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Use of non-motorised modes and life stage in Edinburgh

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Abstract

Links between life stage and travel behaviour are explored using Scottish Household Survey non-motorised mode data for Edinburgh. Employing cluster analysis, the sample is split into ten population segments, largely based on life stage. The life stage of having children is shown to affect individual travel behaviour. Households with children present have distinctive travel behaviour characteristics: they are particularly car dependent, tend to own but not use bicycles, and favour leisure cycling trips. A concerted, targeted policy effort is recommended in order to reduce motor car usage and encourage non-motorised modes.

Key words

Life stage, travel behaviour, segmentation, cycling, walking

1. Introduction

Problems associated with the motor car, such as air pollution and congestion, have led to the search for a more sustainable transport system. The characteristics of a sustainable transport system are sufficient fuel for the future, minimal pollution from such fuel, minimal fatalities and injuries from motor vehicle accidents and manageable congestion (Black, 2000). Non-motorised modes (cycling and walking), the focus of this paper, have been promoted as sustainable modes of transport. For an individual, the advantages of non-motorised modes are an environmentally-friendly, cheap and healthy form of transport. However, these advantages tend to be outweighed heavily by the speed and convenience of the motor car.

It has been argued, with most individuals reliant on a motor car, that society has become car dependent (Goodwin, 1997; Stradling, 2002). Those with the greatest propensity to own and use a motor car include those that are of a working age, male, on higher incomes and who have children (Cullinane, 1992; Huby and Burkitt, 2000; Anderson and Stradling, 2004). Travel demand management measures have been promoted to reduce motorised travel. Such measures can be classified into the following groups (Banister, 2000): organisation and operational (e.g. car sharing, demand responsive transport); infrastructure (e.g. public transport and cyclist facilities); financial (e.g. parking charges, road pricing); land use (e.g. determine the location of development), and technological changes (e.g. teleworking, home delivery of goods).

United Kingdom transport policy-makers have recently emphasised changing travel behaviour away from the motor car within an Integrated Transport Strategy (Department of the Environment, Transport and the Regions, 1998; Department for Transport, 2004a). At the same time, non-motorised modes have been promoted (Department of Transport, 1996; Department of the Environment, Transport and the Regions, 2000; Department for Transport, 2004b), although there has been a varied local authority response to the development of non-motorised policy (Gaffron, 2000; Lumsdon and Tolley, 2001).

Although the principles behind the Integrated Transport Strategy were widely welcomed and agreed upon by most commentators during the late-1990s, the primary problem associated with the Strategy has been policy implementation (Goodwin, 1999).

Furthermore, a combination of public dissatisfaction with progress in transport, political shocks (primarily the national fuel duty protests) and institutional change have led to a policy shift away from integrated transport (Begg and Gray, 2004).

In terms on impacts upon non-motorised modes, Tolley (2003) paints a mixed picture of the recent United Kingdom sustainable transport policy. On the negative side there has been no sign of increase in non-motorised mode use, a lack of appropriate funding, a growth in car ownership, doubts over local authority policy delivery, and a decrease in bus use (knock-on decrease in walking levels). However, on the positive side, arguments to promote non-motorised modes are now in the mainstream, a National Walking Strategy could be developed at some point in the future, and there have been some successes at a local level. It is initiatives at the local level such as Safer Routes to

School, Green Transport Plans, “walking buses” and car free days that could prove important to an increase in non-motorised mode use.

Edinburgh, a compact, high-density city with a historic core, is the case study. It has a relatively sustainable modal split when compared with other United Kingdom cities in terms of walking (21%) and public transport (26%), for the journey to work or study (from 2001 Census data - City of Edinburgh Council, 2003), and a supportive sustainable transport policy (City of Edinburgh Council, 2004). Edinburgh tends to be heralded as a city in the United Kingdom taking the lead on sustainable transport issues (Hazel, 1998; Lumsdon and Tolley, 1999). If sustainable transport policy is to make an impact anywhere, then Edinburgh would seem a prime candidate. Edinburgh has particular socio-economic characteristics: a higher proportion of young adults, households on higher incomes and a lower proportion of families than the United Kingdom average (ACORN data, 'A Classification of Residential Neighbourhoods' - City of Edinburgh Council, 1998).

The paper considers links between non-motorised mode use and life stage in Edinburgh using a contemporary data set, the Scottish Household Survey. A life stage can be defined as a specific, optional event such as learning to drive, moving home, moving job or having children. Life stage is distinct from life cycle, a natural event that affects an individual as he or she gets older, progressing from a child to an adult and then to a senior citizen. An individual's attitude to travel and subsequent travel behaviour changes in response to life stage and life cycle events. The following is an example of a

classification linking household composition and life stage to travel behaviour

(Transport Visions Network, 2001):

- Young single adult living alone. Prime activities for young single adults are work or education and leisure. Nightlife and meeting other young people would tend to be seen as a priority and travel would predominantly be by bus and taxi.
- Young adult living with partner. The effect of two individuals living together would be an increase in household income, a change of leisure activities, and spending time with each other and other couples would tend to be seen as a priority. Car ownership and use would be more affordable, and although not essential, would probably increase.
- Living with partner and young family. With a family, time would become a premium and the patterns of activities would tend to be centred on the children. Motor car use would be seen as essential.
- Living with partner and teenage family. A divergent pattern of activities for parents and children would have increased demands on motor car use, and may lead to an increase in household car ownership.
- Middle aged living with partner. Once children have left home there would tend to be an increase in affluence and a further changes in activities. House size and motor car ownership could be in excess of that required.
- Retired couple. The daily commute(s) would disappear and the absence of the work activity would lead to routines and patterns of activity being redefined with a greater flexibility. Time would tend to be less of a premium, and the activity pattern could be shaped by a role as grandparents.

Such a classification can be adapted for non-motorised mode use. Using cycling as an example, an individual could change their level of cycling at different life stages (Davies et al, 1997). For children, cycling can be a popular pastime, giving them their first chance of independent mobility. However, as they reach adulthood, peer and media pressure make car usage more attractive than cycling. Individuals may return to cycling later in life, perhaps for health reasons or if they have children of their own.

2. Methodology

The analysis presented in this paper used Edinburgh-based Scottish Household Survey data for 1999 and 2000. A sample of 2,910 households, all located within the City of Edinburgh Council area, was obtained from the Scottish Executive. The Scottish Household Survey began in February 1999, and interviews 15,000 households per year across Scotland (Scottish Executive, 2001). It is the largest survey of private households in Scotland, with an aim to provide household and individual information for the Scottish Parliament, the Scottish Executive and other interested parties.

Transport represents one of the three primary subjects of the survey, along with Local Government and Social Inclusion.

The Scottish Household Survey sample was split into three types of data: socio-economic characteristics, background transport information and travel behaviour variables. Socio-economic characteristics included household information (number of people, number of children, income, housing type) and individual characteristics (age,

gender). The background transport information variables related to motor car availability and use (ability to drive, household access to vehicle and vehicle type), and bicycle availability. Of the travel behaviour variables, the primary non-motorised mode information was a record of cycling and walking journeys, split by utility and leisure trips over the previous seven days. In addition, an outline of journeys or trips out of the house made the previous day in a travel diary, including postcodes of origins and destinations, was included.

The variables from the Scottish Household Survey were categorical, determining that non-parametric statistical methods be used to explore travel behaviour relationships. The components of the analysis included the development of population segments based on current socio-economic characteristics using cluster analysis. Cluster analysis can be used to segment the population into potential 'mode switchers' away from the motor car, to understand more fully the structure of the market (Anable, 2005).

Cluster analysis, described in Hair et al (1998), is an exploratory, statistical technique for developing meaningful subgroups of individuals or objects. It classifies, using an algorithm, a sample of entities into a small number of mutually exclusive groups based on the similarities (or differences) among the entities, to reduce the data into manageable parts. Unlike discriminant analysis, the groups are not predefined. As it is a non-parametric test there are not strict assumptions, although the variables must be independent. Analysis should be undertaken without any pre-conceptions of the user, although results depend upon their judgement. It is a technique that provides suggested groups for review rather than definite solutions.

Using the defined population segments, transport availability data and travel behaviour patterns were examined.

3. Developing population segments based on life stage

The initial component of the Scottish Household Survey analysis was to produce distinct household category groups, of a similar size and sharing certain socio-economic characteristics, using cluster analysis. There were eight socio-economic variables within the Scottish Household Survey data set. Of these, four related to the household and four relate to the individual respondent. The household variables were: the number of adults in the household; the number of children in the household; household net annual income; and house type. The respondent variables were: age; gender; current working status; and if the individual had a disability (held an Orange badge).

Of the four age bands (infant, child, working age and retired), only working age and retired were relevant as this study concerns the travel behaviour of adults. The age band and status categories were therefore combined to produce life stage groups. Life stage is a preferable description of the group. The ten most common life stage groups, amongst 5,904 of the 6380 individuals (93%) are shown in Table 1.

Cluster analysis was performed upon the six socio-economic variables of 4,016 adults within the household. The socio-economic variables are shown in Table 2. Four hierarchical technique cluster analysis runs were undertaken, discounting clusters with

less than 50 cases, to produce six (between groups average), eight (within groups average), three (centroid clustering) and eight (Ward's method) clusters respectively. It was considered desirable to create similar sized population segments of between 100 and 400 individuals, large enough for further analysis and small enough to have a sufficient number of clusters. Comparing the clusters from the four runs, the large clusters were split in an iterative fashion to produce ten clusters. Where a cluster group had more than 90% of a socio-economic characteristic, the remainder were removed, to make the population segments more representative.

The most influential variable upon the ten population segments was life stage. The life stages of gaining employment, having children and retiring primarily determined the nature of the population segments. Life stage then became a focus of the research. The three variables of number of adults, income and children present within a household also influenced the nature of the population segments, albeit to a lesser degree.

The cluster analysis produced the following ten groups, re-organised in approximate life stage order: 'students', 'in-between jobs', 'mid earners', 'high earners without children', 'part timers without children', 'child minders', 'high earners with children', 'part-timers with children', 'retired couples' and 'retired living on own'. Adults may be classified in a different population segment to others in the same household. For example, a household comprising a married couple and children could have the adults classified as a 'higher earner with children' and a 'child minder'.

Characteristics of the final ten population segments, consisting of 2,324 individuals (across 1,664 households) are shown in Table 3. Thus, 58% of the 4,016 adults in the sample were allocated to one of the ten groups, reducing the sample to manageable groups of homogeneous individuals and facilitating the identification of travel behaviour relationships.

4. Relating transport availability data to the population segments

Of the ten population segments, almost all of the individuals in high earning households (91% of those without children, 94% of those with children) have motor vehicles available and could be regarded as car dependent. The population segments with lowest motor car availability are the population segments 'retired living on own' (17%), 'students' (26%) and 'in-between jobs' (38%).

In terms of adult bicycle availability, the primary difference between population segments relates to the presence of children within the household. The bicycle availability percentages for 'high earners with children' and 'part-timers with children' are 66% and 59% respectively; the equivalents for the same households without children are much lower (both significantly lower at the 95% confidence level using Chi-square) at 46% and 33% of bicycle availability for both the higher earners and the part-timers with and without children in the household. The three population segments with the highest proportion of adult bicycles available are 'high earners with children' (66%), 'part-timers with children' (59%) and 'students' (51%).

The four combinations of motor car availability (Yes / No) and bicycle availability (Yes / No) are shown in Table 4. These combinations indicate the order of likelihood that certain population segments would cycle. It is of note that only a small proportion of individuals within population segments are captive to cycling (8%), having a bicycle available but not a motor car. This proportion decreases as individuals go through the life cycle.

The availability data provides a background to the population segments with the greatest likelihood to use non-motorised modes. It has included some links between transport availability and life stage, particularly that households with children present are more likely to have an adult bicycle available than households without children present.

5. Examining the links between life stage and travel behaviour

The links between life stage and travel behaviour are examined from three journeys recorded in the Scottish Household Survey: non-motorised journeys made the previous week (over a quarter of a mile), the journey to work and journeys made the previous day, as recorded in a travel diary. Modal split statistics for these three journeys within the Scottish Household Survey are shown in Table 5.

5.1. Non-motorised modes journeys the previous week

Walking and cycling journeys made the previous week by adults randomly selected from the survey population are split into utility (those going somewhere for a purpose) and leisure trips. These journeys, for each of the ten population segments, are shown in Table 6.

Cycling numbers are very small within the Scottish Household Survey data set, with 174 (6% of the sample) having made a trip the previous week. For the overall sample there is an even split between utility and leisure trips (4% in each). It is noticeable that only a quarter of cyclists (43 out of 174 cyclists) make both utility and leisure trips. Therefore, the minority who cycle tend to be either utility or leisure cyclists.

The three population segments containing the highest proportion of cyclists, in order, are 'students' (18%), 'high earners with children' (16%), and those 'in-between jobs' (11%). A comparison can be undertaken of the three population segments containing the highest proportion of adult bicycles available: 'high earners with children' (66%), 'part-timers with children' (59%) and 'students' (51%). It could be suggested that households with children are those most likely to have an adult bicycle available but do not necessarily use it. The numbers were too small to test statistical significance.

The Scottish Household Survey data for cycling the previous week shows there are almost no cyclists amongst some segments. It is note-worthy that only 1% of individuals in each of the 'child minder' and the two retired segments made any trip by

bicycle the previous week. Assuming individuals within the 'child minder' population segment are in households with younger children than the other population segments with children, it can be suggested that adults in households with younger children cycle less than adults in households containing older children.

In comparison to the low reported levels of cycle use, three quarters of the sample made a walking trip the previous week. Individuals not making a walking trip the previous week tend to be retired; many within the retired population segments would have found it difficult to walk (12% of those permanently retired from work are Orange Badge holders). All of the population segments have more individuals making utility than leisure walking trips, indicating walking is more of a utility mode than cycling from this data. The population segments with the highest proportion of utility walkers, namely 'students', 'part-timers without children' and 'child minders', tend to participate in leisure walking the least.

5.2. Journey to work

For the journey to work, respondents list reasons for their mode choice. Respondents can give multiple reasons. Over half of the motorists surveyed (57%) state that the motor car is the most convenient mode; 36% of motorists state that it is the quickest mode. The primary mode choice reasons amongst the 57 adults who cycle to work are convenience, speed and exercise. Over 40% of respondents mention each of these reasons. The most popular reasons amongst the 296 adults who walk to work are the

close proximity of the workplace to the home (57%), convenience (32%), exercise (30%) and speed (16%).

Speed and convenience are considered as reasons for non-motorised mode use, but these are also common reasons given across all transport modes. In relation to this study, it is of particular interest that exercise is provided as a reason by many of those cycling and walking to work. Exercise is a key advantage specific to non-motorised modes and is becoming increasingly important in our fitness and health conscious society, and borne out in recent policy strands on health and obesity (House of Commons Health Affairs Committee, 2004).

Five of the ten population segments are not relevant to the journey to work analysis: 'students', those 'in-between jobs', 'child minders' and the two retired segments. Of the five population segments in work, the most car dependent are 'high earners with children' (65% driving to work); this group has the lowest proportion of individuals walking to work (10%). The other four groups have at least 20% of their population segment walking to work. The greatest proportion is for 'part-timers without children' (31%). Cycling numbers are too low to discern statistically significant differences between population segments (the proportion cycling to work is between 2% and 6% for the five segments).

Due to only five population segments being of relevance for the journey to work analysis, individual socio-economic and transport availability variables are considered in the analysis rather than the population segments. SPSS Answer Tree was employed

on the socio-economic and transport data obtained from the Scottish Household Survey to ascertain the factors affecting travel behaviour for the journey to work. Within Answer Tree, the mode choice (Yes or No) for the five modes of cycle, walk, motor car (driver and passenger) and bus were tested according to the seven variables of: the number of adults in the household, the number of children in the household, household income, house type, gender of respondent, motor car availability and bicycle availability.

As expected, the main influencing variables upon driving to work, in order, are car availability and then income. For the cycling journey to work, the main influencing variables in order, after bike availability, are house type and then gender. An individual is more likely to cycle to work if they are male and live in a flat. For walking, the main influencing variables are house type and then the number of adults in the household. An individual is more likely to walk to work if they live in a flat and are in a household of two or more adults.

The analysis shows that an individual is more likely to cycle or walk to work if they live in a flat. Although residents in flats may have fewer bicycles available than those in other house types, they are more likely to use them, certainly for the journey to work. Car ownership is often not possible amongst flat-dwellers due to the lack of available parking space. The housing distribution in Edinburgh is pronounced, with many flats located towards to the city centre. Flat-living in Edinburgh is, therefore, more suited to travel by non-motorised modes, since living near to the city centre makes journeys shorter than on the periphery of the city. Of the five population segments that work,

this finding is relevant to 'mid earners', the only group in which every individual lives in a flat.

5.3. Journeys made the previous day

There are 2,730 adults and 446 school children within the travel diary data set. Of these individuals, 2,166 made at least one journey the previous day (a total of 6,381 journeys). Of the 6,381 journeys, 3,337 (52%) were by motor car or van (driver or passenger), 1,674 (26%) were walking and 83 (1%) were by bicycle. Each journey was classified according to trip purpose. Cycle trips were small in number (83) and only in double figures for journeys to educational establishment, journeys to work and trips made by those participating in sport. Walking can be seen to compete with the motor car for some trip purpose types such as shopping, educational establishment, eating or drinking, and day trips. However, the motor car is dominant across trip purpose. The number of motor car trips (combining driving and passenger) is greater than cycling and walking for all of the trip purposes.

It is possible to link 926 walking trips within the travel diary to the ten population segments. The primary walking trip purpose for the segments is to the workplace, to an educational establishment or, if neither of these two options were relevant, to the shops. For each of the six segments that work or study, walking to the shops represents the second most frequent trip on foot, at between 15% and 22% of all trip purposes. The second most frequent walking trip is a 'day trip' for the two retired population

segments, and 'visiting friends or relatives' for those 'in-between jobs' and 'child minders'.

6. Discussion and conclusions

Using the cluster analysis technique, ten distinct population segments have been identified using the socio-economic Scottish Household Survey data. These segments are arguably in more depth than the socio-economic population segment summaries in Transport Visions Network (2001) and more relevant for Edinburgh households than the UK Census based demographic classifications such as ACORN (City of Edinburgh Council, 1998). A novel aspect of the study is that it considers cluster analysis of socio-economic variables separately, as a prelude to travel behaviour analysis.

Of the six socio-economic variables tested to devise the population segments from the Scottish Household Survey, the most influential variable upon the characteristics of the ten population segments is life stage. The key life stages identified are gaining employment, having children and retiring. The relationship between these life stages and the travel behaviour of Edinburgh-based respondents has been explored.

The findings of particular interest relate to the life stage of having children. Various studies have shown the presence of children within households increases the propensity to own and use a motor car (Cullinane, 1992; Huby and Burkitt, 2000; Anderson and Stradling, 2004). Scottish Household Survey journey to work analysis confirms 'high earners with children' as the population segment containing the highest proportion of

individuals driving to the workplace. Households with children are most likely amongst the population to own but not use bicycles (amongst high earners and part-timers). Since households with children are more likely to undertake leisure than utility cycling, perhaps leisure cycling routes accessible to housing areas where children predominate could be promoted to encourage more of these household to cycle.

From the travel behaviour analysis, the ten population segments have been placed on a spectrum of high, medium and low propensity to use non-motorised modes. This is shown in Figure 1. 'Students' (typically before entering the life stage of full-time employment), those 'in-between jobs' and 'part-timers without children' have the greatest propensity use non-motorised modes; those in retirement, as well as 'High earners without children', have the least propensity to use non-motorised modes.

Other insights into non-motorised mode travel behaviour have been provided. Evidence has been presented of no cycling the previous week amongst some population segments. The compensatory nature between utility and leisure trips, for both cycling and walking, is a relationship that could be explored further. In addition, exercise is a particular advantage for travelling to work by non-motorised modes; this should be emphasised within non-motorised mode promotion. Travelling on foot, and to a lesser extent by bicycle, as shown by the journey to work analysis, can be strongly linked to high-density accommodation. This type of development, rather than low-density development, needs to be promoted to encourage an increase in non-motorised mode usage.

Travel diary data illustrates motor car dependency, with the motor car dominating across all trip purposes. A concerted policy effort would, therefore, be required to reduce motor car usage. Within a package of travel demand management measures to reduce car use (e.g. Banister, 2000), there should be some to encourage non-motorised modes. As suggested by Tolley (2003), local initiatives such as Safer Routes to School, Green Transport Plans, “walking buses” and car free days can encourage non-motorised mode use. If possible, non-motorised policies should be locally targeted at particular trips, population segments and/or neighbourhoods.

Insights have been provided into the propensity to use non-motorised modes between different population segments (‘inter-segment’); differences within population segments (‘intra-segment’) could also be examined. There are some individuals on high incomes, with children and a car available that still choose to cycle. It would be of interest to understand some of the reasons why these individuals cycle, yet others within the same population segment choose not to.

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Table 1. The ten most common life stage groups in the Scottish Household Survey data set

	Frequency	Percent
1. Full time employment, working age	1971	30.9
2. Permanently retired from work, retired age	1045	16.4
3. Children (5-15) at school	771	12.1
4. Part-time employment, working age	526	8.2
5. Higher/further education, working age	425	6.7
6. Pre-school, pre-school age	343	5.4
7. Self-employed, working age	271	4.2
8. Working age, looking after home/family	256	4.0
9. Permanently sick/disabled, working age	156	2.4
10. Unemployed and seeking work, working age	140	2.2

Table 2. The socio-economic variables of the cluster analysis

Socio-economic variable	Split in the cluster analysis sample (n = 4,016)
1. Number of adults in household	1 : 910 (22.6%)
	2 : 2031 (50.5%)
	3 : 653 (16.2%)
	4 : 331 (8.2%)
	5 : 67 (1.6%)
	6 : 18 (0.4%)
	7 : 6 (0.1%)
2. Household income	£0 - £6000 : 434 (10.8%)
	£6000 -£10000 : 616 (15.3%)
	£10000 - £15000 : 782 (19.4%)
	£15000 - £20000 : 632 (15.7%)
	£20000+ : 1552 (38.6%)
3. House type	Flat : 2118 (52.7%)
	Terraced : 640 (15.9%)
	Semi-detached : 639 (15.9%)
	Detached : 619 (15.4%)
4. Life stage of individual	Full time employment : 1783 (44.3%)
	Self employed : 233 (5.8%)
	Higher/further education : 342 (8.5%)
	Looking after home/family : 221 (5.5%)
	Unemployed and seeking work : 125 (3.1%)
	Part time employment : 467 (11.6%)
	Permanently retired from work : 845 (21.0%)
5. Gender of individual	Female : 2144 (53.3%)
	Male : 1872 (46.6%)
6. Number of children in household	0 : 2870 (71.4%)
	1 : 564 (14.0%)
	2 : 430 (10.7%)
	3 : 122 (3.0%)
	4+ : 30 (0.7%)

Table 3. Characteristics of the ten population segments from the cluster analysis of the Scottish Household Survey data

	Number	%	Key characteristics	Other characteristics
Group 1 – Student	127	5.5%	In higher or further education	3-5 adults in household; mainly low household income (73% < £10K pa); all flat-dwellers; 58% male; no children
Group 2 - In-between jobs	124	5.3%	Unemployed and seeking work	1-4 adults in household; mainly low household income (80% < £15K pa); mainly flat-dwellers (80%); 64% male; 65% no children
Group 3 - Mid earner	310	13.3%	Full-time employment, all mid income (£10K-£20K pa)	1-2 adults in household; all flat-dwellers; 50% male; all no children
Group 4 - High earner without children	349	15.0%	Full-time employment, all high income (over £20K pa); all no children	All 2 adults in household; mainly flat-dwellers (54%); 55% male
Group 5 – Part-timer without children	130	5.6%	Part-time employment; all no children	1-2 adults in household; even income spread; mainly flat-dwellers (64%); 74% female
Group 6 – Child minder	127	5.5%	All looking after home or family; all have children	1-2 adults in household; even income spread; mainly flat-dwellers (55%); all female
Group 7 - High earner with children	268	11.5%	Full-time employment, all high income (over £20K); all have children	All 2 adults in household; even accommodation spread; 75% male
Group 8 – Part-timer with children	205	8.8%	Part-time employment; all have children	1-2 adults in household; mid to high income (54% > £20K pa); even accommodation spread; all female
Group 9 - Retired in a couple	359	15.4%	All 2 adults in household; all permanently retired	Mid to low income (84% < £15K pa); flat most popular (47%); 52% female; no children
Group 10 - Retired living on own	325	14.0%	All 1 adult in household; all permanently retired	Mainly low income (all < £15K pa); mainly flat (70%); 75% female; no children
Total	2324	100%		

Table 4. Combinations of motor car and bicycle availability of individuals within population segments

		Motor car available		
		Yes	No	Total
Bicycle available	Yes	26%. Likely to use motor car for most journeys, although with adult bicycles also available, may have potential for cycling. The main population segments within this group (in order) are 'high earners with children' (63%), 'part-timers with children' (52%) and 'high earners without children' (42%).	8%. Greatest propensity of the groups to cycle, since there is no competition from the motor car. The main population segments within this group (in order) are 'students' (45%), those 'in-between jobs' (17%), 'part-timers without children' (11%) and 'mid earners' (11%).	34%
	No	36%. Greatest propensity to use motor car, least propensity to cycle. The main population segments within this group (in order) are those 'retired with others' (56%), 'high earners without children' (49%) and 'mid earners' (40%).	30%. Greater propensity to use other modes such as walking and public transport, with no motor car or bicycle available. The main population segments within this group (in order) are those 'retired living on own' (82%), 'in-between jobs' (45%) and 'retired in a couple' (34%).	66%
	Total	62%	38%	100%

Table 5. Modal split statistics for the three journeys recorded in the Scottish Household Survey

Description	Sample	Motor car (drivers or passengers)	Cycle	Walk
General walking or cycling for a particular purpose (utility trip)	2,730 adults		115 (4.2%) adults	1,758 (64.4%) adults
General walking or cycling for pleasure (leisure trip)	2,730 adults		102 (3.7%) adults	1,113 (40.8%) adults
Journey to work	1,438 working adults	568 drivers (39.5%), 92 passengers (3.4%)	57 adults (4.0%)	296 adults (20.6%)
Journeys made the previous day, from travel diary entries	6,381 journey stages	3,337 stages by car (52.3%)	83 stages (1.3%)	1,674 stages (26.2%)

Table 6. Cycling and walking journeys the previous week recorded in the Scottish Household Survey data set

	Utility trip		Leisure trip		Any trip		Total (100%)
	Count	%	Count	%	Count	%	
Cycling							
Group 1 – Student	4	14.3%	2	7.1%	5	17.9%	28
Group 2 – In-between jobs	7	8.6%	6	7.4%	9	11.1%	81
Group 3 - Mid earner	14	6.0%	12	5.1%	22	9.4%	234
Group 4 - High earner without children	11	7.1%	8	5.2%	14	9.0%	155
Group 5 – Part-timer without children	1	1.4%	1	1.4%	2	2.7%	74
Group 6 - Child minder	1	1.3%	0	0.0%	1	1.3%	79
Group 7 – High earner with children	9	7.8%	12	10.4%	18	15.7%	115
Group 8 – Part-timer with children	4	3.3%	8	6.5%	10	8.1%	123
Group 9 - Retired in a couple	2	1.1%	0	0.0%	2	1.1%	179
Group 10 - Retired living on own	1	0.3%	1	0.3%	2	0.6%	325
TOTAL OF SEGMENTS	54	3.9%	50	3.6%	85	6.1%	1393
OVERALL TOTAL	115	4.2%	102	3.7%	174	6.4%	2730
Walking							
Group 1 - Student	24	85.7%	7	25.0%	24	85.7%	28
Group 2 - In-between jobs	61	75.3%	30	37.0%	67	82.7%	81
Group 3 - Mid earner	161	68.8%	106	45.3%	188	80.3%	234
Group 4 - High earner without children	103	66.5%	69	44.5%	122	78.7%	155
Group 5 – Part-timer without children	65	87.8%	27	36.5%	66	89.2%	74
Group 6 - Child minder	61	77.2%	28	35.4%	63	79.7%	79
Group 7 - High earner with children	68	59.1%	58	50.4%	91	79.1%	115
Group 8 – Part-timer with children	88	71.5%	48	39.0%	104	84.6%	123
Group 9 - Retired in a couple	103	57.5%	76	42.5%	124	69.3%	179
Group 10 - Retired living on own	177	54.5%	93	28.6%	202	62.2%	325
TOTAL OF SEGMENTS	911	65.4%	542	38.9%	1051	75.4%	1393
OVERALL TOTAL	1758	64.4%	1113	40.8%	2052	75.2%	2730

Figure 1. The ten population segments on a spectrum of propensity to use non-motorised modes

**LOW
PROPENSITY**



**MEDIUM
PROPENSITY**



**HIGH
PROPENSITY**

High earner without children
(most car dependent)

Retired in a couple
(low non-motorised mode usage)

Retired living on own
(low non-motorised mode usage)

Mid earner
(live in flats, but many do not have bicycle available)

Child minder
(low cycling usage, high utility walking usage)

High earner with children
(many have bicycles available, high car dependency)

Part-timer with children
(many have bicycles available, moderate non-motorised mode trips)

Student
(high non-motorised mode usage)

In-between jobs
(high non-motorised mode usage)

Part-timer without children
(high bicycle availability, most utility walking trips)