# SMARTER MODE CHOICES: SCOTTISH FINDINGS

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## 1. INTRODUCTION

The last 30 years has seen a fairly steady and significant growth in car miles per person travelled by car by Scottish residents, rising from an average of less than 8 miles per day in 1975/76 to over 13 miles per day by 2002/03 (Source: Scottish Executive Statistical Bulletin Trn/2005/3). Ignoring year-on-year fluctuations, this represents an average growth of about 2% per annum in the miles per person travelled by car and, since car occupancy has been falling over this period, an even greater increase in car vehicle miles.

In addition, there has been a significant mode shift towards car-based travel over this period, with trips per person made as car driver rising by 65% between 1985/86 and 2002/03 and as car passenger (up by 33%) and corresponding large falls in the number of walking trips per person (down 33%) and by local bus (down 31%) (Source Trn/2005/3). This trend towards more frequent and longer car travel continues, despite a range of policy initiatives aimed at achieving a shift back towards more 'sustainable' travel behaviour.

Understanding the factors which appear to affect mode choice (or to be correlated with mode choice behaviour) will provide insights into areas where modal shift is likely to change over time and/or be influenced by Government policy or investment.

The analysis and reporting is separated into four main sections. These are:

- car availability;
- car vs public transport mode choice;
- motorised vs non-motorised (walk and cycle) mode choice;
- travel to school.

## 2. BACKGROUND

This paper uses Scottish Household Survey (SHS) data to summarise the key statistics on current mode choice and perceptions of alternative modes, identifying factors which affect behaviour of travellers in making a mode choice.

The SHS is a continuous cross-sectional survey which commenced in April 1999 to provide the Scottish Executive and other interested parties with information on the impact on households and individuals of key services and policies. The sample

size of over 15,000 surveyed households per year is designed to provide wide-ranging statistically-robust data at Scottish Local Authority level every two years. As well as questions about transport patterns and choices, the SHS contains a Travel Diary section in which respondents report on their previous day's travel.

This paper is closely based on the SHS Mode Choice Topic Report (Connolly and Barker 2005) which was one of a series of Scottish Executive Analytical Reports based on in-depth analysis of various aspects of the SHS data.

While the SHS Mode Choice Topic Report work has been overseen and reviewed by Scottish Executive representatives, all views expressed here are the individual views of the authors and hence do not necessarily represent the views of the Scottish Executive.

## 3. CAR AVAILABILITY ANALYSIS

The SHS data suggests that more than one in five (21%) trips made by adults from non-car-owning households in Scotland are made by car (predominantly as car passengers). This rises to over three quarters (77%) of trips from households with one car available for personal use and rises again to over 87% of trips by adults from households with two or more cars available. Furthermore, as the number of cars available to the household increases, the percentage of walking or cycling trips made by the adults in the household decreases and the likelihood of children walking/cycling to/from school decreases.

All of the variables suggested by the current UK National Car Ownership model (DfT 2003) and which are available in the SHS data were found to be significant in identifying differences in household car ownership. These factors include household income, household structure, the number of employed adults, the availability of a company car and the rurality/remoteness of the home location.

In addition, the frequency of the nearest bus service to the home and the Scottish Index of Multiple Deprivation (SIMD) of the resident's home area were also shown to be significantly correlated to certain aspects of household car ownership proportions.

SPSS Classification Tree™-based analysis revealed that household income is the most-powerful SHS variable for partitioning households by car ownership proportion.

The proportions of households with one or more cars by household income are reported in Table 3.1.

**Table 3.1 Car Ownership and Income**

| Household Income Band | Proportion of Households Owning One or More Cars | N |
|---|---|---|
| Less than £10,000' | 37% | 28,411 |
| £10,000, up to £20,000 | 68% | 29,365 |
| £20,000, up to £30,000 | 93% | 15,798 |
| Greater than £30,000 | 98% | 9,722 |
| Total | 66% | 83,296 |

Further partitioning of these four main income bands was carried out and revealed additional relationships. The results of this Classification Tree™-based analysis are illustrated in Figure 3.1. Car ownership proportions within each income band are shown as red points (numbers 1 to 4) on the graph. Within each income band, the strongest Classification Tree™ identified partition is shown. For example, for the '0 to £10,000' income band, the household type is shown to be the strongest indicator of car ownership levels. The blue points (numbers 5 to 8) relate to the different household type(s) within the lowest income band. Table 3.2 details the category associated with each number in the graph.

**Figure 3.1 Household Car Availability: Proportion of Households with Access to a Car**

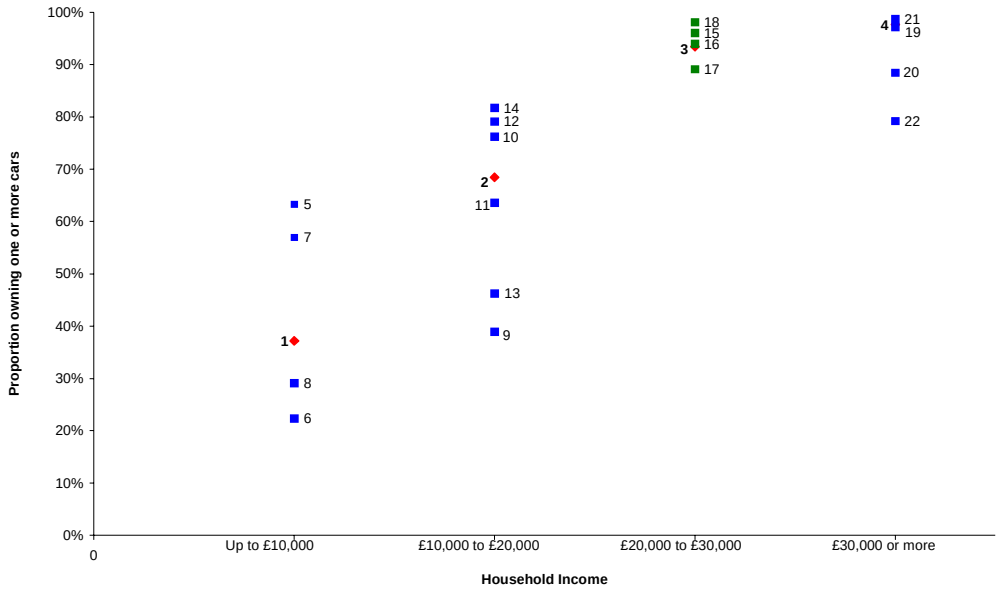


**Table 3.2 Household Car Availability: Proportion of Households with Access to a Car**

| Variable | Chi-Square | Description | Label |
|---|---|---|---|
| Income | 20180 (N=83296 df=3) | Up to £10,000 | 1 |
| | | £10,000 to £20,000 | 2 |
| | | £20,000 to £30,000 | 3 |
| | | £30,000 or more | 4 |
| HH Type | 3805 (N=28411 df=3) | Older Smaller; Large Family; Large Adult | 5 |
| | | Single Pensioner; Single Parent | 6 |
| | | Small Adult; Small Family | 7 |
| | | Single Adult | 8 |
| HH Type | 2420 (N=29365 df=6) | Single Pensioner | 9 |
| | | Small Adult; Large Family | 10 |
| | | Single Adult | 11 |
| | | Small Family | 12 |
| | | Single Parent | 13 |
| | | Large Adult | 14 |
| Area | 262 (N=15798 df=3) | Small accessible Towns; Remote Rural | 15 |
| | | Other Urban; small remote towns | 16 |
| | | Urban settlements over 125,000 | 17 |
| | | Accessible Rural | 19 |
| HH Type | 272 (N=9722 df=3) | Older Smaller; Small Adult | 20 |
| | | Single Adult; Single Parent | 21 |
| | | Large Family; Small Family; Large Adult | 22 |
| | | Single Pensioner | 23 |

Partitioning households by their household structure provided the best partition of car ownership for most income bands. Households comprising of one adult ('single' households) showed lower proportions of car ownership compared to multiple adult households. For example, within the £10,000 to £20,000, 'large adult' households had higher proportions of car ownership (82%) compared to 'single pensioners' (39%). Similarly, within the 'greater than £30,000' income band 'families' and 'large adults' were more likely to own a car (99%) compared to 79% of 'single pensioners'.

Multi-car owning behaviour was similarly strongly linked to household income followed by the nature of the household in terms of type and number of residents.

Mode choice behaviour is likely to vary in direct response to variations in car ownership and hence any government policy which affects car ownership will automatically have an impact on modal shift. For example, policies which discourage car ownership (eg limited and/or expensive residents parking, car-free housing schemes (with or without car clubs), higher car ownership costs etc) are likely to increase the use of other modes by the affected residents. This effect is likely to be most marked where it affects the decisions of households to choose between car-owning and non-car-owning status, but will also be significant where households choose between owning one car and two or more cars.

However, the disadvantages resulting from restricting individual's access to destinations where the non-car alternatives are not realistic are likely to outweigh the benefits of the resulting reduced car use. A policy which attempts to

discourage households from purchasing a car is therefore unlikely to be popular, except perhaps in areas with very levels of high public transport accessibility.
The subsequent choice of whether or not a household purchases a second car tends to have less impact on accessibility and may therefore be an area where policy might be targeted with fewer adverse effects on accessibility.

There therefore may be merit in considering policies which discourage households moving from 1-car to 2+-car status, particularly in areas of high public transport accessibility (typically areas close to city centres and/or on suburban rail corridors).

## 4. PUBLIC TRANSPORT VERSUS CAR ANALYSIS

The second strand of our research has considered the choice between using car or public transport (bus and rail). This research focussed on journeys in the SHS Travel Diary where a 'realistic' car vs Public Transport choice was made (by restricting the analysis to car-available travellers making journeys with a 'realistic' Public Transport alternative was available).

### Realistic Public Transport Option

A journey stage was defined as 'not realistic' by public transport if it was in at least one of the following categories:

- the estimated time taken to walk to the nearest bus stop is greater than 27 minutes or 'no bus available';

- the relative generalised (ie time + money) cost of public transport is more than ten times the cost of car (estimated using data from the Transport Model for Scotland);

- the trip was made in an urban areas between 00:00 and 05:00 or in a small town/rural area between 19:00 and 07:00.

To assess the attractiveness/availability of the public transport alternative, it is important to consider full 'tours' (i.e. from leaving home to returning home), since if any of the legs of this tour cannot be completed by public transport, then a car will be required for the full tour. Thus, where a stage within a tour was identified as not a realistic Public Transport option, the whole tour was assumed to be 'unrealistic' by public transport.

In addition, we have excluded the set of journeys made by adults from non-car-available households and all journeys made by other modes (eg walk, cycle, taxi etc) from this PT vs Car mode choice analysis.

Overall 41% of records were identified as not involving a realistic choice. The analysis of the mode-choice behaviour of the remaining Travel Diary records enable us to focus on the behaviour and attitudes of adults who have made a genuine choice between car and public transport.

## SPSS Classification Tree™ Analysis

SPSS Classification Tree™ analysis revealed that the largest difference between those who travelled by car and those who travelled by public transport was the type of licence held by the respondent (Chi-squared: 7644; df:2 N:80300). The following three categories of 'licence type' were identified as significant:

- 'Full drivers licence' (5% of journey stages were by public transport)
- 'Provisional driving licence' and 'Never held a driving licence' (33% of journey stages where by public transport)
- 'Licence suspended on medical grounds'; 'Did not reapply for licence at age 70' and 'Disqualified from driving' (22% of journey stages where by public transport).

## Analysis of Full Drivers Licence Holders

For those in possession of a full driving licence, the greatest difference between those who travelled by public transport and those who travel by car was the 'competitiveness' of the public transport alternative. The competitiveness of the public transport alternative was assessed by estimating the ratio of the generalised cost of public transport trip (combining fares, walk times, waiting time, in-vehicle time and boarding transfer penalties) and the corresponding cost of the car trip (combining time, tolls and fuel costs). The resulting relationship between public transport competitiveness ratio and mode choice proportions are illustrated in Figure 4.1.

The proportions of SHS Travel Diary public transport trips within each generalised cost ratio grouping are shown as red points (numbers 1 to 7) on the graph. Within each generalised cost grouping, the strongest Classification Tree™ identified partition is shown. For example, for the 'less than or equal to 3' generalised cost grouping, the Scottish six-way Rural/Remoteness classification is shown to be the strongest indicator of the proportion of trips by public transport. The blue points (numbers 8 to 11) relate to the different urban/rural category within the lowest generalised cost grouping. Table 4.1 details the category associated with each number in the graph.

## Figure 4.1 Classification Tree™ Analysis of Car vs Public Transport Trips for SHS Travel Diary Trips where the Respondent Had a Full Drivers Licence

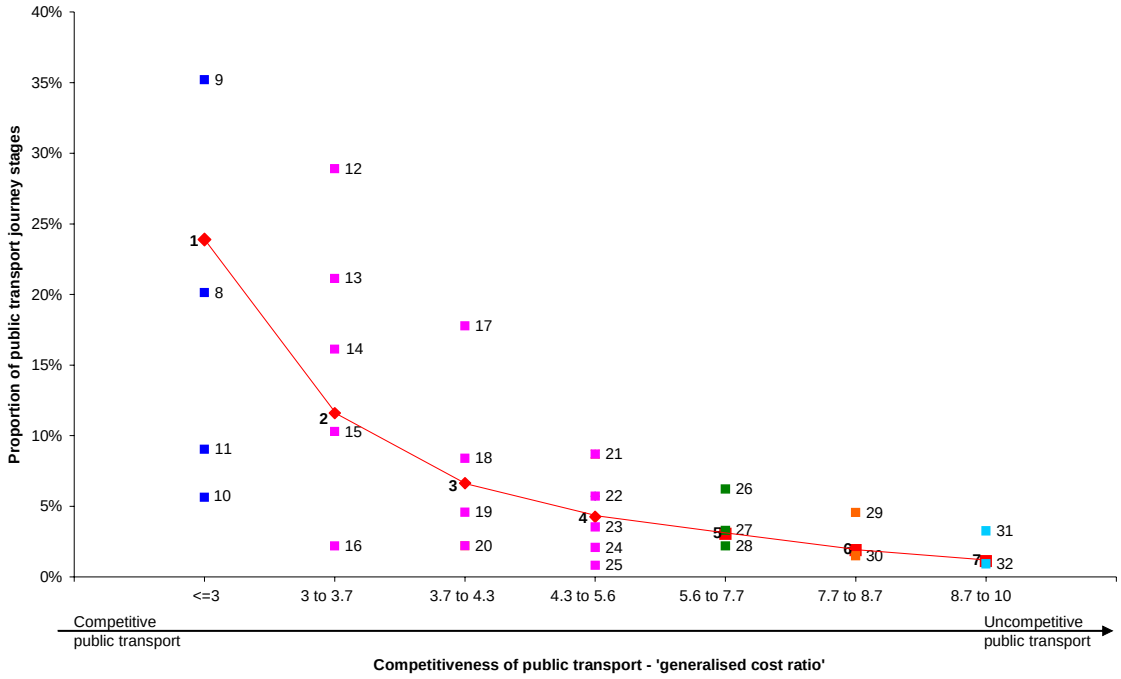


**Table 4.1 Classification Tree™ Analysis of Car vs Public Transport Trips for SHS Travel Diary Trips Where the Respondent Had a Full Drivers Licence**

| Variable | Description | Label |
|---|---|---|
| Competitiveness of public transport – generalised cost ratio | Less than or equal to 3 | 1 |
| | 3 to 3.7 | 2 |
| | 3.7 to 4.3 | 3 |
| | 4.3 to 5.6 | 4 |
| | 5.6 to 7.7 | 5 |
| | 7.7 to 8.7 | 6 |
| | 8.7 to 10 | 7 |
| Scottish six-way Rural/Remoteness classification | Other Urban | 8 |
| | Large Urban Area | 9 |
| | Remote Small Town; Remote Rural; Accessible Rural | 10 |
| | Accessible small town | 11 |
| Distance | Less than 3.5 | 12 |
| | between 3.5 and 5.1 | 13 |
| | between 5.1 and 10.2 | 14 |
| | between 10.2 and 15 | 15 |
| | greater than 15 | 16 |
| Distance | Less than 3.5 | 17 |
| | Between 3.5 and 10.2 | 18 |
| | Between 10.2 and 15 | 19 |
| | Greater than 15 | 20 |
| Distance | Less than 5.1 | 21 |
| | Between 5.1 and 7.3 | 22 |
| | Between 7.1 and 10.2 | 23 |
| | between 10.2 and 15 | 24 |
| | greater than 15 | 25 |
| Bus Headway | 0 | 26 |
| | 0 to 10 | 27 |
| | 10 to 30 | 28 |
| | Greater than 30 | 29 |
| Reduced Fares | Yes | 30 |
| | No | 31 |
| Age | Greater than 69 | 32 |
| | Less than 69 | 33 |

It may be seen on Figure 4.1 that for those in possession of a full driving licence in a household with car(s) available, the following conclusions are supported by our analysis:

- for journeys where the generalised cost ratio for car vs public transport is lowest (ie public transport was at its most competitive ) the standard six-way Scottish rural/remoteness index is strongly linked to the difference between car and public transport use, with car use highest in rural areas and small towns

- for intermediate generalised cost ratio journeys, the proportion choosing public transport is strongly related to the length of the trip, with public transport use lowest for longer trips

- where the generalised cost ratio was highest (ie the public transport alternative is approaching the limits of what we have considered to be 'realistic'), the proportion using public transport is strongly related to whether or not the home is located near a frequent bus service, being higher where services are more frequent

**Analysis of Provisional Licence Holders and Non-Drivers**

Our analysis of the mode choice behaviour of those in possession of a provisional licence or those who had never held a drivers licence, in a household with car(s) available suggests the following conclusions:

- there is again a significant correlation between mode choice and the relative attractiveness of the car and Public Transport alternatives;

- where the generalised cost ratio was lowest (public transport was at its most competitive) the journey purpose was strongly linked to the difference between car and public transport use with the proportion travelling by public transport is greater for those escorting to shops/home/education, travel to education and travel to work;

- for intermediate generalised cost ratio journeys, the proportion choosing public transport is strongly related to length of the of the trip with public transport being lower for longer trips;

- where the generalised cost ratio was highest, the proportion choosing public transport is strongly related to age, with car use highest for the oldest and youngest age groups.

**'Competitiveness' of Public Transport**

This strong relationship between the 'competitiveness' of the public transport and the resulting proportion of travellers choosing the public transport alternative suggests that making public transport more attractive relative to car travel will deliver modal shift from car to public transport. This could be achieved through either decreasing the generalised cost of public transport travel or increasing the generalised cost of car travel (or a combination of the two).

Policy measures aimed at reducing these costs might include some or all of the following:

- **Reducing public transport fares** - concessionary fares, Government subsidies, integrated ticketing etc;

- **Reducing walk times** – eg by identifying and delivering additional bus routes (though note the dangers of creating unattractive bus journey times by designing 'round the houses' bus services and/or adding additional stops to existing bus routes as a way of reducing walk-times);

- **Reducing (perceived) wait time** - policies that contribute to increased service frequency, increased reliability of services, improved integration of public transport service timetables and improved facilities at interchanges, including reliable (and/or real-time) timetable information;

- **Reducing boarding/transfer penalties** by measures such as improving the accessibility of vehicles, integrated ticketing, improved integration of services, improved reliability and investment in key public transport interchanges;

- **Reducing (perceived) in-vehicle times**, for example by providing and enforcing bus priority measures, providing additional express public transport services, reducing/eliminating in-vehicle crowding, improving the quality of the public transport vehicles etc

Policy measures which would increase the cost of the car trips include:

- **Increasing car in-vehicle journey time** – eg by reallocation of road space to give more priority to public transport may increase car journey times;

- **Increasing vehicle operating costs**, for example by increasing the cost of fuel - however, since this cost is often not incurred directly at the time the journey is made, drivers often do not include this cost in their mode-choice decision, so increasing fuel prices is a rather 'blunt instrument' for achieving modal shift (not least because it tends to have more impact on travellers who don't have a realistic public transport alternative such as those with disabilities and/or living in rural areas);

- **Increasing the direct cost of driving** (eg through increased use of tolls and congestion charges) – direct charging schemes can be better targeted at trips where more 'sustainable' alternatives exist and are more 'visible' to the mode 'chooser' than fuel costs – as a result they offer one of the most effective ways of influencing the car/ public transport (and the car/walk) mode choice of car-available traveller. Combining a significant flat-charge with a distance-based charging schemes (ie similar to the pricing mechanism of a taxi fare) will improve the effectiveness of the scheme for eliminating short car journeys. Note also that care should be taken to ensure that realistic public transport alternatives exist for the majority of motorists who face the charge, if the scheme is to be acceptable to the travelling public. However, measures such as tolls and congestion charging are long-term solutions and are unlikely to be introduced in the immediate future given (a) the vote on the City of Edinburgh's proposal for congestion charging and (b) the time required to develop a national congestion charging scheme, and the cost of the monitoring equipment and enforcement measures that would be required.

- **Increasing parking costs** (either by restricting availability or increasing parking charges or both) – Numerous studies have found parking policy measures to be relatively more important than many other traffic management measures in influencing mode choice (See for example

research from Feeney 1988, NEDO 1991 and Shoup and Wilson 1982 - cited by T Rye 2004). More specifically, the decision to use a car for the journey to work is greatly influenced by the availability and cost of parking. The Department for Transport (DfT) published a series of case studies of employers with travel plans in place in 2002. This showed clearly that the most effective travel plans are those that include some form of effective parking management – either rationing or pricing of spaces.

The shape of the relationship between the ratio of costs and the public transport mode share illustrated in Figure 4.1 is also significant. If we assume that a given level of investment in public transport is likely to have a fixed level of impact on this public transport vs car cost ratio (perhaps halving it, say), then the shape of this graph implies that greatest potential for increasing public transport mode share from car is focusing investment in areas where public transport is already fairly competitive (ie where the ratio of public transport to car costs is already low).

For example, for the 10% of records where the generalised cost ratio is lowest (around 3), then halving this ratio (eg by halving the generalised cost of the public transport or doubling the cost of the car trip or some combination of the two) would give a **28%** increase in the level of car available travellers choosing public transport. However, for the 10% of records where the current cost ratio is around nine, (ie the existing public transport is fairly uncompetitive), then the corresponding increase in the proportion choosing to use public transport is only **12%.**

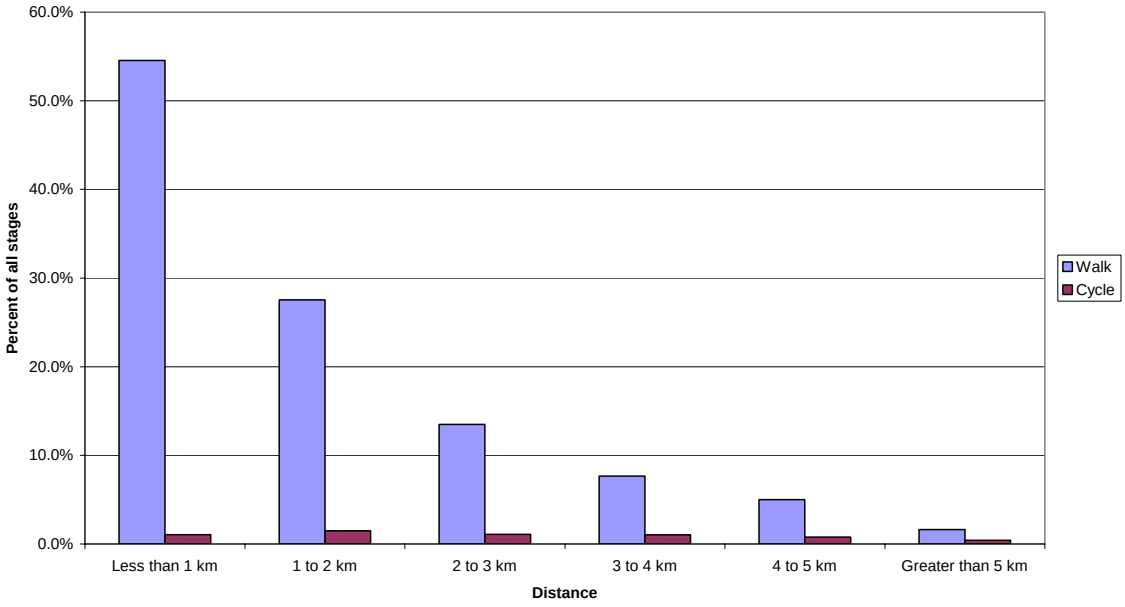
Marketing campaigns can reduce car use through altering the public's perceptions of car and public transport. For example, campaigns such as 'travel wise' 'bike week' and 'walk to school week' use a wide range of media aimed at improving general public understanding of problems resulting from transport choices, and behaviour. Travel Awareness campaigns focus on local environmental and health impacts as well as improving informed knowledge of the facilities available for walking, cycling and public transport use (Cairns S et al 2004).

Travel Awareness campaigns targeted towards specific sub-groups depending upon their characteristics and circumstances may have more of an impact. For example, evidence available from Leeds University (2004) suggests that individualised marketing may be more appropriate in urban environments. The current research suggested that the proportion of public transport trips being made is much higher amongst specific sub-groups (eg households located in urban areas, areas with competitive public transport and/or frequent bus services and short trips). These sub-groups may benefit most from travel awareness campaigns.

## 5. MOTORISED (EG CAR, BUS) VERSUS NON-MOTORISED (WALKING, CYCLING) TRIP ANALYSIS

The third strand of the analysis focuses on the short length trips where walking and cycling offer significant alternative modes. Figure 5.1 illustrates (SHS Data 1999 to 2004) how the mode share for the two non-motorised modes rapidly tails off with increasing trip length. Where short trips are considered it should be noted that respondents to the SHS Travel Diary are only asked to provide details of trips which were greater than a quarter of a mile or more than five minutes on foot.

**Figure 5.1 Trip Length Distributions for Walk and Cycle**




To undertake a more detailed analysis, it was necessary to identify 'potential non-motorised' trips. This was undertaken by selecting those records where the Travel Diary indicated that walking or cycling was a realistic option. These were defined as trips less than 5km in length.

### SPSS Classification Tree™ Analysis

Not surprisingly, for 'potential non-motorised trips' the greatest difference between the proportions using motorised and non-motorised modes was the length of the trip (chi square value:19134 df:9), with shorter trips showing a greater proportion of the non-motorised modes.

A further SPSS Classification Tree™ based analysis was undertaken within each trip length group to determine variations in the proportions of non-motorised journey stages. The full results are illustrated in Figure 5.2 with the key findings summarised below. The proportions SHS Travel Diary non-motorised trips within each distance band are shown as red points (numbers 1 to 4) on the graph. Within each distance grouping, the strongest Classification Tree™ identified partition is shown. For example, for the 'less than 1km' distance band, the car ownership

level is shown to be the strongest indicator of the proportion of non-motorised trips. The blue points (numbers 5 to 7) relate to the different car ownership levels within the shortest distance grouping. Table 5.1 details the category associated with each number in the graph.

**Figure 5.2 Classification Tree™ Analysis of Proportion of Non-Motorised Journey Stages by Distance**

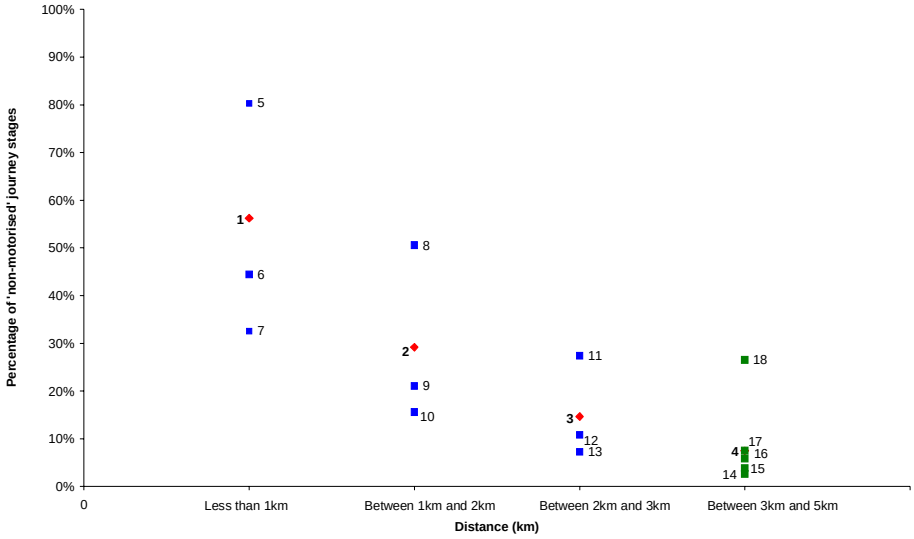



**Table 5.1 Classification Tree™ Analysis of Proportion of Non-Motorised Journey Stages by Distance**

| Variable | Chi-Square | Description | Label |
|---|---|---|---|
| Distance | 17526 (N=98419 df=3) | Less than 1km | 1 |
| | | Between 1km and 2km | 2 |
| | | Between 2km and 3km | 3 |
| | | between 3km and 4km | 4 |
| Car Ownership | 5319 (N=34846 df2) | No car available | 5 |
| | | One car available | 6 |
| | | Two or more cars available | 7 |
| Car Ownership | 2704 (N=26535 df=2) | No car available | 8 |
| | | One car available | 9 |
| | | Two or more cars available | 10 |
| Car Ownership | 848 (N=16529 df=2) | No car available | 11 |
| | | One car available | 12 |
| | | Two or more cars available | 13 |
| Purpose | 989 (N=20509 df=4) | Employers Business; Escort (personal; work; shopping) | 14 |
| | | Eating/drinking; Entertainment; Personal Business; Health; | 15 |
| | | Visiting family/friends; Commuting; Escort Home; Escort Education | 16 |
| | | Shopping; Educational establishment; Sport | 17 |
| | | Other; Day Trip | 18 |

The main conclusions are as follows:

- for trips less than 5km, the greatest difference between the proportions using motorised and non-motorised modes was the length of the trip, with the percentage walking or cycling being higher for shorter trips;

- for distances less than 3km there is a strong relationship between levels of car ownership and proportions of non-motorised journey stages, with the latter falling as the number of cars available to the household rose; and

- for trips between 3 and 5km, the percentage of non-motorised trips is strongly affected by journey purpose, with a higher proportion of non-motorised travel for 'day trips', 'shopping' and trips to an educational establishment or sport and a lower proportion choosing non-motorised travel for escort trips (personal/work/shopping) and employers business than for other journey purposes.

Individuals from larger household (ie with more adults) and from non-family households had higher proportions of non-motorised travel – this may be due to a combination of car-competition effects and the nature of such households (eg groups of young adults, students etc) who may be more likely to walk/cycle than the 'average' adult.

## Cycling

Within the Scottish Household Survey Travel Diary data (1999 to 2004) two thirds (66%) of households report having access to at least one bicycle which can be used by adults.

Classification Tree™ based analysis identified the biggest difference between 'bicycle-access' and 'no-bicycle-access' households to be household type. This is illustrated in Table 5.3. Households consisting of one adult ('single' households) and older households showed lower proportions of bicycle ownership than 'family' households.

**Table 5.2 Bicycle Ownership, Household Type and Cycling Trip Rate**

| Household Type | Proportion of Households [1] | Proportion of Households [2] | Cycle Trip Rate (per 100)[3] |
|---|---|---|---|
| Large adult | 10% | 51% | 3.6 |
| Large family | 7% | 64% | 3.4 |
| Older smaller | 15% | 18% | 3.8 |
| Single adult | 15% | 26% | 12.2 |
| Single parent | 6% | 31% | 3.1 |
| Single pensioner | 16% | 6% | 6.9 |
| Small adult | 17% | 41% | 5.9 |
| Small family | 14% | 58% | 4.0 |
| Total | 100% | 34% | 5.3 |

1. All SHS Data (N=83296)
2. All SHS Data (N=67720, missing=15576)
3. Random Adult Data (N=63376), Travel Diary number of cycle trips=1125

The cycle trip rate for each household type was estimated using Travel Diary data on number of cycling trips made on the previous day. To calculate the trip rate, the total number of travel diary cycling trips was divided by the number of respondents who had a bicycle available for use. Respondents from single adult households showed larger trip rates (12 per 100 households) than those from family households (3 per 100 households).

For those from bike available homes, the greatest difference between those who used a bicycle at least once in the previous day and those who did not was whether the respondent's gender (with males being much more likely to cycle than females).

2001 Census (Travel to Work) show significant variations in the frequency of cycle use across Scotland, with certain Local Authority areas (for example Edinburgh, Moray and Highlands) reporting around a 3% cycling mode-share for trips to work/education, compared to proportions less than 0.5% in certain other areas such as Renfrewshire, Lanarkshire and Inverclyde. Further investigations into the characteristics of areas with greater cycle use might provide additional insights into policy measures that would encourage cycling as a regular mode of travel.

## 6. SCHOOL TRAVEL ANALYSIS

There is considerable policy interest in travel to school, covering issues associated with the health and social benefits of walking, safety implications of alternative modes and the impact of the 'school-run' on congestion, particularly in the morning peak.

Numerous transport policies, projects and budget involve components aimed at influencing the mode of travel to school and/or the safety of this journey. Examples include the provision of Safe Routes to School (eg by providing school crossing patrols, pedestrian crossings etc) promotion of so-called 'walking buses', pedestrian training, personal safety training, safe route trials, parent escort training, walk to school campaigns, safe cycle parking, cycling awareness campaigns and cycle training.

Walking was the reported usual method of travel to school for around 52% of pupils in full time education, with a further 1% cycling. Approximately 24% travelled by bus, with about three quarters of these using a school bus and the remainder using 'regular' bus services). Other modes of transport, such as trains and taxis, were recorded as the usual method of travel for a total of about 2%. This leaves about 20% of school-children who report their normal mode of travel to school to be by car or van. (Source: SHS data (1999 to April 2004)).

The SHS database shows obvious differences in mode choice between primary (aged 11 or less) and Secondary school (Age 12 years or more), with bus used bus use more than doubling from 14% to 38% and walking falling from 57% to 44%. (Source: SHS data 1999 to April 2004). The corresponding data from the Health Behaviour of Scottish School Children (HBSC) Survey suggest that around

two thirds of children in primary seven regularly walk to school and that this falls to about half of children in Secondary school (S2 or S4).

In the research reported here, the distance between home and school yielded the greatest variation in the proportion of children walking and cycling to school. Any policies which result in a reduction in the number of local schools and/or policies which encourage/enable greater parental choice (ie increasing the possibility for parents to send their children 'out of catchment') are therefore likely to reduce the proportion of children walking or cycling to school. However, this impact on mode share is likely to be relatively insignificant relative to other impacts (eg educational and financial) which are likely to be the main influences on such policy decisions.

For both short and long distances, there was a strong link between the car ownership level of the child's household and the likelihood of them either walking or cycling. The greater the number of cars available, the less likely it was that the child would walk or cycle. Any government policy which affects car ownership will therefore automatically have an impact on modal shift in the travel to school.

## 7. SUGGESTIONS FOR FURTHER WORK

Our analysis has revealed a strong relationship between the ratio of the generalised cost of public transport and the competing journey, when considering the mode choice of travellers who have faced a 'realistic car vs public transport mode choice. However, this analysis has also suggested that the trip length affects this relationship.

Traditional mode choice models use logit-based models to estimate the probability of an individual choosing a given mode. These logit-based models use only the absolute difference in generalised cost between modes to predict the mode choice.

Within the current research, SPSS Classification Tree™ based analysis identified generalised cost ratio as a stronger indicator of car vs public transport mode choice than the cost difference. Hence, cost ratio was used in preference to difference throughout this research.

We believe that some combination of the absolute difference and the ratio of generalised costs may yield a better predictor of the car vs public transport mode choice and this should be explored in further research.

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