



Department of the Environment Transport and the Regions

A453 CORRIDOR MULTIMODAL STUDY

WORKING PAPER NO 5

**Surveys
Home Travel Survey – Response and Implications
An Initial Assessment**

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Prepared for:

Government Office for the East Midlands
The Belgrave Centre
Stanley Place
Talbot Street
Nottingham NG1 5GG

Prepared by:

Pell Frischmann Joint Venture
Lloyds Court
659 Silbury Boulevard
Central Milton Keynes
MK9 3DP

1 INTRODUCTION

This Working Paper (WP) has been prepared to provide an initial insight into the methodology of the Home Travel Survey undertaken for the A453 Corridor Multimodal Study, survey returns, initial findings and to review implications for ongoing work.

All results provided within this WP should be viewed as interim as processing and analysis are ongoing at the time of writing. In particular it must be recognised that at this stage it is only possible to quote results from unexpanded data. Expansion to represent the total populations is a complex process involving comparison of survey demographic information with that from a definitive source. The study team anticipate the arrival of the year 2000 planning databank from DETR (HETA) early in November to provide this source. This process is essential to minimise the effect of any bias in the geographical and socio-economic characteristics of the survey response.

A further WP will be prepared at the earliest opportunity to update the information provided in this paper, but a date cannot be given for this at the time of writing.

2 SURVEY METHOD

2.1 Introduction

The Household Interview Survey (H.I.S) is being undertaken in two stages. Stage one is now complete and involved the collection of household information and trip diaries from the household. Stage two will be undertaken in the autumn, involving stated preference techniques based on the stage one responses.

Approximately 3300 households were originally approached within the study area, with the aim of obtaining information about their characteristics and typical travel patterns. In order to appeal to the public a prize draw was on offer for those who returned their questionnaires, with a first prize of £250.

2.2 Sampling Method

The electoral register was used as the most appropriate source of household addresses from which to draw the interview sample. The register from the City of Nottingham was obtained, as were the relevant sections of the Rushcliffe, Gedling, Erewash and Broxtowe District lists.

The method of “firstings” was used to derive the sample of 3000. 2000 households were sampled from across the whole study area, with the remaining 1000 derived by further sampling from a smaller area of greater relevance to the A453 study. Figure 1 shows the standard and enhanced sample areas, a schedule of word names may be found in Table 1. Although it was important to obtain the information from the whole of Greater Nottingham, for the purposes of the A453 corridor study it was necessary to try and learn more about peoples’ travel behaviour in that specific region. For this reason a greater number of questionnaires were sent to this area.

The “firstings” method used can be described as follows: the first member of the household listed on the register was chosen to represent the household as a whole. In the case of the general sample, approximately 220,000 households were considered, meaning that every 110th address had to be

selected. Choosing the sample by this method removed any bias towards larger size households. In the areas covered by the enhanced sample, every 55th household was selected.

In addition to the original sample of approximately 3000 addresses, a reserve sample was also selected. This additional set increased the number of sample households to in excess of 3300. The reserve addresses were also selected from the enhanced sample area.

2.3 Survey Method

After the main sample of 3000 had been selected, the identified member of each household was approached with a letter outlining the purpose of the study and inviting them to take part in the home travel survey. Those who did not wish to participate were asked to respond via a “hotline” freephone to register their wish not to be involved, and these households were omitted from the next stage.

Table 1: Wards Included in the Sample Frame

Ward Index		
0 Abbey	46 Hucknall East	92 Stapleford West
1 Abbey	47 Hucknall North	93 Strelley
2 Ash Lea	48 Hucknall West	94 Strelley and Trowell
3 Aspley	49 Killisick	95 Thoroton
4 Attenborough	50 Kimberley	96 Tollerton
5 Awdsworth and Cossall	51 Kingswell	97 Toton
6 Basford	52 Lady Bay	98 Trent
7 Beechdale	53 Lambley	99 Wilford
8 Beeston Central	54 Lamcote	100 Wiverton
9 Beeston North-East	55 Leake	101 Wolds
10 Beeston North-West	56 Lenton	102 Wollaton
11 Beeston Rylands	57 Leys	103 Woodborough
12 Bestwood Park	58 Lutterell	104 Woodthorpe
13 Bestwood Park	59 Malkin	105 Derby Road East
14 Bilborough	60 Manor	106 Derby Road West
15 Bingham	61 Manvers	107 Long Eaton Central
16 Bishop	62 Mapperley	108 Nottingham Road
17 Bonington	63 Mapperley Plains	109 Sawley
18 Bramcote	64 Melton	110 Wilsthorpe
19 Bridge	65 Musters	111 Sandiacre North
20 Brinsley	66 Netherfield	112 Sandiacre South
21 Bulwell East	67 Nevile	
22 Bulwell West	68 Newstead	
23 Burton Joyce and Stoke Bardolph	69 North Keyworth	
24 Byron	70 Nuthall	
25 Calverton	71 Oak	
26 Carlton	72 Oxclose	
27 Carlton Hill	73 Packham	
28 Cavendish	74 Park	
29 Chilwell East	75 Phoenix	
30 Chilwell West	76 Porchester	
31 Clifton East	77 Portland	
32 Clifton West	78 Priory	

33 Conway	79 Radford
34 Cranmer	80 Rancliffe
35 Dayncourt	81 Ravenshead
36 Eastwood East	82 Robin Hood
37 Eastwood North	83 Sherwood
38 Eastwood South	84 Soar Valley
39 Edwalton	85 South Keyworth
40 Forest	86 St. Anne's
41 Gedling	87 St. James
42 Gotham	88 St. Mary's
43 Greasley	89 Stanford
44 Greenwood	90 Stapleford East
45 Hucknall Central	91 Stapleford North

The original 3000 addresses were divided into nine survey effective days, which were the weekdays between Monday 10th July and Thursday 20th July 2000, by electoral ward. Approximately nine wards were allocated to each survey day, and these were distributed as evenly as possible across the study area. The reserve sample was given effective day nine.

After the approach letter had been dispatched, approximately one week before the effective day, the survey pack was sent to those who had not registered on the hotline. The packs consisted of a cover letter, instructions for completing the questionnaires, survey forms and a prepaid return envelope. The questionnaires themselves consisted of a “household” form, a “person” form and several “trip” forms. These forms sought the following information.

“Household” form: general information concerning the number of persons in the house, number of cars, bicycles and other modes of transport available. The form also asked for approximate annual mileage and distance to the nearest bus and train stations and also local food shop.

“Person” form: information specific to each person within the household such as age, sex, economic activity, car availability and parking facilities.

“Trip” form: details of trip diaries for each person in the house. The trip diary was for the specific day that had been allocated to the household.

Copies of the three survey forms may be found in Appendix A.

In order to increase the rate of return, telephone contact was made with all sampled households where a number could be obtained from the telephone directory. However, only 31% of household numbers could be obtained in this way, the remainder were either ex-directory or not listed.

Between four and seven days after their effective day each household, which had not yet responded, was sent a follow-up letter, requesting again that people complete the questionnaires. Households that had misplaced their forms could telephone the hotline to request a new set, or alternatively the questionnaires could be completed over the telephone with the help of one of Pell Frischmann’s trained staff.

In order to further increase the rate of return, notices were put up in the windows and on notice boards of the local shops. These posters emphasized the importance of the study, the fact that participants could win £250 in the prize draw and reiterated that help and additional information was available through the hotline.

3 SURVEY RESPONSE AND RESULTS

3.1 Response

The rate of return of completed questionnaires was initially slow, however this accelerated to around 60 per day during the second week. The rate of return then reduced slowly, with the majority of the 789 completed packs having been received four weeks after the start of the survey period.

Telephone contact revealed occasional confusion over how to actually fill the forms in, some people did not seem to understand the completion instructions. Also clear was the fact that the letters and guidance notes were not read properly, the length of letters seemed to put people off. Some individuals seemed to have difficulty comprehending basic issues, such as how many days' worth of trips needed recording, although this seemed quite clear to the survey designers.

Many of the people who called the hotline or who were contacted through interview were not initially interested in participating with the study until it was explained that the information would be used to help plan for future transport requirements in Nottingham. People were, naturally, more prepared to be helpful when they were aware of the potential benefits. Unfortunately it is the nature of society within this country that the public are inundated with junk mail, often asking questions for commercial gain, which makes it difficult to persuade them to assist in a survey of this type.

A success rate of approximately 70% was achieved by telephone interview, i.e. 7 out of 10 people contacted in this manner promised to complete their questionnaires. It is unfortunate that this process could not have had a greater influence on the result of the study but, as mentioned previously, the amount of contact numbers obtained was too low to have the desired effect.

As can be seen in Table 2, the number of completed questionnaire returns per effective day is relatively evenly distributed. There is a slightly lower rate of return on Thursday 13th, but this is compensated by the fact that a higher number were received for Thursday 20th. The traffic model is day (rather than date) sensitive, which means that this situation is acceptable.

Table 2: Returns per Effective Day

Effective Day (July 2000)	Number of Returns
Monday 10th	85
Tuesday 11th	78
Wednesday 12th	95
Thursday 13th	69
Friday 14th	85
Monday 17th	95
Tuesday 18th	76
Wednesday 19th	82
Thursday 20th	117

Table 3 shows the distribution of number of persons within each household for the questionnaires received. As can be seen, there is a large proportion of single and two-person households. This is to be expected, as there are likely to be lower numbers of three or more person families living in any given region. This is because children tend to provide the extra people, and they are inclined to leave

home around the age of 20. In addition only persons over the age of 4 were included in the survey. It is also obvious that as the number of individuals in the house increases, the task of completing the necessary forms becomes more onerous. It is probably also fair to say that larger families have less time available to fill in questionnaires such as this, as each family member will have different commitments.

Table 3: Distribution of household size

Household Size	Number of Households
1	216
2	357
3	104
4	78
5	18
6	8
7	1

The age distribution of those persons responding is shown in Table 4. It can be seen that there are a significantly higher number of returns from people aged 30+. The lower return from the under 18 age group could be explained by the fact that families with children would have less time and inclination to complete what may seem like a lengthy questionnaire. The response from the 19-30 age range could be for similar reasons – this group of people are more likely to be socially active, resulting in less available time to fill in forms. In addition, 19-30 will statistically represent a smaller section of society than the other age brackets because it is a narrower range, i.e. 11 years compared to 18 or 20.

Table 4: Age distribution of persons sampled

Age Group	Number of Persons
0 - 18	227
19 - 30	195
31 - 50	468
51 - 65	399
66+	337

Table 5 gives a breakdown of the number of completed survey forms received per electoral ward. Also quoted is a percentage of the number of questionnaires originally dispatched to each area. These percentages are also shown graphically on the map of the study area in Figure 2.

It can be seen that there was a generally lower response from areas of the City of Nottingham itself than rural parts of the A453 corridor. Wards such as Manvers, Aspley, Bridge, Radford and Lenton typically provided responses of between 5 and 20%. These were also the areas where the number of available telephone numbers was at its lowest. More rural wards such as Keyworth, Leake, Edwalton and Gotham had typical return rates of between 20 and 40%. It was also noticeable, and to be expected, that areas which are more directly affected by the A453 generally provided the higher rates of return.

Table 5: Percentage Return by Electoral Ward

Map Code	Ward	Total despatched	Total Received	Percentage Returned
0&1	Abbey	88	22	25
2	Ash Lea	20	5	25
3	Aspley	39	4	10
4	Attenborough	45	13	29
6	Basford	39	3	8
7	Beechdale	36	6	17
8	Beeston Central	61	14	23
9	Beeston North-East	49	7	14
10	Beeston North-West	29	8	28
11	Beeston Rylands	36	11	31
12&13	Bestwood Park	34	4	12
14	Bilborough	27	8	30
17	Bonington	19	3	16
18	Bramcote	44	11	25
19	Bridge	77	7	9
21	Bulwell East	39	9	23
22	Bulwell West	46	3	7
24	Byron	49	9	18
26	Carlton	23	4	17
27	Carlton Hill	23	7	30
28	Cavendish	13	1	8
29	Chilwell East	50	16	32
30	Chilwell West	69	12	17
31	Clifton East	130	28	22
32	Clifton West	129	47	31
33	Conway	52	16	31
39	Edwalton	51	15	29
40	Forest	37	6	16
41	Gedling	20	4	20
42	Gotham	33	11	33
44	Greenwood	40	5	13
49	Killisick	17	6	35
51	Kingswell	22	6	27
52	Lady Bay	19	7	37
54	Lamcote	9	2	22
55	Leake	48	19	40
56	Lenton	75	7	9
57	Leys	27	5	19
58	Lutterell	71	25	35
60	Manor	6	1	17
61	Manvers	42	6	14
62	Mapperley	42	11	26

63	Mapperley Plains	20	9	45
65	Musters	40	16	40
66	Netherfield	28	4	14
69	North Keyworth	6	2	33
70	Nuthall	23	8	35
73	Packham	28	7	25
74	Park	82	12	15
75	Phoenix	11	1	9
76	Porchester	21	7	33
77	Portland	41	6	15
78	Priory	9	2	22
79	Radford	36	2	6
80	Rancliffe	6	2	33
82	Robin Hood	47	6	13
83	Sherwood	40	9	23
84	Soar Valley	29	10	34
85	South Keyworth	21	6	29
86	St. Ann's	35	5	14
87	St. James'	20	8	40
88	St. Mary's	24	3	13
89	Stanford	5	3	60
90	Stapleford East	48	13	27
91	Stapleford North	49	3	6
92	Stapleford West	46	8	17
93	Strelley	33	2	6
94	Strelley & Trowell	9	3	33
96	Tollerton	6	3	40
97	Toton	46	12	26
98	Trent	37	8	22
99	Wilford	154	42	27
101	Wolds	11	7	64
102	Wollaton	103	35	34
104	Woodthorpe	21	6	29
105	Derby Road East	44	7	16
106	Derby Road West	50	12	24
107	Long Eaton Central	47	14	30
108	Nottingham Road	53	11	21
109	Sawley	57	14	25
110	Wilsthorpe	54	20	37
111	Sandiacre North	37	8	22
112	Sandiacre South	33	13	39
113	Kegworth	27	6	22
Total		3362	789	23.5

3.2 Summary Results

The net survey return comprises 782 households and 1,703 persons, out of which 53 are under five years old. This means an average household size of 2.2 persons. Travel data were obtained from 1,647 persons from the age of 5 up, of whom 1,428 (86,7%) stated that they were mobile on their effective day, i.e. they made at least one trip. Information was collected from 4,812 trips. This means an average of 2.92 trips per person and 3.37 trips per mobile person.

The modal split recorded by the survey is shown in Figure 1: Omitting “other modes” 67% of all trips were made by using motorised private transport. Public transport was used for 11% of all trips. The distribution of trip purposes is shown in Figures 2 and 3. The most frequently recorded trips are home trips followed by shopping/personal business trips. The distribution of trip lengths is shown in figure 4. 85% of all trips terminate within a range of up to 10 miles.

These data relate only to residents of the survey area and are not weighted so far, so initial results must be interpreted with great caution.

4 IMPLICATIONS

4.1 Revealed Preference

The household survey data will be used for the development of a travel demand model covering movements by residents of Greater Nottingham. In particular the following data will be integrated directly:

- Frequencies of activity chains
- Distribution of travel distances by trip purposes
- Modal split calibration of the decision model parameters

Other data will be used for model validation:

- Comparative matrices (aggregated level, e.g. districts)
- Modal split of each behavioral group

The response rate of the survey is modest at 23.5%. Possible biases with regard to representativity of the database (e.g. due to self-selection) will be balanced through statistical weighting of the data. This weighting is based on the real distribution of the population within the survey area. (It is currently envisaged that NTEM data will be used.) The weighting factors will be calculated for suitable aggregates of wards (sectors) in order to ensure a sufficient number of observations per sector. Weighting variables are

- number of persons per sector
- number of cars per household
- age and sex.

Whilst weighting factors are commonly computed at the sector level, generation of travel demand may still be undertaken at the model zone (finest) levels. Any comparative aggregation can be selected for validation. Therefore the apparently modest survey response has no detrimental effects on the level of application.

All operations, which are carried out to provide data for the model directly, should be representative. The highest level of disaggregation will be needed for the frequencies of activity chains. The table below shows the number of observations for each type of trip chain likely to be considered for modeling purposes.

Activity chain	Frequency
WAW	416
WEW	404
WFW	359
WSW	140
WAAW	121
WAEW	68
WAFW	45
WASW	3
WEAW	12
WEEW	126
WEFW	46
WESW	7
WFAW	43
WFEW	60
WFFW	88
WFSW	2
WSAW	2
WSEW	4
WSFW	14
WSSW	8

W = home, A = workplace, S = education, E = shopping, F = leisure

As one can see the number of observations is sufficient in most cases. Low frequency chain types need not be modelled explicitly as their contribution to the total mobility generated by the demand model is very small.

The prime application of the data is in the development and calibration of mathematical relationships which are used to compute travel demand and patterns of movement rather than the direct building up of patterns of movements (generally called trip matrices).

4.2 Stated Preference Implications

For 4,328 (90%) trips geocoding was successful and a model zone number could be allocated. Out of these 3,192 trips (66,3% of all trips) could be assigned to the street network by using the MapOCX routing software.

The designs of the two SP elements will be the following:

SP 1: Car – Public transport

Variables car: travel time, motoring costs, parking charge

Variables PT: transport system (bus/LRT), travel time, access+egress time, fare, headway, transfer necessity (yes/no)

SP 2: Car – Park+Ride

Variables car: travel time, motoring costs, parking charge, search time for parking space

Variables Park+Ride: transport system, travel time, fare, headway, transfer necessity

SP 1 will be a tailored one, i.e. it will be based on real trips reported in survey stage one. Trips which can be used for SP 1 have to meet the following conditions:

- car or PT trip (no trips on foot)
- person 17 or older
- personal mobility
- home-based trip
- model zones allocated
- routing identifiable

The number of **persons**, who meet these conditions and reported at least one trip of this kind is circa 800, i.e. roughly the half of all responses. Each of these can be offered 9 to 12 test situations. On the assumption of a 50% return rate¹ and 10 tests per person this means a total of 4,000 observations. This number is absolutely sufficient for model calibration.

SP 2 will be a generalised one, i.e. based on a fictitious trip starting at home going to the inner city of Nottingham. The advantage of this method is that all persons who cannot be provided with SP 1 can be invited to complete an SP 2 questionnaire instead.

¹ This rate can be reached as the remaining persons of the first survey stage already took part and therefore have a higher willingness to participate again.

Figure 1: Modal Split (unweighted)

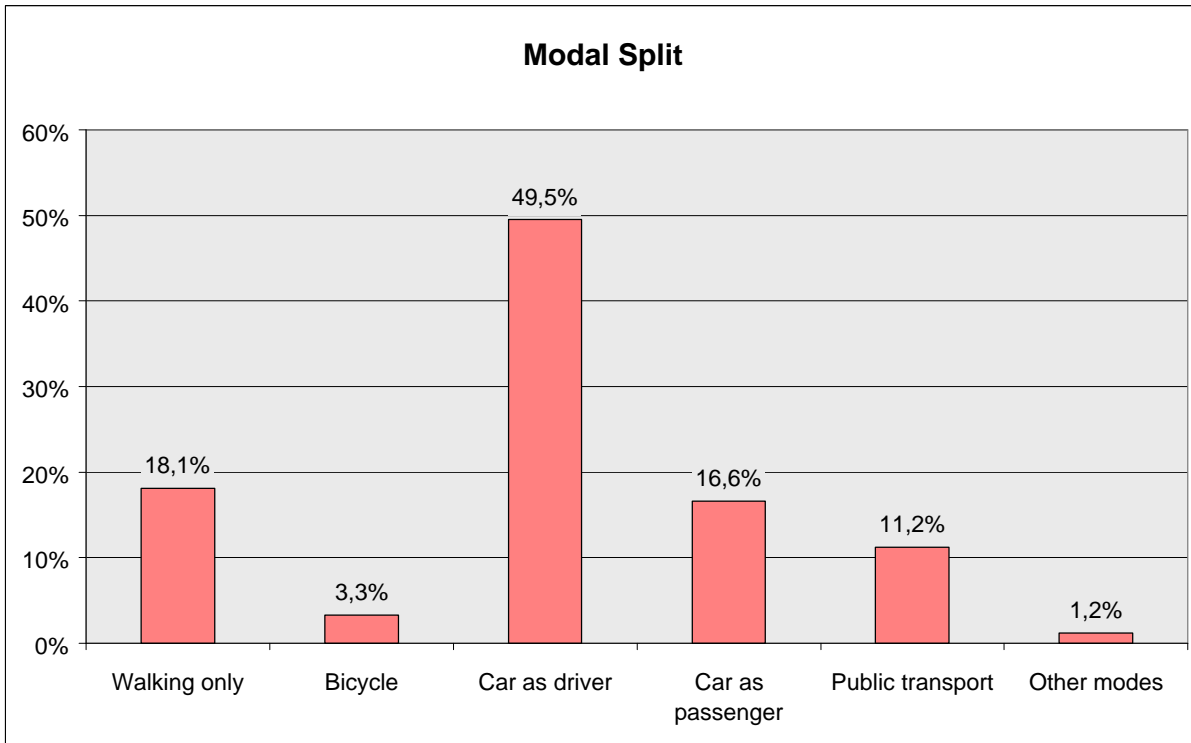


Figure 2: Trip purpose (all trips; unweighted)

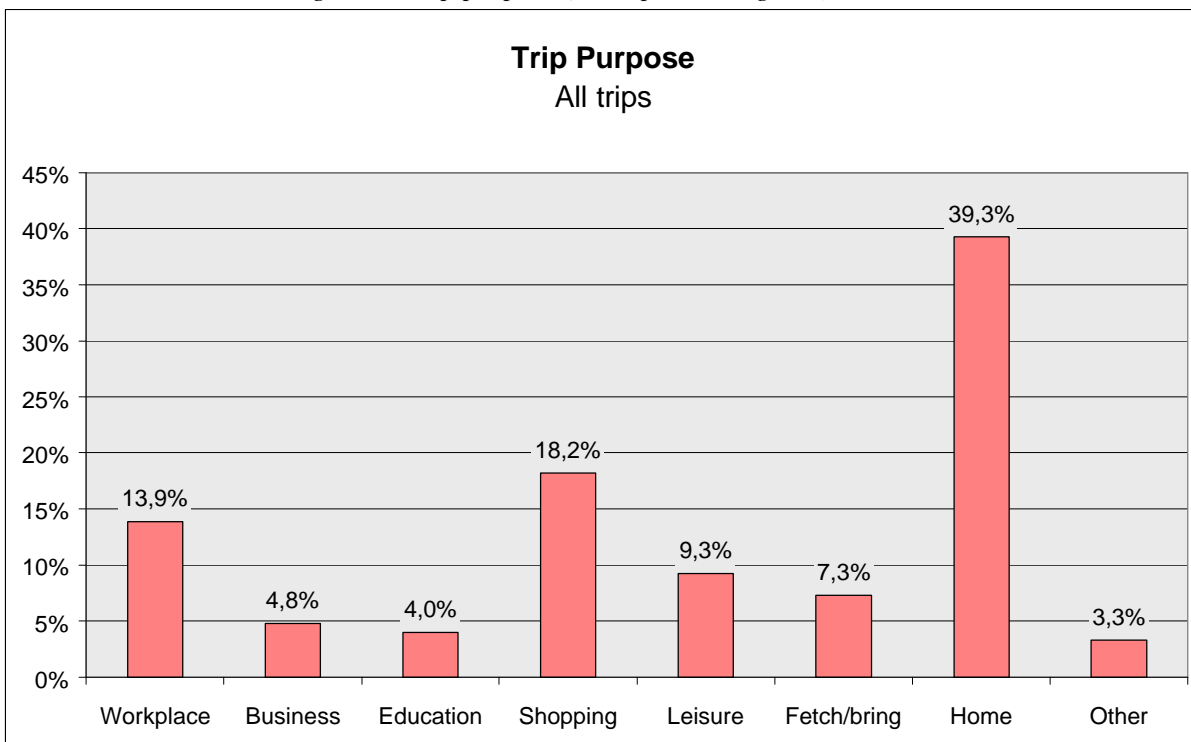


Figure 3: Trip purpose (without home and other trips; unweighted)

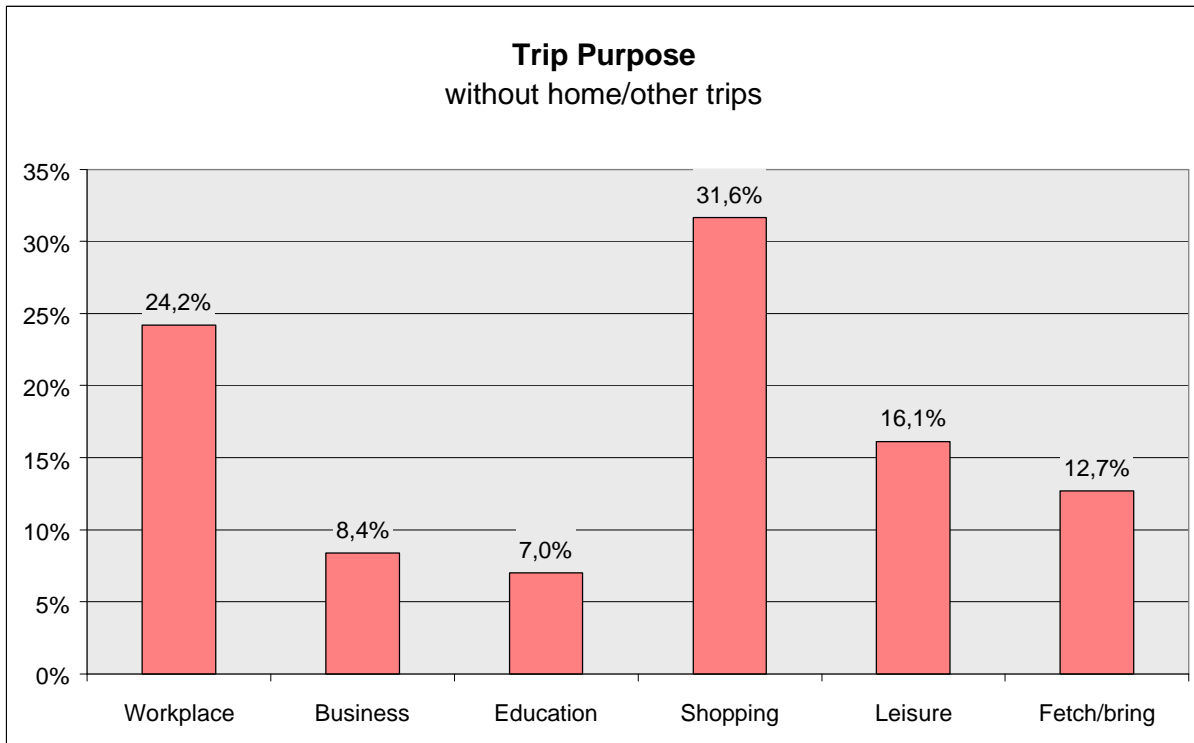
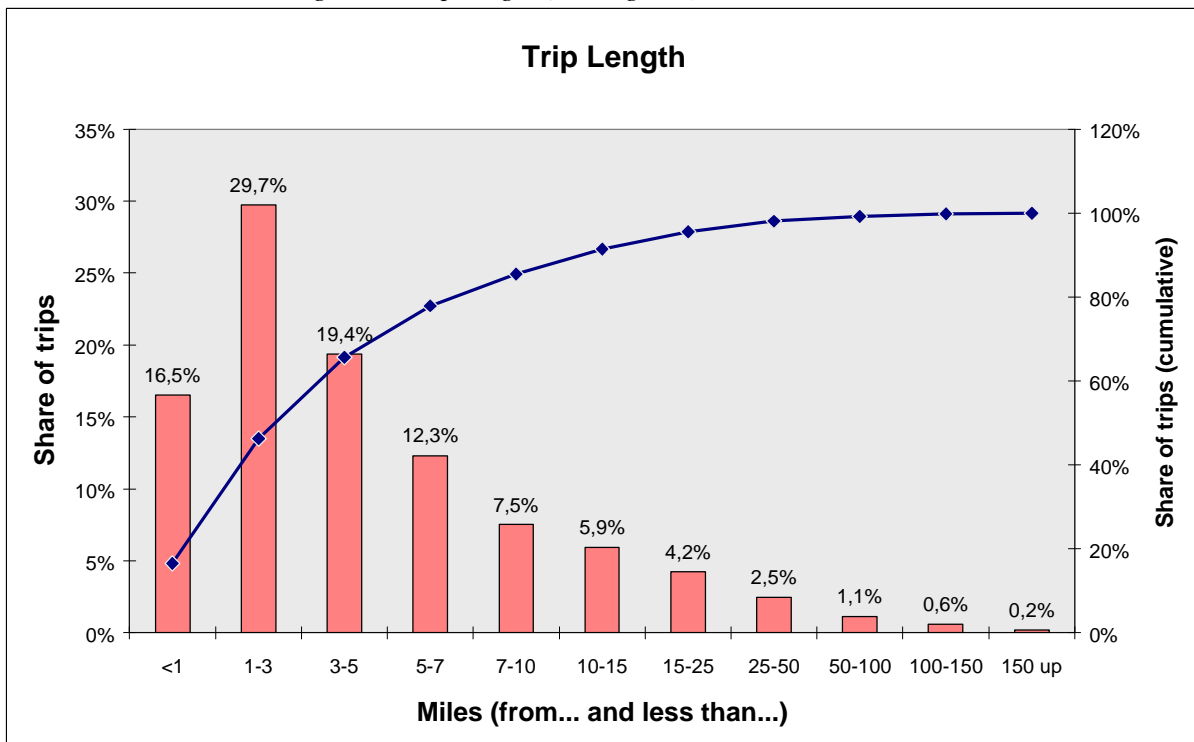


Figure 4: Trip length (unweighted)



APPENDIX A

Survey Forms