuals to use non-motorised transport (cycling and walking) in Edinburgh. One aim of the PhD has been to identify population segments most likely to use non-motorised transport. Transport policy measures can then be targeted more efficiently at these population segments. There are also population segments at the other end of the behavioural response spectrum, unlikely to change travel behaviour towards non-motorised transport whatever policy measures are implemented.

Although there are many undesired by-products of motor car use, such as noise pollution, construction of infrastructure, the manufacture of vehicles, the disposal of vehicles and road accidents, the two major problems associated with the motor car are congestion and air pollution. Motorists tend to recognise these problems but are often unwilling to change travel behaviour.

The problems of congestion and air pollution have been exacerbated by increased car dependency in Scotland. Most adults can drive, most households have access to a motor car and motor car use has increased in recent years; all trends which are set to continue. Furthermore, households are prepared to pay high costs to own and use a motor car. To many people their motor car is a treasured possession, an essential item providing them freedom and independency.

Few transport modes can compete with the cost and convenience of the motor car. Travel by motor car is also faster than non-motorised transport (unless in congested traffic). However, there are distinct advantages of non-motorised transport:

- Convenience - Cycling and walking enable door to door transport
- Cost - Cycling and walking are very cheap
- Environment - Neither mode contributes to air or noise pollution
- Exercise - Regular cycling and/or walking can help fitness levels
- Health - Regular cycling and/or walking can help with heart disease, weight control and stress
- Social activity and interaction - Walking and/or cycling as a social activity, be it shopping in town centres or on an organised bicycle ride
- Socially inclusive - Most people can use non-motorised transport, and they are not dependent on income

Any change in travel behaviour towards non-motorised transport would be small, but cycling and walking do have a role as a viable alternative, particularly for short trips and journeys in urban areas. Edinburgh has been used as the case study for the survey, a compact, growing and prosperous city with an historic core. It represents a particularly interesting transport case study due to its' favourable transport policy, high density development, low car ownership rates and sustainable modal split (in terms of walking and public transport) relative to other UK cities.

2. Responses to transport policy measures

The focus of this paper is on how individuals respond to transport policy measures, particularly those relating to reducing motor car use and increasing non-motorised transport use. Recent transport policy documents have concentrated on reducing the two main problems associated with the motor car, congestion and air pollution.

Policy measures to reduce motor car use can be categorised as either sticks forcing individuals to change travel behaviour or carrots enticing them to change behaviour. Sticks tend to be focused on increasing the cost of using a motor car, say through petrol costs, parking charges or congestion charges. As shown by the fuel tax protests in September 2000, much of the population is resistant to petrol / diesel price changes. Prominent in Edinburgh are plans to introduce a £2 daily congestion charge to alleviate congestion and air pollution. It would also fund a package of transport improvements as part of an Integrated Transport Initiative. Carrots tend to be focused on improving the alternatives such as increasing the frequency of local buses and implementing new cycle and pedestrian facilities.

Cycling and walking have re-emerged on the Scottish transport policy agenda in recent years, one component of the action plan within the 1998 "Travel Choices for Scotland" White Paper. The non-motorised transport policy approach has included the targeting of journeys to work (Green Travel Plans) and journeys to school (Safer Routes to School) to reduce peak time congestion. The encouragement of non-motorised transport has also been prominent in the related policy goals and documents concerned with improving social inclusion, health, exercise / sport and tourism in Scotland.

In terms of cycling, a National Cycling Strategy was implemented in 1996 with targets to increase cycling levels. Many cycle-friendly facilities (e.g. advanced stop lines, Toucan crossings), cycle routes and networks (including the Sustran's National Cycle Network), and secure cycle parking facilities have been developed in Scotland in recent years. Although there has been a recent significant rise in local expenditure and activity to increase cycle use, this has yet to be translated into a modal shift. Levels remain low but due to the many advantages of cycling and recent policy measures, cycling in Scotland could see a renaissance in future years.

Policy measures to encourage walking are not as advanced as those for cycling. Although there is not a National Walking Strategy (at the UK level), it is hoped that a Walking Strategy for Scotland will soon be implemented, following a February 2003 consultation document. The stated aim of the consultation document is to have more individuals choosing walking as their first transport choice for short trips and a combination of walking and public transport for longer trips.

Non-motorised transport policy for Edinburgh is outlined in the City of Edinburgh Council Local Transport Strategy 2004-2007. The objective for non-motorised transport is to provide a city in which they are an "attractive, safe and secure option". Included in the strategy are the promise of detailed cycling / walking strategies, several non-motorised transport targets, policies to improve facilities, pedestrian provision improvements and further development of a city-wide cycle network. After falling in the four years prior to 2001, walking and cycling levels in Edinburgh have stabilised over the last few years.

Although numerous policy documents have been produced, there is much scepticism as to whether the sustainable transport policy agenda can deliver. Requirements for the sustainable transport policy agenda to succeed include political will, general public support and sufficient funding. The emphasis in this paper is on general public support, exploring beneath the policy rhetoric to examine individual travel behaviour. The question remains whether people will actually change mode and an increase in non-motorised transport can be realised.

3. Survey methodology

The travel behaviour survey was undertaken in July 2003 along a transport corridor in West Edinburgh. The study of a transport corridor enabled the comparison of households living at different distances from the centre of Edinburgh. The West Edinburgh transport corridor was chosen for a variety of spatial (e.g. dimension of the postcode sector areas) and transport (e.g. the Union Canal could be used for safe and convenient non-motorised transport journeys) reasons.

The call and post method of delivering questionnaires was the data collection technique used in the travel behaviour survey. Following a pilot survey, this method was considered to offer a more favourable response rate and use of resources than other techniques. Delivery of self-completion questionnaires was undertaken in the evenings when households were more likely to be at home. Survey staff "called" on a household with a questionnaire, asking them to complete the questionnaire, and "post" it back at their own convenience using an enclosed pre-paid return envelope. Calling on a household involved either giving them a questionnaire on the doorstep if they were present and agreed to take part in the survey, or posting the questionnaire (and pre-paid envelope) through the letter-box if the household were not at home.

There were 3,000 questionnaires delivered to households along the West Edinburgh transport corridor. Of these, 1,269 were given to households and 1,731 were posted through letter boxes. There were also 212 refusals (14% of the 1,481 households where someone was in). There were 750 questionnaires delivered in each of four postcode sector areas from EH11 1 (Dalry) out to EH14 5 (Currie); they were equally distributed within each postcode sector to three randomly selected sub-areas.

The questionnaire comprised a range of questions, on the following topics:

- General household information (e.g. number of adults and children)
- Background transport data (e.g. car and bicycle ownership)
- Journeys to or through the city centre
- Non-motorised mode trips
- Attitudes to transport
- Car driver responses to transport policy measures
- Socio-economic data (e.g. age, gender, household income)

The questionnaire also included two stated preference experiments examining hypothetical choices between the bicycle and the current transport mode for the journey to work, and hypothetical choices between the car and on foot for general journeys.

The topics within the questionnaire of most interest to this paper are attitudes to transport and car driver responses to transport policy measures.

In terms of the attitudes to transport topic, respondents were asked their agreement with eleven statements relating to issues associated with the motor car, cycling and walking. A five-point scale was presented (Strongly agree, Agree, Neither agree or disagree, Disagree and Strongly disagree). Agreement with statements helped to clarify perceptions of the main problems associated with the motor car (congestion, air pollution), strength of feeling towards providing facilities for non-motorised transport and possible constraints for non-motorised transport (safety, too wet, too hilly).

In terms of the car driver responses to transport policy measures, two questions were asked. The first question concerned travel behaviour response to six transport policy measures, the second concerned response to price changes in petrol / diesel. A range of responses was available to respondents, to assess their position on a scale of travel behaviour change away from their motor car. It should be borne in mind that respondents tend to over-estimate their responses when stating likelihood in changing travel behaviour away from the motor car.

Answers to these questions were analysed for the overall sample and for different population segments. The responses were correlated against eight segmentation variables, grouped as socio-economic (age, gender, household income), ownership (bicycle and car ownership) and travel behaviour (frequency of travel as car driver, cyclist and pedestrian) information.

4. Survey sample

From the 3,000 questionnaires distributed, approximately a third (997) were returned. There was a different response rate between postcode sector areas (shown in Table 1). Response rates were greater in sub-areas containing higher income households and lower density housing (it was more difficult to access flats, and households in flats were more likely to be out).

Table 1. Questionnaire returned by postcode sector area

Postcode sector area	Frequency	Percentage
Area 1 - Dalry - EH11 1	221	22.3%
Area 2 - Slateford - EH14 1	311	31.4%
Area 3 – Wester Hailes – EH14 2	169	17.1%
Area 4 - Currie - EH14 5	289	29.3%
Total	990	
No area identifier on questionnaire	7	
Total	997	

A summary of the survey sample, using headline statistics of the segmentation variables, is shown in Table 2.

Table 2. The segmentation variables

Segmentation variable	Number of cases (total = 997)	Number of variable categories	Headline statistic
Gender	987	2	Even split (489 male, 498 female)
Age (all adults over 18)	992	8	Representative split (at least 4% in each category)
Income	881	7	23% had a household income more than £40,000
Bicycle ownership	874	N/A	52% of households did not own or have an adult bicycle available
Car ownership	960	N/A	20% of households did not own or have a car available
Travel as car driver	891	7	63% drove “most days”, 14% “never” drove
Travel on foot	836	7	61% walked “most days”, 2% “never” walked
Travel by bicycle	677	7	7% cycled “most days”, 60% “never” cycled

Note: N/A = not appropriate

Some of the responses, particularly the cycling questions, were under-represented. Respondents often left questions blank if they considered them inappropriate. The travel behaviour statistics emphasise that travel by motor car and on foot were regular activities undertaken by most of the sample, whereas cycling remained an activity undertaken by a small minority. Most individuals (60%) never cycled.

Amongst the sample, there were 560 car drivers who drove “most days” (63%). Representation of this group was particularly related to income and postcode sector area. The proportion of the sample driving most days increased through all seven income bands from 33% (household income of less than £6,000) to 74% (household income of more than £40,000). Individuals living further out from the centre of Edinburgh were more likely to drive “most days” (37% in area 1 “Dalry” up to 77% in area 4 “Currie”).

Other variables of interest in the questionnaire included status and journey to or through the centre of Edinburgh. Most of the respondents were in work / study (654) or retired (271). Very few respondents were in education (2% of the sample); it should be noted that the four postcode sectors were not Edinburgh student residential areas. Amongst respondents, travel to or through the city centre was mainly undertaken by bus (57%), a mode particularly suited to transport corridors. The percentage split for other modes of interest was 29% car drivers, 7% walking and 2% by bicycle.

The analysis presented in this paper was organised to reflect the initial research statement, the promotion of sustainable transport (in this case, non-motorised transport) in response to problems associated with the motor car. Firstly, the perception of respondents to the problems associated with the motor car were examined, using responses to general transport attitudinal statements. Secondly, the car driver’s responses to the problems associated with motor car were analysed. Finally, the role of cycling and walking as alternatives to the motor car was examined, using the non-motorised transport attitudinal statements.

5. General attitudes to the problems associated with the motor car

Respondents were asked their agreement to statements concerning the main problems associated with the motor car, congestion and air pollution. Their responses are shown in Table 3.

Table 3. Responses to statements on congestion and air pollution

	Strongly agree or agree		Neither agree nor disagree		Disagree or strongly disagree		Total
Statement: congestion is a problem in Edinburgh	849	85.9%	90	9.1%	80	5.0%	989
Statement: air pollution is a problem in Edinburgh	670	68.0%	230	23.4%	85	8.6%	985

Of all eleven statements (these two plus the cycling and walking statements), the strongest agreement amongst respondents was that “congestion is a problem in Edinburgh” (86%). Most also agreed that “air pollution is a problem in Edinburgh” (68%), although many were unsure (23% neither agreed nor disagreed). Most of the sample considered both congestion and air pollution to be problems in Edinburgh (66%). Examining the population segments, the most disagreement with the statements (particularly with the air pollution statements), was by males, those on higher incomes, and those with higher car ownership and use.

6. Car driver responses to six transport policy measures

The six transport policy measures car drivers responded to could be categorised as either sticks or carrots. The sticks were doubling the cost of petrol (gradually) and charging drivers a £2 daily charge to enter the city centre, making parking penalties and restrictions much more severe, and making most city routes a 20mph speed limit. The carrots were improving the frequency of local buses and improving local cycle facilities. In response to the six transport policy measures, the options offered to respondents were “Use car even more”, “Make no difference”, “Using car a little less”, “Use car a lot less” and “Give up using car”.

There were 609 car drivers who provided responses to the six transport policy measures. Of these, most (489 – 80%) were known to drive “most days”. The responses amongst these drivers, ranked in order of percentage that would at least give up the car a little, were:

1. Gradually double the cost of petrol	70%
2. Improve the frequency of local buses	61%
3. Charge motorists £2 to enter the city centre during the day	50%
4. Make parking penalties and restrictions much more severe	42%
5. Improve the local cycle facilities	27%
6. Make most city routes a 20mph speed limit	20%

Therefore, the main influencing measures were either changes to the user’s costs (petrol, road user charge) or public transport improvements. Only about a quarter of car driver respondents (27%) would “consider” giving up the car “a little” if local cycle facilities were improved.

Further analysis was undertaken of those “ready” to reduce their car use. This group consisted of 78 respondents (13%) that stated they would “give up using the car” for at least one of the six transport policy measures. Those on lower household incomes were more likely to be in this group (particularly less than £15,000 per year – 26% of this group); there was no evident link between readiness to give up using the car and either the remaining socio-economic variables (age, gender) or postcode sector area.

At the other end of the travel behaviour change spectrum, an indicator of those reluctant to reduce car use was the proportion of respondents ticking “Make no difference” or “Use car even more” for all of the six transport policy measures. This was 13% (81 respondents) of car drivers.

7. Car driver responses to price changes in petrol / diesel

Car driver respondents in the survey stated the petrol / diesel price levels they would “consider what alternatives are available” and “definitely use an alternative” to the motor car (622 respondents). The price changes were based on a current price (at time of questionnaire) of 80p a litre. The proposed price level rises in the questionnaire were £1 a litre (25% increase), £2 a litre (250% increase), £5 a litre (625% increase) and £10 a litre (1150% increase).

As expected, there was an overall reluctance to change travel behaviour in response to a change in petrol / diesel price. This was illustrated by low price elasticities (between -0.058 and -0.087) for the four price increases (using those who stated a definite change in behaviour away from the motor car).

However, a small proportion of car drivers would change travel behaviour at the slightest price increase (16% would at least consider alternatives for an increase to £1 a litre). These 99 car drivers (11 of whom would definitely give up driving if petrol prices increased to £1) were tested against the segmentation variables. Income was the only variable significantly correlated against the change in price; respondents in lower income households were more likely to change.

It is of interest to know the price turning points at which respondents would either “consider” or “definitely” change travel behaviour. The most popular trend amongst car drivers (192, 31% of the sample) was to consider what alternatives are available at the £2 level, and then definitely use an alternative at the £5 level. It must be borne in mind that only five prices were provided; the reality would be much more complex.

At the other end of the travel behaviour spectrum, there were a small proportion of car drivers (12%), who would not change their car use even if the petrol / diesel price increased by over ten times current levels (to £10 a litre). Suppressed demand was also evident amongst some drivers for the one option of a decrease in the petrol / diesel price to 60p a litre (25% reduction); 52 respondents (8.4% of the 622 car drivers) would “consider using the car more often” for a 25% price reduction in petrol / diesel.

8. Respondent responses to cycling statements

The cycling attitudinal statements included the strength of feeling towards cycle lane provision (on-road and off-road), and safety fears from traffic, often stated as the main barrier to cycling. It was also of interest to understand the responses to topography (too hilly) and weather (too wet), frequently quoted as deterrents to cycling. It is acknowledged that these aspects cannot be changed by transport policy measures. Results are shown in Table 4.

Table 4. Responses to cycling statements

	Strongly agree or agree		Neither agree nor disagree		Disagree or strongly disagree		Total
Statement: more money should be spent improving on-road cycle lanes in Edinburgh	352	48.6%	270	29.0%	208	22.4%	930
Statement: more money should be spent improving off-road cycle lanes in Edinburgh	648	68.8%	209	22.2%	85	9.0%	942
Statement: safety fears of traffic prevent me from cycling more often in Edinburgh	452	52.7%	248	28.9%	158	18.4%	858
Statement: Edinburgh is too hilly to cycle	190	21.3%	333	37.4%	368	41.3%	891
Statement: Edinburgh is too wet to cycle	199	22.5%	330	37.3%	355	40.1%	884

There was greater agreement than disagreement that “more money should be spent improving (on-road and off-road) cycle lanes in Edinburgh”, particularly amongst younger respondents. There was a preference for off-road (69% agreement) than on-road (49% agreement) cycle lanes. Motor car ownership and use correlated with a preference for off-road cycle lanes; motorists may consider on-road cycle lanes to take away valuable motor car road space.

Just over half of the respondents (53%) agreed that “safety fears of traffic prevent them from cycling more often in Edinburgh”. The proportion was higher for those not currently cycling, reinforcing safety fears of traffic as the main barrier to cycling.

The statements that Edinburgh is too hilly and too wet to cycle produced a mixed response and the most ambivalence (neither agree nor disagree) of the eleven attitude statements. There was significant correlation between these two variables, 73.4% gave exactly the same answers for both questions.

There was a gender difference amongst respondents for the cycling attitudinal statements. More women than men agreed that more money should be spent on on-road cycle lanes, safety fears were more likely to prevent them from cycling, and Edinburgh was too hilly and too wet for cycling.

9. Respondent responses to walking statements

The walking statements in the questionnaire included the strength of feeling towards pavement provision. It was also of interest to ascertain if there were enough convenient or safe pedestrian crossings in Edinburgh. The remaining walking attitudinal statement concerned fears for personal safety, often stated as a barrier to walking. Results are shown in Table 5.

Table 5. Responses to walking statements

	Strongly agree or agree		Neither agree nor disagree		Disagree or strongly disagree		Total
Statement: more money should be spent improving pavements for pedestrians in Edinburgh	683	69.6%	215	21.9%	84	8.5%	982
Statement: there are not enough convenient pedestrian road crossings in Edinburgh	281	28.9%	311	32.0%	381	39.2%	973
Statement: there are not enough safe pedestrian road crossings in Edinburgh	260	26.9%	318	32.8%	391	40.3%	969
Statement: fears for my personal safety prevent me from walking more often in Edinburgh	218	22.6%	203	21.0%	544	56.4%	965

Most respondents agreed (70%) that money should be spent improving pavements for pedestrians in Edinburgh. However, there was less than 30% of agreement for the two pedestrian road crossing statements. Opinion was similar on the convenience and safety of pedestrian crossings; 83.6% provided the same answer to both questions.

There was strong disagreement amongst respondents that fears for their personal safety prevented them from walking more often in Edinburgh (56%). The 23% of the sample who did have fears for their personal safety tended to be women, those on lower incomes and those at each end of the age band spectrum (over a quarter of those in the age bands 18-24, 65-74 and over 75 agreed with the statement).

In terms of correlating the attitudinal walking responses against the socio-economic segmentation variables, there was more agreement with the statements amongst women, older people and those on lower incomes. In terms of the background transport and travel behaviour segmentation variables, akin to the other attitudinal statements, the responses reflected the amount a person used that transport mode (and alternative modes). This reinforces the self-interest individuals use when responding transport policy measures.

10. Conclusions and discussion

A sustainable transport policy agenda has been introduced in response to problems associated with the motor car, primarily congestion and air pollution. Respondents from the survey of travel behaviour survey agreed that these problems were evident in Edinburgh.

Car drivers in the sample typically drove most days, were from higher income households and lived towards the edge of the urban area. A minority of car drivers stated a readiness to change travel behaviour, illustrated by 13% of them willing to give up use of their car for at least one of the six transport policy measures presented. There were therefore signs of travel behaviour change at the margins of the population. The transport policy measures with the largest impact upon car drivers were changes to the user's costs (whether through petrol prices or congestion charging) and public transport improvements. Of these, improving public transport, as an enticing carrot to encourage less reliance on the motor car, would be more popular amongst the public.

However, the majority of respondents were reluctant to change travel behaviour away from the motor car. Much of the population is arguably car dependent and when responding to transport policy measures tend to act in their self-interest. Most car drivers would need a large fuel price rise before considering travel behaviour change. Furthermore, there was a segment of the population extremely reluctant to change travel behaviour, resisting any transport policy measures and indicating no change for any of the petrol / diesel prices changes offered. Some respondents would increase their car use if the price of fuel fell. The costs of motoring are key to changing motor car travel behaviour; of the segmentation variables, only income had an effect upon the readiness of car drivers to change behaviour.

The role of non-motorised transport, as a variable alternative to the motor car for certain journeys, was examined. Cycling is a minority activity and local cycling facility improvements were low on the list of favoured transport policy measures. Concerning the attitudinal statements, policy measures that focus on off-road, rather than on-road, cycle lanes would be more popular with the public. Safety was confirmed as a major barrier to cycling, with just over half of respondents agreeing that safety fears of traffic prevent them from cycling more often in Edinburgh.

Responses to cycling statements were strongly segmented by gender. More men currently cycled; barriers to cycling were greater for women, particularly safety from traffic fears but also topography and weather. Transport policy measures could be implemented that reflect this difference, targeting a particular gender. Depending on the policy goals, examples could include the supply of cycling equipment (e.g. male or female bicycles), helmet promotion (say to ease the safety concerns of women) and a gender targeted marketing strategy.

Almost everyone walks, and yet the responses to the walking attitudinal statements varied according to gender, age and income. In terms of pedestrian provision, most respondents in the survey considered that more money should be spent on pavement improvements in Edinburgh. Agreement was much lower for increasing either the convenience or safety of pedestrian road crossings. Personal safety concerns were more acute amongst women, those on low incomes and at the age extremes. Transport policy measures to improve personal safety such as lighting and CCTV could be targeted at locations where a higher proportion of these population segments walk.