

National Travel Survey GPS Feasibility Study

Final Report

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Contents

Executive summary	1
Acknowledgements	9
1 Introduction	11
1.1 Background to the study.....	11
1.2 Aims and objectives.....	11
1.3 Overview of the study.....	12
The preliminary phase.....	12
The GPS device.....	13
The data collection phase.....	13
The data processing and analysis phase.....	14
1.4 Report structure.....	14
2 Sample	15
2.1 Sample size.....	15
Response rate.....	15
Data loss due to equipment failure and improper use.....	16
2.2 Sample design.....	16
3 Data collection	18
3.1 Overview of the fieldwork process.....	18
3.2 Interviewer briefing.....	19
3.3 Introducing the GPS monitors.....	19
3.4 Returning and downloading the GPS data.....	20
3.5 Other differences in the fieldwork process and data collection.....	20
Allocation of travel weeks.....	20
Incentives.....	20
Questionnaire.....	20
4 Response rates	22
4.1 Household response.....	22
4.2 Individual response.....	23
Proxy vs face-to-face response rates.....	23
Response rates by gender and age.....	24
4.3 Comparison of respondent characteristics between GPS and NTS.....	25
4.4 Acceptance, usage and return of the GPS devices/data.....	27
4.5 Bases for analysis.....	28
5 Ease of use: respondents' experiences	29
5.1 Daily use of GPS device.....	29
5.2 Ease of use.....	29
5.3 Charging the GPS devices.....	30
5.4 Problems with GPS device.....	31
5.5 Summary.....	31
6 Interviewer feedback	33
6.1 Introducing and explaining the device.....	33
6.2 Feedback from using the GPS devices.....	34
7 Processing GPS data	35
7.1 The raw GPS Data.....	35
7.2 Identifying GPS trips.....	35
7.3 Assigning Modes and Stages.....	36
7.4 NTS travel diary: excluded trips.....	37
7.5 GPS/Travel Diary Trip Matching.....	40
Methods.....	40
Observations.....	43
7.6 GPS data processing results.....	43
8 Analysis and observations	47
8.1 Introduction.....	47

8.2 Comparison of trips recorded in the diary and GPS	48
Raw trip counts	48
Journeys excluding short walks under one mile.....	50
Short walks.....	53
8.3 Completeness of GPS data	54
8.4 Accuracy of the GPS and diary data	58
8.5 Unreported trips.....	59
8.6 Comparing the potential levels of under-reporting in the travel diary and under-recording by GPS	62
8.7 Summary	64
9 Lessons learnt and recommendations for the future	65
9.1 Acceptability of GPS devices.....	65
9.2 Usability of GPS devices	66
9.3 Reliability of the selected GPS device and data.....	66
9.4 Consistency of data processing.....	67
9.5 Comparability of GPS and diary trips	67
9.6 Recommendations.....	68
Future technology review and testing	68
A small-scale one or two day travel diary and GPS study	69
Appendix A Pre-testing results.....	71
Appendix B GPS leaflet	74
Appendix C GPS participant instructions.....	76
Appendix D Daily record sheet	79
Appendix E Questionnaire	82
Appendix F GPS Logging Frequency Analysis	146
Appendix G Sensitivity Analysis on Initial Stop Time Threshold.....	149
Appendix H GeoCoding Background.....	151
Appendix I Mode assignment within GPS processing.....	152
Appendix J GPS and Travel Diary Trip Matching Results.....	154

Tables

Table 4.1	Household outcome	22
Table 4.2	Individual outcome	23
Table 4.3	Individual outcome by face-to-face or proxy interview.....	24
Table 4.4	Individual outcome by gender	24
Table 4.5	Individual outcome by age	24
Table 4.6	Face-to-face or proxy interview by age.....	25
Table 4.7	Gender profile by survey.....	25
Table 4.8	Age profile by survey.....	26
Table 4.9	Socio economic profile by survey	26
Table 4.10	Frequency of travel by survey.....	27
Table 4.11	GPS data collection and availability.....	28
Table 5.1	How easy or difficult found GPS device to use.....	30
Table 5.2	Whether charged device during the travel week	30
Table 5.3	Problems with GPS device by day.....	31
Table 5.4	Problems with GPS device across the whole travel week.....	31
Table 7.1	Processing Procedures and Reporting Exceptions	38
Table 7.2	GPS Point Statistics	43
Table 7.3	GPS Trip Summary Statistics	43
Table 7.4	Number of Travel Days with GPS Trips.....	44
Table 7.5	Breakdown of GPS Trips by Number of Stages	44
Table 7.6	Breakdown of GPS Trips by Main Travel Mode	45
Table 7.7	Statistics on Mode Stages	45
Table 7.8	Number of Mode Reassignments by Final Mode	46
Table 8.1	Overview of GPS use.....	47
Table 8.2	Trips recorded/reported by data collection method	48
Table 8.3	Comparison of diary/GPS trips, excluding short walks, by basis of GPS logging.....	49
Table 8.4	Weekly person level trip rates: All trips excluding short walks	50
Table 8.5	Profile of all trips excluding short walks	52
Table 8.6	Daily person level trip rates: Short walks (trip level).....	53
Table 8.7	Profile of short walk trips	54
Table 8.8	Proportion of diary trips matched by GPS trips – by type of area	55
Table 8.9	Proportion of diary trips matched by GPS trips – by day of week	55
Table 8.10	Proportion of diary trips matched by GPS trips – by trip distance.....	56
Table 8.11	Proportion of diary trips matched by GPS trips – by time of departure.....	56
Table 8.12	Proportion of matched diaries at person level	56
Table 8.13	Number of days at person level with missing GPS data	57
Table 8.14	Number of days at person level with missing GPS data where they had no problems and carried the device for all trips.....	57
Table 8.15	Average trip distance (in miles) by mode.....	58
Table 8.16	Average trip duration (in minutes) by mode.....	58
Table 8.17	Difference between diary and GPS start and end times	59
Table 8.18	Number of stages, by logging interval	59
Table 8.19	Unrecorded trips – Short walks excluded from diary	60
Table 8.20	Unrecorded trips - Additional trips.....	61
Table 8.21	Profile of additional trips.....	62
Table 8.22	Trip Analysis by Day	63
Table 8.23	Missed Trip Analysis by Day (excluding trips not eligible for inclusion in diary)	63

Figures

Figure 1.1	GPS device	13
Figure 5.1	Daily use of GPS device	29
Figure 5.2	Whether charged device each day	30
Figure 7.1	Example Speed / Time Graphs for Various Travel Modes	37
Figure 7.2	TIAS Trip Matching Timeline Interface – Examples	41
Figure 7.3	TIAS Trip Matching Timeline Interface – Examples	42
Figure 8.1	Comparison of trips recorded by GPS and diary by travel day	49
Figure 8.2	Trip rates by day of travel week for all respondents, excluding short walks	51
Figure 8.3	Trip rates for respondents whose device logged by time, excluding short walks	51
Figure 8.4	Trip rates for respondents whose device logged by distance, excluding short walks.....	52
Figure 8.5	Trip rates by day of travel week : Short walks	54

Executive summary

Background

The National Travel Survey (NTS) is the Department for Transport's primary source of personal travel data. The survey collects detailed trip information (such as purpose, time of day, duration, mode of transport, distance) through a paper based diary which respondents complete over a seven day period.

Over the last seven years GPS¹ technology has been used on a number of travel surveys as an alternative means of collecting travel survey data. Compared with the NTS diary based methodology, a GPS based study could potentially deliver the following:

- More accurate trip data (time of day, duration, distance)
- Precise origin and destination data for each trip
- Data on all walking trips (rather than just those on Day 7 of the reporting period as currently captured in the NTS travel diary)
- Data on the routes types and speed of travel

GPS data could also be used to calculate weights to correct for the drop-off in reporting observed in the NTS travel diary as the reporting period progresses.

The purpose of this study was to test the feasibility of using personal GPS monitors to collect travel data within the context of the seven day NTS. The specific objectives were:

- To investigate how best to collect, clean and analyse GPS data
- To link GPS data with the data collected from a travel diary in order to explore any differences
- To examine the practical issues of equipping individuals with personal GPS monitors and make recommendations for future implementation

One of the key uses of NTS data is to examine trends in travel behaviour over time. Consequently, when assessing alternative data collection methods, one of the many considerations is the impact of a change in data collection on trend data. For this reason, the focus of this feasibility study was to examine how GPS would perform when used in a manner consistent with the current design of the NTS, focusing on how GPS data differs from data collected via the seven day NTS diary.

This report covers the data collection, processing and analysis stages of the project. Prior to this, a preliminary phase of work was undertaken which consisted of a telephone survey of recent NTS respondents to establish the likely acceptability of GPS monitoring, a review of

¹ The Global Positioning System (GPS) is a navigation satellite system that provides reliable positioning data.

the portable GPS devices available on the market at that time, two rounds of small scale pre-testing of the shortlisted devices and the final selection of the most appropriate.²

Overview of the data collection

Fieldwork was undertaken by NatCen and conducted in two waves between October 2008 and March 2009, with the aim of gathering usable GPS and diary data from around 100 adults (aged 16 or older). In total 108 addresses were issued to interviewers, across three geographical areas. The fieldwork followed the established NTS procedures as far as possible. Respondents were interviewed face-to-face, using a shortened NTS questionnaire.³ At the end of the interview, they were asked to complete the NTS seven day self-completion travel diary and carry a personal GPS monitor over the same period. Following the review of available GPS devices and small-scale testing, the Atmel BTT08 GPS Data Logger was selected for use on this study.

The feasibility study differed from NTS procedures in only including adults, offering a larger incentive (£10 per person) payable regardless of the participation of other household members, and assigning a travel diary (and GPS) data collection period starting the day after the placement interview. (On NTS, a £5 per person incentive is paid but only if all household members fully participate, including children, and there may be a gap of up to five weeks between the placement interview and the start of the assigned diary completion period.)

Overview of the GPS processing and data matching

The processing of the interview and diary data followed the standard NTS procedures. The GPS data was processed by GeoStats who then undertook the matching of the GPS and diary data.

Initially, potential **trip ends** (i.e. the point at which a trip finishes) in the GPS data were automatically identified and tagged on the basis of dwell times of 120 seconds or more, and any trips that appeared to be typical GPS 'noise' within the data were removed. Analysts then reviewed, edited, and/or confirmed trip end locations using an interactive mapping interface which showed GIS⁴ information (such as street and public transport layers). This allowed them to screen out traffic delays and other falsely identified stops and to add stops that had dwell times of less than 120 seconds but had clear stop characteristics. An initial **mode of transport** was then assigned based on the speed characteristics/profiles of different travel modes. These assigned modes were reviewed by analysts, alongside GIS layers and speed profiles, and adjustments made as necessary.

Trips that were not included in the NTS diary data as a result of the NTS reporting rules or treated in a non-standard manner were flagged in the GPS data (such as trips outside of Great Britain, short walks of less than one mile on Days 1-6 and less than 50 yards on Day 7, and trips made off the public highway).

² See separate preliminary phase report for further details.

³ The NTS interview is conducted using CAPI – Computer Assisted Personal Interviewing.

⁴ Geographic Information System

The **GPS/travel diary trip matching** was undertaken based on trip start times and origin/destination locations such that trip start times were automatically matched if they fell within 12.5 minutes of each other and/or trip end locations were automatically matched if they fell within 100 metres of each other. Analysts then reviewed the auto-matches and made adjustments as necessary based on time, location, trip order and mode, using information for home, work and school locations (where these had been collected at the placement interview).

Key findings

Response rates

Of the 90 eligible households identified by interviewers, 52 per cent were classified as fully productive – that is every household member aged 16 or older completed the interview and diary, and accepted a GPS device. ('Accepted a GPS device' indicates that a GPS device was left by the interviewer for each household member and that, at that point, the household members had indicated a willingness to use the devices. However this does not guarantee that they actually used the device and/or that it was returned with data). A further 21 per cent of households in the feasibility study were partially productive (i.e. cases where some eligible household members either refused to take part or did not complete interview/travel diary or accept the GPS device). This compares with a fully productive response rate of 59 per cent on NTS in 2008, and a partial productive response rate of six per cent. The difference in response rates will be influenced by the additional perceived burden of the GPS device, in addition to completing a diary, as well as the different incentive structure used on the feasibility study.

Across the fully and partially productive households, there were a total of 134 eligible (adult) household members. Of these, 121 accepted a GPS device at the placement interview. However, there were a number who decided not to use the device after further thought, in spite of accepting one at the placement interview. Of the total 134 eligible household members, 79 per cent fully participated in the study i.e. completed an interview (either in person or by proxy), completed a travel diary and reported using a GPS device (106 adults). Use of the GPS device was lower amongst those respondents whose interview data was collected by proxy. This is unsurprising as these respondents may not have had the same opportunity to discuss the task with the interviewer.

Although 106 respondents completed the interview and travel diary and claimed to have used the GPS device, GPS data was not available for all of these individuals. In two cases devices failed to collect any data and in three cases devices were lost.

Sample representativeness

It is possible that the request to use a GPS device may deter certain types of respondents who would be willing to participate in the standard NTS and/or attract other types of respondents who may usually be more reticent. There was no variation between men and women's full participation across the two surveys. However, the feasibility study had a lower representation of the 55+ age group. This is in line with reports from the interviewers and findings from earlier exploratory work that older people were more reticent about using the GPS technology, perhaps due to a lack of confidence with technology more generally.

Ease of use: respondent views

Overall it seems that most respondents found the device easy to use and remembered to charge it on a regular basis. Ninety-four per cent found it very or fairly easy to use and 53 per cent reported having no problems during the entire week. However the device used in this study was not without issues. When the device is attempting to acquire a satellite signal, the device plays a message informing the wearer. Unfortunately, this feature cannot be disabled. Although the volume on the device was turned down so that the message was not audible, the volume control could be accidentally adjusted and the message then heard by respondents. The device 'talking' was the most common problem reported (encountered by 18 per cent of respondents).

Sixty-nine per cent of respondents reported using the device every day of the travel week for all journeys made. On any particular travel week day between 85 and 93 per cent of respondents claimed to carry/wear their device for all journeys made. Towards the end of the week, there was a slight decline in the proportion who reported carrying it for all journeys, particularly on Day 7. This probably reflects respondent fatigue as the travel week progressed.

Introducing and explaining the device: interviewer feedback

Interviewers developed various approaches to introducing and explaining the GPS device depending upon who they were talking to. They often referred to satellite navigation and explained to respondents that the device worked in a similar way. Interviewers also referred to mobile phones to explain how the device was operated (switch on/off and charge).

Respondents did raise some concerns and objections. The main issues raised were the level of burden being placed on them, issues relating to privacy and whether they were being tracked, feeling vulnerable when carrying the device, unwillingness to wear the device at all times and the look of the device. The interviewers found the respondent leaflet helpful in overcoming some of the objections raised.

Interviewers reported that some respondents found wearing the selected device problematic. Many did not like wearing the device around their necks and found the clip provided did not enable them to easily attach it to bags or belts. Furthermore, some respondents found it embarrassing to have the device on show.

Processing the GPS data and matching data

The processing and matching of the GPS data makes use of information collected in the interview (such as workplace location) and the trip origin and destination information recorded in the diary, which is subsequently geocoded (i.e. assigned the appropriate latitude and longitude co-ordinates). Within the NTS diary, to limit respondent burden, data on origins and destinations are collected at the level of village or area of town/city and so were not accurate enough to be useful in the GPS trip processing and GPS/travel diary trip matching, making these tasks more challenging.

In addition to this, it became apparent in the data processing stage that some of the GPS devices used had lost their configuration settings due to a software issue. This resulted in GPS data being logged at a distance interval (a minimum of 100 metres between points

captured) rather than at the recommended four-second time interval, which further complicated the processing of some of the GPS data.

Diary trips compared with GPS trips

One possible use of GPS is to record the trips made by respondents without the need for a full travel diary. The overall trip rates and characteristics as captured in the diary were compared with those extracted from the GPS data in order to establish how similar or different results based on the GPS data alone would be compared to those based on diary data. This was undertaken for those 101 respondents who completed the travel diary, reported using the device and for whom some GPS data was received. Given that the NTS respondents are only requested to report short walks in their travel diary on Day 7, the analysis separates out short walks under one mile.

- Overall, excluding short walks that were ineligible to be recorded in the diary, the GPS devices recorded 147 more trips than were reported in the travel diary (eight per cent more).
- The GPS weekly trip rate, excluding all short walks of less than one mile, was higher than the comparable diary trip rate (19.03 and 17.59 respectively).
- The average trip distance (excluding short walks) was higher for diary trips compared with GPS trips (8.1 miles compared with 6.1 miles), as was the average trip duration (22 minutes compared with 15 minutes). This suggests that respondents may over-estimate the distance travelled when reporting trips in their travel diary, although it is possible that some of this difference is attributable to cold starts delaying the start of the GPS recording.
- Interestingly, the diary captures a higher number of walking trips that are more than one mile compared with the GPS. This suggests that respondents may well include ineligible short walks, rounding up the distance travelled to meet the threshold for reporting.
- Turning to short walks (i.e. less than one mile), the daily trip rate is slightly higher based on the diary data compared with the GPS data trip rate (0.40 trips compared with 0.36 trips). This may be due to very short trips being more difficult to detect in the GPS data or respondents forgetting the device for such journeys. Once again the average distance and duration of the trips recorded by the GPS device were lower than those for the short walks reported in the diary.

Completeness of GPS data

If the GPS devices functioned correctly, and were carried and used correctly by respondents, all trips that were recorded in the diary should be present within the GPS data, assuming that no false trips have been reported in the diary. To explore the completeness of the GPS data, the degree to which the diary trips were matched by GPS trips was examined.

- Overall 72 per cent of diary trips were matched by the GPS data (i.e. a similar trip in terms of a combination of start/end times, origin and destination was detected in the GPS data). However there was a sharp drop in the proportion of diary trips with matched GPS data on Day 7, suggesting that respondents tired of using the device towards the end of

the week. Although, this may also reflect a difficulty with recording short walks. On Day 7, 58 per cent of diary trips were matched, compared with 70-78 per cent on Days 1 to 6.

- Diary trips made by car were most likely to be matched by the GPS data, compared with those made by either foot or bus (with 76 per cent of diary trips made by car having a match compared with 31 per cent and 49 per cent of those by foot and bus respectively). These poorer levels of identification may reflect a potential unwillingness of respondents to have the device on show when out in public or difficulties associated with acquiring a satellite signal when on public transport. Longer distance diary trips were also more likely to have a match in the GPS data than short trips less than two miles.
- Looking at the completeness of the data at person level, all diary journeys were matched by GPS data for 20 per cent of respondents only. Seventy-five per cent or more trips were matched for a further 41 per cent of respondents. However, for 20 per cent of respondents less than half of their diary trips were matched by GPS data.

Accuracy of GPS/diary data

GPS data provides the possibility of collecting more accurate measures of trip distance and duration. Comparing all of the matched diary and GPS trips (i.e. those where a diary trip has been linked with a GPS trip on the basis of start/end times, origin and destination) allows the likely accuracy of the data collected to be assessed.

- Differences in the average distance and duration of trips were observed. GPS trips were shorter on average (5.9 miles compared with 6.8 miles, and 15 minutes compared with 18 minutes). This is most likely to be due to respondents rounding up the distance and duration of their trips in the diary, or poorly estimating them.
- The average absolute difference between the start times for matched GPS and diary trips was eight minutes, and nine minutes for end time. For around 50 per cent of matched trips, the GPS start time was within +/- 2 minutes of the diary start time. The same was true for the end times.
- Trips can consist of a number of stages. A new stage is defined when there is a change from one form of transport to another, or where there is a change in vehicle. Unsurprisingly the number of stages captured in the GPS data exceeded the number collected in the diary data for 25 per cent of matched trips. This reflects the GPS data including short walking stages that are excluded from the travel diary.

Trips unreported in the travel diary

One of the advantages of using GPS technology is that all trips can be recorded without increasing the reporting burden placed on the respondent. On NTS some trips are excluded from the diary, such as short walks on Days 1 to 6, which the GPS data should include. In addition, it is known that there is some degree of under-reporting of eligible trips in the diary, as a drop-off in the number of trips reported in the travel diary is observed as the reporting period progresses. The additional trips detected in the GPS data were examined to assess the likely scale of the issue and trips not reported.

- Overall, for the 95 respondents who had completed a travel diary, used a GPS device and where the GPS and diary data was sufficiently similar to be matched, 2,134 GPS trips were captured and 1,723 trips reported in the diary in total. Excluding the short walks which would not have been recorded in the diary and other excluded trips, a minimum of 234 additional trips were captured by the GPS data that had no match in the diary data (14 per cent more trips than recorded in the diary).
- On average the GPS data captured an additional 2.29 short walks per person over the course of the travel week and 2.46 trips that respondents failed to report in the travel diary.
- The additional trips were predominantly car trips (88 per cent) and short trips (49 per cent under two miles and 65 per cent lasting ten minutes or less).

Potential levels of under-reporting/recording of trips

It is known that respondents do not record all eligible trips in the seven day NTS travel diary. It is also evident that the data captured by respondents using the GPS device selected for this study also does not include all journeys made, for a potentially wide range of reasons.

- Examining the data collected by the 95 respondents with matchable data suggests that respondents fail to report at least 16 per cent of eligible trips in their travel diary and that the GPS data failed to capture 17 per cent of trips,
- However it should be remembered that carrying the GPS device may have influenced respondents' diary reporting behaviour, resulting in them taking more care to ensure that they include all eligible trips or, alternatively, relying upon the GPS device and being less interested in reporting all eligible trips in the diary.

Conclusions and recommendations

Generally it appears that members of the public are willing to use GPS devices, although some need additional support requiring interviewers to make multiple calls to the household. Many of the initial objections can often be overcome with the help of clear literature and explanation. The hardware selected for this study by the DfT and NatCen presented some device-specific challenges such as the device 'talking'. However, the ease with which the device can be worn/carried is a key consideration across all GPS devices. Despite the device used in this study being relatively lightweight, the need to wear it outside of clothing presented a number of difficulties.

It is evident that the GPS devices do indeed capture trips that respondents have neglected to report in the travel diary but it is equally evident that not all trips were captured in the GPS data when the devices were used in the context of the NTS, with a sizeable proportion of diary trips being unmatched by GPS data. Based upon this feasibility study, the GPS appeared most effective at capturing car trips but was less successful with journeys made on foot or by public transport. In addition shorter diary journeys were less likely to be captured by GPS. To what degree this is due to respondent error (i.e. not carrying the device or other misuse), device error or processing issues is unclear, although there is strong evidence to suggest that respondent fatigue set in towards the end of the travel week. Furthermore, a

relatively high number of devices developed faults, calling into question the reliability of the device used.

The design of the NTS caused a number of problems and complexities that may not have been encountered in other GPS studies. These included the longer (seven day) deployment period, allowing for multimodal trips and the NTS reporting rules. In addition to these issues, the processing of the GPS data and matching with diary trips was made more difficult by the level of origin and destination data collected on NTS as standard. The loss of the correct configuration settings on some of the devices also made these tasks more challenging. These factors may have diminished the usefulness of the GPS data collected in this study in terms of restricting the GPS trip identification and increasing the likelihood of missing very short trips in the GPS data.

This feasibility study has shown GPS technology to be very promising. However, there are a number of issues that need to be resolved before a NTS style large scale person-based study is undertaken. There are two main areas where further work is recommended:

- Regular reviews should be undertaken of the new GPS devices that become available and their suitability for a person-based study assessed. Potential devices should then be subject to prolonged testing involving both researchers and the general public to fully examine reliability and user-friendliness. Developments in the processing of GPS data should also be kept under review.
- A further study should be undertaken using a shorter travel diary alongside a GPS device, requiring data collection for only one or two days. Respondents would be asked to record all journeys regardless of how short plus full origin and destination data. The trial would be split into two waves in an attempt to disentangle the respective levels of respondent error and device error.

Depending upon the findings of such a study, further consideration could then be given to exploiting the opportunities that GPS technology presents. However, on the basis of the experience of this feasibility study and the hardware used, the ability of GPS technology to deliver the necessary data within the context of the seven-day NTS is unproven.

In some other countries, the decision to use GPS has already been taken. Following a pilot phase, a full scale study is currently being conducted in Cincinnati. This study will collect GPS-only data from 4,000 households in the region, with one third of the households participating in a web-based prompted recall interview based on the GPS data. A further study is planned in Jerusalem in 2010 involving 5,000 households and using face-to-face GPS-based prompted recall software planned for 2010. Another prompted recall study is planned to be conducted in New York City. The findings from these and other studies will help to inform future decisions about the use of GPS within the UK.

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1 Introduction

1.1 Background to the study

The National Travel Survey (NTS) is the Department for Transport's primary source of personal travel data. The survey collects information on travel behaviour including detailed information on trips made during a seven day period. This is achieved via face-to-face interviews and the completion of a travel diary.

Whilst the survey provides detailed trip information (such as purpose, time, duration, mode of transport, distance), consideration has been given to enhancing and improving the data collected. A review was carried out in 2006 to explore the possible use of 'new technologies' on the NTS, including GPS monitors.⁵ GPS provides accurate second-by-second data on the position, route, speed and time of journeys. The review found that GPS is increasingly being used to enhance travel surveys and may also be appropriate to use with the NTS. In particular, the use of personal portable GPS devices was recommended for the NTS, as these are able to monitor all journeys made by the individual, regardless of the mode of transport (as opposed to in-car systems which will only monitor trips by car).

A GPS enhanced NTS could potentially deliver:

- More accurate trip data (time, duration, distance) allowing diary data to be validated/adjusted and NTS trip estimates to be improved
- Precise origin-destination data for each trip which would enable us to look in more detail at particular types of travel (e.g. in the urban environment)
- Data on all walking trips (currently only measured on Day 7 of the diary)
- Data on the routes types and on speed of travel

1.2 Aims and objectives

The purpose of this study was to test the feasibility of using personal GPS monitors to collect travel data on an NTS based survey. The specific objectives are listed below:

- **To examine the practical issues of equipping individuals with personal GPS monitors and make recommendations**

A key objective of this study was to provide recommendations on the feasibility of using GPS monitors on a NTS style seven day personal travel survey, including how monitors could be most effectively incorporated, looking at issues such as take-up rates and overcoming any practical issues encountered.

- **To collect, clean and analyse GPS data from a sample of households**

The data recorded by a GPS monitor is very different to that collected via a written diary. This study aimed to investigate how best to clean, aggregate and analyse the data from GPS monitors, in a way that is compatible with the Department for Transport's information needs.

- **To link GPS data with the data collected from a travel diary**

The study aimed to link GPS and diary derived trip data to assess the differences between the two sources at aggregate and personal level and to identify potential inaccuracies and gaps in the data.

One of the key uses of NTS data is to examine trends in travel behaviour over time. Consequently, when assessing alternative data collection methods, one of the many considerations is the impact of a change in data collection on trend data. For this reason, the focus of this feasibility study was to examine how GPS would perform when used in a manner consistent with the current design of the NTS, focusing on how GPS data differs from data collected via the seven day NTS diary.

1.3 Overview of the study

The study consisted of three main phases: the preliminary phase, the data collection phase and the data processing and analysis phase.

The preliminary phase

The preliminary phase consisted of a number of elements which aimed to inform how best to approach the latter stages of this study and, indeed, whether progressing to the data collection phase was worthwhile. (The method and findings of this phase are the subject of separate report also available on the DfT website.)

The key elements of the preliminary phase were as follows:

- A telephone survey of recent NTS respondents to establish the likely acceptability of GPS monitoring
- A review of the portable GPS devices available on the market at that time
- Two rounds of small-scale pre-testing of the shortlisted devices and the final selection of the most appropriate
- Finalising the design of the study, including ethical review, and developing the survey materials and instruments

The review of devices was conducted by GeoStats, a firm that has experience of conducting GPS studies. A large number of devices were available on the market and they varied in their suitability for use on the National Travel Survey.⁶ GeoStats shortlisted three devices for consideration which met the requirements of the NTS – the Atmel BTT08, the GlobalSat DG-100 and the iBlue 747. Two rounds of pre-testing were undertaken by the research teams at NatCen and the DfT. Following some issues with the iBlue device, the final decision was between the GlobalSat and Atmel device, both of which had been successfully used in GPS studies in the US and Australia. Neither device met all the desired criteria. However, the Atmel device was deemed by NatCen and the DfT to be the easiest device for respondents to carry and was consequently selected for use in the data collection phase.

⁵ See P, Bonsall, J, Wolf, S, Holroyd (2006), Review of the potential role of new technologies in NTS, on the DfT's website

⁶ Devices varied in terms of unit size, battery life, data format, ease of download and ease of use.

Further details of the device pre-testing can be found in Appendix A, as well as in the preliminary phase report.

The GPS device

The Atmel BTT08 GPS Data Logger is a GPS data logging device (Figure 1.1) that has been deployed in several travel studies over the last few years, primarily in Australia. It is small (77x46x23mm), lightweight (68g) and can be worn on a lanyard around the neck or attached to a bag or belt with a clip. The device can log at various frequencies based on time or distance intervals, logging all GPS points or only those points for which the speed is greater than a user-specified speed threshold. It also has a vibration sensor allowing for the additional screening of non-movement events. The device can also generate audible messages related to GPS signal reception, and supports BlueTooth connectivity. The standard GPS data stream elements recorded by the Atmel BTT08 include date, time, latitude, longitude, speed, altitude, bearing, Horizontal Dilution of Precision (HDOP)⁷ and the number of satellites. It has a 512,000 GPS point storage capacity.

Figure 1.1 GPS device



For the purpose of this feasibility study, the logging frequency was set at four-second intervals with the speed screen set at one mile per hour and the vibration sensor enabled. The volume for the audible/voice feature was turned down as low as possible and the BlueTooth feature was disabled.

The data collection phase

Fieldwork was undertaken by NatCen and conducted in two waves between October 2008 and March 2009, with the aim of gathering usable GPS and diary data from around 100 adults (aged 16 or older). The fieldwork followed the established NTS procedures as far as possible, with data being collected via a face-to-face interview, a self-completion travel diary and use of a personal GPS monitor. Both the diary and the GPS monitor were completed/used over a seven day period. The interview and travel diary instruments were based upon those currently used on the NTS. This report outlines the approach adopted in more detail, assesses how successful this approach was, and makes recommendations for future studies.

⁷ Horizontal Dilution of Precision (HDOP) values provide an indicator of the loss of positional accuracy of the GPS data based upon the geometry of the satellites used.

The data processing and analysis phase

The processing of the interview and diary data followed the standard NTS procedures. The GPS data was processed by GeoStats who then undertook the matching of the GPS and diary data. This phase posed a number of challenges, not least taking into account the NTS reporting conventions, such as the exclusion of journeys made off the public highway and walks of less than one mile on Days 1-6 of the travel diary period. This report provides an overview of the processing of the GPS data and presents the findings of the data analysis.

1.4 Report structure

As noted above, this report focuses upon the final phases of the feasibility study from data collection through to the data processing and analysis. The report is structured as follows:

- Chapter 2 provides the details of the sample size and design, outlining the underlying assumptions
- Chapter 3 outlines the fieldwork procedures adopted in the data collection phase, focusing upon aspects relating specifically to the inclusion of the GPS element and other differences between the approach used on this study and the main NTS
- Chapter 4 examines the response rates achieved, making some comparisons with NTS, and examines the profile of respondents
- Chapter 5 presents the feedback gained from respondents with regards the ease of use of the GPS device and any problems encountered
- Chapter 6 sets out the feedback from the interviewers who worked on the study
- Chapter 7 provides an overview of the processing of the GPS data, covering the identification of trip, mode assignment and matching with the diary data
- Chapter 8 presents the analysis of the data, making comparisons between the diary and GPS data to examine the completeness and accuracy of both the diary and GPS data
- Chapter 9 finally highlights the lessons learnt during the course of the study and presents recommendations for the future use of GPS on the National Travel Survey

2 Sample

The feasibility study aimed to gather usable GPS information, alongside full diary and interview data, from around 100 adults.

On NTS all household members are eligible to participate, regardless of age. However, it was recognised that equipping children and young people with GPS devices raised a number of issues:

- The value (or lack of value) of equipping very young children with devices as they usually travel with other household members
- Whether GPS devices would be allowed to be taken into schools
- Whether carrying a GPS device would place children at greater risk (perceived or real) of being the target of theft
- How easy young people would find it to understand what was required of them.

In light of these issues, it was decided to limit the feasibility study to adults, defined as those aged 16 or older. This chapter provides the details of the sample size and design used in the feasibility study.

2.1 Sample size

In order to estimate the required sample size which would need to be issued to achieve successful data collection with 100 adults, a number of factors were considered.

Response rate

At the outset, it was difficult to estimate the likely response rate. On NTS 2007, 56 per cent of all sampled households returned at least some completed diaries (55 per cent returned all diaries) – that is 61 per cent of all non-deadwood addresses.⁸ However it was recognised that some factors, such as a shorter interview and a higher incentive, may have the impact of increasing willingness to participate. On the other hand, asking respondents to carry or wear a GPS unit as well as complete the diary increases respondent burden and may raise ‘big brother’ concerns, thus having a negative impact.

A similar study trialling GPS conducted in London in 2002 found that 40 per cent of selected households were willing to take part.⁹ There were a number of factors, both positive and negative, to suggest that the feasibility study response rate may differ to this:

- Response rates in London tend to be lower than elsewhere
- Improvements in the technology (smaller and lighter GPS data loggers)
- The rising popularity of GPS
- Increased suspicion about the use made of personal data

For the purposes of estimating the sample size required, a conservative achieved sample rate of 45 per cent was assumed. (This is equivalent to assuming a 10 per cent deadwood rate and a 50

⁸ Deadwood addresses are those sampled addresses that are found to be commercial, non-residential or unoccupied.

⁹ Steer Davies Gleave & GeoStats (2003), The Use of GPS to Improve Survey Data: Use of GPS in Travel Surveys, DTLR New Horizons Programme Study Report.

per cent response rate among eligible households. On NTS 2007, the deadwood rate was 10 per cent and the response rate 61 per cent.)

Data loss due to equipment failure and improper use

As with any technology there is a risk of equipment failure. The study conducted in London suggested that the likelihood of this was minimal but that the risk of missing data due to improper use or lack of use was more of an issue. The London study found that 18 per cent of data was lost/unusable due to improper use (based on days of data collection), although the study used a far larger and bulkier device than those available at the time of this feasibility study.

For the purposes of estimating the required sample size it was assumed that 20 per cent of respondents would have incomplete data due to equipment failure or improper use. This was assumed to be an upper limit, on the assumption that technology had developed and was likely to be more user-friendly. (In fact, 80 per cent of the 101 respondents with both diary and GPS data did not have complete GPS data, with some trips recorded in the diary missing from the GPS data. Section 8.3 provides more detail.)

On the basis of these assumptions, and the average number of eligible respondents per household being in the region of two, it was estimated that a sample of 162 addresses would be required (18 addresses per postcode sector).

2.2 Sample design

For the purpose of the feasibility study, nine postcode sectors were selected across three geographical areas.

The geographical areas – Lincoln, Stoke on Trent and Swindon – were selected by the DfT and NatCen to represent different sizes of town/city. They were selected to ensure that NatCen had existing trained NTS interviewers available to conduct the fieldwork, while avoiding areas already involved in DfT initiatives where a relatively high proportion of residents would have already been engaged in research and surveys regarding travel.

Within each area, three postcode sectors were purposefully selected to represent the urban centre, an outer urban area (around 5 miles from the urban centre) and a more rural area on the outskirts of the city (around 10 miles outside the urban centre). This was done to ensure that the GPS devices were tested in a range of settings and in the hope of capturing journeys using a range of different modes of transport. GPS devices are known to have more difficulty logging position in built-up areas, particularly where there are high buildings, and it seemed likely that their logging ability may also be influenced by mode.

Within these postcode sectors, 28 addresses were randomly selected from the Postcode Address File, having first removed any addresses that had been selected for the National Travel Survey within the previous two years (2007 and 2008). From these 28 addresses, 18 were selected at random and the remaining 10 kept as a reserve sample should this be necessary.

During the pre-testing, a number of issues regarding the use of devices had become apparent (see Appendix A for further details). In light of this it was decided that it would be prudent to split the fieldwork across three waves to allow for any necessary remedial action should further problems be encountered.

Consequently the nine postcode sectors were split such that each wave contained one postcode sector from each geographical area and one postcode sector from each urban/rural type. (In fact only the first two waves of fieldwork were undertaken as the response rate was higher than expected.)

In order to replicate the NTS survey procedure, for the purposes of comparability, interviewers were instructed to select up to three households at any one address.¹⁰ Within selected households, all household members aged 16 or older were eligible to participate.

¹⁰ At any one address there may be multiple households – for example, where one house has been split into flats. A household is defined as a group of people who share one main meal a day or share the living room/area.

3 Data collection

The data collection aimed to replicate the main NTS fieldwork processes as closely as possible, while making allowances for the GPS component, in order to allow for some comparison of response rates to be made. The National Travel Survey 2008 Technical Report¹¹ provides full details of the NTS fieldwork procedures. The preliminary phase report for the feasibility study provides a discussion of the approach adopted to introducing the GPS devices and gaining informed consent. This chapter therefore provides a brief overview of the data collection stage and highlights the aspects of the main NTS processes that were changed for the feasibility study.

3.1 Overview of the fieldwork process

As on the main NTS, interviewers were issued with addresses selected from the postcode address file, and attempted to make contact in person. At the start of the fieldwork period an advance letter, enclosing a book of first class stamps, was sent to each address to tell them about the study and inform them that an interviewer would be calling in the next few days. Once the interviewer had made contact, and where the household agreed, a face-to-face¹² placement interview was conducted with all eligible household members. At the end of the placement interview, the interviewer introduced a seven day travel diary and the GPS device. Interviewers were asked to give the respondents a leaflet which was designed to answer any questions they may have about the GPS element of the study. Respondents were asked to complete the diary and use the device for the following seven days (starting the following day) – this is known as the Travel Week. During this period they were also asked to record whether they had charged the device each day, used it for all journeys and any problems they had encountered.

Where an eligible household member was not interviewed in person but information collected by proxy, the interviewer left a consent form with the leaflet for the household member to sign to indicate that they understood what they were being asked to undertake, as they were not present to ask the interviewer questions at the time of the placement interview.

During the travel week, interviewers conducted a short mid-week call (either in person or by phone) to check whether the household was encountering any difficulties and to provide extra motivation. At the end of travel week, the interviewer then returned to collect the completed travel diaries and GPS devices, and to administer a short pick-up interview. At this point, and prior to returning them to the office for processing, the interviewers checked the travel diaries for any missing information which they then tried to obtain from the respondents. Individual respondents who had fully completed a travel diary and/or used the GPS device (to the best of the interviewers knowledge) were given a promissory note confirming that a high street voucher would be sent to thank them for their help.

The fieldwork was conducted in two waves: one in October/November 2008 and one in January/March 2009. In each wave interviewers were given five weeks in which to complete their assignment.

¹¹ Anderson et al (2009), National Travel Survey 2008 Technical Report, London: NatCen.

¹² The interview was conducted using CAPI – Computer Assisted Personal Interviewing.

3.2 Interviewer briefing

Trained NTS interviewers were used for the feasibility study as they were already familiar with the NTS procedures and accustomed to securing participation to complete the travel diaries.

All the interviewers attended a one day face-to-face briefing led by the NatCen research team. Prior to the briefing, interviewers were asked to read the participant instructions for the GPS device and to carry the device for a day. This enabled them to familiarise themselves with the device. It also gave them an appreciation of the issues that a respondent may encounter so that they could start to think about how they may support respondents during fieldwork.

The briefing covered:

- The background to the GPS feasibility study
- What GPS data is and what it can be used for
- Informed consent
- How to use and explain the GPS devices
- How to overcome objections
- The fieldwork process (particularly highlighting any changes to the standard NTS procedures)
- Providing support to respondents

Interviewers were also issued with comprehensive written instructions.

At the end of the fieldwork period, interviewers were asked to complete a feedback form detailing any difficulties they encountered. An interviewer debriefing was also held to explore the practical issues, such as how best to introduce and explain the GPS device, common respondent concerns and how to overcome them in the field. (See Chapter 6 for a summary of the feedback provided.)

3.3 Introducing the GPS monitors

Interviewers were instructed to explain how to complete the travel diary using the usual explanations adopted for NTS. When introducing the GPS monitors, interviewers were asked to talk through the GPS leaflet (Appendix B) and make clear that:

- The device is easy to use and they will be shown how to use it
- The data will be used to improve the accuracy of the information collected about people's travel behaviour
- The data collected is stored on the device itself (rather than transmitted back) and will only be used for research purposes and by the research team
- Using the device is voluntary
- That they will not be held liable in cases of loss or damage

Interviewers explained to respondents how to use the device; this included how to switch the device on/off and how to charge the device each night. Respondents were also given a set of instructions with pictures showing how to charge and use the device (Appendix C). The instructions provided a contact number for the NatCen operations team should they have any further questions or encounter any problems.

Respondents were encouraged not to carry the device in their bags or under clothing but instead to wear the device around their neck using the strap provided or to clip it to their belt, bag or rucksack. In addition, respondents were asked to complete a daily record sheet, in which they noted whether they had used the device for all journeys, whether they had charged the device and any problems they had encountered (Appendix D).

Where more than one household member was participating and multiple GPS devices left with the household, interviewers used coloured stickers and labels to differentiate whose was whose.

3.4 Returning and downloading the GPS data

Once the GPS devices were collected by the interviewer, they were returned to NatCen in pre-paid padded A5 envelopes. NatCen had successfully used this method of return on other studies which equipped respondents with devices without significant loss.

Upon receipt, the GPS data was downloaded and the memory cleared. The configuration settings of the device were then reset and the device recharged ready for reuse.

3.5 Other differences in the fieldwork process and data collection

Other than the changes that relate directly to the GPS devices, there were three key differences in the fieldwork processes/survey instruments adopted for the feasibility study compared with the main NTS fieldwork – the allocation of travel weeks, the incentives paid and the questionnaire.

Allocation of travel weeks

On NTS, the allocation of travel week start dates (i.e. the date on which respondents must start completing their travel diaries) is undertaken by the interviewer. Interviewers are provided with a list of random start dates that they must allocate in order. This is done to ensure an even spread of data collection across the fieldwork period but means in some cases travel diaries are placed well in advance of the start of the travel week (sometimes a matter of weeks in advance). In such cases, interviewers are instructed to make a reminder call just prior to the start date to remind the respondents to start completing their travel diaries.

For the feasibility study, there was a risk that if this same approach was adopted and GPS devices were left with respondents well in advance of being used, they may forget the instructions given by the interviewer. In addition operating in this manner would have resulted in devices sitting unused for a greater amount of the fieldwork period, necessitating a larger number of devices in order to complete the fieldwork in the given period. For these reasons, the decision was taken to have the travel week for each household starting on the day after the placement interview.

Incentives

On NTS, respondents are given a £5 high street voucher if the CAPI interview is completed and all household members provide a fully completed travel diary. For the purposes of the feasibility study, the incentive payment was increased in recognition of the higher respondent burden, particularly as respondents were expected to recharge the GPS device. Payment of the incentive was also made regardless of the participation of other household members.

A £10 high street voucher was offered for full participation, i.e. the respondent fully completed a travel diary and accepted and returned a GPS device. Making payment of the incentive conditional on the return of the GPS device also limited the risk of the non-return of the devices. Although not offered at the outset by interviewers at the placement interview, respondents received a £5 high street voucher for completing one component of the study i.e. returned a fully completed travel diary or accepted and returned a device. This was only mentioned by interviewers as a last resort where respondents were adamant that they would only complete the diary or carry the GPS.

Questionnaire

The data collection comprised of two main elements: a face-to-face interview which was administered by an interviewer and a seven day travel diary. The face-to-face interview was based

upon the main NTS CAPI questionnaire; however a number of questions that were deemed unnecessary for the feasibility study were removed. These were as follows:

- Length of time at address
- Accessibility of certain services
- Why children do not travel to school alone
- Awareness of special transport services
- Details of most recent walk of 20 minutes or more
- Where in a car children usually sit
- Type of car usually driven
- Age when obtained driving licence
- Likelihood of learning to drive
- Reasons for not driving
- Reasons for not working at home more often
- Use of technology when working at home
- Transport difficulties
- Details of accidents in the last 12 months

A small number of new questions were introduced for the GPS feasibility study to aid the processing of the GPS data and to gather feedback from the respondents. These are detailed below:

- Full address of school or college
- How easy they found using GPS monitor
- Whether they charged the device each day
- Whether they used device each day
- Whether they had any problems with the device each day

The full text of the questionnaire can be found in Appendix E.

The feasibility study used the standard NTS adult travel diary.¹³

¹³ A copy of the NTS travel diary can be found in the NTS technical report on the DfT website <http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/methodology/ntstechreports/>

4 Response rates

4.1 Household response

In total, 108 addresses were issued to interviewers over the course of the two waves of fieldwork. Seventeen per cent of these addresses were found to be ineligible for the study (i.e. they were not occupied and/or non-residential).¹⁴ Of the 90 eligible households identified at these addresses, 52 per cent were fully productive – that is every household member aged 16 or older completed the interview and diary, and accepted a GPS device¹⁵ (Table 4.1). This was slightly higher than the anticipated 50 per cent, upon which the sample size calculation was based. The GPS feasibility study did achieve a lower response rate than NTS, where 59 per cent of eligible addresses were fully productive in 2008. However this was expected considering the greater burden placed on respondents. A further 21 per cent of households in the feasibility study were partially productive (i.e. cases where some eligible household members either refused to take part or did not complete interview/travel diary and accept the GPS device), compared with only six per cent on NTS. This may be partially attributable to the differing incentive structure, with the payment of incentives being independent of the participation of other household members.

The eligibility and response rates differed between the waves. The proportion of issued cases found to be ineligible or with unknown eligibility was higher in Wave 1 compared with Wave 2. However the proportion of eligible households who fully participated was higher in Wave 1 (63 per cent compared with 43 per cent in Wave 2 which had noticeably higher rates of refusal and partial participation). This level of variation is unsurprising given the small number of addresses issued for each wave and the fact that interviewers may have encountered more or less resistance to participation in some of the selected postcode areas compared with others. Some individual interviewers may have also been more effective at overcoming objections than others – and with a small study, such as this, there was limited opportunity for interviewers to develop and refine their approach.

Table 4.1 Household outcome

Base: All issued sample and eligible households

	Wave 1			Wave 2			Total			NTS 2008		
	N	% of issued	% of eligible	N	% of issued	% of eligible	N	% of issued	% of eligible	N	% of issued	% of eligible
Fully productive	27	50	63	20	37	43	47	44	52	8094	53	59
Partial	8	15	19	11	20	23	19	18	21	873	6	6
Non contact	0	0	0	3	6	6	3	3	3	452	3	3
Refusal	3	6	7	10	19	21	13	12	14	3325	22	24
Other unproductive	1	2	2	3	6	6	4	4	4	562	4	4
Unknown eligibility– no contact	4	7	9	0	0	0	4	4	4	343	2	3
Unknown eligibility– contact	0	0	0	0	0	0	0	0	0	45	-	-
Ineligible	11	20	0	7	13	0	18	17	0	1440	10	0
<i>Bases</i>	54	54	43	54	54	47	108	108	90	15134	15134	13694

¹⁴ This is higher than the 10 per cent observed in the main NTS fieldwork but is likely to reflect the small number of addresses issued.

¹⁵ 'Accepted a GPS device' indicates that a GPS device was left by the interviewer for each household member and that, at that point, the household members had indicated a willingness to use the devices.

4.2 Individual response

Across the fully and partially productive households, there were a total of 134 eligible (adult) household members. Of these, 121 accepted a GPS device at the placement interview. However, there were a number of respondents (14) who accepted a device at the placement interview but then decided not to use it after further consideration. This resulted in 107 respondents who claimed to have used a GPS device during the travel week, all but one of whom also completed the travel diary.

Of the total 134 eligible household members, 79 per cent (106) fully participated in the study i.e. completed an interview (either in person or by proxy), completed a travel diary and claimed to have used a GPS device (Table 4.2).¹⁶ Thirteen per cent of eligible respondents only completed the interview and the diary, the majority of whom were in the second wave of fieldwork. Only one respondent chose to use the GPS device only, and not complete the travel diary.

Table 4.2 Individual outcome

Base: All adults, fully and partially productive households

Individual Outcome	Wave 1		Wave 2		Total	
	N	%	N	%	N	%
Interview, diary & used GPS	56	85	50	74	106	79
Interview & used GPS only	1	2	0	0	1	1
Interview & diary only	5	8	12	18	17	13
Interview only	4	6	5	7	9	7
Refused**	0	0	1	1	1	1
Base	66	100	68	100	134	100

**Eligible household member who refused to do any components (individual interview, diary and GPS)

Proxy vs face-to-face response rates

At times it was not always possible to interview all eligible household members in person and so proxy interviews were allowed for adults who were difficult to contact. Overall, 72 per cent of respondents were interviewed face-to-face and 28 per cent by proxy.

Table 4.3 shows take-up on the feasibility study by face-to-face and proxy respondents. Respondents whose interview data were collected by proxy were less likely to fully participate in the study than those interviewed face-to-face (70% compared to 83%). Proxy respondents were also more likely to do the interview and diary only compared with face-to-face respondents. This was to be expected to some degree as proxy respondents may not have had the opportunity to hear about the study directly from the interviewer or hear a full explanation of the task.

¹⁶ Although 106 respondents accepted the GPS device at the placement interview and claimed to have used it, GPS data was not available for all of these individuals. Chapter 7 provides more detail.

Table 4.3 Individual outcome by face-to-face or proxy interview*Base: All adults, fully and partial productive household*

Individual outcome	Type of interview						All %
	Face to face		Proxy		Not available		
	N	%	N	%	N	%	
Interview diary & used GPS	80	83	26	70	0	0	79
Interview & used GPS only	0	0	1	3	0	0	1
Interview & diary only	10	10	7	19	0	0	13
Interview only	6	6	3	8	0	0	7
Refused	0	0	0	0	1	100	1
<i>Bases</i>	96	100	37	100	1	100	100

Response rates by gender and age

Although the sample sizes are small, Tables 4.4 and 4.5 show the response rate by gender and age group. Women were more likely than men to fully complete all the elements of the study (84% compared with 74%) (Table 4.4). This may reflect the higher proportion of men who were not interviewed in person (59 per cent compared with 41 per cent of women).

Table 4.4 Individual outcome by gender*Base: All adults, fully and partially productive households*

Individual outcome	Gender		
	Men %	Women %	Total %
Interview diary & used GPS	74	84	79
Interview & used GPS only	2	0	1
Interview & diary only	14	12	13
Interview only	9	4	7
Refused	2	0	1
<i>Bases</i>	66	68	134
NTS 2008 (interview & diary)	90	92	91
<i>Bases</i>	8132	8893	17025

Full participation was lowest among the 16-34 year olds for the feasibility study, as it is for NTS generally (Table 4.5). This may reflect the fact that this age group were more likely to be interviewed by proxy than older age groups on both the feasibility study and NTS (46% and 40% respectively).

Table 4.5 Individual outcome by age*Base: GPS - All adults, fully and partial productive households. NTS - all adults who completed an interview*

Individual outcome	Age			Total %
	16-34 %	35-54 %	55+ %	
Interview, diary & used GPS	70	85	79	79
Interview & used GPS only	3	0	0	1
Interview & diary only	11	11	17	13
Interview only	14	4	5	7
Refused	3	0	0	1
<i>Bases</i>	37	55	42	134
NTS 2008 (Interview & diary)	87	90	94	91
<i>Bases</i>	4627	5963	6435	17025

Table 4.6 Face-to-face or proxy interview by age

Base: GPS - All adults, fully and partial productive households. NTS - all adults who completed an interview and travel diary

Type of interview	Age			Total %
	16-34 %	35-54 %	55+ %	
GPS				
Face-to-face	51	76	83	72
Proxy	46	24	17	28
Not available	3	0	0	1
<i>Bases</i>	37	55	42	134
NTS 2008				
Face-to-face	60	77	88	76
Proxy	40	23	12	23
Not available	1	0	0	0
<i>Bases</i>	4627	5963	6435	17025

4.3 Comparison of respondent characteristics between GPS and NTS

It is possible that the introduction of a GPS element to the NTS may deter certain types of respondents who would be willing to participate in the standard NTS and/or attract other types of respondents who may usually be more reticent. In this section we compare the profile of GPS respondents to NTS respondents. In addition to comparing the profile across all respondents, comparisons are also made with NTS respondents outside of London and NTS respondents in the regions where the GPS study was conducted (East Midlands, West Midlands, South West and South East excluding London).

Table 4.7 shows that there was almost no variation in the gender profile of respondents across the two surveys.

Table 4.7 Gender profile by survey

Base: GPS - all fully participating individuals, NTS - all individuals aged 16+ who completed an interview and travel diary

	GPS	NTS	NTS (exc London)	NTS (selected regions)
	%	%	%	%
Men	46	47	47	48
Women	54	53	53	52
<i>Bases</i>	106	15424	13614	5968

Looking at the age profile, the feasibility study had a lower representation of the 55+ age group (Table 4.8). This is in line with reports from the interviewers, and findings from earlier exploratory work, that older people were more reticent about using the GPS devices, perhaps due to a lack of confidence with technology more generally.

Table 4.8 Age profile by survey

Base: GPS – all fully participating individuals, NTS - all individuals aged 16+ who completed an interview and travel diary

	GPS	NTS	NTS (exc London)	NTS (selected regions)
	%	%	%	%
16-24	11	12	12	12
25-34	13	14	13	12
35-44	18	18	18	19
45-54	26	17	17	17
55-64	14	17	17	18
65+	17	22	23	23
<i>Bases</i>	106	15424	13614	5968

There was little difference in the profile of respondents across socio-economic grouping (Table 4.9).

Table 4.9 Socio economic profile by survey

Base: GPS – all fully participating individuals, NTS - all individuals aged 16+ who completed an interview and travel diary

	GPS	NTS	NTS (exc London)	NTS (selected regions)
	%	%	%	%
Managerial and professional occupations	33	33	32	35
Intermediate occupations	15	12	12	13
Small employers and own account workers	8	8	8	8
Lower supervisory and technical occupations	5	9	9	9
Semi routine and routine occupations	28	28	28	26
Never worked and long term unemployed	3	4	4	3
Students/unclassified	8	7	6	6
<i>Bases</i>	106	15424	13614	5968

There are also some limited differences between the GPS and NTS respondents in terms of their frequency of use of different modes of transport (Table 4.10). A greater proportion of respondents in the GPS feasibility study never travelled on buses compared with all NTS respondents (52% compared to 43%); however, once London respondents are excluded, the bus travel behaviours of the GPS and NTS respondents are more similar. The GPS and NTS respondents do differ in their frequency of walking, even when London respondents are excluded or analysis is limited to the relevant regions. Fewer GPS respondents walked for 20 minutes or more three or more times a week (27% compared to 36%).

Table 4.10 Frequency of travel by survey

Base: GPS – all fully participating individuals, NTS – all individuals aged 16+ who completed an interview and travel diary

	GPS	NTS	NTS (exc London)	NTS (selected regions)
	%	%	%	%
BUS				
3 or more times a week	13	17	14	11
Once or twice a week	8	11	10	9
Less than that but more than twice a month	2	4	4	4
Once or twice a month	7	8	8	8
Less than that but more than twice a year	8	8	8	8
Once or twice a year	10	9	10	11
Less than that or never	52	43	47	49
Bicycle				
3 or more times a week	6	5	5	5
Once or twice a week	7	4	4	5
Less than that but more than twice a month	2	2	2	2
Once or twice a month	6	4	4	5
Less than that but more than twice a year	6	4	4	4
Once or twice a year	1	5	5	5
Less than that or never	74	76	76	73
Walk				
3 or more times a week	27	36	36	37
Once or twice a week	27	22	22	23
Less than that but more than twice a month	4	5	5	4
Once or twice a month	11	7	7	7
Less than that but more than twice a year	3	3	3	3
Once or twice a year	0	2	2	2
Less than that or never	29	25	25	23
<i>Bases</i>	106	15424	13614	5968

4.4 Acceptance, usage and return of the GPS devices/data

As previously mentioned, 121 respondents accepted a GPS device from the interviewer at the placement interview. Of these, 14 reported that they had not used the device when the interviewer returned to conduct the pick-up interview. However, for three of these cases it was evident, when the GPS device was inspected, that the respondent had in fact used the device for a certain amount of time and that some data had been collected.

Of the 107 respondents who reported using the device, no GPS data was received for six. In two cases, no GPS data was collected on the device and the device was assumed to be faulty. In the other four cases (three of whom completed the travel diary one of whom did not), the device was lost either by the respondent or in transit.

Table 4.11 summarises the number for whom GPS data was collected and returned.

Table 4.11 GPS data collection and availability

	Completed diary	Did not complete diary	Total
Accepted a GPS device at placement interview	113	8	121
Reported using a GPS device at pick-up interview	106	1	107
Reported using a GPS device but no GPS data due to faulty device	2	0	2
Reported using a GPS device but no GPS data due to loss of device	3	1	4
Reported using a GPS device and data received	101	0	101
Reported not using a GPS device but some data recorded	1	2	3
Total with GPS data	102	2	104

4.5 Bases for analysis

The following chapters present various analyses of the interview, diary and GPS data. In each chapter, an appropriate base is adopted. The bases used are as follows:

Chapter 5: Ease of use: respondents' experiences

- All respondents who claimed to have used a GPS device at the pick-up interview, which includes 106 respondents who fully participated plus one respondent who only completed the interview and used the GPS (107)

Chapter 7: Processing GPS data

- All respondents for whom any GPS data was returned (104)

Chapter 8: Analysis and observations

- All respondents who completed a diary, reported using a GPS device and for whom data was received (101), unless otherwise stated

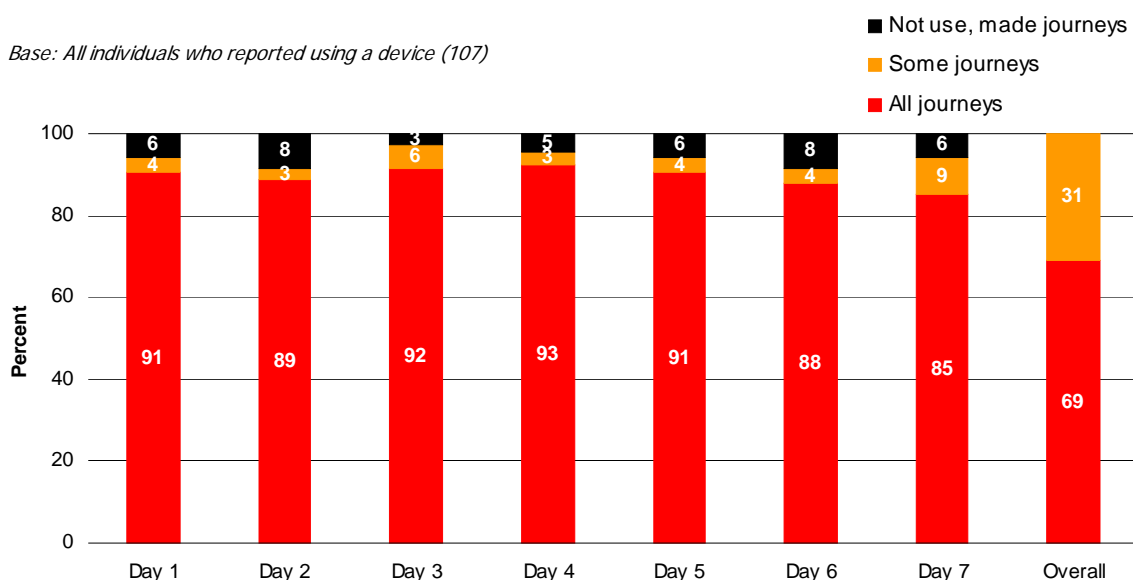
5 Ease of use: respondents' experiences

In addition to recording whether they used the device for all journeys and any issues encountered during the travel week, respondents were also asked at the pick-up interview to rate how easy or difficult they found the device to use. This chapter focuses on how respondents viewed the device and its ease of use.¹⁷

5.1 Daily use of GPS device

Respondents were advised to carry the GPS device whenever they made a journey, by any form of transport, during the travel week. Overall, 69 per cent of respondents reported using the device every day of the travel week for all their journeys. Looking at each day of the travel week separately, a high proportion of respondents reported using the device for all journeys made, ranging from 85 to 93 per cent (Figure 5.1). Towards the end of the travel week, there was a slight decline in the proportion who reported carrying it for all journeys, particularly on Day 7. This probably reflects respondent fatigue as the travel week progressed, which is also observed in the travel diary completion on the NTS.

Figure 5.1 Daily use of GPS device



5.2 Ease of use

A very high proportion of respondents (94 per cent) that used a GPS device said they found it very or fairly easy to use (Table 5.2). Only three per cent found it very difficult to use.

¹⁷ The analysis in this chapter is based upon all respondents who reported having used the GPS device at the pick-up interview (106 respondents who fully participated plus one respondent who only completed the interview and used a GPS device).

Table 5.1 How easy or difficult found GPS device to use

Base: All individuals who reported using a device

	N	%
Very easy	58	54
Fairly easy	43	40
Fairly difficult	2	2
Very difficult	3	3
Not answered	1	1
Base	107	100

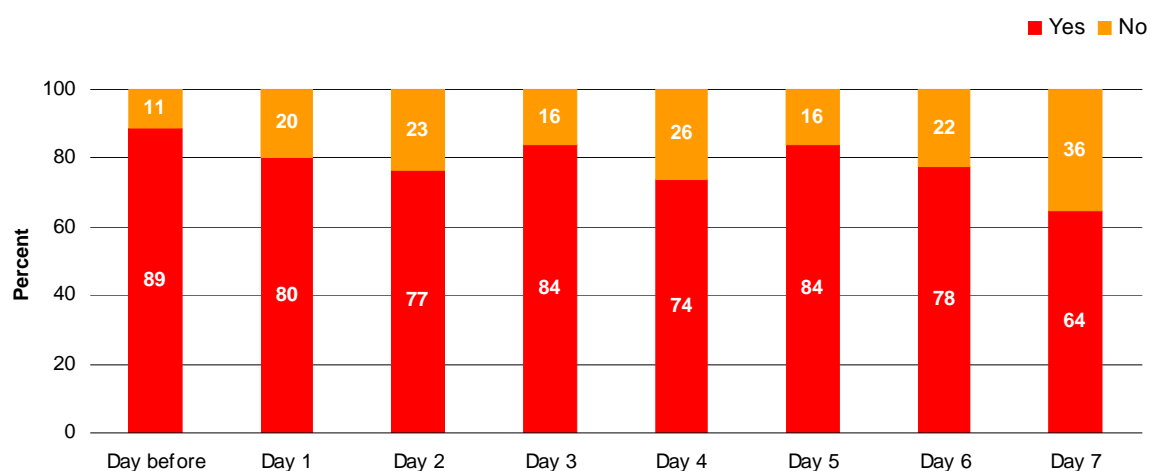
5.3 Charging the GPS devices

Once the GPS devices were fully charged, they could hold their charge for up to 72 hours when the vibration sensor was activated. Nevertheless, it was important to get respondents into the routine of charging the devices, particularly as there was no battery indicator on the device itself. Respondents were therefore advised to charge the device each night ready for the following day.

In total, the proportion of respondents who charged their device dropped from 89 per cent (before the start of the travel week) to 64 per cent on Day 7 (Figure 5.2). The drop-off on Day 7 can be attributed to the fact that the devices were not going to be used the following day.

Figure 5.2 Whether charged device each day

Base: All individuals who reported using a device (107)



In total, 48 per cent of respondents charged the device before each day of the travel week and 52 per cent charged it on some days of the travel week (Table 5.2). No respondents completely forgot to charge the device.

Table 5.2 Whether charged device during the travel week

Base: All individuals who reported using a device

	N	%
Charged device everyday	51	48
Charged device some days	56	52
Total	107	100

5.4 Problems with GPS device

Having an understanding of the main problems encountered by respondents using the device is useful knowledge for any further trials with GPS technology. The pre-testing undertaken by the research teams had already revealed a number of issues, such as the unexpected tendency of the device to ‘talk’ when searching for a signal¹⁸, which interviewer and participant instructions aimed to tackle so that respondents knew what to do when such things occurred (if the issues could not be entirely prevented).

The majority of respondents reported having no problems with the device each day of the travel week (Table 5.3). Furthermore, just over half of respondents (53 per cent) reported having no problems with the device over the course of the full travel week (Table 5.4). The most common problem encountered was the device talking (18 per cent) followed by forgetting to carry the device (12 per cent) and the inconvenience of carrying the device (11 per cent).

Table 5.3 Problems with GPS device by day

Base: All individuals who reported using a device

	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
No problems	78	73	80	75	83	78	79	74	81	76	77	72	81	76
Monitor talking	8	7	11	10	10	9	12	11	10	9	11	10	7	7
Forgot to carry	4	4	5	5	1	1	2	2	3	3	4	4	7	7
Inconvenient to carry	9	8	8	7	8	7	8	7	8	8	9	8	8	7
Battery ran out	2	2	2	2	3	3	4	4	0	0	0	0	0	0
Problem charging	1	1	2	2	1	1	1	1	2	2	2	2	0	0
Other problem	11	10	2	2	4	4	3	3	4	4	5	5	6	6
Base	107		107		107		107		107		107		107	

Table 5.4 Problems with GPS device across the whole travel week

Base: All individuals who reported using a device

	N	%
No problems	57	53
Monitor talking	19	18
Forgot to carry	13	12
Inconvenient to carry	12	11
Battery ran out	11	10
Problem charging	3	3
Other problem	16	15
Base	107	

5.5 Summary

Overall it seems that most respondents found the device relatively easy to use and remembered to charge it on a regular basis. However the device was not without issues. The device ‘talking’ was the most common problem encountered but this could be overcome by using a different device without a ‘voice’ or at least one that can be completely turned off. The inconvenience of carrying

¹⁸ When the device is attempting to acquire a satellite signal, a message is played informing the wearer. Unfortunately, this feature cannot be disabled. The volume on the device was turned down so that this message was not audible, however the volume control could be accidentally adjusted resulting in the message being heard by respondents.

the device, and remembering to carry it, may also be issues that are more easily overcome as the technology improves such that devices are smaller, can be more easily carried, and can be worn inside clothing or carried inside a bag with minimal disruption to its signal.

6 Interviewer feedback

Interviewers were asked to attend a debriefing session after the fieldwork was completed to provide feedback on which aspects of the study worked well, the issues raised by respondents and suggestions for future surveys involving GPS devices. This chapter summarises their insights.

6.1 Introducing and explaining the device

Generally interviewers did not mention the travel diary or the GPS element of the study at the first point of contact on the doorstep. However, on occasions, depending on who they were talking to, they did mention that the study was trialling new GPS technology and they were part of a small select group chosen to take part. In some cases, they felt that this raised the respondent's interest and helped persuade the household to participate.

At the end of the placement interview, when interviewers usually introduced the GPS device, they would refer to satellite navigation and explained that the device worked in a similar way. Interviewers also referred to mobile phones to explain how the device was operated (switch on/off and charge). When explaining how to use the device to respondents, interviewers would physically show them the device and how to turn it off/on, how to turn down the volume, how to charge it and how to wear it. The interviewers thought it was also very important to leave the instructions with the respondent.

Inevitably, respondents did raise some concerns and objections:

- *Respondent burden:* Many respondents felt they were already doing a lot by completing the travel diary, without having to carry a device and then complete a daily record sheet. Interviewers used the incentive to try to overcome this and explained that it was a feasibility study so we would be learning from what people thought this time to ensure that future studies did not overburden people. Interviewers suggested that, in any future studies, the travel diary should be more concise and incorporate the daily record sheet rather than having two separate documents.
- *Privacy:* A few people initially raised the issue of privacy i.e. would the device be tracking them? Interviewers explained that they were not being tracked but that the data would be used to understand their travel patterns. Interviewers would use the GPS leaflet to explain this and that the data was being recorded on the device rather than being transmitted back to somewhere in real time. On a few occasions, interviewers were not able to overcome respondents' doubts.
- *Vulnerability:* Some respondents suggested that they would feel very vulnerable walking around with the device on show (especially if there were lights flashing). They felt they could be mugged. Interviewers suggested wearing it under clothing if respondents felt particularly vulnerable rather than not use it at all.
- *Unwillingness to wear at all times:* Some respondents were not keen to wear the device at certain times (such as while at work). Interviewers pointed out that they could just wear it for the journey to work and then leave it in the car (or put it away in their bag/pocket) until they made their next trip.
- *Look of device:* Some of the younger respondents were put off by the look of the device and were aware that their friends at school would draw attention to it.

At times, it was not possible to interview all eligible household members in person and so proxy interviews were conducted for adults who were difficult to contact. These household members were still eligible to complete a travel diary and carry a GPS device; however they did not have the opportunity to hear the interviewer explain what they had to do or answer any of their questions. In such situations many interviewers explained that they would leave the necessary materials for such respondents and then call them to explain the GPS component and answer any queries. The interviewers felt that this was a good way of trying to ensure they took part.

Interviewers also felt that the mid-week check was very important in getting respondents to continue to participate and use the device/complete the travel diary. It was noted that elderly respondents often needed more support and assistance than younger respondents, as they were unsure about the technology or unable to operate it themselves. In some cases, interviewers would call round more often to help these particular respondents. Some allowance would need to be made for this in any future studies.

6.2 Feedback from using the GPS devices

Interviewers were asked about the general feedback they received from respondents once they had used the device. The main issues they highlighted were as follows:

- *The monitor speaking*: This was thought to be the biggest problem with the device. Two respondents stopped using it after it went off on a bus and in a shop.
- *Wearing the device*: This was problematic. Many respondents did not like wearing it around their necks, which was not made any easier by the long neck strap provided with the device. Respondents would have preferred to strap/clip it to their bags or their belts. Some respondents found it embarrassing having the device on show (at school, in pub, shops, public transport).
- *Charging*: Some respondents, particularly the elderly, thought that because they had only used it outside for half an hour, they did not need to charge it (even though it had been turned on all day). Furthermore, they did not want to keep it charging overnight, as they tend to turn everything off. Interviewers thought that it would be useful if there was a battery indicator on the device, so that respondents actually knew when it needed charging.
- *Pressing buttons*: Some respondents, particularly the frail, had difficulty pressing down the buttons on the device and could only operate the device with assistance.

Many of these issues are device-specific and not common to all GPS devices.

7 Processing GPS data

The processing of the GPS data was undertaken by GeoStats, alongside the matching of the diary and GPS trips. This chapter sets out how the data was processed: starting with the raw data, then moving on to cover the process by which GPS trips were identified, the assignment of modes to GPS trips, and the matching of the diary and GPS trips.

7.1 The raw GPS Data

The processing of the data was undertaken using GeoStats' Trip Identification and Analysis System (TIAS), with the diary data¹⁹ and the raw GPS data being imported into a project database.

As the GPS data were imported, the UTC (Universal Time Coordinate) date and time stamps in the GPS point data were translated to local date and time. The offset used for this study was 0 hours given that all timestamps collected were in Western European Time (UTC+0) and outside of the range for Summer Time (DST). The speed filter settings on the Atmel BTT08 GPS Data Loggers were set to screen out all points with speed less than one mile per hour. This screening filter, along with the vibration sensor which also filtered out non-movement points, proved to filter out much of the typical GPS noise experienced in wearable GPS logger datasets.

In spite of this speed screen, of the 364,428 raw GPS points collected in Wave One, GeoStats received 69 points with 0 speed (55 were in the same file). In Wave Two, 36,022 zero speed points were logged out of 269,342 raw GPS points collected; all but 11 of these were captured in the same file. For the two files that had the vast majority of zero speed points, it is likely that the speed filter was not set properly. All zero speed points contained in the raw GPS files were blocked during the import process.

During the course of the data processing, it became apparent that some of the GPS devices had lost their configuration settings due to a problem in the configuration software. This resulted in GPS data being logged at a distance interval (a minimum of 100 metres between points captured) rather than at the recommended four-second time interval for seven Wave One participants and 25 Wave Two participants.²⁰ Appendix F provides further details regarding this.

7.2 Identifying GPS trips

After all data were imported into the project database, the GPS points were processed in GeoStats' GIS-based software (TIAS, or Trip Identification and Analysis System). Initially TIAS automatically identified and tagged potential trip ends in the GPS data streams based on time intervals between consecutively logged points. For this study, all initial dwell times of 120 seconds or more were flagged as potential trip ends. (Appendix G presents the findings from some dwell time sensitivity analysis exploring the impact of alternate settings on initial trip counts.)

¹⁹ Most of the fields needed were present in the diary journey files; however, a few minor changes were required to handle missing trip start time, trip end time, and destination name (which are needed for the GPS to Travel Diary trip matching step.) Essentially, if the arrival time was missing but a departure time was provided, then the arrival time was set to one minute after the departure time. If the departure time was missing but the previous trip's arrival time was provided, then the departure time was set to one minute after the arrival time. These steps were repeated until all times were set. Since the journey destination's name was not provided, GeoStats populated this field with the journey purpose.

²⁰ Atmel distance logging is based on the straight line distance from the last logged point.

TIAS also automatically blocked certain types of phantom trips (trips that have typical ‘noise’ characteristics):

1. Trips with a combination of high HDOP values²¹, unreasonable speed values based on adjacent point speeds, and numerous ‘backtracks’ (i.e. point traces that go back and forth across the same line multiple times within a relatively short distance)
2. Trips with extremely low values of speed and distance with little or no movement from last location (i.e. data wandering)

Data analysts then reviewed, edited, and/or confirmed trip end locations using an interactive mapping interface that shows GIS information (i.e. street and public transport layers, points of interest, etc.) while simultaneously displaying trip level summaries and speed/time profiles for each trip. Analysts used this interface to screen out traffic delays and other falsely identified stops with dwell times of 120 seconds or more, and to add stops that had dwell times of less than 120 seconds but had clear stop characteristics. Also, if the analyst identified any phantom trips that were not blocked automatically by the phantom trip detection algorithms, then these trips were manually blocked.

In most GPS-enhanced travel surveys, GeoStats uses geocoded addresses collected during the initial contact with the respondent (i.e. habitual destinations such work and school locations) and from the pick-up visit (i.e. each reported destination made by each household member) to assist in the trip end identification and/or confirmation process. In this study, the geocoding of home addresses was provided with the sample file and were based on the central point of the full postcode. (In each full postcode there are around 20 delivery points or addresses on average.) Geocoding of work and school locations collected during the initial visit was also performed at the postcode centroid level for those households who provided sufficient information. In the diary, origin and destination data are recorded at the level of village or area of town/city, and geocoded using the NTS Gazetteer – therefore providing less accurate location information. The DfT reported that the largest distance between a home postcode and associated Gazetteer point is 1.5 miles. Details of the Gazetteer geocoding as provided by the DfT are given in Appendix H.

Generally speaking, the initial home location, as well as work and school locations where provided, were reasonably close to associated GPS trip ends and were helpful during GPS trip processing and GPS / travel diary trip matching. The reported trip origins and destinations, which were geocoded using the Gazetteer, were not nearly as close to the GPS trip end locations and did not prove to be as useful.

7.3 Assigning Modes and Stages

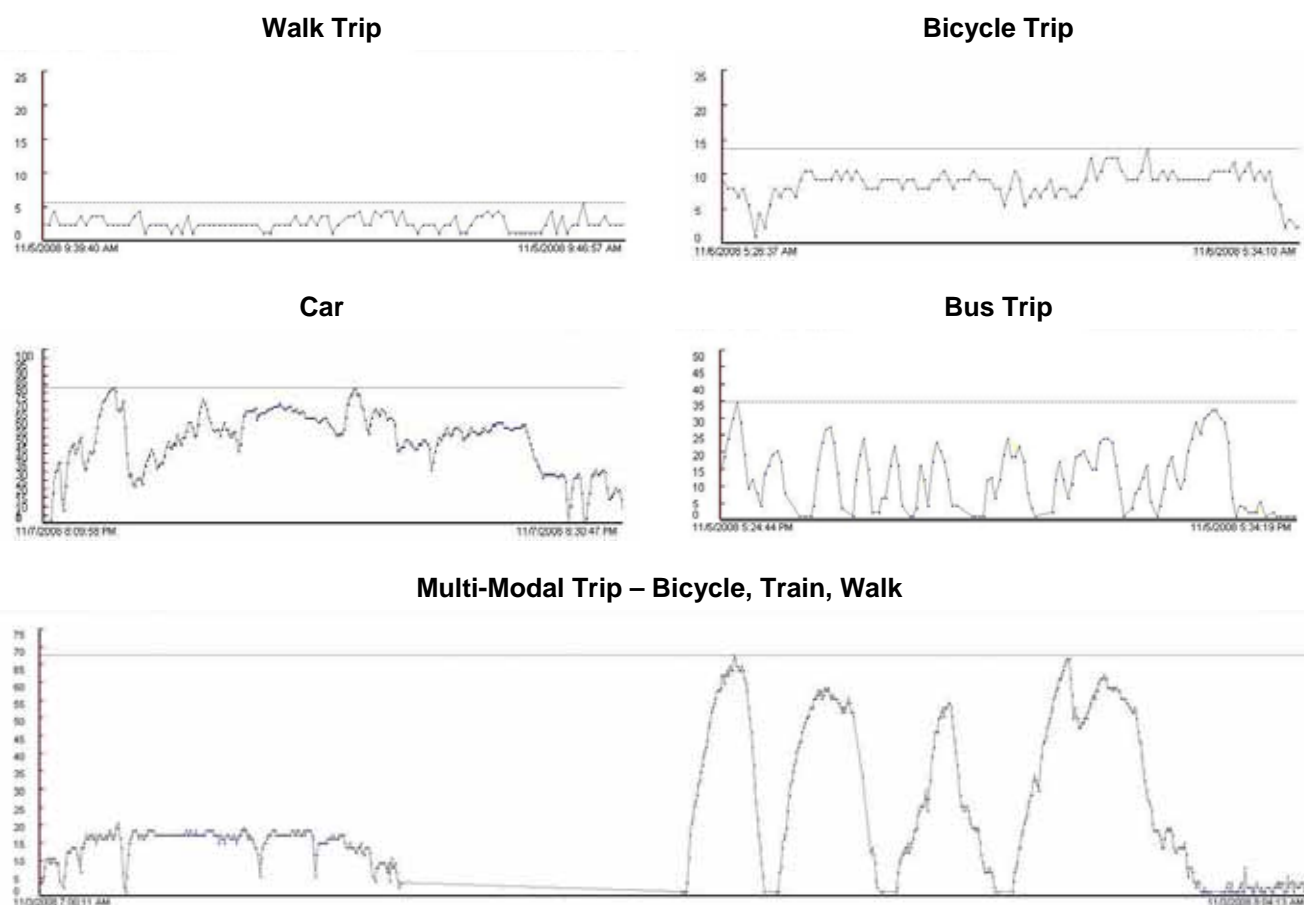
Although GeoStats had previously been involved in several previous person-based pilot studies for household travel surveys (i.e., London 2003, Portland 2004, Chicago 2007), TIAS had limited functionality for handling mode assignment and trip stage identification. Trips can consist of a number of stages. A new stage is defined when there is a change from one form of transport to another, or where there is a change in vehicle.

²¹ Horizontal Dilution of Precision (HDOP) values provide an indicator of the loss of positional accuracy of the GPS data based upon the geometry of the satellites used.

After the pre-test for the NTS Feasibility Study, it was decided that automated techniques for identifying multi-modal trips and for determining modes would be required. GeoStats designed and implemented algorithms to automatically identify stages and corresponding modes within the GPS trips, based on the speed characteristics and profiles of different travel modes. A detailed description of the mode assignment logic can be found in Appendix I.

After the automatic mode assignment, analysts reviewed the modes assigned at trip and stage-level alongside GIS layers and speed profiles, making adjustments as necessary. These included combining multi-modal trips that had been split into separate trips due to lengthy dwell times or to signal loss (such as for underground trains). Additional adjustments to the mode assignments were made later during the matching process based on the information in the diary data for atypical modes (e.g., trips made by taxi and personal hire buses). Figure 7.1 shows examples of speed/time graphs for a walk, bicycle, car, and bus trips (single travel mode) and for a multi-modal trip that consisted of bike, train, and walk stage.

Figure 7.1 Example Speed / Time Graphs for Various Travel Modes



7.4 NTS travel diary: excluded trips

The reporting rules for the NTS travel diary mean that not all trips collected by GPS would be reported in the diary. To facilitate the subsequent matching of GPS and diary trips, such trips were identified at the GPS processing or GPS/travel diary trip matching stage. The trips excluded from the NTS diary as outlined below:

- **Trips outside of Great Britain:** trips (or stages of trips) made outside of Great Britain and its inshore islands (Isle of Wight and the Scottish Islands)
- **Short walks:** walks of less than one mile (Days 1-6) or less than 50 yards (Day 7) made as trips in their own right or as stages of trips
- **Trips off-road:** trips (or stages of trips) made off the public highway (e.g. travelling across fields, along dirt tracks, private roads)
- **Trips made in the course of work for selected professions:**
 - people who are paid to walk/cycle (e.g. policemen on the beat)
 - people who delivering or collecting goods
 - people who are the crew of specialist vehicles (e.g. bus drivers, firemen)
- **Recreational trips by air/water:** trips made by air/water if they are not competitive to public transport (i.e. if made for the pleasure of going out in a boat or plane rather than to get somewhere)

There are also two further reporting rules that required modifications to the processing. These rules are:

- **Series of calls.** Travel involving a number of stops for the same main purpose and using the same form of transport are treated as one continuous journey from the first such call to the last one. **Only shopping and travel in the course of work can be treated in this way.** For example, if a respondent went shopping and called into a number of different shops, the trips reported in the travel diary would comprise one trip from home to the first shop, a second trip from the first shop to the last shop, and a third trip from the last shop to home.

Journey 1: A (home) → B (first shop)

Journey 2: B (first shop) → C (last shop)

Journey 3: C (last shop) → A (home)

The series of calls would be broken if the respondent stopped for a longer period at one call (this is not specifically defined). For example if the respondent decided to stop in a shop to have lunch.

- **Round trips.** When a respondent has undertaken a round trip, this will be reported as two trips of equal distance – one outward and one inward. For example, if someone took the dog for a walk, the trip sequence would be:

Journey 1: A (home) → B (mid point)

Journey 2: B (mid point) → C (home)

Table 7.1 summarises these reporting exceptions, along with the associated procedures implemented during GPS data processing. Detailed explanations of the procedures implemented to handle these exceptions can be found in the following table.

Table 7.1 Processing Procedures and Reporting Exceptions

Exception Type	Analyst Procedure	Processing Stage
Trips outside of GB	GPS trip flagged as Internal – External, External – Internal, or External – External	GPS Trip Processing and independent GIS procedures
Short walks	GPS walk trips flagged as short walk	GPS Trip Processing and independent algorithm
Trips off-road	GPS trip flagged as off-road	GPS Trip Processing
Excluded work-related trips	GPS trip flagged as work-related	GPS Trip Processing
Air/water recreation	GPS trip flagged as air/water recreation	GPS Trip Processing
Series of calls	None other than work-related at GPS Processing Stage	GPS / Travel Diary matching
Round trips	GPS trip flagged as round trip	GPS Trip Processing

Trips outside of GB: If the analyst observed a GPS trip either crossing the study boundary or occurring entirely outside of the study boundary, these GPS trips were flagged as internal – external, external – internal, or external – external. The default was internal – internal. There were no out-of-area trips identified by the analyst in the data; this was confirmed by independent GIS spatial analysis.

Short Walks: Analysts were instructed to flag all trips that appeared to meet the study definition of a short walk. There were 171 Wave One trips flagged by analysts as short walk only, 36 of which took place off-road. In Wave Two there were 47 short walk trips, two of which took place off road. It is likely that the decrease in the number of short walk trips detected in Wave Two is attributable to the unintended use of the default distance based logging frequency, which was more prevalent in Wave Two.

Software was written to independently flag any GPS trip that either wholly met the short walk trip criteria or that contained a stage that met these criteria); 655 GPS trips were flagged by this process. Of the 218 short walk trips identified by the analyst in Waves One and Two, all but five were also found by the automated process. The additional trips flagged via this the automated short walk identification process were multimodal trips in which the primary mode was not walk but a short walk stage was captured as part of the trip.

Trips off-road: Analysts were instructed to flag trips when the entire trip clearly occurred off-road and only if the trip did not exhibit the speed signature of a train trip that was likely to have occurred off network. If a multi-stage trip included one or more stages that were on-road, then the trip was not flagged as off-road. (Many mode stages did occur off-road even though other portions of the trip were on-network. In most cases these were walk stages which occurred near the start or end locations of a trip.) Forty-five off-road trips were found in Wave One, 36 of which were also short walk trips; and three trips in Wave Two, of which two were short walk trips.

Work-related trips: Analysts were instructed to look for sequences of trips that occurred during typical workday hours that could possibly be work-related. In Wave One there were a total of 71 trips flagged as potentially work-related, captured by four participants. In Wave Two there were 52 trips flagged as work-related, all made by the same participant.

Air/water recreation: Analysts were instructed to flag any trips observed by air (based on speed) or over water (based on map interface) that were not competitive to public transport. No such trips were observed.

Series of calls: During the GPS trip processing stage, potential work-related trips were the only sequence of trips flagged. Seventy-one trips were flagged as potentially work-related in Wave One and 52 were flagged in Wave Two. Only one participant was indicated in the diary data as having made a series of calls. This participant reported a 'series of calls' (coded in diary "in the course of work") on two travel days, but made the same kinds of trips on other days which were not reported.

Round trips: Analysts were instructed to flag any trip with the same origin and destination and during which there is no stop along the way as a round trip. Nine trips were flagged as round trips in Wave One and 35 in Wave Two.

7.5 GPS/Travel Diary Trip Matching

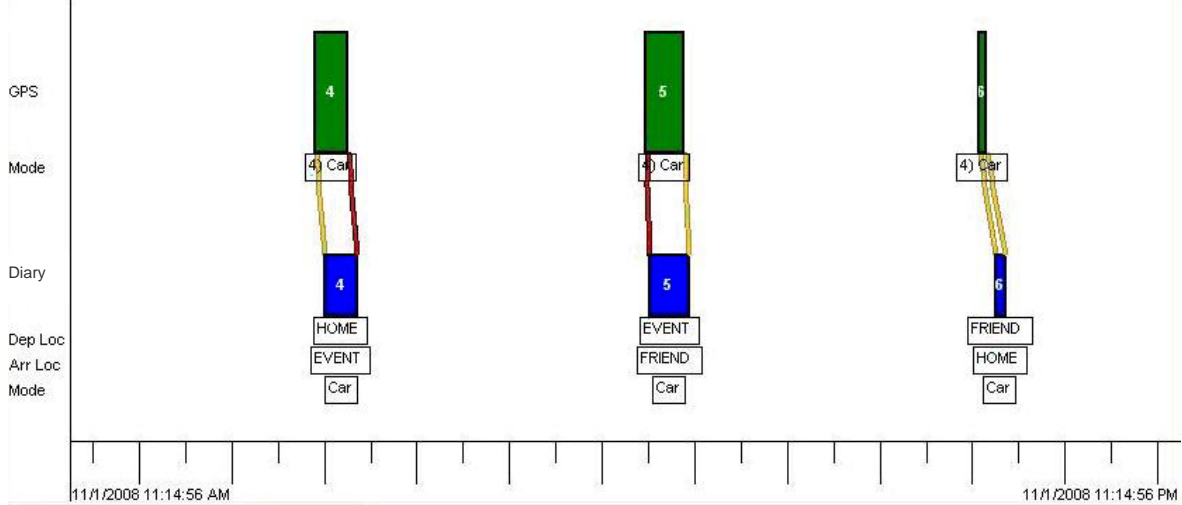
Methods

Once trip end identification was completed, the updated GPS-based trips were compared and matched with the travel diary trips reported for the same person. Initial automated matching was undertaken using trip start times and origin/destination locations as the matching variables. Trip start times were automatically matched if they fall within 12.5 minutes of each other and/or trip end locations were automatically matched if they fall within 100 metres of each other. Due to the low level of accuracy in the geocoded travel diary trip ends the automated location matching was not helpful on this study. In some cases trip times were missing which made the matching process more challenging. Fortunately, this only occurred for 68 of the 2105 trips (3%) reported in the travel diaries.

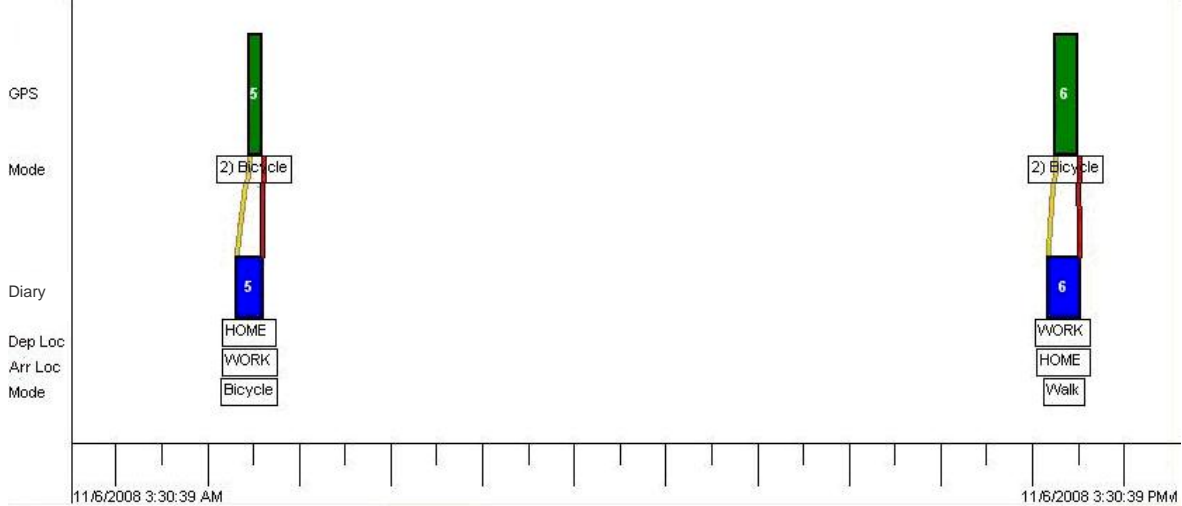
After the automatic matching, analysts reviewed the auto-matches and made adjustments as necessary based on time, location, trip order, and mode. At this point, the analyst used the more accurate geocoded information for home, work and school locations (where this had been collected at the placement interview). This process also included confirmation of missing GPS trip ends or missing (i.e. unreported) travel diary trip ends.

Figure 7.2 TIAS Trip Matching Timeline Interface – Examples

Example of Perfect Matches Between GPS (in green) and Travel Diary (in blue) trips



Example of Misreported Travel Mode (GPS and Travel Diary trip 6)



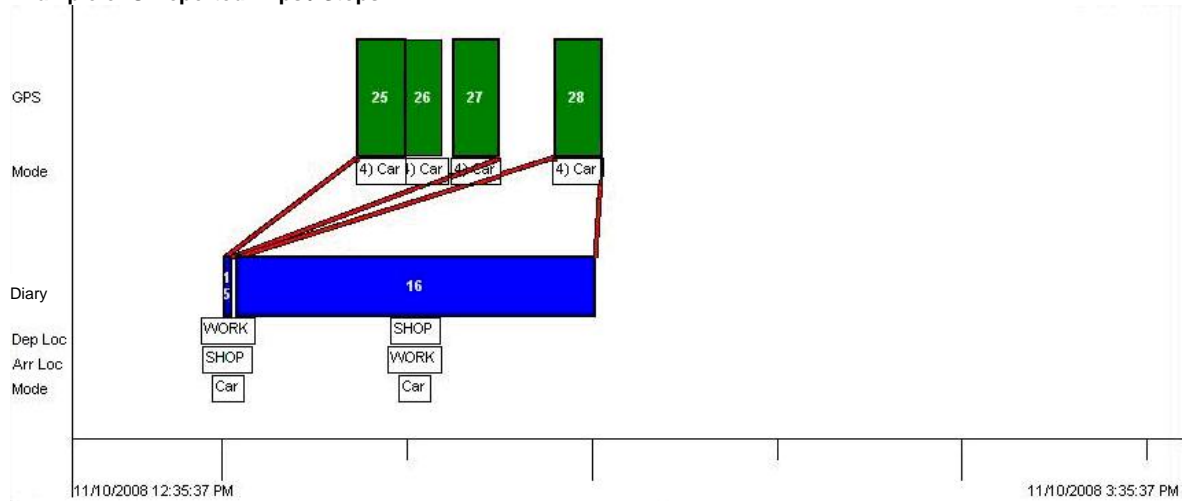
The primary matching interface is a graphical timeline that includes numerous details about the GPS trips collected and travel diary trips reported within a given timeframe.²² Figures 7.2 and 7.3 depict some examples. The lines connecting the GPS trips (shown in green) and the travel diary trips (shown in blue) represent matched trip ends and are colour coded based on the distance between the matched trip ends (green is less than 100 metres, yellow is less than 1,000 metres, and red is greater than 1,000 metres). The numbers in the centre of each trip box (green or blue) reflect the GPS and diary trip number. The width of the boxes represents the trip duration.

²² Several enhancements were added to the TIAS matching interface and methodology to accommodate some of the unique features of this study. These enhancements included support for multi-day GPS to travel diary trip matching, display of modes and mode stages for GPS and Travel Diary reported trips and new match types to support reporting rule exceptions such as series of calls, round trip, short walk trip, and recreation trips.

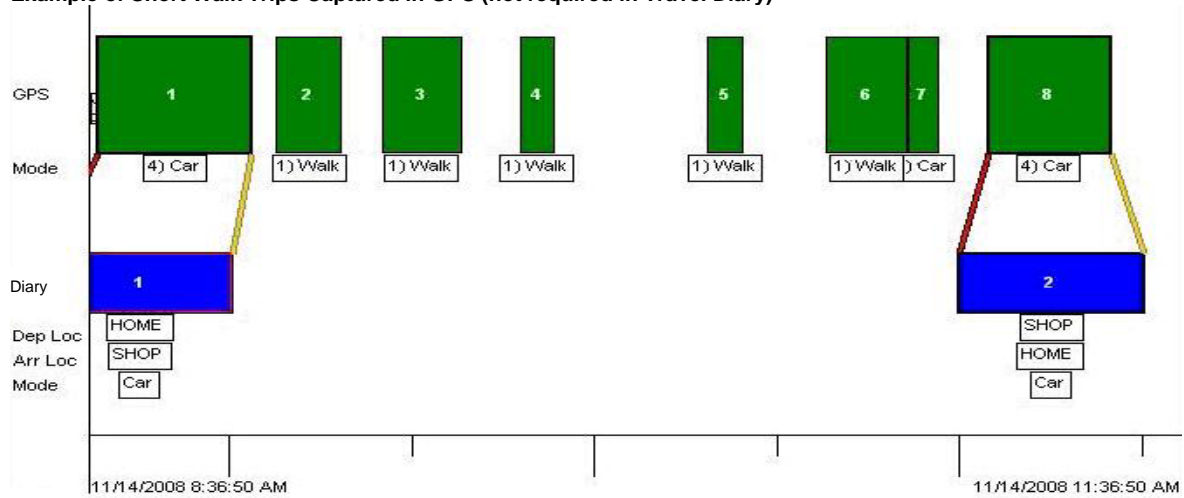
The analysts also used TIAS's mapping interface, which presents all GPS traces with supporting GIS layers, the GPS trip summary table, and GPS trip speed profiles for each trip, to confirm GPS trip details and/or to make corrections to the GPS trips as needed.

Figure 7.3 TIAS Trip Matching Timeline Interface – Examples

Example of Unreported Trips / Stops



Example of Short Walk Trips Captured in GPS (not required in Travel Diary)



Observations

A number of notable issues were identified in the course of the matching process:

- In two households the GPS trips assigned to person 1 matched the Travel Diary trips reported by person 2, and vice versa. This is a fairly common occurrence in GPS-enhanced household travel surveys where there are multiple respondents within one household. Once the GPS files were swapped between household members, the GPS and Travel Diary trip were able to be matched.
- A number of eligible round trips identified in the GPS data were not reported in the diary data (28, although it is possible that 18 of these were excluded trips made in the course of work). All but one of the missed trips were by car; the other was by foot.
- The GPS and diary data were too different to undertake matching for six respondents across four households; although much effort was spent trying to do so. The underlying issues in these cases were as follows:
 - Devices being switched between household members during the travel week
 - Device used over a period other than the travel week
 - Large gaps in the GPS data
 - Incorrect ordering of diary trips
 - Start/end of diary trips at the wrong time of day

Further results from the matching process can be found in Appendix J.

7.6 GPS data processing results

Overall some GPS data was collected for 104 respondents²³, from which 2,229 GPS trips were identified. (In addition to the 101 respondents who reported using the device and for whom data was returned, data was also recorded on the devices of three respondents who reported no usage of the device.) Table 7.2 provides some summary information regarding the GPS points collected (including the number filtered out using the processes described earlier), while Table 7.3 provides a summary of the GPS trips.

Table 7.2 GPS Point Statistics

Wave	Raw GPS Points collected	Final GPS Points After Processing	Total Points Filtered	Average Points Filtered	Median Points Filtered	Minimum Points Filtered	Maximum Points Filtered
1	364,359	229,138	135,221	2,459	1,518	0	11,626
2	233,320	143,107	90,213	1,841	572	1	11,357
<i>Total</i>	597,679	372,245	225,434	2,168	1,246	1	11,626

Table 7.3 GPS Trip Summary Statistics

Wave	Participants	Total Trips	Average Trips per person	Total Minutes	Average Trip Time (mins)	Total Distance Travelled	Average Trip Distance
1	55	1328	24.1	19,618	14.8	6,911	5.2
2	49	901	18.4	12,303	13.7	4,905	5.4
<i>Total</i>	104	2,229	21.4	31,921	14.3	11,816	5.3

²³ This includes the six respondents for whom the GPS and diary data was too different to match.

Table 7.4 shows number of travel days with GPS trips. Only 20 respondents had GPS data for every day of the travel week and five respondents had no GPS trips at all (two of whom said they had not used the GPS device, although they accepted the device at the placement interview and returned the device with some data recorded). (This is examined in relations to the days with diary trips in Section 8.3.)

Table 7.4 Number of Travel Days with GPS Trips

Days with Trips	Wave One	Wave Two	All Persons	
	Persons	Persons	N	%
0	1	4	5	5
1	2	3	5	5
2	2	5	7	7
3	3	2	5	5
4	9	8	17	16
5	12	9	21	20
6	15	9	24	23
7	11	9	20	19
<i>Total</i>	55	49	104	100

With respect to trip stage identification, 970 of the 1,328 Wave 1 GPS trips (73 per cent) were single mode/stage trips, 277 were two mode/stage trips (21 per cent), and the remainder consisted of three or more stages (in which the same mode may have been used more than once). In Wave 2 806 of 901 GPS trips (89 per cent) were single mode/stage trips and 80 were two mode/stage trips (9 per cent). It is likely that the higher percentage of multi-stage trips in Wave 1 versus Wave 2 is a result of the logging frequency configuration issue. (This is explored further in Chapter 8.) Overall, of the 2,229 GPS trips collected, 1,776 (80 per cent) were single mode/stage trips and 357 (16 per cent) were two mode/stage trips (Table 7.5).

Table 7.5 Breakdown of GPS Trips by Number of Stages

Trip Stages	Wave One	Wave Two	All Trips	
	GPS Trips	GPS Trips	N	%
1	970	806	1,776	80
2	277	80	357	16
3	73	13	86	4
4	3	2	5	+
6	2	0	2	+
8	1	0	1	+
9	1	0	1	+
10	1	0	1	+
<i>Total</i>	1328	901	2,229	100

Note: Trips can consist of a number of stages. A new stage is defined when there is a change from one form of transport to another, or where there is a change in vehicle.

Table 7.6 Breakdown of GPS Trips by Main Travel Mode

Main Travel Mode	Wave One	Wave Two	All Trips	
	GPS Trips	GPS Trips	N	%
Walk	240	84	324	15
Bicycle	16	20	36	2
Private (hire) bus	6	0	6	+
Car	915	773	1,688	76
Van, lorry	64	0	64	3
Private - Other	15	0	15	1
Ordinary bus - in London	1	0	1	+
Ordinary bus - elsewhere	44	16	60	3
Train (formerly BR)	21	4	25	1
Taxi	4	4	8	+
Minicab	2	0	2	+
<i>Total</i>	1328	901	2,229	100

Note: The main travel mode is the mode used for the longest distance.

Table 7.6 shows the breakdown of GPS trips by main mode of transport. Table 7.7 provides stage level summary statistics by mode.²⁴ For example, 848 walking stages were identified, covering a total of 230 miles and collectively lasting 5,576 minutes. Dividing these figures by 848 provides the average duration and distance of a walking stage, 6.6 minutes and 0.3 miles respectively.

Table 7.7 Statistics on Mode Stages

Travel Mode	Total Duration (minutes)	Total Distance (miles)	# of Trip Stages	Average Duration per Trip Stage (minutes)	Average Distance per Trip Stage (miles)
Walk	5,576.4	230.3	848	6.6	0.3
Bicycle	619.6	83.2	50	12.4	1.7
Private (hire) bus	180.0	136.6	6	30.0	22.8
Car	21,602.4	9,636.3	1,707	12.7	5.6
Van, lorry	563.0	271.9	64	8.8	4.2
Private - Other	541.1	75.0	15	36.1	5.0
Ordinary bus - in London	13.8	2.6	2	6.9	1.3
Ordinary bus - elsewhere	856.2	194.3	68	12.6	2.9
LT underground	91.7	0.0	3	30.6	0.0
Train (formerly BR)	1,318.2	1,101.6	34	38.8	32.4
Taxi	91.5	35.6	8	11.4	4.5
Minicab	38.3	10.7	2	19.1	5.4
<i>Totals / Averages</i>	31,492.2	11,778.3	2,807	11.2	4.2

It should also be noted that some of the mode assignments reported in the previous tables were updated based on travel diary matching procedures (such as any modes not assigned in the automated process, including van/lorry, taxi, or minicab). The modes of 858 stages (31 per cent) were reassigned manually after the automated assignment was complete. Table 7.8 shows the breakdown of the trip stage reassignments by final travel mode assigned.

²⁴ The presence of a duration value, but not distance value, for the stages by Underground is a result of the absence of a valid GPS point after the Underground stage, resulting from a delay in satellite acquisition.

Table 7.8 Number of Mode Reassignments by Final Mode

Final Travel Mode	Wave One #	Wave Two #	All Modes Reassigned	
	Reassigned	Reassigned	N	%
Walk	44	97	141	16
Bicycle	13	19	32	4
Private (hire) bus	6	0	6	1
Car	144	339	483	56
Van, lorry	64	0	64	7
Private - Other	15	0	15	2
Ordinary bus - in London	2	0	2	+
Ordinary bus - elsewhere	51	17	68	8
LT Underground	0	3	3	+
Train (formerly BR)	29	5	34	4
Taxi	4	4	8	1
Minicab	2	0	2	+
<i>Total</i>	374	484	858	100

8 Analysis and observations

8.1 Introduction

Overall, 80 per cent of respondents (106 people) were interviewed, completed a travel diary and reported using a GPS device (Table 8.1).

Respondents were asked to record whether they used the GPS device for all trips each day of the reporting period, and whether they encountered any problems each day (such as the device talking, the battery running out, difficulty carrying the device). Seventy per cent of those who used the GPS device (and completed a travel diary) reported carrying the device for all journeys made during the week but only 42 per cent did so without problems. Furthermore, the GPS device successfully recorded all the trips reported in the travel diary for only 20 per cent of respondents who used the GPS device.

Table 8.1 Overview of GPS use

Base: All respondents interviewed/completed a travel diary/used GPS device

	N	% of interviewed	% of completed diary	% of used GPS
Fully completed a travel diary	123	92%	-	-
Accepted GPS device at placement interview (and completed travel diary)	113	85%	92%	-
Used GPS device (and completed travel diary)	106	80%	86%	-
Used GPS device (and completed travel diary) – but no GPS data due to faulty device	2	2%	2%	2%
Used GPS device (and completed travel diary) – but no GPS data due to loss of device	3	2%	2%	3%
Used GPS device, data received (and completed travel diary)	101	76%	82%	95%
Used GPS device for all trips	74	56%	60%	70%
Used GPS device for all trips but device did not record all diary trips	53	40%	43%	50%
Used GPS device for all trips and device recorded all diary trips	21	16%	17%	20%
Used GPS device for all trips without problems	45	34%	37%	42%
Used GPS device for all trips without problems but device did not record all diary trips	31	23%	25%	29%
Used GPS device for all trips without problems and device recorded all diary trips	14	11%	11%	13%
<i>Base</i>	<i>133</i>	<i>133</i>	<i>123</i>	<i>106</i>

However, two respondents had devices that failed to collect any data and the devices of three respondents were lost either by the respondent or in transit²⁵, leaving 101 respondents who completed a travel diary and reported using a working (and returned) GPS device.

This chapter examines the GPS and diary data in more detail. The focus of this feasibility study was to examine how GPS would perform when used in a manner consistent with the current design of the NTS. For this reason the analysis explores how GPS data differs from data collected via the seven day NTS diary. First it compares the diary and GPS data collected by the 101 respondents who reported using the GPS device (for whom a working device was returned) and fully completed the travel diary. The completeness of the GPS data amongst this group of respondents is then explored, examining the degree to which the GPS device recorded the trips reported in the travel diary. The differences between the matched GPS and diary trips are then presented before examining the types of trips the GPS devices collected that were not reported in the travel diary and the potential levels of under-reporting/recording.

²⁵ In total four GPS devices were lost but one was used by a respondent who did not complete the travel diary.

Please note that, in the following tables, the use of '+' indicates greater than 0 but less than 0.5.

(Further analyses that examine how the diary data differ from the GPS data can be found in Appendix J. The analyses presented in the appendix is similar to that undertaken in other GeoStats GPS-enhanced travel surveys.)

8.2 Comparison of trips recorded in the diary and GPS

One possible use of GPS is to record the trips made by respondents without the need for a full travel diary. This section compares the trip rates and trip characteristics observed in the diary and GPS data to examine whether relying upon the GPS data alone would provide different results. The analysis separates out short walks under one mile as these are only recorded on Day 7 in the travel diary.

Raw trip counts

Based on the 101 cases with GPS and diary data, across the seven days, the GPS devices recorded a total of 2,226 trips compared with 1,817 trips recorded in the diary, a net difference of 409 trips (Table 8.2). Given that the GPS devices should record all journeys, including short walks which are excluded from the diary, this was to be expected. Generally, the GPS devices recorded more trips each day than the diary, although the difference varied considerably across days from four to 109. However it is worth noting that there were individual days in Wave 1 or 2 where this was not the case and the number of diary trips actually exceeded the number of GPS trips.

Table 8.2 Trips recorded/reported by data collection method

Base: Trips recorded/reported for respondents who fully completed a travel diary and used a GPS device.

	Diary	GPS (all)	Difference	GPS - logging by time	GPS - logging by distance
Total trips	1817	2226	409	1600	626
- Day 1	254	346	92	262	84
- Day 2	258	300	42	232	68
- Day 3	289	365	76	260	105
- Day 4	237	303	66	208	95
- Day 5	237	346	109	254	92
- Day 6	256	276	20	181	95
- Day 7	286	290	4	203	87
Total trips excluding short walks	1817	1964	147	1423	541
- Day 1	254	286	32	216	70
- Day 2	258	259	1	203	56
- Day 3	289	322	33	234	88
- Day 4	237	257	20	173	84
- Day 5	237	289	52	223	66
- Day 6	256	262	6	172	90
- Day 7	286	289	3	202	87
<i>Base (respondents)</i>	<i>101</i>	<i>101</i>		<i>69</i>	<i>32</i>

Even when short walks not reported in the diary were excluded²⁶, the GPS devices still recorded more trips each day in comparison with the diary overall (although there were still individual days in Wave 1 or 2 where this was not the case), with the total net difference across the week decreasing to 147 trips. Excluding respondents who did not use the GPS for any or all of their trips on each day, a similar pattern can still be seen (excluding short walks).

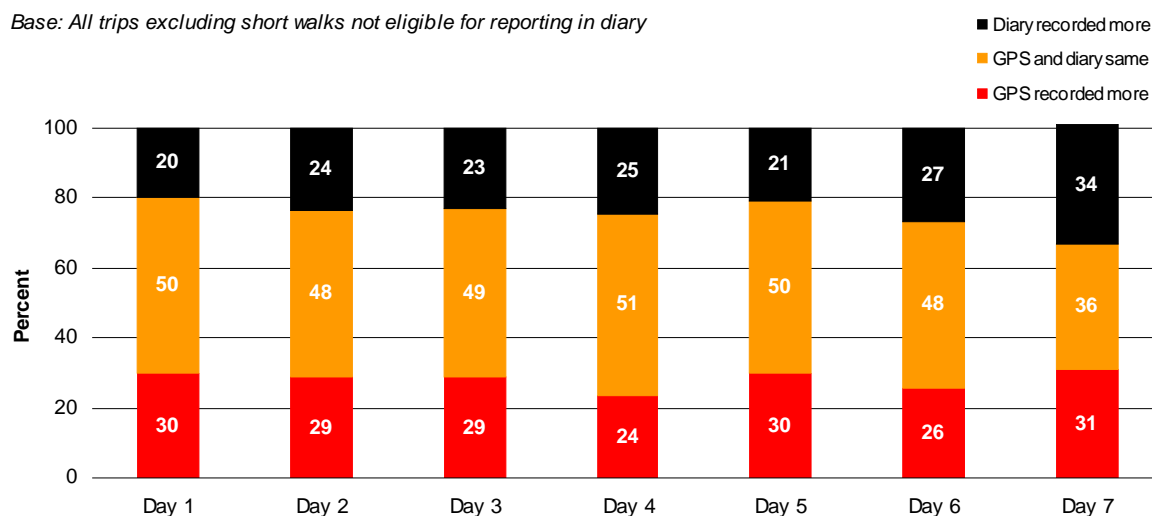
²⁶ The excluded short walks were those ineligible to be recorded in the diary i.e. walks of less than one mile on Days 1-6 and less than 50 yards on Day 7.

Comparing the number of GPS and diary trips at respondent level, there were the same or more GPS trips recorded in most cases (57 per cent of respondents). However it is notable that for sizeable proportion of cases (36 per cent), more trips were reported in the diary than collected by the GPS device.

When short walks are excluded, for 45 per cent of respondents more GPS trips were recorded than diary trips reported across the entire week, although this was the case for no more than 31 per cent of respondents on any one day of the travel week (Figure 8.1). This suggests that the GPS devices did capture some trips that should have been reported in the travel diary but were not.

Figure 8.1 Comparison of trips recorded by GPS and diary by travel day

Base: All trips excluding short walks not eligible for reporting in diary



The degree to which this occurred appears to be linked to the GPS logging interval, with the GPS data being less likely to capture more trips than the diary when logging by distance than by time (Table 8.3).

Table 8.3 Comparison of diary/GPS trips, excluding short walks, by basis of GPS logging

Base: Respondents who fully completed a travel diary and used a GPS device.

	All	GPS logging by time	GPS logging by distance
Overall			
- GPS recorded more trips	45	49	34
- Diary & GPS recorded same	10	9	13
- Diary recorded more trips	46	42	53
Proportion where GPS recorded more trips			
- Day 1	30	35	19
- Day 2	29	35	16
- Day 3	29	30	25
- Day 4	24	20	31
- Day 5	30	30	28
- Day 6	26	28	22
- Day 7	31	33	25
Base	101	69	32

Even among those respondents who reported using the GPS device for all of their journeys on any particular day, there are a reasonable number (between 15 and 25 per cent) where more trips

(excluding short walks) are reported in the diary than recorded by the GPS. This suggests that while the selected GPS device captures some trips omitted from the diary, it fails to record all of the reported diary trips.

Journeys excluding short walks under one mile

On average, the GPS devices recorded more trips (excluding short walks) than were reported in the travel diaries, with an average weekly trip rate of 19.03 compared with 17.59. (Both are substantially higher than the comparable trip rate for NTS as a whole but may be a result of the smaller sample sizes and the travel patterns in the local areas covered by the feasibility study.) The basis of GPS logging appeared to have some impact on the overall trip rate excluding short walks. The diary and GPS trip rates were fairly similar for those respondents whose trips were being logged by distance. However the GPS trips rates were substantially higher than the diary trip rates for those whose trips were being logged every four seconds (Table 8.4). This may be due to the time-based logging being better able to capture short trips than the distance-based logging.

Comparing the trip rates across modes, the GPS data captured more car trips. However, the diary appeared to capture more walking trips (of more than one mile) than the GPS (0.72 trips per week compared with 0.28). This may be a result of either respondent forgetting or choosing not to carry the GPS device while walking. Alternatively it may be that respondents have over-estimated the distance of their walking trips such that the 'true' distance is less than one mile thus excluding them from this analysis. (If this is the case, these trips will have been captured in the GPS data but excluded from the analysis and falsely reported in the diary.) The GPS data also captured more short (non-walking) trips of less than one mile on average compared with the diary.

Table 8.4 Weekly person level trip rates: All trips excluding short walks

Base: Respondents who fully completed a travel diary and used a GPS device. Includes trips made on the public highway only.

	Diary	GPS (all)	GPS - logging by time	GPS - logging by distance	NTS 08
Total	17.59	19.03	20.16	16.59	15.20
Basis of GPS logging					
Time	18.55	20.16	-	-	-
Distance	16.41	16.59	-	-	-
Mode					
Walk	0.72	0.28	0.29	0.25	1.36
Bicycle	0.18	0.35	0.42	0.19	0.28
Car	14.90	16.68	17.39	15.16	11.25
Van, lorry	0.26	0.63	0.93	0.00	0.30
Ordinary bus	0.86	0.60	0.65	0.50	1.14
Train	0.30	0.25	0.26	0.22	0.29
Taxi/minicab	0.20	0.10	0.09	0.13	0.19
Other	0.18	0.14	0.13	0.16	0.40
Distance					
Under 1 mile	0.90	3.81	3.52	4.44	0.80
1 to under 2 miles	3.71	3.41	3.83	2.50	3.34
2 to under 3 miles	2.14	2.99	2.93	3.13	2.13
3 to under 5 miles	3.75	3.47	4.12	2.06	2.73
5 to under 10 miles	4.00	3.00	3.28	2.41	2.95
10 to under 25 miles	2.02	1.61	1.74	1.34	2.20
25 to under 50 miles	0.42	0.35	0.36	0.31	0.54
50 to under 100 miles	0.50	0.35	0.33	0.38	0.22
100 miles and over	0.08	0.05	0.06	0.03	0.12
<i>Base</i>	<i>101</i>	<i>101</i>	<i>69</i>	<i>32</i>	<i>19,280</i>

Comparing person level trips rates across the travel week (Figure 8.2), GPS tended to record slightly more trips than the diary. This was particularly true where the GPS device was logging by time, as planned (Figure 8.3 and Figure 8.4). Both the GPS and diary trips rates fluctuated during the week but the GPS trip rates was most similar to the diary trip rate on days 2, 6 and 7. For these latter days, this may reflect respondents tiring of using the device towards the end of the week. (Indeed in Chapter 5 it was noted that respondents increasingly did not use the device for all journeys on these later days of the week.) There were some differences by type of GPS logging interval across the travel week. For those whose GPS data was logged at time intervals, the difference between the diary and GPS trip rates ranged from +0.04 to +0.74 trips; for those whose data was logged at distance intervals, the difference ranged from -0.16 to +0.28.

Figure 8.2 Trip rates by day of travel week for all respondents, excluding short walks

Base: Respondents who fully completed a travel diary and used a GPS device. Includes journeys made on the public highway only.

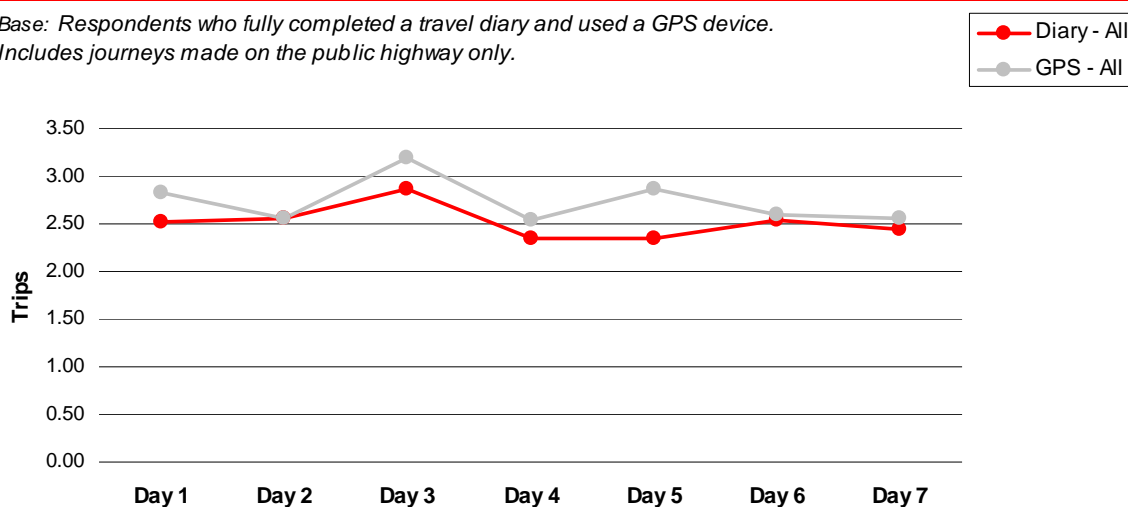


Figure 8.3 Trip rates for respondents whose device logged by time, excluding short walks

Base: Respondents who fully completed a travel diary and used a GPS device logging by time

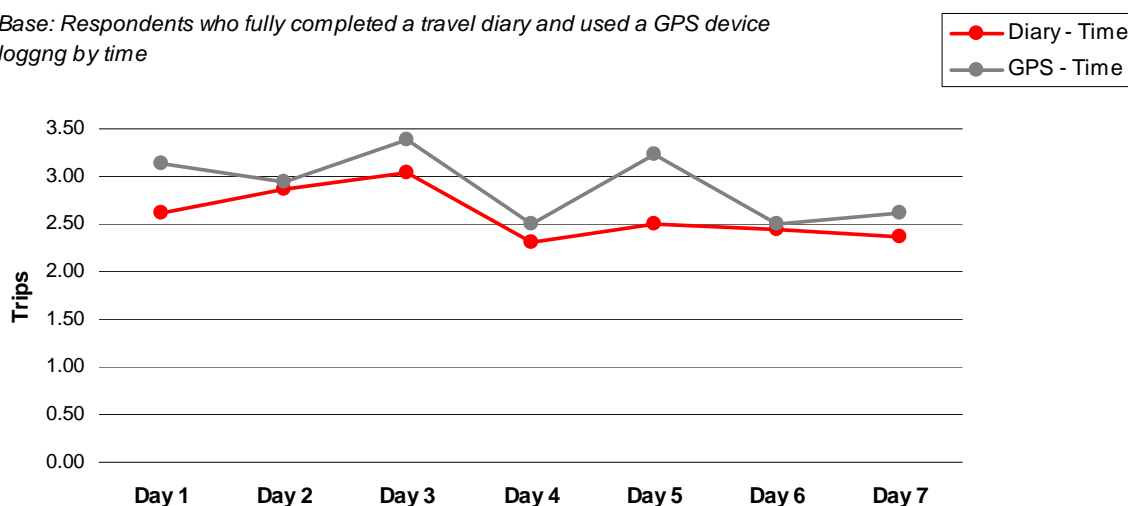
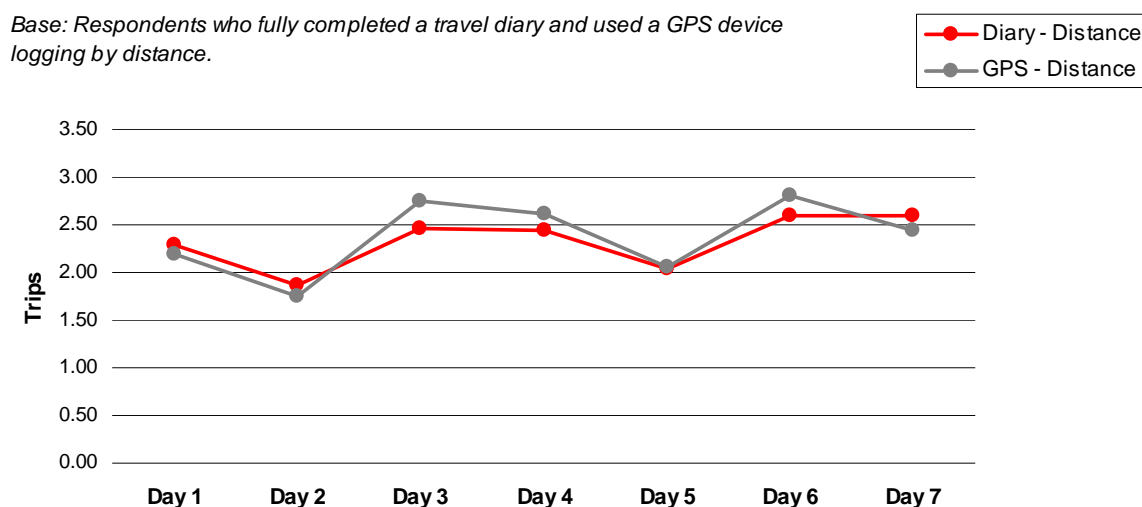


Figure 8.4 Trip rates for respondents whose device logged by distance, excluding short walks



The differences in trip rates are reflected in the profile of GPS and diary trips excluding short walks (Table 8.5).

Table 8.5 Profile of all trips excluding short walks

Base: Trips made on the public highway by respondents who fully completed a travel diary and used a GPS device - excludes short walks.

	Diary %	GPS (all) %	GPS - logging by time %	GPS - logging by distance %	NTS 08
Mode					
Walk	4	1	1	2	9
Bicycle	1	2	2	1	2
Car	85	88	86	91	74
Van, lorry	1	3	5	0	2
Ordinary bus	5	3	3	3	7
Train	2	1	1	1	2
Taxi/minicab	1	1	+	1	1
Other	1	1	1	1	3
Base	1,777	1,922	1,391	531	293,039
Distance					
Under 1 mile	5	20	17	27	5
1 to under 2 miles	21	18	19	15	22
2 to under 3 miles	12	16	15	19	14
3 to under 5 miles	21	18	20	12	18
5 to under 10 miles	23	16	16	15	20
10 to under 25 miles	12	8	9	8	15
25 to under 50 miles	2	2	2	2	4
50 to under 100 miles	3	2	2	2	1
100 miles and over	0.5	0.3	+	+	1
Base	1,864	1,922	1,391	531	289,957
Duration					
5 minutes or less	16	27	25	32	14
6-10 minutes	22	26	24	29	20
11-20 minutes	32	28	29	24	30
21-30 minutes	14	9	11	6	17
More than 30 minutes	16	10	11	9	19
Base	1,717	1,922	1,391	531	287,497

A higher proportion of GPS trips that were under a mile than the diary (20 per cent compared to 5 per cent) and lasted for 5 minutes or less (27 per cent compared to 16 per cent), compared with diary trips. This is reflected in the average trip distance and durations which for GPS trips are 6.1 miles and 15 minutes compared with 8.1 miles and 22 minutes for diary trip. (The average figures for the diary trips are in line with the figures for NTS)

There was little variation in the profile of trips, excluding short walks, according to time of departure or weekday.

Short walks

Looking at daily person level trip rates for short walking trips (i.e. walks under one mile), slightly more trips were reported on Day 7 in the diary on average compared with the average daily number recorded by the GPS device across all days of the travel week (Table 8.6). Just looking at the GPS data for Day 7, the GPS trip rate still fell short of the diary trip rate (0.32 compared with 0.40 trips in the diary). Given that there is evidence of under-reporting of short walks in the NTS diary, this is somewhat surprising but may reflect respondents being less likely to remember the GPS device when making a short walking trip – or choosing not to take it with them. Alternatively it may be that the GPS devices struggled to pick up a signal for some of the short walks made, or that some short walks are too short for the processing to accurately identify as trips.

Table 8.6 Daily person level trip rates: Short walks (trip level)

Base: Respondents who fully completed a travel diary and used a GPS device. Includes trips made on the public highway only.

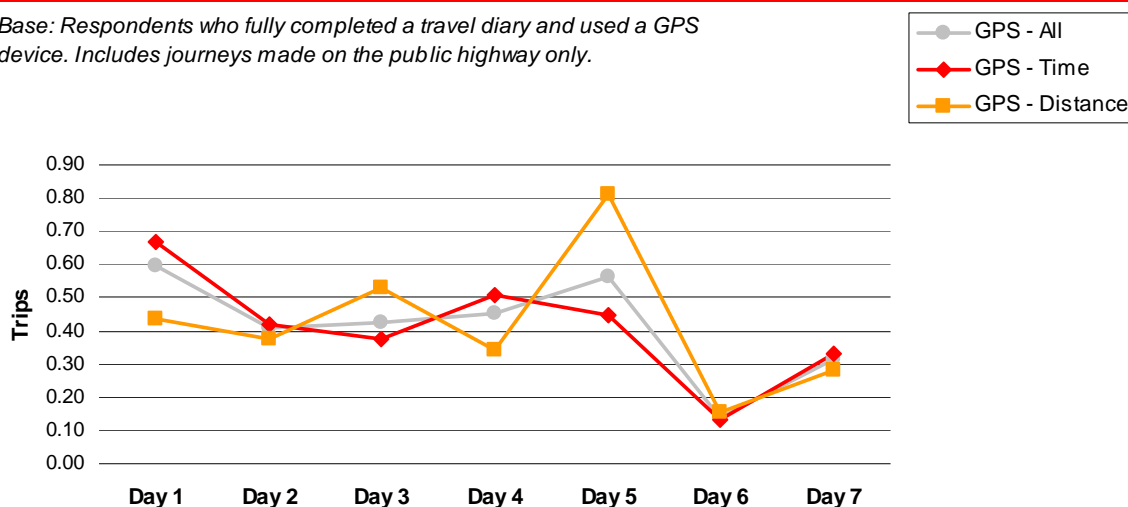
	Diary	GPS (all days)	GPS (Day 7 only)	NTS 08
Short walk – daily trip rate	0.40	0.36	0.32	0.39
Basis of GPS logging				
Time	0.41	0.35	0.33	-
Distance	0.38	0.40	0.28	-
<i>Base (all)</i>	<i>101</i>	<i>101</i>	<i>101</i>	<i>19280</i>
<i>Base (GPS logging by time)</i>	<i>69</i>	<i>69</i>	<i>69</i>	<i>-</i>
<i>Base (GPS logging by distance)</i>	<i>32</i>	<i>32</i>	<i>32</i>	<i>-</i>

Some differences were evident by type of interval used in the GPS logging. While the overall daily GPS short walk trip rate was lower than the diary trip rate, among those using device logging by distance the GPS trip rate was higher than the corresponding diary trip rate. However, when comparing Day 7 data only, both GPS trip rates (logging by time and distance) fell short of the diary trip rate. Figure 8.5 shows that the GPS short walk trip rates varied across the travel week according to type of logging interval, but both saw a drop towards the end of the week.

The higher diary trip rate also runs counter to the theory that respondents were over-estimating the distance of walking trips, as this would suggest that more short walks should have been recorded by the GPS than reported in the diary, assuming that respondents were carrying the GPS device for these trips and the device was logging as anticipated.

Figure 8.5 Trip rates by day of travel week : Short walks

Base: Respondents who fully completed a travel diary and used a GPS device. Includes journeys made on the public highway only.



Similar to the other trips, a larger proportion of short walks detected by GPS were very short (five minutes or less) compared with diary trips (Table 8.7). This was reflected in the average duration and distance of these short walks which were lower for GPS trips, at seven minutes and 0.3 miles compared with twelve minutes and 0.4 miles for diary trips.

Table 8.7 Profile of short walk trips

Base: Short walks made on the public highway by respondents who fully completed a travel diary and used a GPS device.

	Diary %	GPS (all) %	GPS - logging by time %	GPS - logging by distance %	NTS 08 %
Duration					
5 minutes or less	10	39	41	37	33
6-10 minutes	58	40	35	49	34
11-20 minutes	30	19	22	13	27
21-30 minutes	3	1	2	0	5
More than 30 minutes	0	+	1	0	1
Base	40	256	167	89	7302

One factor which can influence the trip rates are the number of no travel days i.e. days within the reporting period where no trips were recorded or reported. On average respondents had 1.6 days with no diary trips and 2.0 days with no GPS trips. Forty-five respondents (out of the 101) had the same number of no diary travel days as no GPS travel days. Only 15 respondents had fewer no GPS travel days than no diary travel days, leaving 41 who had more no GPS travel days than no diary travel days.

8.3 Completeness of GPS data

If the GPS devices functioned correctly, and were carried and used correctly by respondents, all trips that are recorded in the diary should be present within the GPS data – assuming that the respondent has not reported fictitious trips, which seems unlikely if they were also using a GPS device. This section explores the completeness of the GPS data by examining the proportion of diary trips which are matched by GPS trips.

Overall 72 per cent of diary trips (1,280 trips made by the 101 respondents) were matched in the GPS data. The proportion of matched trips varied by the type of logging interval used by the GPS devices, with a higher proportion of diary trips matched when the GPS data was logged by distance

rather than time intervals (78% compared to 69%). The reason for this is not clear; it would be expected that the devices logging by time would be best placed to capture trips most accurately.

Sometimes the ability of a GPS device to obtain a signal can be affected by the environment in which it is used. The expectation would be for the GPS device to have greater difficulty within a built-up area. This could affect the proportion of diary trips matched. However the reverse was true, with a higher proportion of trips made by respondents who live in the city centre having a match compared with those who live further out (Table 8.8).

Table 8.8 Proportion of diary trips matched by GPS trips – by type of area

Base: All diary trips made by respondents who fully completed a diary and used a device.

	City centre	5 miles from city centre	10 miles from city centre	Total
	%	%	%	%
No match	20	26	35	28
Match	80	74	65	72
<i>Bases</i>	<i>424</i>	<i>660</i>	<i>733</i>	<i>1817</i>

The proportion of diary trips matched by GPS data varied across day of the travel week and weekday (Table 8.9). There was a distinct drop in the proportion of diary trips with a match on Day 7, dropping from 70-76 per cent on Days 1 to 6 to 58 per cent, which once again is likely to reflect respondents growing tired of using the device towards the end of the travel week.

Table 8.9 Proportion of diary trips matched by GPS trips – by day of week

Base: All diary trips made by respondents who fully completed a diary and used a device.

	%	%	%	%	%	%	%	%
Travel day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
No match	27	24	23	27	22	30	42	28
Match	73	76	77	73	78	70	58	72
<i>Bases</i>	<i>254</i>	<i>258</i>	<i>289</i>	<i>237</i>	<i>237</i>	<i>256</i>	<i>286</i>	<i>1817</i>

Day of week	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Sun
No match	28	24	30	22	33	35	25	28
Match	72	76	70	78	67	65	75	72
<i>Bases</i>	<i>201</i>	<i>249</i>	<i>279</i>	<i>257</i>	<i>263</i>	<i>281</i>	<i>287</i>	<i>1817</i>

The proportion of diary trips matched by GPS trips also varied by main mode of transport. Seventy-six per cent of car trips were matched compared with only 49 per cent of bus trips and 41 per cent of walking trips. (Too few trips were made by other modes of transport to include them in the analysis.) Given that one of the potential opportunities presented by GPS is to collect data on all short walking trips, further work will be required to explore why this occurred. The challenges faced when processing the GPS data logged by distance may have contributed to this. The poor identification of bus trips may also reflect respondents not being keen to have the device on show when using public transport or the device struggling to get a signal where the respondent was not sitting beside a window or was on a very crowded bus.

The distance of the journey was also related to the likelihood of diary trips being matched by the GPS data, with journeys under one mile being the least likely to be matched (Table 8.10). This may be due to respondents forgetting to take the GPS device on shorter trips (or deciding not to take the device) or cold starts increasing the likelihood of missing GPS data. It may also be linked to the logging frequency issue.

Table 8.10 Proportion of diary trips matched by GPS trips – by trip distance*Base: All diary trips made by respondents who fully completed a diary and used a device.*

	Under 1 mile %	1 to under 2 miles %	2 to under 3 miles %	3 to under 5 miles %	5 to under 10 miles %	10 to under 25 miles %	25+ miles %	Total %
No match	39	34	31	23	26	22	25	28
Match	61	66	69	77	74	78	75	72
<i>Bases</i>	<i>131</i>	<i>375</i>	<i>216</i>	<i>379</i>	<i>404</i>	<i>204</i>	<i>101</i>	<i>1810</i>

The proportion of trips matched by time of departure was highest at the beginning of the day (Table 8.11), with over 75 per cent of diary trips made before midday having a GPS match.

Table 8.11 Proportion of diary trips matched by GPS trips – by time of departure*Base: All diary trips made by respondents who fully completed a diary and used a device..*

	0.30 - 7.00am %	7.01 - 9.30am %	9.31 - 12.00am %	12.01 - 2.30pm %	2.31 - 5.00pm %	5.01 - 7.30pm %	7.30 - 10.00pm %	10.01pm - 7.00am %	Total %
No match	24	24	23	30	28	34	28	39	28
Match	76	76	77	70	72	66	72	61	72
<i>Bases</i>	<i>76</i>	<i>293</i>	<i>323</i>	<i>339</i>	<i>342</i>	<i>271</i>	<i>85</i>	<i>41</i>	<i>1770</i>

This could reflect respondents being more likely to remember to carry the device first thing in the morning but forgetting as the day progresses. Alternatively, it may be linked to the device battery running out and so later trips were not recorded. Although very few people reported this happening, it may be that they did not realise given that the device would have simply switched off without any warning.

It is clear from the analysis above that there is a sizeable proportion of diary journeys that were not matched in the GPS data. This raises the question as to whether there were a few respondents who had a very low proportion of matches due to poor diary data and/or device problems/misuse or whether having diary trips not captured in the GPS data was more widespread. Table 8.12 shows the proportion of matched diary trips at person level. Twenty per cent of respondents who fully completed a travel diary and used (and returned) a working GPS device had all diary journeys matched in the GPS data; a further 41 per cent had 75 per cent or more of their diary trips matched.

Table 8.12 Proportion of matched diaries at person level*Base: Respondents where diaries completed and they used a device. Off road trips are excluded.*

	GPS - logging by time %	GPS - logging by distance %	Total %
All diary journeys matched	22	16	20
75% or more matched but not all	35	53	41
50% or more matched but less than 75%	20	19	20
25% or more matched but less than 50%	6	6	6
Less than 25% matched	17	6	14
<i>Bases</i>	<i>69</i>	<i>32</i>	<i>101</i>

This suggests that either many respondents mis-recorded some journeys in their travel diary and/or had problems of some sort with the GPS device (either forgetting to carry it, device not working as hoped or the respondent not correctly operating the device). There does not appear to be a

consistent pattern by GPS logging interval. Respondents whose GPS device was logging every few seconds were more likely to both have all their diary journeys matched and have less than 25 per cent of their journeys matched, compared with those whose GPS device was logging by distance.

It is also interesting to know whether the proportion of unmatched diary trips is due to respondents having days of no GPS data (due to them forgetting to carry it for entire days or device issues). Table 8.13 shows the number of days on which trips were recorded in the diary but no GPS data was collected. In total, 56 per cent of respondents had GPS data on all the days where they recorded trips in their diary and 34 per cent had a one or two days of missing GPS data. The small minority of respondents who had missing data for six or seven days had reported problems with their device. However, one quarter of respondents had at least one day where trips were reported in the diary but no GPS trips were detected in spite of reporting no problems with the device and carrying it for all trips (Table 8.14). This suggests that some of these missing GPS trips could have been due to a combination of unknown technical faults with the device and/or the device not being worn/used correctly by the respondent and so disrupting the GPS signal.

Table 8.13 Number of days at person level with missing GPS data

Base: Respondents where diaries completed and they used a device.

Number of days with diary trips but no GPS trips	GPS - logging by time %	GPS - logging by distance %	Total %
0	54	63	56
1	23	19	22
2	13	9	12
3	6	6	6
4	1	3	2
6	1	0	1
7	1	0	1
<i>Bases</i>	<i>69</i>	<i>32</i>	<i>101</i>

Table 8.14 Number of days at person level with missing GPS data where they had no problems and carried the device for all trips

Base: Respondents where diaries completed and they used a device.

Number of days with diary trips but no GPS trips	GPS - logging by time %	GPS - logging by distance %	Total %
0	75	75	75
1	17	9	15
2	6	13	8
3	1	0	1
4	0	3	1
<i>Bases</i>	<i>69</i>	<i>32</i>	<i>101</i>

8.4 Accuracy of the GPS and diary data

GPS data provides the possibility of collecting more accurate measures of trip distance and duration. Comparing all of the matched GPS and diary trips, this section examines the differences between the two.²⁷

The diary distance exceeded the GPS distance by at least 0.1 mile for 64 per cent of trips with an average overestimate of 1.9 miles, and was less than the GPS distance in 28 per cent of cases. The average trip distance as recorded in the diary was 6.8 miles compared with 5.9 miles in the GPS data, which may reflect respondents over-estimating the distance they were travelling and/or portions of trips being missed by the GPS device due to cold starts. However, given the large proportion of trips where diary distance exceeds the GPS distance, it is probable that the former is the main reason as it would seem unlikely to have that proportion of trips affected by cold starts. The difference between the two averages was greater for those trips where the GPS data was logged by distance rather than time (2.0 miles compared with 0.4 miles). The average diary trip distance was not greater across all modes as the GPS distance of bus trips was slightly higher than the distance reported in the diary, although it should be remembered that the base size is small (Table 8.15).

Table 8.15 Average trip distance (in miles) by mode

Base: All matched trips

	Diary	GPS	Bases <i>n</i>
Walk	1.2	1.2	32
Car	6.1	5.7	936
Ordinary bus	2.9	3.0	30

There were also differences in the average trip duration with the diary trips being slightly longer on average (18 minutes compared with 15 minutes). The diary trip duration was longer than GPS trip duration by at least one minute in 53 per cent of cases, and less than the GPS trip duration by one minute or more in 24 per cent of cases. Once again the difference was greater for trips where the GPS device was logging by distance (five minutes compared with one minute). Average duration particularly differed for walking trips where the average diary duration was more than ten minutes greater than the corresponding GPS duration (Table 8.16). This again, could be due to respondents over-estimating the duration of their trips unless the GPS trips are missing significant sections on the trip. Interestingly the average GPS duration for bus trips was higher than the average diary duration.

Table 8.16 Average trip duration (in minutes) by mode

Base: All matched trips

	Diary	GPS	Bases <i>n</i>
Walk	32	21	32
Car	16	14	914
Ordinary bus	17	26	30

²⁷ Comparisons are only made between those trips with both GPS and diary data. Analysis by mode excludes those cases where the GPS assigned mode did not coincide with the mode recorded in the diary.

The average absolute difference between the trip start time reported in the diary and that recorded in the GPS data was eight minutes, and nine minutes for the end time. This is probably due to respondents estimating the start and end times reported in their diary. Table 8.17 shows the banded difference between the diary start and end times and those recorded in the GPS data. For around one half of the matched trips the GPS start/end time was within two minutes of the start/end time reported in the diary.

Table 8.17 Difference between diary and GPS start and end times

Base: All matched trips

	Start time	End time
	%	%
-11 minutes or more	7	5
-6 to -10 minutes	8	4
-3 to -5 minutes	12	9
-1 to -2 minutes	15	10
No difference	21	24
1-2 minutes	15	20
3-5 minutes	9	13
6-10 minutes	5	7
11 minutes or more	8	9
<i>Bases</i>	<i>1045</i>	<i>1044</i>

Given that the GPS data should capture all stages of trips including those short walking stages which the respondents do not have to record in the diary, it is expected that the number of stages assigned to any one matched trip should be equal or great than the number of diary stages. This was indeed the case for the vast majority of cases, particularly where the GPS device was logging every few seconds. Where the GPS was logging by distance, it appears that stages recorded in the diary may have been missed on some trips and additional stages above those recorded in the diary not captured or detected (Table 8.18).

Table 8.18 Number of stages, by logging interval

Base: All matched trips

	GPS - logging by time	GPS - logging by distance	Total
Number of days	%	%	%
More stages reported in diary	+	2	1
Same number of stages in diary and GPS	63	96	74
More stages recorded by GPS	37	3	25
<i>Bases</i>	<i>710</i>	<i>356</i>	<i>1066</i>

Although it was not anticipated that there would be differences in the modes of transport assigned to the matched diary and GPS trips, it is worth noting that in two per cent of cases the main mode of transport recorded in the diary did not match the mode assigned to the matching GPS trip (19 trips in total). These included five trips (all made by the same respondent) where the diary mode had been miscoded as walk and the GPS mode was correct (bicycle), and six trips that had included an underground stage. Four trips that were assigned as the main mode in the GPS data had been assigned some other mode in the diary data.

8.5 Unreported trips

One of the advantages of using GPS technology is that all trips can be recorded without increasing the reporting burden placed on the respondent. On NTS some trips are excluded from the diary,

such as short walks on Days 1 to 6, which the GPS data should include. In addition, it is known that there is some degree of under-reporting of eligible trips in the diary as a drop-off in the number of trips reported in the travel diary is observed as the reporting period. This section examines the GPS trips that were unreported in the diary (i.e. those GPS trips with neither a full nor partial match in the diary data) made by those 95 respondents who completed a diary, reported using a GPS device and who were found to have matchable GPS and diary data. (Due to data issues, it was not possible to match the diary and GPS data for all respondents, as explained in Section 7.5.)

Overall, 573 trips were captured in the GPS data but were not reported in the diary, with 74 of the 95 respondents having at least one GPS trip unreported in their diary. Of these, 218 were short walks that are excluded from the diary, an average of 2.29 short walks per respondent over the course of the travel week (Table 8.19). The number of GPS short walks ineligible for inclusion the diary fluctuated across the travel week, with a significant drop in the number of additional short walks collected by GPS on Day 6 of the travel week, which may be linked to respondent fatigue and the burden of using the GPS device becoming too great. (On Day 7 no excluded short walk trips were recorded – this is to be expected as respondents were asked to report all short walks in the diary on Day 7.)

Table 8.19 Unrecorded trips – Short walks excluded from diary

Base: Unmatched GPS trips for those with matchable GPS/diary trips

	Number of unmatched GPS trips	Average per person
Total	218	2.29
Time	149	2.33
Distance	69	2.23
Travel day		
Day 1	53	0.56
Day 2	28	0.29
Day 3	35	0.37
Day 4	44	0.46
Day 5	47	0.49
Day 6	11	0.12
Day 7	0	0.00
<i>Total number of people</i>	<i>95</i>	

In addition to the short walks excluded from the diary, the GPS data included a further 25 trips that were not reported in the travel diaries as a result of the NTS reporting rules. These included eleven trips that were made off the public highway and 14 trips that were part of a series of call trip. This leaves a total of 330 trips that were recorded in the GPS data that potentially should have been reported in the travel diary. Of these 96 were flagged as potentially work related so may have been correctly excluded from the diary. Therefore, at a minimum the GPS device captured 234 additional trips that should have been reported in the travel diary data, 2.46 more trips per person per week on average. (Fifty-five of the 95 respondents had at least one additional trip captured in the GPS.)

The average number of additional trips per person differed by logging interval with the time based GPS data capturing a higher number of additional GPS trips. A greater number of additional trips were also recorded on Day 1 of the travel week, perhaps while the instructions of how to use the device were still fresh in the respondents mind and the task was still new (Table 8.20).

Table 8.20 Unrecorded trips - Additional trips*Base: Unmatched GPS trips for those with matchable GPS/diary trips*

	Number of missed trips	Average per person per week
Total	234	2.46
Time	175	2.73
Distance	59	1.90

Travel day	Number of missed trips	Average per person per day
Day 1	53	0.56
Day 2	23	0.24
Day 3	35	0.37
Day 4	23	0.24
Day 5	26	0.27
Day 6	36	0.38
Day 7	38	0.40
<i>Total number of people</i>	<i>98</i>	

These additional trips were predominantly car trips (88 per cent), short trips (with 31 per cent being under one mile and 65 per cent being 10 minutes or less), and occurred throughout the day (Table 8.21). These additional trips include six Day 7 short walks of less than one mile.

If all of these additional trips are eligible trips that should have included in the diary, this confirms that there is a considerable degree of under-reporting that occurs within NTS diary data. Furthermore, given that the GPS device may not have captured all trips made by respondents, the true degree of under-reporting may be higher.

Table 8.21 Profile of additional trips*Base: Unmatched GPS trips for those with matchable GPS/diary trips*

	GPS – logging by time %	GPS – logging by distance %	Total %
Mode			
Walk	5	2	4
Bicycle	1	5	2
Car	86	93	88
Van, lorry	2	0	2
Ordinary bus	1	0	1
Train	1	0	+
Other	4	0	3
Distance			
Under 1 mile	26	46	31
1 to under 2 miles	18	17	18
2 to under 3 miles	18	10	16
3 to under 5 miles	22	15	20
5 to under 10 miles	6	12	7
10 to under 25 miles	6	0	5
25 to under 50 miles	3	0	3
50 to under 100 miles	1	0	1
Duration			
5 minutes or less	34	49	38
6-10 minutes	27	27	27
11-20 minutes	27	22	26
21-30 minutes	6	2	5
More than 30 minutes	6	0	5
Time of departure			
0.30 - 7.00am	19	37	24
7.01 - 9.30am	18	10	16
9.31 - 12.00am	14	17	15
12.01 - 2.30pm	21	14	19
2.31 - 5.00pm	20	12	18
5.01 - 7.30pm	7	10	8
7.30 - 10.00pm	1	0	1
10.01pm - 7.00am	19	37	24
<i>Bases</i>	<i>175</i>	<i>59</i>	<i>234</i>

8.6 Comparing the potential levels of under-reporting in the travel diary and under-recording by GPS

It is known that respondents do not record all eligible trips in the seven day NTS travel diary. It is also evident from the above analysis that the data captured by respondents using the GPS device selected for this study also does not include all journeys made, for a potentially wide range of reasons. This section compares the diary and GPS data for those 95 respondents with matchable data who completed a diary and reported using a GPS device in an attempt to establish the degree of under-reporting with each data collection method.

Among these 95 respondents, a total of 1,723 trips were reported in travel diary and 2,134 GPS trips recorded. Excluding GPS trips that would have not been eligible to be reported in the diary and return journeys of round trips which would have been recorded as one trip within GPS, the comparable trip count for this group is 1,717 diary trips and 1,863 GPS trips (Table 8.22).

Table 8.22 Trip Analysis by Day*Base: Respondents with matchable GPS/diary trips who completed a diary and used GPS*

Travel Day	All Trips			Without Excluded Trips		
	Number of GPS trips	Number of diary trips	Raw diff	Number of GPS trips	Number of diary trips	Raw diff
Day 1	329	235	94	270	235	35
Day 2	282	248	34	247	247	0
Day 3	355	274	81	315	273	42
Day 4	295	221	74	245	221	24
Day 5	338	230	108	281	230	51
Day 6	265	248	17	248	247	1
Day 7	270	267	3	257	264	-7
<i>Total</i>	2134	1723	411	1863	1717	146

Of these trips, 388 trips were reported in the diary but not captured in the GPS data. This suggests that the level of GPS under-recording is in the region of 17 per cent (Table 8.23). Of the GPS trips, 330 were not reported in the diary although they appeared to be eligible for inclusion, suggesting that 16 per cent of eligible trips were not reported in the diary. However a number of other factors should be considered in estimating the likely level of under-reporting in the diary. Given that 96 of these unreported trips were flagged as potentially work-related, some may be eligible for exclusion. This will lower the estimated level of under-reporting in the diary.

Table 8.23 Missed Trip Analysis by Day (excluding trips not eligible for inclusion in diary)*Base: Respondents with matchable GPS/diary trips who completed a diary and used GPS*

Travel Day	Diary trips					GPS trips				
	Number with full match in GPS	Number with partial match in GPS	Number with no match in GPS	Additional trips recorded in GPS	Total trips	Number with full match in diary	Number with partial match in diary	Number with no match in diary	Additional trips recorded in diary	Total trips
Day 1	185	6	44	66	301	162	42	66	44	314
Day 2	195	0	52	23	270	161	63	23	52	299
Day 3	222	1	50	47	320	170	98	47	50	365
Day 4	172	6	43	37	258	140	68	37	43	288
Day 5	186	0	44	66	296	149	66	66	44	325
Day 6	179	8	60	40	287	156	52	40	60	308
Day 7	165	4	95	51	315	130	76	51	95	352
<i>Total</i>	1304	25	388	330	2047	1068	465	330	388	2251
<i>% of total trips</i>	64	1	19	16	100	47	21	15	17	100

On the other hand, it should be noted that there are 465 GPS trips which were only partially matched with the diary data (i.e. this means that only the start or end of the trip could be identified in the diary data), compared with only 25 diary trips that were partially matched. Some of these GPS trips will be where a single diary trip should have been recorded as multiple separate trips.²⁸

²⁸ The NTS reporting rules mean that respondents record journeys by main purpose and therefore if a respondent calls in at the newsagent on the way to work to buy a newspaper this may not be recorded as separate trip unless they have gone out of their way to do so.

As a result of this potential merging of trips in the diary, the true level of under-reporting within the diary may be considerably higher than the 16 per cent estimated above.²⁹ (Such merging of trips could also impact upon various trip estimates. Assuming that respondents have correctly summed the distances travelled across trips, the trips in the diary may still accurately reflect the total distance travelled. However, as the total number of trips made may be underestimated, the average trip distance overestimated. The total journey duration as calculated using the departure and arrival time may also be overestimated as it will include time spent at the interim stopping point.)

It should also be remembered that carrying the GPS device may have influenced respondents reporting behaviour, resulting in them taking more care to ensure that they include all eligible trips or, alternatively, relying upon the GPS device and being less interested in reporting all eligible trips in the diary.

8.7 Summary

This chapter has examined the diary and GPS data in detail. It is evident that the GPS devices do indeed capture trips that respondents have neglected to report in the travel diary but it is equally evident that the GPS data collected in this study did not include all trips with around one quarter of diary trips being unmatched by GPS data. Within this study and using the particular device selected, the GPS data appeared most effective at capturing car trips but was less successful with journeys made on foot or by public transport. In addition shorter diary journeys were less likely to be captured. To what degree this is due to respondent error (i.e. not carrying the device or other misuse), device error or processing rules is unclear, although there is strong evidence suggesting that respondent fatigue did set in towards the end of the travel week. The data also suggests that respondents may over-estimate the distance and duration entered into their travel diaries for a proportion of the journeys they make.

²⁹ Table 8.23 shows that the estimated total number of trips based on diary data is 2,047 compared with 2,251 based on the GPS data. In reality it is likely that the true total number of trips is somewhere between these two, assuming that all trips made have been captured in one or the other.

9 Lessons learnt and recommendations for the future

The use of a GPS device to capture travel behaviour presents a number of potential opportunities to enhance the data that is collected through the National Travel Survey diary:

- The ability to collect more accurate data on time and distance
- The ability to collect information on speed of travel and route taken
- The ability to capture information on all trips including all short walks
- Reducing the amount of information collected in the travel diary or switching to some form of prompted recall for the trip information not captured by a GPS device (such as purpose, cost)
- The calculation of weights to correct for the known under-reporting of trips in the travel diary

The feasibility of using GPS to achieve these things is dependent upon a number of factors:

- Whether respondents are willing to use GPS devices (acceptability)
- Whether respondents are able to use GPS devices (usability)
- Whether the devices collect the data anticipated (reliability)
- Whether the GPS data can be processed in a suitably consistent manner (consistency)
- Whether the GPS and diary data can be accurately matched (comparability)

This chapter sets out what has been learnt relating to these factors during the feasibility study and makes recommendations about how the DfT should proceed with regard to GPS and the National Travel Survey.

9.1 Acceptability of GPS devices

The feasibility study has shown that a high proportion (79 per cent) of eligible respondents within households interviewed were willing to fully participate in the study (i.e. conducted an interview, completed a travel diary and used a device). The manner in which interviewers introduced the travel diary and GPS element of the study undoubtedly had an impact on the likelihood of respondents agreeing to fully participate. Many interviewers introduced the diary and GPS elements of the study after the placement interview, once some rapport had been built with respondents. That said, there were still a number of respondents (14) who accepted a GPS device at interview but who later decided against using it.

In order to secure participation it was important to explain certain key issues:

- That use of the device was voluntary
- That the data collected was stored on the device itself (rather than transmitted back) and would only be used for research purposes and by the research team
- That they would not be held liable in cases of loss or damage

Interviewers thought that the GPS leaflet used was an invaluable aid as it clearly explained these and other issues. Any further studies should ensure that there is a clear document which covers any issues respondents are likely to have queries about. It is worth also worth remembering that this study focused upon adults only. Should future studies wish to include children, careful consideration would need to be given as to how to secure informed consent and potential concerns of parents.

Interviewers found it necessary to offer additional support to those who were less confident with technology (particularly older people) in order to secure and maintain participation. At times interviewers would have to visit or call the respondent more regularly to provide help. The need for some additional contacts, above the usual midweek check, should be allowed for on any future studies.

Although a high proportion of respondents found it acceptable to use the device during the travel week, there was a drop-off in the number of GPS trips recorded towards the end of the week. This suggests that the acceptability of the task is limited and respondents may become fatigued with using the device as time progresses. (There is also evidence of a similar drop-off in reporting with the NTS travel diary.) Future studies may want to consider a shorter data collection period so that the respondent burden is not too great and to minimise the drop-off.

9.2 Usability of GPS devices

Feedback from respondents and interviewers has highlighted that the ease with which the device can be used is an important factor in terms of whether respondents agree to use the device and maintain their use during the travel week. Respondents and interviewers highlighted how wearing the selected device on a strap around the neck and/or outside of one's clothing was not always practical and could draw unwanted attention, making respondents feel vulnerable. In addition, the tendency for the device used in this study to talk was off-putting and meant that some respondents actively chose not to carry the device on certain trips.

The device review undertaken in the early stages of the feasibility study did not identify a 'perfect' GPS device and the issues relating to the device talking were identified as a potential problem early on. With the rapid development of the technology available, it is hoped that in the future a more suitable device would be available that is small, discreet and easy to use and could preferably be carried inside a bag or pocket.

It also evident from the analysis of the GPS and diary data that some trips were not recorded even when people thought that they were carrying the devices correctly and did not encounter any problems. While this may be due to unrecognised device issues, it seems likely that some respondents did not follow the instructions provided by the interviewer as a result of miscomprehension. The respondent would have been faced with a great deal of information regarding the completion of the diary and the use of the GPS device at the same time. The potential for such information overload needs to be given careful consideration for any future studies. Some further element of support/training may be required in future combined diary/GPS studies. While testing data collections methods requires respondents to carry a GPS and complete a diary, it should be noted that the future of GPS use in travel surveys will be to replace diary usage, rather than asking respondents to do both.

9.3 Reliability of the selected GPS device and data

Although most of the 60 devices used on the study were reliable, a number of devices (five) were found to be faulty by NatCen staff and two devices developed faults whilst they were with respondents. In addition, 32 devices lost their configuration settings due to a software issue, consequently logging at distance rather than time intervals. (This was not detected until the GPS data was processed.) These issues had not been encountered in the pre-testing and highlight the necessity of thorough testing of both the hardware and software prior to using a device on a full-scale study. (It is feasible that the error was introduced into the software between the pre-testing and fieldwork and any further studies should be sure to check that no software changes occur during the course of the study.) Testing should include multiple waves of charging the devices,

configuring the devices, checking the configuration, using the device, downloading and processing the data.

It would also seem prudent to develop easy checks that can be conducted on the GPS data as soon as it is downloaded in order to detect any problems early in the fieldwork period.

These issues aside, the GPS devices failed to detect a substantial number of the trips reported in the travel diaries even where respondents reported that they had carried the device for all trips and not encountered any problems. Obviously not all respondents who said this will have followed the instructions provided to the letter. However, it may be that some of these missing trips are due to the device being unable to obtain a satellite signal or other device issues. Unfortunately the feasibility study does not enable us to separate the data loss due to respondent error and that which is due to the devices themselves.

9.4 Consistency of data processing

The GPS data was subject to a mixture of automated and manual processing. GeoStats' software package, TIAS, automatically identified trip ends according to pre-determined rules and then analysts manually reviewed, edited and confirmed the trip end locations. A similar procedure was adopted for mode and stage assignment, with automated identification and assignment being reviewed and amended by analysts.

There is likely to be some degree of variation with manual processing and so it is very important that there are clear rules which analysts can follow to ensure the data is processed as consistently as possible. The feasibility study did not include any testing of the consistency of the manual processing. If GPS data collection was to be rolled out on a large scale, greater automated processing would be desirable, if possible, and it would be important to develop clear rules for analysts to adhere to in their editing.

The processing of the GPS data was made more difficult by the lack of accurate origin and destination data. To aid processing, it would be desirable to have postcode level origin and destination data. However, requesting this information from respondents would substantially increase the burden placed on them and could deter many from participation, whether this information was requested as part of a travel diary or as part of a prompted recall exercise once the GPS data has been collected is something to consider.

9.5 Comparability of GPS and diary trips

In order to make use of GPS data and make the comparisons necessary to develop correction weights or reduce the diary element of the NTS, it is critical that GPS devices capture the vast majority of trips made by respondents. It is evident that the GPS devices do capture trips that respondents fail to record in their travel diaries but, in this feasibility study which covered a seven day period, only 72 per cent of diary trips were matched in the GPS data. As mentioned above, whether this is due to respondent and/or device error cannot be concluded. Regardless, a higher proportion of matches would be desirable before considering the possible calculation of correction factors and the like, as the findings from the feasibility study suggest that the GPS devices may also be missing some trips that respondents neglected to report in their travel diary.

It should be noted that had the devices operated as intended (i.e. maintained the correct configuration) it may be that the proportion of diary trips with matched data could have been higher. Similarly having more detailed origin and destination data may have benefited both GPS trip identification and the matching of GPS and diary trips. (Processing of GPS trips was more difficult for the 32 participants that had their data logged at 100 metre minimum distance frequencies rather

than every four seconds. This may have contributed to the lack of short GPS trips, as well as the decreased number of multistage trips, as it is difficult to discern a stage of say 250 metres when only two GPS points are available.)

9.6 Recommendations

GPS technology appears to be very promising. However, this feasibility study found a number of issues which need to be resolved before a large scale NTS style person-based study is undertaken.

It is evident that GPS does indeed capture trips that respondents have neglected to report in the travel diary but it is equally evident that not all trips were captured within the GPS data on this feasibility study. To what degree this is due to respondent error (i.e. not carrying the device or other misuse), device error or processing issues is unclear. The device selected for use by the DfT and NatCen presented a number of problems for those who participated in this study and raised unexpected challenges in the data processing due to the changing logging settings. Furthermore the design features of the NTS caused a number of problems and complexities that may not have been encountered in other GPS studies. These included the longer (seven day) deployment period, allowing for multimodal trips and the NTS reporting rules. Furthermore, the processing of the GPS data and matching with diary trips was made more difficult by the level of origin and destination data collected on NTS as standard.

There are a two main areas where further work is recommended - firstly, to review the availability of appropriate devices and secondly, to further test GPS technology in such a way that a clearer picture can be gained as to the degree to which missing data is due to respondent issues rather than device or processing issues.

Future technology review and testing

Finding an appropriate and reliable GPS device is crucial to being able to conduct a GPS enhanced travel survey. A review of technology was undertaken as part of this study. However, a number of problems with the selected device were encountered when it was used in the fieldwork on this study. The relevant technologies continue to advance and the potential to find a reliable, cost-effective, off-the-shelf device with sufficient power and storage capacity for the NTS should increase. Given the rapidity with which the technology is progressing, it would be appropriate to undertake a regular review of the devices which are new to the market to establish whether they meet the needs of NTS, including how the device can be carried/worn and whether it is sufficiently discreet.

It is further recommended that any potentially suitable devices are subject to an extended period of testing by the research team to fully explore any potential issues prior to making a decision as to whether the device is appropriate for use in any further feasibility work. The testing should involve multiple waves of configuration, use and downloading with simple checks being performed on the data to ensure configuration settings are maintained and data collected over the time periods expected.

It is also suggested that some testing work is undertaken with members of the general public to examine their comprehension of the instructions provided for using the GPS device and identify any potential barriers to using different devices. Findings from this work could feed into any future feasibility study using GPS technology.

In addition to reviewing the hardware available, developments in the processing of GPS data should also be monitored. As academics and researchers make greater use of GPS data, new

approaches to processing such data will be explored, opening up the potential for increased automation. Software for use in GPS-based prompted recall studies is being developed, with plans for use in 2010.

A small-scale one or two day travel diary and GPS study

The feasibility study placed a heavy burden on respondents during the travel week, with a seven day travel diary to complete, a GPS device to charge and carry, and a GPS daily record form to complete. Furthermore, the processing and matching of the GPS data was hampered by the lack of detailed origin and destination data (as well as some GPS data being logged at distance rather than time intervals). It therefore seems pertinent to explore the impact of reducing this burden in terms of the number of days, whilst collecting more detailed information which could aid the processing of the GPS data. To this end, a shorter (one or two day) travel diary could be trialled, alongside the use of a GPS device. Respondents would be asked to record all journeys regardless of how short plus full origin and destination data. (A slightly longer travel diary period of up to five days could be used on the basis that the drop-off in GPS use appeared on Day 6. However the additional burden of recording all trips and full origin and destination data will be considerable so it is recommended that a far shorter diary is used.)

It is recommended that the trial is split into two waves. One wave would involve a selected sample of respondents (possibly researchers) who agreed and could be relied upon to complete their travel diary fully for the entire period, accurately recording start and finish times and distance, and to use the GPS device as per the instructions. This would enable the GPS and diary data to be compared to establish to what degree GPS collects complete data when properly used. This data could also be used to look at the differences between GPS and diary distance and duration estimates to establish how close these measures are prior to any 'noise' being introduced by poor reporting in the diary and GPS misuse. The second wave would be undertaken with a sample of the general public which would provide an indicator to the degree to which respondent error contributes to differences in trip rates and estimates.

As part of this study, it would be recommended that some of the GPS data was processed more than once by different analysts to examine any data inconsistencies and to refine the data processing rules for analysts (assuming that a large part of the processing is undertaken manually).

Depending upon the findings of such a study, further consideration could then be given to exploiting the opportunities that GPS technology presents. However, on the basis of the experience of this feasibility study and the hardware available at that time, the ability of GPS technology to deliver the necessary data within the context of the seven-day NTS is unproven.

In some other countries, the decision to use GPS in household travel surveys has already been made. Following a pilot phase, a full scale study is currently being conducted in Cincinnati. This study will collect GPS-only data from 4,000 households in the region, with one third of the households participating in a web-based prompted recall interview based on the GPS data. Another study is planned in Jerusalem in 2010 involving 5,000 households and using face-to-face GPS-based prompted recall software. A GPS-based prompted recall study is also planned as part of the New York City regional household travel survey, also scheduled to start in 2010. The findings from these and other studies will help to inform future decisions about the use of GPS within the UK.

Appendix A Pre-testing results

Aims and method

Once the most appropriate GPS units had been identified by GeoStats, pre-fieldwork testing was conducted to trial the three shortlisted GPS devices (GlobalSat DG-100, Atmel BTT08, IBlue 747) and identify any potential problems with using them for the study.

Specifically this pre-fieldwork testing aimed to explore:

- Whether the devices are easy to use
- Whether the respondent instructions are understood by participants and provide all of the necessary information
- Whether participants remember to use the devices and use them as instructed
- Whether the devices meet manufacturers claims in terms of battery life and reliability
- Whether there are any problems experienced when downloading GPS data
- Whether there are any instances of data loss and the reasons for this

The participants for the trial consisted of volunteers from the DfT and NatCen research team. Participants were provided with a GPS unit and an information sheet providing instructions on how to use the device. Participants were asked to use the GPS device for a period of time (five to seven days) and to complete a daily feedback form, recording any problems experienced. They were also asked to complete a travel diary over the same period. GeoStats then undertook the processing of the GPS data and made some initial comparisons with the diary data.

Summary of findings

The Atmel and GlobalSat devices appeared to be suitable for use on the National Travel Survey. Both have advantages over the other. The GlobalSat device is simple to use and the data is easily downloaded and processed. The Atmel device is smaller, easier to carry/wear and benefits from a longer battery life should respondents forget to charge the device.

The two key concerns for a study of this nature were whether the device would be acceptable to respondents and whether the data would be sufficiently accurate and usable. The GlobalSat is the easiest to operate but was felt to be too bulky and difficult to carry/wear external to clothing by those participating in the pre-test. (It was believed that this could make it off-putting for respondents unless they were able to carry it inside a bag. However this would sometimes disrupt the signal received.) The Atmel was thought to be easier to carry but the data can be more problematic but still usable.

For the Atmel, it was identified that the instructions needed to be reviewed to draw attention to what the respondent should do if the device starts talking. The pre-testing also highlighted the need for interviewers also to be briefed to cover this in their explanations. In addition to this, it was recognised that it would be helpful if the device was issued with a larger clip to aid easy carrying/wearing.

The following table summarises the issues for each device tested.

	GlobalSat DG-100	Atmel BTT308	iBlue 747
Battery life	24 hours	48-72 hours with vibration sensor	20 hours
Functions	Has speed/distance screen but no vibration sensor	Has speed/distance screen and vibration sensor	Has speed/distance screen but no vibration sensor
Data recorded	Latitude, longitude, time, date, speed, altitude	Latitude, longitude, time, date, speed, altitude, bearing, HDOP/number of satellites	Latitude, longitude, time, date, speed, altitude, bearing
Settings	Settings maintained throughout testing	Settings maintained throughout testing	Settings not maintained for speed screen and logging interval
Charging	Problems initially encountered, but remedied with new chargers. Cannot tell when device is fully charged	Sometimes the cable needed to be jiggled before charging would start. Device can sometimes look like it is logging whilst charging. Benefits from a long battery life when used with vibration sensor.	Encountered some charging problems with one device but able to charge using USB
Carrying/wearing	Bulky and not always suitable to clip onto clothes. Bulkiness could deter respondents from taking it out on certain trips including jogging and social trips to pub etc. It would be more convenient to carry in bag.	Small and relatively easy to carry but would benefit from larger clip	Small and relatively easy to carry but would benefit from larger clip
Safety issues	Some conscious of it being on display due to size	Some conscious of it being on display when all the lights are flashing and when the device starts speaking.	Some conscious of it being on display when lights are flashing.
Ease of use	Simple to use	Lights can be confusing and it is surprising when it starts talking. Although the instructions did explain how to turn the volume down, testers did not always read them before using the device. The lights on the device sometimes seem to go off if there was no movement for a while.	Lights could be confusing. Instructions which explained how to turn the blue light off did not work – this was because the device did not retain its configuration so the blue light indicated that the memory was nearly full. Risk of switch being in wrong position and data not recorded.
Data format	.csv format	.csv format	.nmea format
Download	Straightforward	Straightforward but need to rename file	Takes a relatively long time, data file is much larger due to logging every second.
Trace accuracy		Route tends to be more 'wavy' than the GlobalSat	
Processed data compared to travel record	Collects most journeys, though some missed trips. Route can be difficult to make out if carried inside a bag.	Collects most journeys, though some missed trips. Route can be difficult to make out if carried inside a bag.	Collects most journeys, though some missed trips. Route can be difficult to make out if carried inside a bag.

Other observations

The testers encountered other issues that were not specific to particular devices but likely to be encountered with respondents such as forgetting to charge the device and forgetting to carry the device. On occasions, testers also chose to carry the device in way other than that recommended (i.e. putting it in a pocket or a bag). Realistically similar behaviour can be expected in the field.

Testers felt that using the GPS device had some impact on their diary completion. Some felt that they needed to ensure that all the information recorded in the diary was exact, as the GPS device would highlight their errors. Others felt that they could worry less about the detail in the diary as the GPS data would provide exact time, distance etc. Concern was also raised about whether respondents who forgot to take their GPS device on a journey may choose not to enter the journey in their diaries, rather than admit to having forgotten. Similarly if a respondent chose not to take the device with them (e.g. because it was difficult to carry when they were running), they may also decide not to 'own up' to doing this by not recording the journey in their diary.

Appendix B GPS leaflet

Frequently Asked Questions

I don't use much technology, what if I can't work the monitor properly?

The GPS monitors are simple to use and do not require any specialist knowledge. You will be given full, clear instructions on how to use the monitor and your interviewer will be happy to help if you have any problems during the week. You can also call the number provided on the GPS instruction sheet.

Will the GPS monitor harm me in any way?

No, the GPS monitor cannot harm you. The rechargeable battery is securely housed in the device shell. The monitor does not emit radiation, electrical current, vibration, or heat.

What if I lose or damage the monitor?

The monitor is an expensive piece of equipment. We would appreciate your help in keeping it safe at all times, however we will not hold you responsible if any harm comes to it.

I'm already completing a diary, why do you need me to carry a GPS device as well?

The GPS monitor will provide us with additional information on routes taken and speed of travel, as well as accurate distance and time data.

Are you doing this so you can keep track of where I go?

The GPS monitor does not transmit your position back to a central computer but simply stores the data in its memory until the device is returned.

I don't travel much, will I need to use a GPS monitor?

It is important that we include everyone's experiences of travel however much or little they do. Carrying a GPS monitor on the journeys you do make will help to ensure the information we collect is representative of the different types of journeys that people make.

P2803 NTS GPS



National Travel Survey – GPS Study

The National Travel Survey collects information on personal travel within Great Britain. Each year we ask over 15,000 households to take part, asking household members to complete a travel diary for seven days.

As part of this study, we would also like participants to use a GPS monitor. This leaflet provides more information about the GPS monitor and why we are asking you to use it.



Department for
Transport

 **NatCen**
National Centre for Social Research

What is a GPS monitor?

GPS stands for Global Positioning System. A GPS monitor is a small device, about the size of a mobile phone, that logs your position every few seconds. This information is then stored on the device itself until the memory is cleared.

Why do we want to collect information using GPS?

The diaries used on the National Travel Survey give us detailed information about people's travel patterns including the modes of transport they use and the reasons for the journeys they make. However sometimes people are not sure about the exact distances they have travelled or how long a particular journey has taken them. The GPS monitors will give researchers accurate information on the times and distance of journeys, as well as information on speed and the route type, helping to complete our understanding of travel patterns.

What will be done with information collected?

The GPS data will be securely transferred to GeoStats in the United States, alongside the information you recorded in your diary and some of the information given to the interviewer during the interview. GeoStats are GPS experts and will be linking the diary and GPS information.

The combined information will then be used by NatCen and the main users of the data, the Statistics Travel Division of the Department for Transport (DfT).

Is the study confidential?

Yes. NatCen and the main users of the data, the Statistics Travel division of the Department for Transport (DfT), are bound by the same code of confidentiality, which GeoStats are also committed to uphold. (See <http://www.geostats.com/privacy.htm> for further details).

Your answers and information will be treated in strict confidence in accordance with the Data Protection Act. They will be used for

statistical research purposes only. Names and addresses are never included in the results and are never passed to DfT.

Is using the GPS monitor compulsory?

No. We rely on voluntary co-operation for all aspects of our surveys. The success of the study depends on the goodwill and co-operation of those asked to take part. The more people who do use a GPS monitor, the more useful the results will be. However, you are free to withdraw from the study at any time.

What am I supposed to do with the GPS monitor?

We would like you to carry the monitor whenever you travel during the same seven days as you complete the travel diary. Please take the monitor with you whenever you travel no matter how short the journey. You do not need to wear it when you are moving around indoors but you may prefer to keep the monitor on you at all times so that you do not forget it.

The GPS monitor operates using a rechargeable battery. To ensure that the battery does not run out, please recharge the monitor every night (including the night before you use it for the first time).

Do I get anything for using the GPS monitor?

If you complete the diary and use the GPS monitor, you will be sent a £10 high street voucher as a token of appreciation for your time and to thank you for taking part.

Any other questions?

You can find some frequently asked questions on the next page but if you have any other questions about the survey or the GPS monitor, please do not hesitate to ring either Sandra Laver or Sheila Duke on freephone 0800 652 4568.

Appendix C GPS participant instructions

GPS INSTRUCTIONS FOR PARTICIPANTS

HOW TO CHARGE THE GPS DEVICE

Please plug in and charge the GPS device as soon as possible and leave it charging overnight before you begin using it.

1. Insert the small end of the charger into the opening on the bottom of the GPS device.



2. Plug the other end of the charger into the electric socket.



Central green light will blink twice quickly when charging. When complete the light will blink once quickly.

3. When the charger is plugged in, the central green light on the GPS device will begin blinking twice, quickly, indicating that it is charging. When charging is complete, the light will only blink once quickly (when switched on).
4. Recharge the GPS device every evening once you are home for the night so that it is fully charged for the following day.

HOW TO SWITCH ON THE GPS DEVICE

1. Turn the GPS device on by pressing and holding the centre power button for three seconds. The green light will flash when the device is turned on.
2. The green light should then start blinking, meaning the device is ready to collect data.
3. Make sure that the device is switched on at the start of every day and throughout the day.
4. To turn the device off, press and hold the middle button until the green light is solid.



**Green light (middle)
should be blinking**

HOW DO I KNOW IF THE DEVICE IS WORKING?

If the device is working, the green light should be on and flashing. The red light (to the left of the green) will also flash sometimes.

If this is not the case or you are unsure, restart the device by pressing and holding the power button until the green light is solid, and then pressing and holding the power button again until the green light flashes.

HOW AND WHEN DO I CARRY THE GPS DEVICE?

You can either:

- wear the device around your neck using the strap provided, or
- clip the device on to the outside of your bag, rucksack or belt loop.

The device should be worn outside of coats or jackets, as far as possible. It should not be carried inside a bag as this can result in the signal being interrupted and/or accidental changing of the device settings.

WHEN DO I NEED TO CARRY THE DEVICE?

- Wear the GPS device whenever you are travelling, regardless of the method of transport used (i.e. car, bus, train, bicycle, foot etc).
- Wear the GPS device whenever you go for a walk, jog or bike ride.
- You do not need to wear the GPS device when you are inside a building, but remember to put it back on whenever you go outside.

FREQUENTLY ASKED QUESTIONS

What should I do if there is a red flashing light?

- This is fine – you do not need to do anything.

What should I do if there is a blue flashing light?

- If there is a blue light, please press and hold the middle power button and the 'BT' button on the right hand side at the same time. This should turn off the blue light.

What should I do if the device starts speaking?

- This device has a voice feature that is not needed for this study. If you hear the voice, repeatedly press the right 'BT' button to turn the volume down until you can no longer hear the voice.

What should I do if it rains?

- The GPS device is shower-proof so please continue to use the device as normal in the event of light rain. If it is raining very heavily, you may temporarily place the device inside your clothing. This will affect the quality of the signal so please revert to carrying the device as normal as soon as the heavy rain stops.

What should I do if I am playing sport outdoors?

- If you play tennis, football or other outdoor sports, take the GPS device off and place it next to the court or field facing up. Be sure to take it with you when you leave.

Should I switch the device off when I am indoors?

- There is no need to switch the device off when you are indoors as the battery should last for a full day. However, please switch off the GPS device if you are entering a hospital to prevent the device interfering with any of the medical equipment - but remember to switch it back on as you leave.

If you have any other questions or are having problems with your GPS device, please contact Sheila Duke on 01277 690043.

Appendix D Daily record sheet

Area Add H Chkl P



National Travel Survey - GPS daily record sheet

Please complete this for each day of the travel diary.

Did you charge the GPS monitor at all today?
Tick one box for each day

	Before Day 1	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Yes								
No								

Did you carry your GPS monitor when you were travelling today?
Tick one box for each day

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Yes – for all journeys							
Yes – for some journeys							
No – but did make journeys							
Did not travel today							

PLEASE TURN OVER

Information classification Level 3 – Respondent – Confidential

Did you experience any problems using the monitor today?

Tick all that apply for each day

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
No problems							
Forgot to carry							
Inconvenient to carry							
Battery ran out							
Problem with charging							
Device started talking							
Other problems (please provide details in the box below)							

Are there any other comments you would like to make about the GPS monitor and how you found using it? If so, please write below.

Thank you.

Information classification Level 3 – Respondent – Confidential

Appendix E Questionnaire

Household Questionnaire

BID/QID.NTS

Area

AREA NUMBER.
JUST PRESS <Enter>.

Address

ADDRESS NUMBER.
JUST PRESS <Enter>

Hhold

HOUSEHOLD NUMBER.
JUST PRESS <Enter>.

BSignin/ QSIGNIN.NTS

RECORD ALWAYS

AdrField

PLEASE ENTER THE FIRST TEN CHARACTERS OF THE FIRST LINE OF THE ADDRESS TAKEN FROM A.R.F. ADDRESS LABEL FOR THE FIRST HOUSEHOLD AT THIS ADDRESS. MAKE SURE TO TYPE IT EXACTLY AS IT IS PRINTED.

No DK, No refusal

RECORD ALWAYS

StatusQ

What is the status of this interview?
INTERVIEWER: IF YOU ARE NOW STARTING THE PICK-UP INTERVIEW, CHANGE THE CODE TO '2' THEN PRESS <ENTER> AND <END> TO GO TO THE FIRST PICK UP QUESTION. YOU CANNOT GO BACK TO CODE '1' ONCE YOU HAVE CODED '2'

1. Placement interview
2. Pick-up interview

No DK, No refusal

RECORD ALWAYS

StartDat

DATE PLACEMENT INTERVIEW WITH THIS HOUSEHOLD WAS STARTED
PRESS ENTER TO CONFIRM DATE
: DATETYPE

RECORD ALWAYS

FirstQ

INTERVIEWER: IS THIS THE FIRST TIME YOU HAVE OPENED THIS QUESTIONNAIRE?

(TO UPDATE ADMIN DETAILS PRESS <CTRL + ENTER>)

1. the first time you've opened this questionnaire
2. or the second or later time?
5. EMERGENCY CODE IF COMPUTER'S DATE IS WRONG AT LATER CHECK

RECORD ALWAYS

TravDate

INTERVIEWER: ENTER START DATE OF TRAVEL WEEK FOR THIS HOUSEHOLD.
: DATETYPE
NO DK, No Refusal

RECORD ALWAYS

Summary

INTERVIEWER: Summary of PLACEMENT interviewing (Placement Interviewing not done yet in red):

Session 1: Name unfinished / reached end
Session 2: Name unfinished / reached end
Session 3: Name unfinished / reached end
Session 4: Name unfinished / reached end
Make a note of the session for anyone coded as unavailable. Use <CTRL+ENTER> at any point and select the appropriate session to complete individual interviews for people if they become available.

Vehicles: Name unfinished / reached end.
When you press the END key you will be stopped at any place where you coded 'later'
1. Press 1 and <Enter> to continue.

RECORD ALWAYS

Whohere

I am just going to ask you some questions about the members of your household to help us understand your travel patterns. What are the first names or initials of the people who normally lives at this address?

1. Press <ENTER> to continue

BBNames/ QNAMES.HAR

ASK ALWAYS

Name

RECORD NAME/IDENTIFIER FOR EACH MEMBER OF THE HOUSEHOLD.

Helpscreen:

WHEN ALL HOUSEHOLD MEMBERS HAVE BEEN ENTERED, PRESS PgDn
PRIMARY SET OF QUESTIONS ON HOUSEHOLD COMPOSITION AND

RELATIONSHIPS ASKED ON ALL SURVEYS.

HOUSEHOLD COMPOSITION

Stage 1: Establish Residency - only/main residence 6 month rule/ Check Adult Children

Stage 2: One or more households - 'Do you all share at least one main meal a day or share living accommodation?'

Stage 3: Establish Household Reference Person (HRP) - 'In whose name is the accommodation owned or rented?'

INTERVIEWER: If joint owners then enter one of the joint owners. HRP will be established later

DEMOGRAPHICS

BHComp / QTHCOMP.NTS

ASK ALWAYS

Sex

NAME

INTERVIEWER: CODE SEX OF RESPONDENT

1. Male
2. Female

ASK ALWAYS

Birth

NAME

What is your date of birth?

FOR DAY NOT GIVEN....ENTER 15 FOR DAY.

FOR MONTH NOT GIVEN....ENTER 6 FOR MONTH

ENTER FULL YEAR, eg. 9/11/1952

RATHER THAN 52

: DATETYPE

IF respondent does not know their date of birth or refuses to provide it (Birth = DK OR refusal)

Agelf

NAME

What was your age last birthday?

98 or more = CODE 97

: 00..97

No DK, No refusal

Helpscreen:

IF YEAR OF BIRTH NOT GIVEN

What was your age last birthday?

Interviewer note:

If respondents refuse to give their age, or cannot, then give your best estimate.

IF age is 16 or over (DVAge >= 16)

DVage

(Computed variable) Age of each person in the house.

DM510

(Computed variable) How many people in the house aged 5 to 10.

DM1115

(Computed variable) How many people in the house aged 11 to 15.

DM1619

(Computed variable) How many people in the house aged 16 to 19.

DM713

(Computed variable) How many people in the house aged 7 to 13.

IF age is 16 or over (DVAge >= 16)

MarStat

NAME ASK OR RECORD CODE FIRST THAT APPLIES

Are you

1. single, that is, never married
2. married and living with your husband/wife
3. married and separated from your husband/wife
4. divorced
5. or widowed?

No DK, No refusal

INTERVIEWER: IF THE RESPONDENT IS IN A SAME-SEX CIVIL PARTNERSHIP CODE THEM AS IF THEY WERE MARRIED.

Helpscreen:

The aim is to obtain legal marital status, irrespective of any de facto arrangement.

The only qualification to this aim is that you should not probe the answer 'separated'.

Should a respondent query the term, explain that it covers any person whose spouse is living elsewhere because of estrangement (whether the separation is legal or not).

Ignore temporary absences, e.g. on oil rig.

A person whose spouse has been working away from home for over 6 months, e.g. on a contract overseas or in the armed forces, should still be coded as married and living with husband/wife if the separation is not permanent.

IF Marital status is not married and living with husband/wife (Marstat is not 2)

LiveWith

NAME

ASK OR RECORD

May I just check, are you living with someone in the household as a couple?

1. Yes
2. No
3. SPONTANEOUS ONLY - same sex couple

No DK, No refusal

Helpscreen:

Only respondents who are living with their partner in this household should be coded as living together as a couple. You may code No without asking the question ONLY if all members of the household are too closely related for any to be living together in a de facto marital relationship.

IF age is 16 or over (DVAge >= 16)

Hhldr

NAME

In whose name is the accommodation owned or rented?

ASK OR RECORD.

1. This person alone
2. This person jointly
3. NOT owner/renter

Helpscreen:

You can ask this question once, covering the whole household, the first time it comes up on screen. Then ASK or RECORD for individuals as necessary.

ASK ALWAYS

EthGroup

SHOW CARD A

NAME

To which of these ethnic groups do you consider you belong? Please choose from this card...

1. White British
2. Another white background
3. White and Black Caribbean
4. White and Black African
5. White and Asian
6. Any other Mixed background
7. Indian
8. Pakistani
9. Bangladeshi
10. Any other Asian background
11. Caribbean
12. African
13. Any other Black background
14. Chinese
15. Any other

Helpscreen:

We need to know what ethnic group the respondent thinks he or she is in (or, if you are taking proxy information, what group the

respondent thinks another household member is in). Never attempt any judgement of your own

IF ethnic group = another white background (Ethgroup = 2)

OthWht

Please can you describe your ethnic group?
ENTER DESCRIPTION OF ETHNIC GROUP.

IF ethnic group = any other mixed background (Ethgroup = 6)

OthMxd

Please can you describe your ethnic group?
ENTER DESCRIPTION OF ETHNIC GROUP.

IF ethnic group = any other asian background (Ethgroup = 10)

OthAsn

Please can you describe your ethnic group?
ENTER DESCRIPTION OF ETHNIC GROUP.

IF ethnic group = any other black background (Ethgroup = 13)

OthBlk

Please can you describe your ethnic group?
ENTER DESCRIPTION OF ETHNIC GROUP.

IF ethnic group = any other (Ethgroup = 15)

OthETH

Please can you describe your ethnic group?
ENTER DESCRIPTION OF ETHNIC GROUP.

BHRP / QHRP.NTS

IF the accommodation is jointly owned or rented/there is more than one householder (NumHHldr > 1)

HiHNum

You have told me that [Names] jointly own or rent the accommodation. Of these, who has the highest income (from earnings, benefits, pensions and any other sources)?

IF THEY HAVE THE SAME INCOME, CODE 11

INTERVIEWER: THESE ARE THE JOINT HOUSEHOLDERS

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

ENTER PERSON NUMBER

Helpscreen:

IF THE RESPONDENT ASKS, EXPLAIN THAT WE ARE ASKING THIS QUESTION AS A CONSISTENT METHOD OF DETERMINING WHO WILL ANSWER SOME OF THE QUESTIONS WHICH FOLLOW.

IF TWO OR MORE JOINT HOUSEHOLDERS HAVE THE SAME INCOME, SELECT THE ELDEST.

IF RESPONDENT ASKS FOR PERIOD TO AVERAGE OVER – LAST 12 MONTHS, AS CONVENIENT.

PROMPT AS NECESSARY IS ONE JOINT HOUSEHOLDER THE SOLE PERSON WITH:

- PAID WORK?
- OCCUPATIONAL PENSION?

IF the joint householders have the same income (HiHNum = 11)

JntEldA

ENTER PERSON NUMBER OF THE ELDEST JOINT HOUSEHOLDER FROM THOSE WITH THE SAME HIGHEST INCOME.

ASK OR RECORD

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

No DK, No refusal

IF the highest income of joint householders is refused or not known (HiHNum = DK OR Refusal)

JntEldB

ENTER PERSON NUMBER OF THE ELDEST JOINT HOUSEHOLDER

ASK OR RECORD

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9

10. Person 10

No DK, No refusal

BHRels / QTHRELS.HAR

ASK ALWAYS

R

CODE RELATIONSHIP OF EACH HOUSEHOLD MEMBER TO THE OTHERS - [Name] is [Name]'s...

1. Spouse
2. Cohabitee
3. Son/daughter (incl. adopted)
4. Step-son/daughter
5. Foster child
6. Son-in-law/daughter-in-law
7. Parent/guardian
8. Step-parent
9. Foster parent
10. Parent-in-law
11. Brother/sister (incl. adopted)
12. Step-brother/sister
13. Foster brother/sister
14. Brother/sister-in-law
15. Grand-child
16. Grand-parent
17. Other relative
18. Other non-relative

Helpscreen:

You may want to introduce this section. A possible introduction is: 'There are a lot of changes taking place in the make-up of households/families and this section is to help find out what those changes are. I'd like you to tell me the relationship of each member of the household to every other member.' This section must be asked for all households consisting of more than one person. Please ask in every case. You should not make assumptions about any relationship.

Treat relatives of cohabiting members of the household as though the cohabiting couple were married, unless the couple are a same sex couple.

Half-brothers/sisters should be coded with step-brothers/sisters.

See interviewer instructions for further details.

BSPout / QSPOUT.NTS

IF respondent has said they are married and living with spouse but they are without a spouse in the household (MarStat = 2 AND (Spouses [Loop1] = 0))

SpOut

INTERVIEWER:

You've recorded [Name] as 'Married & living with spouse', but without a spouse in the household. PLEASE CHECK THIS. If spouse is away for six months or more, press 1 and enter to continue.

BUT IF NOT (eg if separated), ENTER 2 AND AMEND HOUSEHOLD GRID.

1. Married, spouse not in household
 2. Other - AMEND HOUSEHOLD GRID
- No DK, No Refusal

ACCOMMODATION

BAccom / QACCOM.NTS

RECORD ALWAYS

Accom

INTERVIEWER CODE: IS THE HOUSEHOLD'S ACCOMMODATION:

N.B. MUST BE SPACE USED BY HOUSEHOLD

1. a house or bungalow
2. a flat or maisonette
3. a room/rooms
4. ...other?

Helpscreen:

If the household occupies a flat in a converted house, code 2

which are joined together.

A house at the end of a terrace must be coded 3 even if there are only three houses in the terrace.

Houses which are joined only by a garage (link-detached) should be coded as detached.

IF Household accommodation is a flat or maisonette (Accom = 2)

FltTyp

INTERVIEWER CODE: IS THE FLAT/MAISONETTE:

1. a purpose-built block
2. a converted house/some other kind of building?

IF Household accommodation is another type (Accom = 4)

AccOth

INTERVIEWER CODE: IS THE ACCOMMODATION A:

1. caravan, mobile home or houseboat
2. or some other kind of accommodation?

BTenure / QTENURE.NTS

ASK ALWAYS

Ten1

SHOW CARD B

In which of these ways do you occupy this accommodation?

MAKE SURE ANSWER APPLIES TO [NAME] - THE HRP

1. Own outright
2. Buying it with the help of a mortgage or loan
3. Pay part rent and part mortgage (shared ownership)
4. Rent it
5. Live here rent-free (including rent-free in relative's/friend's property; excluding squatting)
6. Squatting

Helpscreen:

This question is looking for formal legal tenure (e.g. a widow living in a house bought by her son (in his name) who is living elsewhere, should be coded as living rent free though she may regard herself as an owner occupier.

OWNERS - only code person as an owner if they have a mortgage. Owners are also people who pay a service charge.

SHARED OWNERS - ie pay part rent and part mortgage, and will receive some of the proceeds from the sale of the property.

RENT-FREE - the person pays upkeep but not formal rent.

TIED ACCOMODATION - these are private renters. Code according to whether person pays rent (code 4) or lives rent free (code 5).

SCHEMES - 'Rent to mortgage' schemes are available to council tenants, where they have a right to buy a share of their home for roughly the same price as the rent. Anyone purchasing their home under this scheme should be coded 2

HOUSING ACTION TRUSTS - i.e. tenant rents from local authority

CO-OWNERSHIP - This no longer exists.

HOUSING CO-OPERATIVE - (code 4) renting from housing association

COMMONHOLD - code as owner

PRIVATE SECTOR - i.e. private property rented from the council

HOME INCOME PLANS & RETIREMENT HOME PLANS - code as owner.

SCHEMES FOR MORTGAGE

DEFAULTERS - Code as renting.

LOCAL TRANSPORT SERVICES

BLocServ / QLOCSERV.NTS

ASK ALWAYS

ServIntr

INTERVIEWER: ANYONE IN THE HOUSEHOLD WHO KNOWS THE ANSWERS CAN BE ASKED THESE QUESTIONS.

I would like to ask you a few questions about local bus and train services. First I would like to ask about your local bus service...

1. Press <Enter> to continue.

ASK ALWAYS

NearBus

About how long would it take (me) to walk from here to the nearest bus stop or place where I could get on a bus? I am interested in the nearest one even if it isn't the main one you use.

INTERVIEWER: REMEMBER WE WANT TO KNOW HOW LONG IT WOULD TAKE AN AVERAGE PERSON (APPROX. 3 MPH /5KPH), SO IF THE RESPONDENT IS OBVIOUSLY ELDERLY OR INFIRM THEN ASK HOW LONG IT WOULD TAKE "ME" (I.E. YOU THE INTERVIEWER) TO WALK THERE.

TEMPORARY BUS STOPS DO NOT COUNT

RECORD TO NEAREST MINUTE
IF RESPONDENT DOES NOT KNOW,
ENTER <CTRL-K> AND ENCOURAGE
ESTIMATE AT NEXT QUESTION

IF the time it would take to walk to the nearest bus stop is not known (NearBus = DK)

NearBand

SHOW CARD C

Taking your answer from this card, approximately how long would it take (me) (to walk to your nearest bus stop)?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

1. 6 minutes or less
2. 7-13 minutes
3. 14-26 minutes
4. 27-43 minutes
5. 44 minutes or longer

ASK ALWAYS

GetBus

How frequent are the buses from that bus stop during the day? Is there ... READ OUT

...

IF 'VARIES' TAKE WEEK DAY OFF-PEAK FREQUENCY

1. ...Less than one a day,
2. at least one a day,
3. at least one an hour,
4. at least one every half-hour,
5. or, at least one every quarter of an hour?

ASK ALWAYS

NearSta

Now thinking of your local train service, how long would it take (me) to walk to your nearest railway (that is, National Rail) station? (Again I am interested in the NEAREST one, even if it is not the main one or the one you use).

IF TOO FAR TO WALK, PROBE: If you did walk, how long would it take? DO NOT INCLUDE UNDERGROUND STATIONS. RECORD TO NEAREST MINUTE
IF RESPONDENT DOES NOT KNOW,
ENTER <CTRL-K> AND ENCOURAGE
ESTIMATE AT NEXT QUESTION

IF the time it would take to walk to the nearest train station is not known (NearSta = DK)

BanRail

SHOW CARD C

Taking your answer from this card, approximately how long would it take (me) (to walk to your nearest railway station)?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

1. 6 minutes or less
2. 7-13 minutes
3. 14-26 minutes
4. 27-43 minutes
5. 44 minutes or longer

ASK ALWAYS

BusSta

How long would it take (me) to get to the railway station by bus? Please include any time spent walking but not waiting time.

RECORD TO NEAREST MINUTE
IF RESPONDENT DOES NOT KNOW,
ENTER <CTRL-K> AND ENCOURAGE
ESTIMATE AT NEXT QUESTION
IF QUICKER TO WALK, ENTER <CTRL K>
AND CODE 6 AT NEXT QUESTION
IF NO CONVENIENT BUS SERVICE,
ENTER <CTRL K> AND CODE 7 AT NEXT
QUESTION.

Helpscreen:

A 'convenient' bus service means within 13 minutes walk of a stop with a service at least once per hour

IF the time it would take to take the bus to the nearest railway station is not known (BusSta = DK) OR if it is quicker to walk or there is no convenient bus service

BanBus

SHOW CARD D

Taking your answer from this card, approximately how long would it take (me) (to get to your nearest railway station by bus)?

INTERVIEWER: IF DK ENCOURAGE

ESTIMATE

IF BOTH CODE 6 AND 7 APPLY, USE CODE 7.

1. 6 minutes or less
2. 7-13 minutes
3. 14-26 minutes
4. 27-43 minutes
5. 44 minutes or longer
6. Quicker to walk
7. No convenient bus service

ASK ALWAYS

DescTa

What is your nearest railway station like? Is it ... READ OUT...

1. ...a station with frequent services throughout the day (at least once per hour),
2. a station with frequent services only during rush hours (at least once per hour),
3. or a station with less frequent services?

ASK ALWAYS

ClosSta

Is there a (London Underground), metro, light rail or tram stop which is closer?

IF YES, PROBE: Which type of stop is closer?

1. London Underground
2. Metro
3. Light Rail
4. Tram
5. No, no other stop is closer

IF there is a tube London Underground/metro/light rail/tram closer than the nearest railway station (ClosSta =1, 2, 3, or 4)

NearTube

How long would it take (me) to walk to your nearest [tube/metro/light rail/tram] stop?

RECORD TO NEAREST MINUTE

IF RESPONDENT DOES NOT KNOW, ENTER <CTRL-K> AND ENCOURAGE ESTIMATE AT NEXT QUESTION

IF the time it would take to walk to nearest London Underground/metro/light rail/tram

stop is not known (ClosSta =1, 2, 3, or 4 AND NearTube = DK)

BanTube

SHOW CARD C

Taking your answer from this card, approximately how long would it take (me) (to walk to your nearest [tube/metro/light rail/tram] stop)?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE

1. 6 minutes or less
2. 7-13 minutes
3. 14-26 minutes
4. 27-43 minutes
5. 44 minutes or longer

IF there is a tube London Underground/metro/light rail/tram closer than the nearest railway station (ClosSta =1, 2, 3, or 4)

BusTube

And how long would it take (me) to get to the nearest [tube/metro/light rail/tram] stop BY BUS? (including any time spent walking but not waiting time)?

RECORD TO NEAREST MINUTE

IF RESPONDENT DOES NOT KNOW, ENTER <CTRL-K> AND ENCOURAGE ESTIMATE AT NEXT QUESTION

IF QUICKER TO WALK, ENTER <CTRL K> AND CODE 6 AT NEXT QUESTION IF NO CONVENIENT BUS SERVICE, ENTER <CTRL K> AND CODE 7 AT NEXT QUESTION.

Helpscreen:

A 'convenient' bus service means within 13 minutes walk of a stop with a service at least once per hour

IF the time it would take to get bus to nearest London Underground/metro/light rail/tram stop is not known (ClosSta =1, 2, 3, or 4 AND BusTube = DK)

BanTBus

SHOW CARD D.

Taking your answer from this card, approximately how long would it take (me) (to get to your nearest ^tubetxt stop by bus)?

INTERVIEWER: IF DK, ENCOURAGE ESTIMATE

IF BOTH CODE 6 AND 7 APPLY, USE CODE 7.

1. 6 minutes or less
2. 7-13 minutes
3. 14-26 minutes
4. 27-43 minutes
5. 44 minutes or longer
6. Quicker to walk
7. No convenient bus service

ACCESSIBILITY OF SERVICES

BAmenity / QAMENITY.NTS

ASK ALWAYS

IntroA

I would now like to ask you some questions about how long it would take to get to certain places using whichever is the quickest route. INTERVIEWER: IF BY FOOT – REMEMBER WE WANT TO KNOW HOW LONG IT WOULD TAKE AN AVERAGE PERSON (APPROX. 3 MPH /5KPH), SO IF THE RESPONDENT IS OBVIOUSLY ELDERLY OR INFIRM THEN ASK HOW LONG IT WOULD TAKE “ME” (I.E. YOU THE INTERVIEWER) TO WALK THERE. IF BY PUBLIC TRANSPORT - DO NOT INCLUDE ONE-OFF DELAYS.

1.Press 1 and <Enter> to continue.

ASK ALWAYS (odd and even years)

AccGP

How long would it take (me) to get to the nearest GP surgery (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

INTERVIEWER: RECORD NORMAL JOURNEY TIME TO NEAREST MINUTE. IF GREATER THAN 97 MINUTES CODE 97. IF RESPONDENT DOES NOT KNOW, ENTER <CTRL-K> AND ENCOURAGE ESTIMATE AT NEXT QUESTION.

:0..97

IF (AccGP=DK)

AccGPDK

SHOW CARD E

Taking your answer from this card, approximately how long would it take (me) to get to the nearest GP surgery (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

1. 15 minutes or less
2. 16-20 minutes
3. 21-30 minutes
4. 31-40 minutes
5. 41-60 minutes
6. 61 minutes or longer

ASK ALWAYS (odd and even years)

AccGro

How long would it take (me) to get to the nearest shop selling groceries (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

NOTE: We are referring to the NEAREST shop where they can buy groceries. This is not necessarily where they usually shop.

INTERVIEWER: RECORD NORMAL JOURNEY TIME TO NEAREST MINUTE. IF GREATER THAN 97 MINUTES CODE 97. IF RESPONDENT DOES NOT KNOW, ENTER <CTRL-K> AND ENCOURAGE ESTIMATE AT NEXT QUESTION.
:0..97

IF (AccGro=DK)

AccGroDK

SHOW CARD E

Taking your answer from this card, how long would it take (me) to get to the nearest shop selling groceries (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

1. 15 minutes or less
2. 16-20 minutes
3. 21-30 minutes
4. 31-40 minutes
5. 41-60 minutes
6. 61 minutes or longer

ASK EVEN YEARS ONLY (Module A)

AccPO

How long would it take (me) to get to the nearest post office (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

INTERVIEWER: RECORD NORMAL JOURNEY TIME TO NEAREST MINUTE. IF GREATER THAN 97 MINUTES CODE 97. IF RESPONDENT DOES NOT KNOW, ENTER <CTRL-K> AND ENCOURAGE ESTIMATE AT NEXT QUESTION.
:0..97

IF (AccPO=DK)

AccPODK

SHOW CARD E

Taking your answer from this card, approximately how long would it take (me) to get to the nearest post office (even if it is not the one you use) on foot or by public transport using whichever is the quickest?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

1. 15 minutes or less
2. 16-20 minutes
3. 21-30 minutes
4. 31-40 minutes
5. 41-60 minutes
6. 61 minutes or longer

ASK EVEN YEARS ONLY (Module A)

Order

SHOW CARD F.

I'd now like to ask a few questions about things which your household might have had delivered.

Nowadays, does anyone in your household (do you) ever order any of these things over the phone, by post or on the internet?

CODE ALL THAT APPLY

1. Food and drink (not including take away meals)
2. Clothes
3. Books/CDs/software
4. Furniture
5. Holiday/travel tickets
6. Any other tickets (not for travel)
7. Plants/bulbs/flowers
8. Health Goods
96. Anything else
9. None of these

Helpscreen:

We ask this question because we want to see to what extent shopping by phone/post/internet reduces people's need to travel. Thus we are only interested in goods ordered in one of these ways and NOT in goods bought in person but delivered by the shop later on.

ASK EVEN YEARS ONLY (Module A)

IF Household orders deliveries by phone, post or the internet (Order = Response AND is not 98)

Deliv

SHOW CARD G.

Can you tell me how often you or anyone in your household has any of these things delivered, which have been ordered by phone, by post or on the internet?

ONLY INCLUDE THINGS FOR DOMESTIC USE

EXCLUDE LETTERS/ MILK/ NEWSPAPERS/MAGAZINES and TAKE AWAY MEALS

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than once a year

Helpscreen:

If a self-employed person gets things for their business delivered to home, don't count this

unless the items are primarily for personal use. Exclude catalogues but include anything ordered from them. Items don't have to be ordered from or delivered to home.

ASK EVEN YEARS ONLY (Module A)

IF Household orders deliveries by phone, post or the internet AND Household has deliveries more than once a year (Order = Response AND is not 9 AND Deliv = 1, 2, 3, 4 or 5)

LastD

SHOW CARD F.

What was the last delivery of this sort that your household (you) received?

CODE ALL THAT APPLY

1. Food and drink (not including take away meals)
2. Clothes
3. Books/CDs/software
4. Furniture
5. Holiday/travel tickets
6. Any other tickets (not for travel)
7. Plants/bulbs/flowers
8. Health Goods
97. Anything else (specify)

IF another item was last delivered, not listed at LastD (LastD=97)

XLastD

Please specify other answer.

ASK EVEN YEARS ONLY (Module A)

IF household had something delivered (LastD = Response)

HowOrd

And was this ordered by phone, by post or on the internet?

1. by phone
2. by post
3. on the internet

ASK EVEN YEARS ONLY (Module A)

IF the last delivery was ordered by phone, by post or on the Internet (HowOrd = 1, 2 or 3)

HowB

SHOW CARD H.

And if you had not ordered this [by phone/by post/ on the internet], how do you think you would have bought it?

CODE ONE ONLY

IF MORE THAN ONE ANSWER, PROBE FOR MOST LIKELY METHOD

1. In person e.g. from a shop or travel agent, railway station etc.
2. By phone
3. By post
4. On the internet
5. By fax
6. On the doorstep

7. Would have asked someone else to buy it in person
8. Would not have bought it
97. Other (Specify)

If would have bought it via another method (HowB=97)

XHowB

Please specify other reasons.

ASK ALWAYS

WhoShop

Can I check, who does the main food shopping for your household?

NOTE: IF DOES NOT TRAVEL TO DO FOOD SHOPPING (E.G. INTERNET SHOPPING, GETS SHOPPING DELIVERED) THEN USE CODE 12. CODE ALL THAT APPLY

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10
11. Non-household member
12. Household does not do food shopping

IF more than one person does the food shopping (whoshop >1)

ShopOf

And which one person does the main food shopping most often? Is it [Name] or [Name]?

INTERVIEWER: If respondent says all or equal prompt for who did main food shopping by themselves most recently. Otherwise ask respondent to nominate person to answer later questions about shopping.

CODE ONE ONLY

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

NO DK, NO REFUSAL

DVShop

(Computed variable) Person number of main food shopper in household.

IF the household does not do food shopping (WhoSho = 12)

YNoShop

Why is this?

CODE ALL THAT APPLY

1. Delivered by shop
2. Most food from meals on wheels/day centre/restaurant etc.
97. Other reason (specify)

IF 'other reason' why household does not do food shopping (YNoShop = 97)

XYNoShop

Please specify other reasons.

ATTITUDE TO LOCAL SERVICES

BAttitud / QATTITUD.NTS

ASK ATTITUDE QUESTIONS EVEN YEARS ONLY (Module A)

ASK ALL

SatServ

SHOW CARD K

Now I would like to ask some questions about your local bus services. By local I mean services which operate near your home. How satisfied are you with your local bus services?

1. Very satisfied
2. Fairly satisfied
3. Neither satisfied or dissatisfied
4. Fairly dissatisfied
5. Very dissatisfied
6. Don't use buses

ASK ALL

ReliaBus

SHOW CARD M

And, how would you rate the reliability of local buses?

1. Very reliable
2. Fairly reliable
3. Neither reliable nor unreliable
4. Fairly unreliable
5. Very unreliable
6. (No local service)
7. (Do not use)
8. (No opinion/Don't know)

IF local buses are very or fairly reliable, neither reliable or unreliable, fairly unreliable or very unreliable or not used (ReliaBus = 1,2, 3, 4, 5, OR 7)

FrqBus

SHOW CARD L

How would you rate the frequency of local buses?

1. Very frequent
2. Fairly frequent
3. Neither frequent nor infrequent
4. Fairly infrequent
5. Very infrequent"
6. (No local service)
7. (Do not use)
8. (No opinion/Don't know)

ASK ALL

RelMetro

SHOW CARD M

How would you rate the reliability of the train/underground/metro/light rail/tram?

1. Very reliable
2. Fairly reliable
3. Neither reliable nor unreliable
4. Fairly unreliable
5. Very unreliable
6. (No local service)
7. (Do not use)
8. (No opinion/Don't know)

IF local trains/tubes/metros/light rails/trams fairly reliable, neither reliable or unreliable, fairly unreliable or very unreliable or not used by HRP (RelMetro = 1, 2, 3, 4, 5 OR 7)

FrqMetro

SHOW CARD L

How would you rate the frequency of the train/underground/metro/light rail/tram?

1. Very frequent
2. Fairly frequent
3. Neither frequent nor infrequent
4. Fairly infrequent
5. Very infrequent
6. (No local service)
7. (Do not use)
8. (No opinion/Don't know)

CHILDREN'S TRAVEL TO SCHOOL

BChTrav / QTCHTRAV.NTS

IF ANY INDIVIDUAL HOUSEHOLD MEMBER IS AGED 7- 13, ASKED FOR EACH MEMBER IN TURN, ANSWERED BY HRP OR ANOTHER RESPONDENT AGED 16 OR OVER

ASK FOR EACH CHILD IN TURN

Schlnt

I'd now like to ask a few questions about your/the children's journey to and from school.

1. Press 1 and <Enter> to continue.

ASK FOR EACH CHILD IN TURN

SchDly

Does [Name] make a daily journey to and from school?

1. Makes daily journey
2. No daily journey (e.g. educated at home/boarding school)

IF child makes a daily journey to and from school (SchDly = 1)

TravSc

And how does [Name] usually travel to school?

CODE ONE ONLY, FOR THE LONGEST PART, BY DISTANCE, OF THE CHILD'S USUAL JOURNEY TO SCHOOL

IF DIFFERENT METHOD USED TO AND FROM SCHOOL, CODE METHOD TO SCHOOL.

1. Underground, metro, light rail, tram
2. Train
3. Public bus, minibus or coach
4. School or local authority bus, minibus or coach
5. Motorcycle, scooter or moped"
6. Car or van
7. Taxi/minicab
8. Bicycle
9. On foot
97. Other (specify)

Helpscreen:

If different methods used on different days of the week, code method used on the majority of days in the week

IF child travels to school by 'other' method (TravSc=97)

XTravSc

Please specify other answer.

IF usually travels by car or van to school (TravSc=6)

TravScW

And does [Name] usually travel to school with any children from a different household?

INTERVIEWER: ONLY INCLUDE OTHER CHILDREN ALSO GOING TO SCHOOL.

1. Yes
2. No

IF child makes a daily journey to and from school (SchDly = 1)

AccAd

When [Name] travels to or from school is he/she ...READ OUT...

NOTE: BUS DRIVERS DO NOT COUNT AS AN ACCOMPANYING ADULT

1. ...usually accompanied by an adult,
2. not usually accompanied by an adult,

3. or sometimes accompanied and sometimes not?
4. (part of way accompanied, part of way not)

IF child is usually accompanied by an adult (AccAd=1Add)

AccWho

Who is it the usually accompanies ^Name to school?

- 1-10. List household members <=16
11. Non-household member
12. Differs from day to day

VEHICLE GRID

BVehNum / QVEHNUM.NTS

ASK ALWAYS

IchEmp

INTERVIEWER: ASK OR RECORD

May I just check is anyone in this household (are you) in paid employment?

NOTE: INCLUDE SELF-EMPLOYMENT

1. Yes (Someone in household working)
2. No-one in household working

NO DK, NO REFUSAL

IF a household member is in paid employment (IchEmp = 1)

CarPool

Some companies have a car-pool from which employees take a car when they need one.

Does your household use cars from a company car-pool?

NOTE: AS A DRIVER

1. Yes
2. No

Helpscreen:

Company pool cars are cars which are taken from an employer run pool and not necessarily the same one is taken each day. They are not counted as household vehicles and are not routed through the rest of the questionnaire.

ASK ALWAYS

UseVcl

SHOW CARD J

Do you, or any members of your household, at present own or have continuous use of any of the motor vehicles listed on this card? Please choose your answer from this card.

INCLUDE COMPANY CARS (IF AVAILABLE FOR PRIVATE USE)

PLEASE REMEMBER TO INCLUDE NOT JUST CARS BUT ALSO LIGHT VANS, MOTORBIKES, SCOOTERS AND MOPEDS

1. Yes
2. No

ASK ALWAYS

BrokenV

And are there any other motor vehicles which are broken down or not in use but which your household may begin to use in the next month?

1. Yes
2. No

Helpscreen: We ask about broken down vehicles in case they come back into use during the survey period.

IF household has continuous use of motor vehicle OR there are broken vehicles which may be used in the next month (UseVcl= 1 OR BrokenV=1)

NoPlveh

How many vehicles does your household own or have continuous use of at present?

INTERVIEWER: INCLUDE ANY BROKEN DOWN VEHICLES WHICH MAY BE IN USE WITHIN THE NEXT MONTH BUT EXCLUDE COMPANY POOL CARS

: 0..10

NO DK, NO REFUSAL

IF pick up interview is being conducted (StatusQ=2)

NewVeh

When we completed the main interview together on [Date of Placement Interview], I asked you about any vehicles that your household had regular use of:

(May I just check), have you acquired the use of any (other) vehicles since then but before the end of the travel diary week.

i.e before [end of travel week]

ENTER RESPONSE AND <ENTER>, THEN PRESS <END> TO GO TO THE NEXT PICK-UP QUESTION. SEE HELP SCREEN <F9> FOR HOUSEHOLD VEHICLE DEFINITION...

1. Yes
2. No

Helpscreen:

INCLUDE HOUSEHOLD OWNED available for all or part of the Travel Week, EMPLOYER OWNED available for all or part of the Travel Week.

HIRED/BORROWED if household has FULL access for the WHOLE Travel Week TEMPORARILY OUT OF ACTION.

VAN/LORRY if used or private use of any kind

IF Household has acquired new vehicle since placement interview (NewVeh = 1)

NewNo

How many other vehicles have you acquired since [start of travel week]?

ENTER RESPONSE AND <ENTER>, THEN PRESS <END> TO GO TO NEXT PICK-UP QUESTION

:1..10

NO DK, NO REFUSAL

NumVeh

(computed variable) Number of vehicles. PRECODED. PRESS ENTER TO CONTINUE

BVehTab/ QTVEHTAB.NTS

Asked of respondent who best knows about vehicle (normally main driver but not necessarily) if there is a vehicle in the household (Numveh > 0)

IF pick up interview and household has acquired new vehicle since main interview (StatusQ=2 AND NewVeh = 1)

WhenAcq

When did you acquire the use of your [first/second etc] additional vehicle?. Was it...READ OUT...

NOTE: Travel week was from [date] to [date].

1. ...before the start of the Travel Week,
2. during the Travel Week,
3. or, after the end of the Travel Week?

IF Household acquired new vehicle during the Travel Week or does not know when they acquired the vehicle in relation to the Travel Week (WhenAcq = 2 OR DK)

DateAcq

Can you tell me the date on which you acquired the vehicle?

*If placement OR pickup interview
FOR EACH HOUSEHOLD VEHICLE*

Make

What is the make of vehicle number [1, 2, 3, etc].

E.G. FORD, VAUXHALL, RENAULT, PEUGEOT

*If placement OR pick up interview
FOR EACH HOUSEHOLD VEHICLE*

Model

And the model? [1, 2, 3, etc].

E.G FIESTA, CLIO, MICRA, 106

IF the model is known (Model = Response)

ModSpec

Is there a model type or specification for this vehicle? If so enter it here. [Vehicle number]. E.G 1.6, XR2i, TURBO, ESTATE, CONVERTIBLE, 5 DOOR, 4x4
INTERVIEWER: If 'no' press <ENTER> to continue.

IT IS IMPORTANT THAT YOU COLLECT FULL DETAILS ABOUT THE VEHICLE AS YOU WILL NEED THIS INFORMATION FOR CODING LATER IN THE INTERVIEW

FOR EACH HOUSEHOLD VEHICLE

VehUse

CODE WHETHER the [Vehicle Make] [Vehicle Model]

1. is in regular use,
2. may begin to be used in the next month,
3. ONLY ASK AT PICK UP: vehicle acquired since placement?

IF household has regular use of the motor vehicle (VehUse=1)

TypeVcl2

SHOW CARD J

I would now like to ask about the [Vehicle Make] [Vehicle Model] [Model Specification] vehicle. Can you tell me the type of vehicle this is from the list on this card.

1. 4-wheel car (side windows behind driver) (includes Multi Purpose Vehicles and people carriers)
2. 4-wheel drive passenger vehicle (side windows behind driver)(eg Landrover, Jeep or similar)
3. 3-wheel car (side windows behind driver)
4. Minibus, motor-caravan, dormobile etc (side windows behind driver)
5. Light van (no side windows behind driver) (includes pick ups and car based vans)
6. Some other type of van or lorry
7. Motorcycle/scooter with sidecar
8. Motorcycle/scooter
9. Moped
10. Some other motor vehicle (specify)

IF household owns some other vehicle (TypeVcl2 = 10)

XOthType

INTERVIEWER: Record other type of motor vehicle

*FOR EACH HOUSEHOLD VEHICLE
IF household vehicle is a car, minibus, motor-caravan, dormobile, or van (TypeVcl2=1, 2, 3, 4, or 5)*

PrivVcl

FOR EACH VEHICLE IN TURN

Is the [Vehicle Make] [Vehicle Model]...

1. privately owned

2. or is it a company vehicle?

Helpscreen:

PRIVATELY OWNED includes vehicles:

- being bought on hire purchase
- used continuously, i.e. for private as well as business purposes, by a self-employed respondent who owns the business and uses the vehicle as if owned, although the respondent may state that it is owned by the company

A COMPANY car is any car for which someone in the household pays company vehicle tax. It includes:

- cars supplied by an employer, spouse's employer etc.

Company cars provided exclusively for company business, i.e. where no private usage is permitted, should be excluded (at the first question on vehicle ownership or continuous use). Cars purchased from an employer should be coded as privately owned.

*IF placement or pick up interview
FOR EACH HOUSEHOLD VEHICLE*

HmnDriv

Who drives the most mileage in the [Vehicle Make] [Vehicle Model] (taken over the year as a whole)?

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

89. IF MAIN DRIVER NOT HOUSEHOLD MEMBER, ENTER 89

IF pick up interview and had a vehicle in the placement interview (StatusQ=2 AND UseVcl=1)

StillGot

INTERVIEWER: CODE OR ASK:

Does the household still have the [Vehicle Make] [Vehicle Model]?

ENTER RESPONSE THEN <ENTER>, THEN PRESS <END> TO GO TO NEXT PICK-UP QUESTION

1. Yes
2. No

IF the household no longer has their vehicle at pick up ((StatusQ= 2 AND StillGot = 2)

WhenDis

Was the [Vehicle Make] [Vehicle Model] sold or disposed of...READ OUT...

NOTE: Travel Week was from [Date] to [Date]

1. ...before the start of the Travel Week,
2. during the Travel Week,
3. or, after the end of the Travel Week?

IF the household disposed of their vehicle during the Travel Week or does not know when it was disposed of (Whendis=2 OR DK)

DateDis

On what date did you sell or dispose of the [Vehicle Make] [Vehicle Model]?

*If Placement Interview
ASK ALL HOUSEHOLDS*

BlueBdg

Does anyone in this household have a blue badge that allows them to park in disabled parking spaces?

INTERVIEWER: This badge was formerly referred to as the orange badge.

1. Yes
2. No

If a household member has a blue badge (BlueBdg=1)

WhoBlue

Which household member or members hold a blue badge?

INTERVIEWER: Code the household member(s) whose disability qualifies them for a blue badge.

CODE ALL THAT HOLD BADGES

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

INDIVIDUAL QUESTIONNAIRE

BWhoInt / QTWhoInt.NTS

RECORD ALWAYS

WhoInt

ENTER THE NUMBER OF THE PERSON YOU WANT TO INTERVIEW (OR RECORD AS NOT AVAILABLE) FROM THE LIST BELOW

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Person 5
6. Person 6
7. Person 7
8. Person 8
9. Person 9
10. Person 10

NO DK, NO REFUSAL

RECORD ALWAYS

IndQn

CODE WHETHER FACE TO FACE INTERVIEW, PROXY INTERVIEW, OR PERSON NOT AVAILABLE. INTERVIEWER: IN GENERAL, FOR CHILDREN UNDER ELEVEN, INTERVIEW AN ADULT AND CODE AS 'PROXY'

1. Face to face
2. Proxy
3. Not available

NO DK, NO REFUSAL

DISABILITIES THAT AFFECT TRAVEL

BDisab / QTDisab.NTS

ASK OF EACH PERSON AGED 16 OR OVER IN TURN (DVAge >= 16)

ASK ALL

MobDiff

NAME

(First of all I want to ask some questions about any health problem or physical disability that affects travelling).

Do you have any disability or other long standing health problem that makes it difficult for you to do any of the following... READ OUT EACH IN TURN...

INTERVIEWER: INCLUDE PROBLEMS DUE TO OLD AGE.

CODE ALL THAT APPLY.

1. go out on foot?

2. use local buses?
3. get in or out of a car?
4. no difficulty with any of these (SPONTANEOUS)

IF does not have any mobility difficulties when using transport (MobDiff=4)

OthDis

And do you have any other disability of long standing health problem that limits your activities in any other way?

By 'long standing' I mean anything that has troubled you over a period of at least 12 months or that is likely to affect you over a period of at least 12 months.

1. Yes
2. No

IF respondent has health problem that makes it difficult for them to go out on foot (MobDiff = 1)

Footout

NAME

Do you go out on foot at all?

IF YES, PROBE: on your own or only with someone to assist you

1. Yes, on own
2. Yes, only with someone to assist
3. No

NO DK, NO REFUSAL

IF respondent does not go out on foot alone (Footout = 2 or 3)

GoOut

NAME

Is it impossible for you to go out alone on foot or could you manage it but with difficulty?

1. Impossible
2. Difficult

IF has a disability that makes it difficult to walk (MobDiff= 1)

PowWhl

SHOW CARD N

You said that you have difficulties going out on foot. I would now like to ask you about your use of powered wheelchairs and powered 'mobility' scooters.

Do you have the use of a powered wheelchair?

INTERVIEWER: A POWERED WHEELCHAIR IS SIMILAR IN DESIGN TO A MANUAL WHEELCHAIR EXCEPT IT IS POWERED.

1. Yes
2. No

IF respondent has use of a powered wheelchair (PowWhl = 1)

PowWhUse

SHOW CARD N

How often is it used?

1. 3 or more times a week,
2. Once or twice a week,
3. Less than that but more than twice a month,
4. Once or twice a month,
5. Less than that but more than twice a year,
6. Once or twice a year,
7. Less than that or never

IF use powered wheelchair once or twice a year OR less than that or never (PowWhUse = 6 or 7)

PwWhOpen

Why isn't it used much? Please specify answer.

IF has a disability that makes it difficult to walk (IF MobDiff = 1)

MobSct

SHOW CARD N

Do you have the use of a powered 'mobility' scooter?

1. Yes
2. No

IF use mobility scooter (MobSct = 1)

MobScUse

SHOW CARD N

How often is it used?

1. 3 or more times a week,
2. Once or twice a week,
3. Less than that but more than twice a month,
4. Once or twice a month,
5. Less than that but more than twice a year,
6. Once or twice a year,
7. Less than that or never

IF use mobility scooter once or twice a year OR less than that or never (MobScUse = 6 or 7)

MobOpen

Why isn't it used much? Please specify answer.

IF respondent has health problem that makes it difficult for them to use local buses (MobDiff = 2)

DifBusY

NAME

How does this disability or health problem make it difficult for you to use local buses?

PROBE: How else?

CODE ALL THAT APPLY

1. Difficulty getting to and from the bus stop

2. Difficulty standing waiting at the bus stop
3. Difficulty identifying destination of bus
4. Difficulty getting on or off buses
5. Difficulty getting to and from the seat
6. Difficulty communicating with the driver/conductor

97. Other (please specify)

IF respondent's disability makes it difficult to use buses for other reason (DifBusY = 97)

XDifBusY

NAME

Please specify other answer.

IF respondent has health problem that makes it difficult for them to use local buses (MobDiff = 2)

BusOut

NAME

Can I check, do you use local buses at all nowadays?

1. Yes
2. No

IF respondent does not use local buses at all nowadays (BusOut = 2)

BusPrb95

NAME

CODE FIRST THAT APPLIES

Is it because of a disability or health problems or because the bus service is poor or for some other reasons?

1. Disability or health problem
2. Poor bus service
3. Other (specify)

IF respondent does not use local buses at all nowadays for other reasons (BusPrb95=3)

XBusPb95

NAME

INTERVIEWER: Record other reason

METHODS OF TRANSPORT USED

BMethod / QTMethod.NTS

If respondent is aged 16 or over (DVage=>16)

LeaHous

The next few questions are about your activities yesterday. Thinking about yourself, did you leave the house at all yesterday, including for any walks of more than 50 yards?

1. Yes
2. No

IF left house yesterday (LeaHous=1)

QLeaHous

How many times did you leave the house yesterday?

INCLUDE ALL OUTINGS BY ANY METHOD OF TRANSPORT, INCLUDING WALKS IF THEY ARE MORE THAN 50 YARDS.

:0..97

If did not leave house yesterday

(LeaHous=2)

NotLea

SHOW CARD P

Can you tell me the main reason why you did not leave the house yesterday?

CODE ONE ONLY

1. Didn't want or need to leave house
2. Had to stay at home
3. No car in the household
4. Car broken down
5. Nobody to drive
6. Bad weather
7. Too busy at home
8. Unable to leave house because of temporary illness/disability
9. Unable to leave house because of permanent illness/disability
10. Other reasons

ASK ALL YEARS (Modules A and B)

IntroC

NAME

I would now like to ask you about different methods of transport you currently use. You may have told me some of this already but I just need to check.

1. Press 1 and <Enter> to continue.

ASK ALL YEARS (Modules A and B)

Ordbus

NAME

SHOW CARD Q

How frequently do you use an ordinary bus? PLEASE COUNT EACH SINGLE TRIP AS ONE JOURNEY AND EACH RETURN TRIP AS TWO.

NOTE: ONLY INCLUDE TRAVEL WITHIN GREAT BRITAIN, OVER THE LAST YEAR OR SO.

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than that or never

ASK ALL YEARS (Modules A and B)

Plane

NAME

SHOW CARD Q

(How frequently do you use) an **internal** air flight within Great Britain?

PLEASE COUNT EACH SINGLE TRIP AS ONE JOURNEY AND EACH RETURN TRIP AS TWO.

NOTE: ONLY INCLUDE TRAVEL WITHIN GREAT BRITAIN, OVER THE LAST YEAR OR SO.

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than that or never

ASK ALL YEARS (Modules A and B)

IF age is 5 or over (DVAge >=5)

Bicycle

NAME

SHOW CARD Q

How frequently do you use a bicycle?

PLEASE COUNT EACH SINGLE TRIP AS ONE JOURNEY AND EACH RETURN TRIP AS TWO

NOTE: ONLY INCLUDE TRAVEL WITHIN GREAT BRITAIN, OVER THE LAST YEAR OR SO.

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than that or never

Helpscreen:

This means independently riding a bicycle. Do not count riding on a child seat or bicycle attached to an adult's

ASK ALL YEARS (Modules A and B)

IF age is 1 or over and respondent goes out on foot (DVAge >1 AND Footout is not 3)

Walk

NAME

SHOW CARD Q

How frequently do you walk anywhere for 20 minutes or more without stopping. Please count each single trip as one journey and each return trip as two?

INCLUDE ALL WALKS, WHETHER FOR PLEASURE OR WITH A PURPOSE. IF ROUND TRIP, COUNT AS ONE JOURNEY
NOTE: ONLY INCLUDE TRAVEL WITHIN GREAT BRITAIN, OVER THE LAST YEAR OR SO.

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than that or never

Helpscreen:
Children in pushchairs do not count as walking

CYCLING

BCycle / QTCycle.NTS

ALL QUESTIONS ASKED OF EACH PERSON AGED 5 OR OVER IN TURN (DVAGE=>5)

ASK ALL

GenCycle

NAME

(The next few questions are about cycling.)
Excluding exercise bikes, do you... READ OUT...

1. ...own a bicycle yourself,
2. have regular use of a bicycle owned by someone else,
3. or have no regular use of a bicycle?

IF respondent regularly uses bicycle owned by someone else (GenCycle = 2)

CycElse

NAME

Is that bicycle owned by someone in your household or someone outside the household?

1. Someone in the household
2. Someone outside the household

ASK ALL

Cycle12

NAME

(May I just check,) have you ridden a bicycle during the last 12 months, (that is since [this date last year])?

1. Yes
2. No

3. Don't know / Can't remember

Helpscreen:

This means independently riding a bicycle. Do not count riding on a child seat or bicycle attached to an adults

IF respondent has ridden bike in last 12 months (Cycle12 = 1)

CycRoute

NAME

SHOW CARD S

When you cycled in the last 12 months, where did you usually cycle? Please choose an answer from this card.

1. ...mainly on the road,
2. mainly on pavements, cycle paths or cycle lanes that were not part of a road,
3. mainly off the road in parks, open country, or private land,
4. or on a variety of different surfaces?

DRIVING LICENCE

BDrLic / QTDrLic.NTS

ASKED OF EACH PERSON AGED 16 OR OVER IN TURN (DVage=> 16)

ASK ALL

DLFull

NAME

Do you hold a full driving licence valid in Great Britain to drive either a car, or a motorcycle, scooter or moped?

INCLUDE: DISQUALIFIED DRIVERS AND INTERNATIONAL PERMITS/OTHER LICENCES VALID IN THE UK.

1. Yes
2. No

If respondent has full driving licence (DLFull = 1)

DLTyp95

NAME

Is it for a car only, a motorcycle only or for both, or is it for a car with special adaptations?

THE CODES AFTER THE '/' APPLY TO LICENCES ISSUED AFTER JUNE 1990
INTERVIEWER: ASK RESPONDENT TO CHECK DRIVING LICENCE

1. Car (A or B) / (B)
2. Car (A or B) / (B) - (AUTOMATIC ONLY)
3. Both car and motorcycle (A&D)/(A&B)
4. Motorcycle (D) / (A)/P
5. Car with special adaptations (A restricted, B)

6. Moped (E) / (P)

IF respondent does not hold a full driving licence or has a motorcycle or moped licence and is older than 59 ((DLFull = 2 OR DLTyp95 = 4 OR DLTyp95 = 6) AND (DVAge > 59))

EvDLic95

NAME

Have you ever held a full driving licence valid in Great Britain to drive a car?

1. Yes
2. No

IF respondent does not have a full driving licence for a car, motorcycle, scooter or moped and respondent has never held a full driving licence for a car (DLFull = 2 AND EvDLic95 = 2)

DLProv

NAME

Do you hold a provisional driving licence for a car, motorcycle, scooter or moped?

1. Yes
2. No

If respondent has a provisional licence for a car, motorcycle, scooter or moped (DLProv = 1)

ProTyp95

NAME

Is it for a car only, a car and motorcycle, a car with special adaptations or something else?

CODE FIRST THAT APPLIES

1. Car only
2. Car and motorcycle
3. Car with special adaptations
5. Motorcycle, scooter or moped only
4. Something else (SPECIFY)

IF provisional licence is for some other vehicle (ProTyp95 = 5)

XProTp95

NAME

INTERVIEWER: Record other answer

IF the respondent has a provisional licence for a car, automatic car or car with adaptations (ProTyp95=1,2,3)

PDrvSt

Are you currently learning to drive?

1. Yes
2. No

EDUCATION, PAID WORK AND JOURNEY PLANNING

BILO / QTILO.NTS

ASKED OF EACH PERSON AGED 16 OR OVER IN TURN (DVage=>16)

ASK ALL

EdAttn1

I would now like to ask you a few questions about your education and employment.

Do you have any educational qualifications for which you received a certificate?

1. Yes
2. No

Helpscreen:

If the respondent is unsure, then educational qualifications are usually obtained at school, college or university. Respondent need not have the certificate in their possession NOW - just must have received one once.

IF does not have any educational qualifications (EdAttn1 = 2)

EdAttn2

Do you have any professional, vocational or other work-related qualifications for which you received a certificate?

1. Yes
2. No

Helpscreen:

Respondent need not have the certificate in their possession NOW - just must have received one once.

IF has a qualification (EdAttn1 = 1 OR EdAttn2 = 1)

EdAttn3

NAME

Was your highest qualification....

1. at degree level or above
2. or another kind of qualification?

Helpscreen:

Do not attempt to give any guidance, or express any opinion of your own about any of the terms used. If respondents say they are unsure what counts as a 'certificate' or 'degree-level' (or any other term), reassure them that we would like them to make their own best judgement of how to answer.

ASK ALL

Wrking

NAME

Did you do any paid work in the 7 days ending Sunday the [date of last Sunday], either as an employee or as self-employed?

1. Yes
2. No

Helpscreen:

Take respondent's definition, but it must be PAID work. PAID WORK means ANY work FOR PAY OR PROFIT done in the reference week, including Saturday jobs, casual work (eg baby-sitting, running a mail order club, etc.) children with a paper round etc, even though they may still be at school, work by 'retired'.

Include self-employed people if they work in their own business, professional practice, or farm for the purpose of earning a profit.

Exclude nurses in training under Project 2000 and other student nurses.

IF respondent did not do any paid work (Wrking = 2)

SchemeET

NAME

Were you on a government scheme for employment training?

1. Yes
2. No

IF respondent was not on a government training scheme (SchemeET = 2)

JbAway

NAME

Did you have a job or business that you were away from?

1. Yes
2. No
3. Waiting to take up a new job/business already obtained

Helpscreen:

Only code YES if there is definitely a job to return to.

Take the respondent's definition of whether they are in paid work or not. If they are unsure:

a job exists if there is a definite arrangement between an employer and an employee for work on a regular basis, whether work is full or part time.

Long term absence from work, except career breaks: if total absence exceeds 6 months, a person has a job only if full or partial pay has been received during absence and they expect to return to same employer.

Career breaks - as above except pay not necessary.

Seasonal workers 'between seasons' (ie not currently working) should be coded 2. (Note, the odd week of sick leave during the working season should be treated the same as in other work, and coded 1.

Casual workers - code No even if expect to work for employer again in future.

IF respondent was not away from a job or business OR was waiting to take up a new job (JbAway = 2 OR 3)

OwnBus

NAME

Did you do any unpaid work in that week for any business that you own?

1. Yes
2. No

Helpscreen:

The people we expect to answer Yes here are those whose work contributes directly to a business, farm, or professional practise that they own, but who receive no pay or profits. EXCLUDE unpaid voluntary work done for charity etc.

IF not doing any unpaid work for own business (OwnBus = 2)

RelBus

NAME

...or that a relative owns?....

1. Yes
2. No

Helpscreen:

The people we expect to answer Yes here are those whose work contributes directly to a business, farm, or professional practise OWNED BY A RELATIVE, but who receive no pay or profits (e.g. a wife doing her husband's accounts or helping with family business).

EXCLUDE unpaid voluntary work done for charity etc.

IF respondent did not do unpaid work for own business or one that a relative owns (RelBus = 2)

Looked

NAME

Thinking of the 4 weeks ending Sunday the [Date of last Sunday], were you looking for any kind of paid work or government training scheme at any time in those 4 weeks?

1. Yes
2. No
3. Waiting to take up a new job or business already obtained

Helpscreen:

'Looked for paid work' may cover a wide range of activities and you should NOT try to interpret the phrase for the respondent.

Looking in the paper for vacancies is an active form of search.

Looking for work on government scheme requires an approach to the agency.

IF respondent was looking for a job or waiting to take up a new job or business already obtained (Looked=1 or 3, OR JbAway= 3)

HowLong

SHOW CARD V

NAME

How long have you been looking/were you looking for paid work/a place on a government scheme

1. Not yet started
2. Less than 1 month
3. 1 month or more, less than 3 months
4. 3 months or more, less than 6 months
5. 6 months or more, less than 12 months
6. 12 Months or more

IF respondent was looking for a job or waiting to take up a new job or business already obtained (Looked=1, or 3 OR JbAway= 3)

StartJ

NAME

If a job or a place on a government scheme had been available in the week ending Sunday the [date of last Sunday], would you have been able to start within 2 weeks?

1. Yes
2. No

IF respondent did not do any paid work AND respondent was not on a government training scheme AND respondent was not looking for paid work or did not have a job that they were away from ((Wrking = 2 AND SchemeET = 2 AND (Looked = 2 OR StartJ = 2))

YInAct

NAME

What was the main reason you (did not seek any work in the last 4 weeks/would not be able to start in the next 2 weeks?)

1. Student
2. Looking after the family/home
3. Temporarily sick or injured
4. Long-term sick or disabled
5. Retired from paid work
6. Other reasons

Helpscreen:

There is no predetermined definition of any of the categories at this question; you should accept the respondent's answer.

Do not prompt the categories. If, exceptionally, an answer covers more than one coding category, ask which is the main reason and code that one only.

Computed variable

DVIL03a

DV for ILO in employment - 3 categories

1. InEmp (employed)
2. Unemp (unemployed)
3. EclnAct (economically inactive)

EMPTY

Computed variable

DVIL04a

DV for ILO in employment - 4 categories

1. InEmpXuf
2. UFW
3. Unemp
4. EclnAct

EMPTY

BEDUC / QTEduc.NTS

ASKED OF EACH PERSON, IN TURN, WHO ARE AGED 16 OR OVER, AND ARE WORKING OR ON A TRAINING SCHEME OR AWAY FROM A JOB OR WAITING TO TAKE UP A JOB OR LOOKED FOR WORK IN LAST 4 WEEKS OR ARE NOT LOOKING FOR WORK BECAUSE THEY ARE A STUDENT

(DVAGE=>16 AND (WRKING=1 OR SCHEMEET=1 OR JBAWAY=1 OR 3 OR LOOKED=1 OR YINACT=1))

ASK ALL

Educ

NAME

Are you at present attending a school or college?

1. Yes
2. No

IF respondent is attending school or college (Educ=1)

EducFT

NAME

May I check, are you a full-time student?

1. Yes
2. No

IF FULL TIME STUDENT (EducFT=Yes)

EdAdd1

NAME

What is the address of your school/college?

INTERVIEWER: OBTAIN AS FULL AN ADDRESS AS POSSIBLE, INCLUDING POSTCODE IF RESPONDENT CAN SUPPLY THIS. IF THE RESPONDENT IS UNSURE OF EXACT ADDRESS/ POSTCODE, PLEASE ASK THEM TO LOOK IT UP. IF THEY ARE UNABLE TO DO THIS, RECORD THE NAME OF THEIR SCHOOL/COLLEGE AND AS MUCH OF THE ADDRESS AS THEY CAN PROVIDE.
USE <CTRL + R> IF RESPONDENT DOES NOT WISH TO PROVIDE THE ADDRESS.
ENTER FIRST LINE OF THE ADDRESS."

"INTERVIEWER: THE JOURNEY TO SCHOOL/COLLEGE IS THE MOST FREQUENTLY TRAVELLED JOURNEY FOR STUDENTS. THIS INFORMATION WILL ALLOW THE EXACT DISTANCE OF THIS JOURNEY TO BE CALCULATED."

EDAdd2

NAME

Address of school/college.

INTERVIEWER: ENTER NEXT LINE OF THE ADDRESS
OR PRESS <ENTER> KEY IF NO MORE.
DO NOT ENTER POSTCODE HERE."

EdAdd3

NAME

Address of school/college.

INTERVIEWER: ENTER NEXT LINE OF THE ADDRESS
OR PRESS <ENTER> KEY IF NO MORE.
DO NOT ENTER POSTCODE HERE."

EdAdd4

NAME

Address of school/college.

INTERVIEWER: ENTER NEXT LINE OF THE ADDRESS
OR PRESS <ENTER> KEY IF NO MORE.
DO NOT ENTER POSTCODE HERE."

EdPC

NAME

What is the postcode of your school/college?

"INTERVIEWER: IF THE RESPONDENT DOES NOT KNOW THEIR FULL SCHOOL/COLLEGE POSTCODE ASK THEM IF THEY COULD LOOK THIS UP.

ADD IF NECESSARY: THE JOURNEY TO SCHOOL/COLLEGE IS THE MOST FREQUENTLY TRAVELLED JOURNEY FOR STUDENTS. THIS INFORMATION WILL ALLOW THE EXACT DISTANCE OF THE JOURNEY TO BE CALCULATED.

INTERVIEWER: USE <CTRL + K> IF DOES NOT KNOW."

SkKnow

"INTERVIEWER: RECORD WHETHER THE RESPONDENT KNEW THEIR SCHOOL ADDRESS, INCLUDING FULL POSTCODE OR WHETHER THEY HAD TO LOOK IT UP."

Knew school address including post code

Looked it up

Did not provide full postcode

TRANSPORT RELATED BARRIERS TO WORK

BTrEmp / QTTrEmp.NTS

ASKED OF EACH MALE IN TURN, IF THEY ARE 16 TO 64 AND UNEMPLOYED OR ECONOMICALLY INACTIVE AND NOT AT SCHOOL OR COLLEGE (DVAGE = 16-64 AND (DVIL03a = 2 OR 3) AND EDUC=2)

ASKED OF EACH FEMALE IN TURN, IF THEY ARE 16-59 AND UNEMPLOYED OR ECONOMICALLY INACTIVE AND NOT AT SCHOOL OR COLLEGE (DVAGE = 16-59 AND (DVIL03a = 2 OR 3) AND EDUC=2)

ASK ALL

PrbJob

NAME

Have you turned down a job in the past 12 months due to problems with transport?

1. Yes
2. No

IF respondent had problems with transport (PrbJob = 1)

PrbTyp1

NAME

What sort of problems with transport were these?

CODE ALL THAT APPLY

1. Too far
2. Car not available
3. Don't have a current driving licence/can't drive
4. Cost of petrol
5. Lack of parking facilities
6. Cost of parking
7. Traffic congestion/roadworks
8. Inadequate public transport
9. Cost of using public transport
10. Personal physical difficulties/disability
11. Personal safety concerns
97. Other (specify)

IF respondent had other problem with transport (PrbTyp1=97)

XPrbTyp1

NAME

Please specify other answer.

ASK ALL

PrbNow

NAME

And do you have any problems with transport now which would stop you from taking a job?

1. Yes
2. No

If respondent has transport problems AND has mentioned a problem with transport earlier (PrbNow = 1 and PrbTyp1 = response)

PrbSame

NAME

Are these problems the same as those you mentioned before?

1. Yes
2. No

IF respondent does not have same problem as before OR did not specify the earlier problem (PrbSame = 2 OR PrbTyp1 <> response)

PrbTyp2

NAME

What sort of problems with transport are these?

CODE ALL THAT APPLY

1. Too far
2. Car not available
3. Don't have a current driving licence/can't drive
4. Cost of petrol
5. Lack of parking facilities
6. Cost of parking
7. Traffic congestion/roadworks
8. Inadequate public transport
9. Cost of using public transport
10. Personal physical difficulties/disability
11. Personal safety concerns
97. Other (specify)

IF respondent had other problem with transport (PrbTyp2 = 97)

XPrbTyp2

NAME

Please specify other answer.

LAST PAID JOB

BLastJb / QTLastJb.NTS

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND UNEMPLOYED OR ECONOMICALLY INACTIVE (DVAGE =>16 AND DVIL03a = 2 OR 3)

ASK ALL

Everwk

NAME

Have you ever had a paid job, apart from casual or holiday work?

1. Yes
2. No

IF has had a paid job (Everwk = 1)

DtJbL

NAME

When did you leave your last PAID job?

FOR DAY NOT GIVEN.....ENTER 15 FOR DAY

FOR MONTH NOT GIVEN....ENTER 6 FOR MONTH

THIS QUESTION DOES NOT INCLUDE CASUAL OR HOLIDAY WORK

Helpscreen:

If day and month are not volunteered readily, only probe as follows:

day....if in last 12 months

month....if in last 24 months.

MAIN JOB DETAILS

TMainJb / QTMainJb.NTS

BMainJb

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND EMPLOYED OR HAVE EVER HAD A PAID JOB (DVAge >= 16 AND (DVIL03a = 1 OR EVERWK=1))

ASK ALL

IndD

NAME

CURRENT OR LAST JOB

What did/(does) the firm/organisation you work(ed) for mainly make or do (at the place where you work(ed))?

DESCRIBE FULLY - PROBE

MANUFACTURING or PROCESSING or DISTRIBUTING ETC. AND MAIN GOODS

PRODUCED, MATERIALS USED,

WHOLESALE or RETAIL ETC.

ASK ALL

OccT

NAME

JOB TITLE CURRENT OR LAST JOB

What was/(is) your (main) job (in the week ending Sunday the [date of last Sunday])?

Helpscreen:
REFERENCE PERIOD: MAIN job in
reference week or last job if ever worked.

DEFINITION OF MAIN JOB: respondents
with more than one job should decide
themselves which is their main job. Only if
they are unable to do so should the LFS
criterion be applied: the job which was the
largest number of hours.

ASK ALL

OccD

NAME

CURRENT OR LAST JOB

What did/(do) you mainly do in your job?

CHECK SPECIAL

QUALIFICATIONS/TRAINING NEEDED TO
DO THE JOB

ASK ALL

Stat

NAME

Were/(Are) you working as an employee or
were/(are) you self-employed?

1. Employee
2. Self-employed

Helpscreen:

The division between employees and self-
employed is based on RESPONDENTS'
OWN ASSESSMENT of their employment
status in their main job.

Freelancers can be employed or self-
employed. If respondent cannot decide
which they are, ask if they are invoicing
another company for work carried out **and**
are responsible for their own tax and NI. If
so, then they are self-employed.

IF respondent is/was an employee (Stat = 1)

SVise

NAME

In your job, do/(did) you have formal
responsibility for supervising the work of
other employees?

DO NOT INCLUDE PEOPLE WHO ONLY
SUPERVISE:

- children, e.g. teachers, nannies,
childminders
- animals
- security or buildings, e.g. caretakers,
security guards

1. Yes

2. No

*IF respondent did supervise other employees
(SVise = 1)*

SViseDesc

NAME

Please describe the type of responsibility you
have/(had) for supervising the work of other
employees.

INTERVIEWER: PROBE FOR WHO AND
WHAT IS BEING SUPERVISED

IF respondent is/was an employee (Stat = 1)

EmpNo

NAME

How many people work(ed) for your
employer at the place where you work(ed)?
Were there...READ OUT

1. ...1 to 24,
2. 25 to 499,
3. or 500 or more employees?

Helpscreen:

We are interested in the size of the local unit
of the establishment at which the respondent
works but we only want the number of
employees working for the **same employer**
as the respondent. Thus at sites shared by
several organisations we would not include
all employees - just those working for the
respondent's employer. The 'local unit' is
considered to be the geographical location
where their job is mainly carried out.
Normally this will consist of a single building,
part of a building, or at the largest a self-
contained group of buildings.

It is the total number of employees at the
respondent's workplace that we are
interested in, not just the
number employed within the particular
section or department in which he/she works.

If a respondent works from a central depot or
office (e.g. a service engineer) base, then the
answer is the number of people who work at
or from the central location. Note that many
people who work 'from home' have a base
office or depot that they communicate with. It
may even be true of some people who work
'at home' (e.g. telecommuter who retains a
desk or some minimal presence in an office).
If in doubt, accept the respondent's view of
whether or not there is a wider establishment
outside the home that they belong to for work
purposes.

For self-employed people who are
subcontracted for any significant
(respondent's definition) length of time to
work in a particular place (e.g. building site),
that is their place of work.

IF respondent was/is self employed (Stat = 2)

Solo

NAME

Were/(are) you working on your own or did/(do) you have employees?

ASK OR RECORD

1. on own/with partner(s) but no employees
2. with employees

Helpscreen:

The following should not be counted as employees. They should be excluded from the total number of employees at SENO:

- Any relative who is a member of the informant's household.
- Any partners in a partnership (as they would also be self employed)

For self-employed people who are subcontracted for any significant (respondent's definition) length of time to work in a particular place (e.g building site) that is their place of work.

If the informant is unable to decide whether they employ anyone or not then code 1 ('on own/with partner(s) but no employees') should take priority.

IF respondent works/has worked with employees (Solo = 2)

SENo

NAME

How many people did/(do) you employ at the place where you work(ed)?

Were/(Are) there ... READ OUT ...

1. ...1 to 24,
2. or, 25 or more?

Helpscreen:

We are interested in the size of the 'local unit of the establishment' at which the respondent works in terms of total number of employees. The 'local unit' is considered to be the geographical location where their job is mainly carried out. Normally this will consist of a single building, part of a building, or at the largest a self-contained group of buildings.

It is the total number of employees at the respondent's workplace that we are interested in, not just the number employed within the particular section or department in which he/she works.

The following should not be counted as employees. They should be excluded from the total number of employees at SENO:
-Any relative who is a member of the informant's household.

-Any partners in a partnership (as they would also be self employed)

For self-employed people who are subcontracted for any significant (respondent's definition) length of time to work in a particular place (e.g building site) that is their place of work.

ASK ALL

FtPtWk

NAME

In your (main) job were/(are) you working...

READ OUT ...

1. ...full time,
2. or part time?

Helpscreen:

We are interested in SELF-ASSESSMENT - let the RESPONDENT decide whether the job is full-time or part-time.

INCOME

TIncme / QTIncme.NTS BIncme

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER (DvAge >= 16)

ASK ALL

Incme

NAME

SHOW CARD W

This card shows a number of possible sources of income. Can you tell me whether you personally receive income from any of these? I do not need to know which.

PRESS <F9> FOR SOURCES OF INCOME SHOWN ON CARD L
CODE 1 IF INFORMANT RECEIVES INCOME FROM ANY OF THESE SOURCES
CODE 2 IF INFORMANT STATES THAT THEY HAVE NO SOURCE OF INCOME.

1. Income received
2. No source of income

Helpscreen:

We ask about income because it has a strong influence on people's travel patterns - e.g. how far they travel and by what methods. Knowing about the travel patterns of people on different incomes helps the Department for Transport to meet the needs of people on low incomes, for example, by ensuring that enough buses are available in the areas where they live.

This question is designed to remind the respondent of all possible sources of income which are to be included in the next questions. You do not need to enter these sources - simply code 1 if they have any of the sources of income on the card (shown below) or 2 if they have no source of income.

SHOW CARD W.

Earned Income/ Salary
Income from self employment
Pension (state, private or from former employer)
Child Benefit
Disabled Person's Tax Credit (formerly Disability Working Allowance)
Disability Living Allowance
Other state benefits or allowances e.g.
- Working Families Tax Credit
- Jobseeker's Allowance
- Income Support
- Housing Benefit
- Council Tax Benefit
- Incapacity Benefit (formerly NI Sickness/Invalidity Benefit)
- Maternity Allowance/Statutory Maternity Pay
- Attendance Allowance
- Invalid Care Allowance
- Severe Disablement Allowance
- Widow/Widowers'/Bereavement Benefits
Interest from savings, building society, investments etc.
Other regular allowances (e.g. maintenance from former partner, annuity, student grant etc)
Other sources.

If respondent received income (Incme = 1)

IncGrp

NAME

SHOW CARD X (SEE APPENDIX K)

Which of the letters on this card represents your own gross income from all sources mentioned?

By gross income, I mean income from all sources before deductions for income tax, National Insurance etc. Please just tell me the letter.

INTEVIEWER - PLEASE TYPE IN THE LETTER

Helpscreen:

Income from shares / dividends are included.

We ask about income because it has a strong influence on people's travel patterns - e.g. how far they travel and by what methods. Knowing about the travel patterns of people on different incomes helps the

Department for Transport to meet the needs of people on low incomes, for example, by ensuring that enough buses are available in the areas where they live

If respondent is the Household Reference Person AND the number of adults in the household is greater than 1 (QTHComp.NumAdult > 1)

HIncGrp

NAME

SHOW CARD X (SEE APPENDIX K)

INTERVIEWER: IF YOU ALREADY KNOW THAT THIS IS A ONE PERSON HOUSEHOLD, YOU CAN ENTER THE SAME ANSWER GIVEN AT THE PREVIOUS QUESTION [Letter entered at IncGrp]

And now think of the income of the household as a whole. Which of the letters on this card represents the gross income of the WHOLE household?

INTEVIEWER - PLEASE TYPE IN THE LETTER

Helpscreen:

Income from shares / dividends are included. We ask about income because it has a strong influence on people's travel patterns - e.g. how far they travel and by what methods. Knowing about the travel patterns of people on different incomes helps the Department for Transport to meet the needs of people on low incomes, for example, by ensuring that enough buses are available in the areas where they live.

LOCATION OF WORK

TWorkPI / QWorkPI.NTS BWorkPI

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND EMPLOYED (DVAge >= 16 AND DVIL03a = 1)

ASK ALL

WkPlace

NAME

When you go to work do you... READ OUT

1. ...go to the same place every time,
2. go to the same place on at least 2 days running each week,
3. go to different places,
4. or work at home or in the same building as your home.

Helpscreen:

Informants can only have one usual place of work. This will be a place they visit on at

least 2 consecutive days per week for at least 4 consecutive weeks.
If the respondent has two work places he/she visits regularly (2 consecutive days per week or more, etc), then the one visited **most frequently** is treated as the usual place of work. If both are visited with the same frequency the one **furthest away from home** is the usual place of work.

IF respondent goes to the same workplace each time or at least 2 days a week (WkPlace = 1 or 2)

WkRef

NAME

Where do you go to work?

ADD IF NECESSARY: Can you tell me the town or area?

INTERVIEWER: TYPE IN FIRST FEW LETTERS OF PLACE NAME TO ENTER CODING FRAME. IF THE PLACE IS NOT LISTED, TYPE XXX AND CODE AS 9999997 (NOT LISTED/DON'T KNOW) ON EXITING CODING FRAME PRESS ENTER TO MOVE TO NEXT QUESTION.

IF respondent goes to the same workplace each time or at least 2 days a week (WkPlace = 1 or 2)

WkCodeUA

NAME

Unitary Authority code of place of work PRECODED - PRESS ENTER TO CONTINUE

Computed variable

WkUrbCod

City Centre code for urban areas

Computed variable

UrbRur

(P5). Urban/Rural code.

IF respondent works in a town (WkUrbCd = 1..22 OR WkUrbCd = 24..48)

WkTown

NAME

Is it within [X minutes walk of X]?

1. Within
2. Not within

See Appendix L for "Where do you work" lookup table.

IF respondent works in an urban area (WkUrbCd = 50, 89 AND UrbRural = 1..14, 89)

WkOthUrb

NAME

Is it within 5 mins walk of the main shopping/business centre?

1. Within
2. Not within

IF respondent goes to the same workplace each time or at least 2 days a week (WkPlace = 1 or 2)

WkAdd1

NAME

What is the address of your usual place of work?

INTERVIEWER: obtain as full an address as possible, including postcode if respondent can supply this. If the respondent is unsure of exact address/ postcode, please ask them to look it up. If they are unable to do this please record the Name of their employer/office and as much of the address as they can provide.

Use <ctrl + R> if respondent does not wish to provide the address.

Enter first line of the address.

INTERVIEWER: The journey to work is the most frequently travelled journey for many People. This information will allow the exact distance of this journey to be calculated.

If first line of work address entered (WkAdd1 = Response)

WkAdd2

NAME

Address of usual place of work.

INTERVIEWER: ENTER NEXT LINE OF THE ADDRESS

OR PRESS <ENTER> KEY IF NO MORE. DO NOT ENTER POSTCODE HERE.

If second line of work address entered (WkAdd2 = Response)

WkAdd3

NAME

Address of usual place of work.

INTERVIEWER: enter **next line of the address**

Or press <enter> key if no more.

DO NOT ENTER POSTCODE HERE.

If third line of work address entered (WkAdd3 = Response)

WkAdd4

NAME

Address of usual place of work.

INTERVIEWER: enter **next line of the address**

Or press <enter> key if no more.

DO NOT ENTER POSTCODE HERE.

If first line of work address entered (WkAdd1 = Response)

WkPC

NAME

What is the postcode of your usual place of work?

INTERVIEWER: IF THE RESPONDENT DOES NOT KNOW THEIR FULL WORK POSTCODE ASK THEM IF THEY COULD LOOK THIS UP.

ADD IF NECESSARY: THE JOURNEY TO WORK IS THE MOST FREQUENTLY TRAVELLED JOURNEY FOR MANY PEOPLE. THIS INFORMATION WILL ALLOW THE EXACT DISTANCE OF THE JOURNEY TO BE CALCUALTED.

If work postcode given (WkPC = Response)

WkKnow

INTERVIEWER: Record whether the respondent knew their work place address, including full postcode, or whether they had to look it up.

1. Knew work place address including post code,
2. Looked it up,
3. Did not provide full postcode/Other

TRAVEL TO WORK

TWkMeth / QTWkMeth.NTS BWkMeth

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND WORK AT SAME PLACE EVERY TIME, AT LEAST 2 DAYS A WEEK OR GOES TO DIFFERENT PLACES (DVAge>=16 AND (WkPlace = 1, 2 or 3))

ASK ALL

WkTrav

NAME

How do you usually travel to work?

THIS QUESTION APPLIES FOR THE MAIN JOB, THAT IS THE JOB IN WHICH RESPONDENT USUALLY WORKS THE MOST HOURS.

CODE ONE ONLY, FOR THE LONGEST PART, BY DISTANCE, OF THE RESPONDENT'S USUAL JOURNEY TO WORK.

1. Underground, metro, light rail, tram
2. Train
3. Bus, minibuss or coach
4. Motorcycle, scooter or moped
5. Car or van
6. Taxi/minicab
7. Bicycle
8. On foot

97. Other (specify)

Helpscreen:

Only Use 'other' code at WkTrav if none of the following apply:

Code 1 (tube) for Tyne & Wear Metro, Greater Manchester Metrolink, Glasgow Underground, Croydon Tramlink, West Midlands Metro, Sheffield Supertram, and Docklands Light Railway.

Code 3 (bus) for coaches, works bus, contract buses and minibuses.

Code 5 (car) for works vans, firms car, and transit vans.

Leave following as 'other': lorry, plane, works abroad.

If the respondent has two work places he/she visits regularly (2 consecutive days per week or more, etc), then the one visited **most frequently** is treated as the usual place of work. If both are visited with the same frequency the one **furthest away from home** is the usual place of work.

If respondent travels to work some other way (WkTrav = 97)

XWkTrav

NAME

INTERVIEWER: Please record how informant usually travels to work.

Remember to recode WkTrav 1 to 8 where possible.

If respondent now says they work and live in the same premises then please go back and amend WkPlace

Helpscreen:

Only Use 'other' code at WkTrav if none of the following apply:

Code 1 (tube) for Tyne & Wear Metro, Greater Manchester Metrolink, Glasgow Underground, Croydon Tramlink, West Midlands Metro, Sheffield Supertram, and Docklands Light Railway.

Code 3 (bus) for coaches, works bus, contract buses and minibuses.

Code 5 (car) for works vans, firms car, and transit vans.

Leave following as 'other': lorry, plane, works abroad

If travels to work by motorcycle, scooter or moped, car or van or taxi/minicab (WkTrav = 3,4 OR 5)

WkRoad

NAME

SHOW CARD Y

And on your journey to work, which of these types of road do you travel on?

INTERVIEWER NOTE: We are interested in all road types used, not just the ones covering the greatest distance.

CODE ALL THAT APPLY.

1. Motorway
2. Dual carriageway
3. Other major roads (other A roads)
4. Local road in a city or town (including B roads)
5. Local road outside a city or town (including B roads)
6. Other (please specify)

If travels to work on other type of road (WkRoad=6)

XWkRoad

NAME

INTERVIEWER: Please record details of other type of road used"

If respondent normally travels to work by car or van (WkTrav = 5)

WkDrive

NAME

When travelling to work are you...READ OUT

1. ...usually the driver,
2. usually the passenger
3. or sometimes driver and sometimes passenger

If respondent drives to work (WkDrive = 1 OR 3)

ParkWrk

NAME

SHOW CARD Z

Where do you usually park your [car/van] when you drive to work?

1. on the street
2. on a driveway
3. in a garage
4. in a park-and-ride car park
5. in another public car park
6. in a firm/work car park
7. in another private car park
8. (DOES NOT USUALLY PARK AT/NEAR WORKPLACE)

WORKING AT HOME

TWkHome / QTWkHome.NTS BWkHome

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND IN EMPLOYMENT (DVage=>16 AND DVILO3a=1).

If respondent works at same places every time, at least two days a week or goes to different places (WkPlace = 1, 2 or 3))

WkHome

NAME

Can I just check, in the week ending last Sunday (the [Date of last Sunday]), did you work at home on any of the days INSTEAD of travelling to your usual place of work?

1. Yes
2. No

Helpscreen:

Only code 'Yes' if respondent worked at home on any usual work day INSTEAD of travelling to (their usual place of) work. Those who went into work late or who worked at home in the evenings or at weekends (if these are outside their usual working hours) should be coded 'No'

If respondent did work at home (WkHome = 1)

HomeDay

NAME

On which days did you work at home?

CODE ALL THAT APPLY

1. Monday
2. Tuesday
3. Wednesday
4. Thursday
5. Friday
6. Saturday
7. Sunday

If respondent did not work at home (WkHome = 2)

PossHom

NAME

Can I check, in your (main) job, would it be possible to do your kind of work at home instead of travelling to work?

IF SOMETIMES, CODE 'YES'

IF POSSIBLE TO BORROW NECESSARY EQUIPMENT FROM WORK, (E.G. LAPTOP, SEWING MACHINE), CODE YES

1. Yes
2. No

IF respondent did work at home (WkHome = 1) OR if it is possible for respondent to work from home (PossHom = 1)

OffHome

NAME

How often do you work at home (in your main job) instead of travelling to work?

NOTE: DO NOT INCLUDE IF OUTSIDE NORMAL WORKING HOURS E.G. ADDITIONAL WORK AT HOME IN EVENING/WEEKENDS

1. 3 or more times a week
2. Once or twice a week
3. Less than that but more than twice a month
4. Once or twice a month
5. Less than that but more than twice a year
6. Once or twice a year
7. Less than that or never

EASE/DIFFICULTY OF TRAVELLING TO WORK

TWkDiff / QTWkDiff.NTS BwkDiff

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND WORK AT SAME PLACE EVERY TIME, AT LEAST 2 DAYS A WEEK OR GOES TO DIFFERENT PLACES (DVAge >= 16 AND (WkPlace = 1, 2 or 3))

If respondent travels to work by car or motorbike (WkTrav = 4 OR 5)

CarW
NAME

(I'm now going to ask a few questions about how easy or difficult you find it to make different types of journeys, and why.)

Do you usually experience any difficulties with travelling to or from work by [car/van] / [motorcycle/scooter/moped]?

IF YES, PROBE: What difficulties?

CODE ALL THAT APPLY

1. No no difficulties
2. Too far
3. Car not available
4. Don't have a current driving licence/can't drive
5. Cost of petrol
6. Lack of parking facilities
7. Cost of parking
8. Traffic congestion/roadworks
9. Inadequate public transport
10. Cost of using public transport
11. Personal physical difficulties/disability
12. Personal safety concerns
97. Other (specify)

IF respondent experiences some other difficulty (CarW = 97)

XCarW
NAME

specify other answer.

If respondent has more than one difficulty (CarW > 1)

CarWM
NAME

And which **one** of these things creates most difficulty?

CODE ONE ONLY

1. No no difficulties
2. Too far
3. Car not available
4. Don't have a current driving licence/can't drive
5. Cost of petrol
6. Lack of parking facilities
7. Cost of parking
8. Traffic congestion/roadworks
9. Inadequate public transport
10. Cost of using public transport
11. Personal physical difficulties/disability
12. Personal safety concerns
97. Other (specify)

If respondent has some other difficulty (CarWM = 97)

XCarWM
NAME

Please specify other answer.

IF respondent does not travel to work in a private car or motorbike (WkTrav = 1, 2, 5, 6, 7, 8, 97)

OthW
NAME

(I'm now going to ask a few questions about how easy or difficult you find it to make different types of journeys, and why.)

Do you usually experience any difficulties with travelling to or from work by [underground/metro/light rail/tram] / [train] / [bus/minibus/coach] / [taxi/minicab] / [bicycle] / [foot]?

IF YES, PROBE: What difficulties?

CODE ALL THAT APPLY

1. No, no difficulties
2. Too far/long journey
3. Journey not possible by public transport
4. Unreliable public transport
5. Cost of using public transport/taxis
6. Poor information about public transport services
7. Poor connections
8. Finds public transport unpleasant
9. Personal disability
10. Concerns over personal safety
11. Traffic congestion/roadworks
12. Lack of/no cycle lanes
13. The weather
97. Other (specify)

IF respondent experiences some other difficulty (OthW = Other)

XOthW
NAME

Please specify other answer.

If respondent has more than one difficulty (OthW > 1)

OthWM

NAME

And which **one** of these things creates most difficulty?

CODE ONE ONLY

1. No, no difficulties
2. Too far/long journey
3. Journey not possible by public transport
4. Unreliable public transport
5. Cost of using public transport/taxis
6. Poor information about public transport services
7. Poor connections
8. Finds public transport unpleasant
9. Personal disability
10. Concerns over personal safety
11. Traffic congestion/roadworks
12. Lack of/no cycle lanes
13. The weather
97. Other (specify)

If respondent has some other difficulty (CarWM = Other)

XOthWM

NAME

Please specify other answer.

SHOPPING

TShDiff / QTShDiff.NTS BShDiff

ASK HOUSEHOLD MEMBER WHO IS THE MAIN FOOD SHOPPER IN THE HOUSEHOLD (DVShop)

ASK ALL

TravSh

NAME

Now some questions about shopping. How do you usually travel when you do your main food shopping?

CODE ONE ONLY, FOR THE LONGEST PART, BY DISTANCE, OF THE RESPONDENT'S USUAL JOURNEY TO THE SHOPS.

IF DIFFERENT METHOD TO GET TO SHOPS AND RETURN HOME, CODE METHOD TO GET HOME

IF NO USUAL METHOD, ASK ABOUT THE LAST TIME

1. Underground, metro, light rail, tram
2. Train
3. Bus, minibus or coach
4. Motorcycle, scooter or moped
5. Car or van

6. Taxi/minicab
7. Bicycle
8. On foot
9. Does shopping online/gets shopping delivered
97. Other (specify)

If respondent uses other method of travel for food shopping (TravSh = 97)

XTravSh

NAME

Please specify other answer.

If respondent usually does the food shopping in a car or motorbike (TravSh=4 OR 5)

CarS

NAME

Do you usually experience any difficulties with travelling by [car/van] / [motorcycle/scooter/moped] when you do your main food shopping?

IF Yes, PROBE: What difficulties?

CODE ALL THAT APPLY

1. No, no difficulties
2. Too far/ long journey
3. Cost of petrol
4. Lack of parking facilities
5. Cost of parking
6. Personal disability
7. Difficulty carrying shopping to car
8. Concerns over personal safety
9. Traffic congestion/roadworks
10. Rely on non-household member taking them shopping
11. The weather
97. Other (please specify)

If respondent experiences other difficulty with travelling to or from food shopping (CarS = 97)

XCarS

NAME

Please specify other answer.

If respondent experiences more than one difficulty (CarS more than 1 response)

CarSM

NAME

And which **one** of these things creates most difficulty?

CODE ONE ONLY

1. No, no difficulties
2. Too far/ long journey
3. Cost of petrol
4. Lack of parking facilities
5. Cost of parking
6. Personal disability
7. Difficulty carrying shopping to car
8. Concerns over personal safety

9. Traffic congestion/roadworks
10. Rely on non-household member taking them shopping
11. The weather
97. Other (please specify)

IF respondent experiences some other difficulty (CarSM = 97)

XCarSM

NAME

Please specify other answer.

IF respondent does not usually do the food shopping in a private vehicle or online (TravSh = 1, 2, 3, 6, 7, 8 OR 97)

OthS

NAME

Do you usually experience any difficulties with travelling by [underground/metro/light rail/tram] / [train] / [bus/minibus/coach] / [taxi/minicab] / [bicycle] / [foot] when you do your main food shopping?

IF Yes, PROBE: What difficulties?

CODE ALL THAT APPLY

1. No, no difficulties
2. Too far/long journey
3. Journey not possible by public transport
4. Unreliable public transport
5. Cost of using public transport/taxis
6. Poor information about public transport services
7. Poor connections
8. Finds public transport unpleasant
9. Personal disability
10. Concerns over personal safety
11. Traffic congestion/roadworks
12. Difficulties carrying the shopping
13. Difficulties managing with children
14. The weather
97. Other (specify)

IF respondent experiences some other difficulties when travelling for main food shopping (OthS = 97)

XOthS

NAME

Please specify other answer.

IF there is more than one reason which creates difficulty when travelling for the main food shopping (OthS more than 1 response)

OthSM

NAME

And which **one** of these things creates most difficulty?

CODE ONE ONLY

1. No, no difficulties
2. Too far/long journey
3. Journey not possible by public transport
4. Unreliable public transport

5. Cost of using public transport/taxis
6. Poor information about public transport services
7. Poor connections
8. Finds public transport unpleasant
9. Personal disability
10. Concerns over personal safety
11. Traffic congestion/roadworks
12. Difficulties carrying the shopping
13. Difficulties managing with children
14. The weather
97. Other (specify)

IF there is some other reason which creates difficulty (OthSM = 97)

XOthSM

NAME

Please specify other answer.

ROAD ACCIDENTS

TAccid / QAccid.NTS

BAccid

ASKED OF ALL IN TURN, IF THEY ARE 16 OR OVER AND IT IS A FACE TO FACE INTERVIEW (DVAge >= 16 AND IndQn = 1)

AccInt

NAME

INTERVIEWER: THE NEXT QUESTIONS CONCERN ROAD ACCIDENTS. **PLEASE BE AWARE THIS MAY BE A SENSITIVE TOPIC FOR SOME RESPONDENTS.**

ASK ALL

Accident

NAME

In the last 3 years, that is since [Date], have you been in any type of road accident, no matter how minor?

Please include any accidents in which you were involved as a pedestrian, driver, passenger, cyclist or motorcyclist, even if no other party were involved.

Only include incidents that happened on a public road, including pavements and cycle lanes on the public road.

1. Yes
2. No

If respondent has been in accident (Accident=1)

Acc3Yr

NAME

And how many times have you been involved in a road accident, no matter how minor, in the last 3 years?

INTERVIEWER: IF THE RESPONDENT DOESN'T KNOW HOW MANY TIMES PRESS <Ctrl K> :1..97

If respondent has been in accident (Accident=1)

Acc12Mn
NAME

And how many times have you been involved in a road accident within the last 12 months, that is since [Date]?

INTERVIEWER: IF THE RESPONDENT DOESN'T KNOW HOW MANY TIMES PRESS <Ctrl K> : 0..97

If respondent has been in accident (Accident=1)

Injury3
NAME

Thinking again about the last 3 years, that is since [Date], have you been in a road accident on a public road in which you were injured in some way?

Please include incidents where you were in a vehicle, on a bicycle or motorbike, or a pedestrian.

INTERVIEWER ONLY INCLUDE INCIDENTS WHERE THE RESPONDENT WAS DIRECTLY INVOLVED - DO NOT INCLUDE INCIDENTS WHERE THE RESPONDENT WAS ONLY A WITNESS. INCIDENTS WHILE RIDING A HORSE SHOULD BE INCLUDED, EVEN IF NO OTHER PARTY WAS INVOLVED. INCIDENTS THAT DID NOT HAPPEN ON A PUBLIC ROAD (E.G. ON PRIVATE ROADS, IN PUBLIC PARKS, IN CAR PARKS, IN PETROL STATIONS) SHOULD NOT BE INCLUDED.

1. Yes
2. No

If respondent has been injured in accident (Injury3=1)

Acc3Inj
NAME

How many times have you been involved in a road accident in which you were injured in the last 3 years?

INTERVIEWER: IF THE RESPONDENT DOESN'T KNOW HOW MANY TIMES PRESS <Ctrl K> :1..97

If respondent has been injured in accident (Injury3=1)

Acc12Inj
NAME

And how many times, if any, have you been involved in a road accident in which you were injured in the last 12 months, that is since [Date]?

INTERVIEWER: IF THE RESPONDENT DOESN'T KNOW HOW MANY TIMES PRESS <Ctrl K> :0..97

SPECIAL TICKETS/PASSES

BNoTick / QNOTICK.NTS

If age is greater than 4 (DVAge > 4)

StckT
NAME

SHOW CARD AF

Do you have any of these special tickets or passes, valid for a week or longer?

INTERVIEWER: EXCLUDE ONE DAY TRAVELCARDS, CARNETS AND OYSTER CARDS (LONDON AREA) WHICH ARE SOLELY PAY-AS-YOU GO. BLUE/ORANGE DISABLED BADGES ARE NOT INCLUDED. ASK TO SEE TICKET/PASS.

1. Yes
2. No

If respondent does have special ticket (StckT = 1)

SeeTick
NAME

INTERVIEWER: Ask Respondent to get ticket/pass if possible.

1. Ticket/Pass seen
2. Ticket/Pass NOT seen

If respondent does have special ticket (StckT = 1)

NoTckt
NAME

How many of these do you have?

: 1..3

NO DON'T KNOW, NO REFUSAL

TTicket / QTICKET.NTS
BTicket

ASKED OF EACH IN TURN, IF THEY HAVE A SPECIAL TICKET (StckT=1)

ASK ALL

Tckt
NAME

TO RECORD DETAILS OF FIRST/SECOND/THIRD TICKET. PRESS <ENTER> AND CONTINUE

ASK ALL

SpecTk
NAME

TICKET NUMBER: [Number]

TYPE OF SPECIAL TICKET/PASS

INTERVIEWER: CODE TYPE OF TICKET
NAME

1. NON-CONCESSIONARY Season ticket
2. NON-CONCESSIONARY Area travel card
3. NON-CONCESSIONARY Combined season/area travel card
4. NON-CONCESSIONARY Railcard
5. NON-CONCESSIONARY Employee's special pass
6. Other NON-CONCESSIONARY ticket (SPECIFY)
7. CONCESSIONARY Passes for older people
8. CONCESSIONARY Scholar's pass
9. CONCESSIONARY Disabled person's pass
10. CONCESSIONARY Subsidised travel tokens
11. Other CONCESSIONARY ticket (SPECIFY)

Helpscreen:

Codes 01-06 are for special tickets / passes produced for commercial ('non-concessionary') reasons.

Code 07-11 are for tickets / passes subsidised by local or central government (hence 'concessionary').

SEASON TICKET (01) - a ticket valid for journeys between two places (or stops) on **one specified route only**, for any number of journeys within a set period.

AREA TRAVEL CARD (02) - special tickets valid on any route **within a specified area**, and for any number of journeys within a specified period (e.g. Travelcard, Rover, Runabout, Capitalcard etc)

COMBINED SEASON / AREA TRAVEL CARD (03) - a season ticket which includes unlimited travel within a special area at one end of the journey

RAILCARD (04) - include Senior Citizens Rail Card, Young Persons Railcard, Family Rail Card, Network Card etc

EMPLOYEE'S SPECIAL PASS (05) - special passes provided by employers (often transport operators) for employees (and sometimes their widows and families). e.g.

National Rail, LRT, British Coal, National Bus Company

OTHER NON-CONCESSIONARY (06) - all other kinds of non-concessionary tickets not covered elsewhere

Passes for older people / SCHOLAR'S / DISABLED PERSON'S PASS (07-09) - tickets or passes issued free or at a subsidised cost, which allow free or reduced rate travel. The main ones are Passes for older people, scholars passes and passes for the disabled

SUBSIDISED TRAVEL TOKENS (10) - tokens can be issued free or they can have a charge

OTHER CONCESSIONARY (11) - all other kinds of concessionary tickets not covered elsewhere

If respondent has some other concessionary ticket (SpecTk = 11)

XSpecTk
NAME

INTERVIEWER: Please describe what kind of other concessionary or non-concessionary ticket the informant has.

ASK ALL

TkMode

NAME

TICKET NUMBER: [Number]

What forms of transport does the ticket cover?

1. Train
2. LT underground/Tyne and Wear Metro/ Glasgow underground
3. Light Rail/Tram
4. Bus
5. Other single method
6. Combined (National Rail) train & underground
7. Combined (National Rail) train & bus (NOT IN LONDON)
8. Combined underground/bus
9. Combined (National Rail) train & underground & bus
10. Combined (National Rail) train & underground & bus & light rail/tram
11. Other combination of methods

IF ticket covers combined methods of transport (Tkmode = 6, 7, 8, 9, 10 OR 11)

MoMIs

NAME

TICKET NUMBER: [Number]

When you use your combined ticket, on which method of transport do you travel the most mileage?

1. Train
2. Underground
3. Light Rail/Tram
4. Bus
5. DK/Other

IF ticket type is anything other than a subsidised ticket (SpecTk is not 10)

TkTime

NAME

TICKET NUMBER: [Number]

How long does the ticket\pass last for?

1. 1 week
2. 1 month
3. 3 months/school term
4. 6 months
5. 1 Year
6. more than 1 year
7. unlimited
97. Other (specify)

IF ticket lasts for a different time period (TkTime = 97)

XTkTime

NAME

INTERVIEWER: Please record the length of time the ticket covers.

Remember to recode wherever possible.

IF ticket type is anything other than a subsidised ticket (SpecTk <> 10)

TkCst

NAME

TICKET NUMBER: [Number]

What was the actual (net) cost to you of the ticket?

ENTER COST TO THE HOUSEHOLD IN POUNDS & PENCE. EXAMPLES

10 pounds and 6p. Enter 10.06

7 pounds and 63p. Enter 7.63

IF NIL ENTER 0

IF ticket type is anything other than a subsidised ticket (SpecTk <> 10)

NumJrn

NAME

TICKET NUMBER: [Number]

How many [light rail/tram] / [underground/metro] / [bus] / [train] / [light rail/tram] / [underground/metro]

journeys per week would you expect to use the ticket\pass for. Please count each single trip as one journey and return trips as two?

INTERVIEWER: IF AVERAGE IS LESS

THAN ONCE A WEEK ENTER 0

IF the respondent makes on average less than one journey a week (NumJrn = 0)

YrNum

NAME

SHOW CARD AG

TICKET NUMBER: [Number]

Could you look at this card and tell me on about how many (main method) journeys you use the ticket\pass?

PLEASE COUNT THE NUMBER OF SINGLE JOURNEYS

1. More than 12 times per year/once a month
2. Up to 12 times per year/once a month
3. Three or four times a year
4. Once or twice a year
5. Less than once a year or never

IF ticket type is anything other than a subsidised ticket (SpecTk <> 10)

TkTPay

NAME

TICKET NUMBER: [Number]

When you use the ticket\pass do you usually have to pay anything at the time of travel, or do you travel free?

1. Pay something
2. Travel free

LONG DISTANCE JOURNEYS

TWhoLDJ / QTWhoLDJ.NTS BWhoLDJ

ASK ALWAYS

IntPlane

How many times have you left the country by plane in the last 12 months?

INTERVIEWER: ONLY INCLUDE OUTWARD JOURNEYS GOING ABROAD.

DO NOT INCLUDE INTERNAL FLIGHTS WITHIN GREAT BRITAIN OR FLIGHTS ORIGINATING ON OTHER COUNTRIES. ACCEPT BEST ESTIMATE IF NECESSARY. CODE 'NONE' AS 0.

ASK ALWAYS

AnyLDJ1

NAME

Now I'd like to ask you about any long distance journeys you have made in the last seven days / between DATE and DATE.

I mean journeys within Great Britain of 50 miles or more in one direction, say from here to [NAMES OF 2 OR 3 PLACES 45 MILES AWAY].

Have you made any long distance journeys within Great Britain of 50 miles or more since [Day / Date one week ago] / between

[Day/Date one week before start of travel week] and [Day/Date of start of travel week]?
INTERVIEWER - please refer to calendar.

1. Yes
2. No

IF Respondent did not make any long distance journeys (AnyLDJ1 = 2)

Longest

NAME

How far was the longest journey you made since [Day / Date one week ago] / between [Day/Date one week before start of travel week] and [Day/Date of start of travel week]?
INTERVIEWER: ENTER THE LENGTH OF THE JOURNEY IN MILES. IF THE JOURNEY WAS 50 MILES OR MORE, ENTER '0' THEN GO BACK TO CHANGE ANYLDJ1 TO 'YES'.

QLDJINT.NTS
BLDJINT

If Respondent made any long distance journeys (AnyLDJ1 = 1)

LDJInt

NAME

INTERVIEWER: DO YOU WANT TO ENTER THE JOURNEYS MADE BY [Name] NOW OR LATER?

1. Now
2. Later

TLDJQs / QTLDJQs.NTS
BLDJQs

ASKED OF ALL IN TURN, IF THEY HAVE MADE ANY LONG DISTANCE JOURNEYS (AnyLDJ1=1 or More =1)

ASK ALL

LDJ

ENTER LONG DISTANCE JOURNEY NUMBER

ASK ALL

LDJDate

NAME

On what date did you make your [1st/2nd/3rd etc.] long distance journey of 50 miles or more since [Day / Date one week ago] / between [Day/Date one week before start of travel week] and [Day/Date of start of travel week]?

IF Respondent made more than one long distance journey (LTLDJQs1 > 1)

RepJ

NAME

IF **REPEAT** OF PREVIOUS JOURNEY MADE BY THIS PERSON, ENTER JOURNEY NUMBER, THEN PRESS <ENTER> THEN <END>. OTHERWISE ENTER 0

IF Respondent made more than one long distance journey (LTLDJQs1 > 1) and journey was not a repeat (RepJ=0)

RepJR

NAME

IF **RETURN** JOURNEY OF PREVIOUS JOURNEY MADE BY THIS PERSON, ENTER JOURNEY NUMBER, THEN PRESS <ENTER> THEN <END>. OTHERWISE ENTER 0

IF Respondent made more than one long distance journey (LTLDJQs1 > 1) and journey was not a repeat (RepJ=0) or return journey (RepJR=0)

DupP

NAME

IF **DUPLICATE** OF JOURNEY MADE BY ANOTHER HOUSEHOLD MEMBER, ENTER THEIR PERSON NUMBER OTHERWISE ENTER 0

IF journey was a duplicate of another household members journey (DupP>0)

DupJ

NAME

ENTER [Name's] JOURNEY NUMBER FOR THE DUPLICATE JOURNEY, THEN PRESS <ENTER> THEN <END>.

ASK FOR ALL LONG DISTANCE JOURNEYS

OrigRef

NAME

From where did your journey begin?

INTERVIEWER: TYPE IN FIRST FEW LETTERS OF PLACE NAME TO ENTER CODING FRAME. IF THE PLACE IS NOT LISTED, TYPE XXX AND CODE AS 9999997 (NOT LISTED/DON'T KNOW). ON EXITING THE CODING FRAME PRESS ENTER AGAIN TO MOVE TO NEXT QUESTION.

IF placename is not in codeframe (Orig = 9999997)

XOrig

NAME

INTERVIEWER: TYPE IN NAME OF PLACE FROM WHICH JOURNEY BEGAN, INCLUDING COUNTY OR NEAREST LARGE TOWN

CODE FOR ALL LONG DISTANCE
JOURNEYS

OrigUA

NAME

Unitary Authority code of origin

PRECODED - PRESS ENTER TO
CONTINUE

CODE FOR ALL LONG DISTANCE
JOURNEYS

OrigUR

NAME

Urban/Rural code of origin

PRECODED - PRESS ENTER TO
CONTINUE

CODE FOR ALL LONG DISTANCE
JOURNEYS

OrigPI

Place of origin - from coding frame

ASK FOR ALL LONG DISTANCE
JOURNEYS

PurpTo

NAME

What was the purpose of your journey?

PROBE AS NECESSARY.

Was it **principally** to pick up or accompany
someone else?

IF SO: What were **they** doing at the time?

TYPE IN AS MUCH DETAIL AS POSSIBLE

ASK FOR ALL LONG DISTANCE
JOURNEYS

PurpFro1

NAME

ASK OR RECORD

(Can I check) Did your journey start from
home or from somewhere else?

1. Home
2. Somewhere else

*If the journey started from somewhere else
(PurpFro1 = 2)*

PurpFro

NAME

Why were you at the place where your
journey started from?

ADD IF NECESSARY: 'for example, were
you at work/college, visiting friends, on
holiday etc?'

PROBE AS NECESSARY.

Were you there **principally** to pick up or
accompany someone else?

IF SO: What were **they** doing at the time?

TYPE IN AS MUCH DETAIL AS POSSIBLE

ASK FOR ALL LONG DISTANCE
JOURNEYS

DestRef

NAME

Where did your journey end?

INTERVIEWER: TYPE IN FIRST FEW
LETTERS OF PLACE NAME TO ENTER
CODING FRAME. IF THE PLACE IS NOT
LISTED, TYPE XXX AND CODE AS

9999997 (NOT LISTED/DON'T KNOW).

ON EXITING THE CODING FRAME, PRESS
ENTER AGAIN TO MOVE TO THE NEXT
QUESTION.

*IF placename is not in codeframe (Dest =
9999997)*

XDest

NAME

INTERVIEWER: TYPE IN NAME OF PLACE
WHERE JOURNEY ENDED, INCLUDING
COUNTY OR NEAREST LARGE TOWN

CODE FOR ALL LONG DISTANCE
JOURNEYS

DestUA

Unitary Authority code of destination

PRECODED - PRESS ENTER TO
CONTINUE

CODE FOR ALL LONG DISTANCE
JOURNEYS

DestUR

NAME

Urban/Rural code of destination

PRECODED - PRESS ENTER TO
CONTINUE

CODE FOR ALL LONG DISTANCE
JOURNEYS

DestPI

Place of destination - from coding frame

ASK FOR ALL LONG DISTANCE
JOURNEYS

Dist

NAME

How far did you travel (in total on this
journey) between [origin] and [destination]?

IF INFORMANT ANSWERS DON'T KNOW,
ASK FOR AN ESTIMATE.

ENTER DISTANCE IN MILES

ASK FOR ALL LONG DISTANCE
JOURNEYS

Meth95

NAME

What method of travel did you use for the
main part of your journey? (By main part I
mean the part of your journey which covered
the longest distance)

1. Walk
2. Bicycle

3. Private (hire) bus
4. Car
5. Motorcycle
6. Van, lorry
7. Other private
8. Ordinary bus - London
9. Ordinary bus - elsewhere
10. Coach, express bus
11. Excursion/tour bus
12. LT Underground
13. Train
14. Light Rail
15. Aircraft (public)
16. Taxi
17. Minicab
18. Other public
19. Private (unspecified)
20. Public (unspecified)

Helpscreen:

The code are listed in your Definitions Manual.

IF LDJ was undertaken in a private vehicle (Meth95 IN [Car, MCycle, VanLorry, OthPriv]) AND age 16 or more (DVAge >= 16)

DriPas

NAME

Were you the driver of this vehicle or the passenger?

1. Driver
2. Passenger

Helpscreen:

If the driving was shared, then code the person who drove the longest distance as the driver. If they drove equal distances, then the driver is the one who drove for the longest time

ASK FOR ALL LONG DISTANCE JOURNEYS

More

NAME

Did you make any other long distance journeys since [Day / Date one week ago] / between [Day/Date one week before start of travel week] and [Day/Date of start of travel week]?

Please include return journeys.

1. Yes
2. No

FOLLOW UP

BFollup.NTS BFollowUp

ASK IF RESPONDENT IS OLDER THAN 15 (DVAGE>15) AND FACE-TO-FACE INTERVIEW (INDQN=1).

ASK ALL

FollowUp

Before we continue, can I ask whether it would be alright to contact you again, if at sometime in the future there were a follow-up study to this one?

1. Yes
2. No

Interviewer note:

IF YOU THINK IT WOULD BE HELPFUL, SAY ONE OR MORE OF THE FOLLOWING: You do not have to say now whether you would actually take part in the study, just whether it would be OK to contact you about it

Any follow-up study would be quite short
Any follow-up study would focus on transport issues and would be carried out on behalf of the Department for Transport

IF THE RESPONDENT SAYS "YES" TO THE ABOVE, MAKE SURE YOU RECORD A CONTACT TELEPHONE NUMBER FOR THE HOUSEHOLD ON THE ARF

If respondent agrees to follow up (FollowUp=1)

TelNoH

NAME

And what would be the best telephone number to reach you on?

Include standard code.

INTERVIEWER: IF NOT OBTAINED PRESS <CTRL R>

If respondent agrees to follow up (FollowUp=1)

TelNoM

NAME

Is there an alternative number?

IF NOT OBTAINED PRESS ENTER TO CONTINUE

INDIVIDUAL PICK UP INTERVIEW

TPickUp / QTPICKUP.NTS
BPickUp

ASKED OF ALL IN TURN, DURING PICKUP INTERVIEW (QSignIn.StatusQ = 2)

RECORD ALWAYS

WhoPU

Which person do you want to do the individual pick up interview for? ENTER PERSON NUMBER FROM LIST BELOW.

1. Name [1]
2. Name [2]
3. Name [3]
4. Name [4]
5. Name [5]
6. Name [6]
7. Name [7]
8. Name [8]
9. Name [9]
10. Name [10]

RECORD ALWAYS

PUQn

CODE WHETHER FACE TO FACE INTERVIEW, PROXY INTERVIEW, OR PERSON NOT AVAILABLE.
INTERVIEWER: IN GENERAL, FOR CHILDREN UNDER ELEVEN, INTERVIEW AN ADULT AND CODE AS 'PROXY'

1. Face to face
2. Proxy
3. Not available

RECORD ALWAYS

Session

Session original interview in (computed)

RECORD ALWAYS

SessLine

Line number in session original interview in (computed)

IF Respondent aged over 4 (DVAge > 4)

StckPic

NAME

SHOW CARD AA

Since I interviewed you on [Date], have you bought or been given any of these special tickets or passes **for your own use**, valid for a week or longer?

INTERVIEWER: EXCLUDE ONE DAY TRAVELCARDS, CARNETS AND OYSTER CARDS (LONDON AREA) WHICH ARE SOLELY PAY-AS-YOU GO.

BLUE/ORANGE DISABLED BADGES ARE NOT INCLUDED.

ASK TO SEE TICKET/PASS.

1. Yes
2. No

IF Respondent has been bought or been given a special ticket or pass (StckPic = 1)

NewTNo

NAME

How many special tickets or passes **for your own use** have you bought or been given since then?

:1..3

IF Respondent has been bought or been given a special ticket or pass (StckPic = 1)

NewTick

NAME

And is this a replacement for the old ticket or pass, or is it a different one?

/And are these all replacements for an old ticket or pass, or are any of them different ones?

IF ANY DIFFERENT, CODE NUMBER OF **NEW** TICKETS.

IF ONLY REPLACEMENT TICKETS OBTAINED SINCE THE PLACEMENT INTERVIEW THEN CODE '0'

If anyone in the household has bought or been given any new special tickets or passes since the placement interview they are asked the questions in block BTickPU. This block includes the same questions as are asked in block BTicket in the special tickets section of the individual questionnaire. These questions are:

Tckt

SpecTk

XSpecTk

TkMode

MoMIs

TkTime

XTkTime

TkCst

NumJrn

YrNum

TkTPay

IF respondent did not have a driving licence at placement interview (DLFull=2)

DLFNew

NAME

Since I last interviewed you on [Date], have you acquired a full driving licence valid in Great Britain to drive either a car, or a motorcycle, scooter or moped?

1. Yes
2. No

If has acquired a licence (DLFnew=1)

DLTyp95

NAME

Is it for a car only, a motorcycle only or for both, or is it for a car with special adaptations?

THE CODES AFTER THE / APPLY TO LICENCES ISSUED AFTER JUNE 1990
INTERVIEWER: ASK RESPONDENT TO CHECK LICENCE

1. Car (A or B) / (B)
2. Car (A or B) / (B) - (AUTOMATIC ONLY)
3. Both car and motorcycle (A&D)/(A&B)
4. Motorcycle (D) / (A)/P
5. Car with special adaptations (A restricted, B)
6. Moped (E) / (P)

If licence is for car and motorcycle

(DLTyp95=3)

CarMot95

NAME

May I just check, have you actually passed a test to drive a motorcycle of over 125CC?

1. Yes
2. No

IF Respondent has not acquired a full driving licence (DLFNew = 2)

DLNPro

NAME

Have you acquired a provisional driving licence since I last interviewed you on [Date]?

1. Yes
2. No

If has acquired provisional licence

(DNLPro=1)

ProTyp95

NAME

Is it for a car only, a car and motorcycle, a car with special adaptations or something else?

CODE FIRST THAT APPLIES

1. Car only
2. Car and motorcycle
3. Car with special adaptations
5. Motorcycle, scooter, moped only
- 4.. Something else

If provisional licence is for something else

(ProTyp95=4)

XProTp95

INTERVIEWER: Record other answer
STRING[60]

(Ask for each individual at pick-up)

GPSDiff

And can I just check, overall, how easy or difficult did you personally find it to use the GPS monitor? Did you find it.. READ OUT...

- 1 Very easy...
- 2 Fairly easy...
- 3 Fairly difficult or
- 4 Very difficult

(Ask for each individual at pick-up)

Collect

INTREVIEWER: COLLECT GPS DAILY RECORD SHEET. YOU WILL NEED THIS TO COMPLETE THE ADMIN BLOCK.

(Ask for each individual at pick-up)

PrNote

INTERVIEWER: IF THE RESPONDENT FULLY COMPLETED THE DIARY AND/OR USED THE GPS MONITOR, COMPLETE THE PROMISSORY NOTE AND GIVE THEM THE TOP COPY.

1. Promissory note given
2. Promissory note not given

Vehicle Questionnaire

BVehInt / QVehInt.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK. (Numveh > 0 AND WhenAcq=1 or 2)

ALWAYS RECORD

Intro

THIS IS THE START OF THE VEHICLE QUESTIONNAIRE FOR THE [VEHICLE] INTERVIEWER: DO YOU WANT TO COMPLETE THE QUESTIONNAIRE FOR THIS VEHICLE NOW OR LATER? INTERVIEWER: ASK THESE QUESTIONS OF THE MAIN DRIVER [Name] IF POSSIBLE.

THEN PRESS <ENTER> & <END> TO GO TO THE NEXT PICK-UP QUESTION

1. Now
2. Later

NO DK, NO REFUSAL

If vehicle questionnaire is to be conducted later (Intro=2)

LStop

INTERVIEWER: Please remember to come back to the vehicle questionnaire for the [VEHICLE].

Each time you exit then re-enter the questionnaire and move through it by hitting the END key you will stop at this question.

Go back to the previous question and change 'later' to 'now' when you are ready to complete the missing questions.

Press 1 and <Enter> to continue.

1. Continue

REGISTRATION NUMBER

ASK ALWAYS

RegIntr

I'd now like to ask for some details about the [Vehicle number] so that we can collect information about the types of motor vehicles that people use.

First, could you give me the registration number?

ADD IF NECESSARY: If you are able to give us the registration number, we will be able to get some of the information we need from DVLA rather than asking you for the information now.

1. Willing to give (British) registration number

2. Not willing to give registration number
3. Willing to give registration number but cannot remember it correctly
4. Foreign registration number

Helpscreen:

No information on your vehicle will be given to anyone outside the statistics section at DfT and the registration number will not be used to identify you or your household.

DVLA = Driver and Vehicle Licensing Agency

IF Respondent is willing to give registration number (RegIntr = 1)

RegExpl

READ OUT: We will use this to look up some details already held by DVLA.

No information on your vehicle will be given to anyone outside the statistics section at DfT and the registration number will not be used to identify you or your household.

DVLA = DRIVER AND VEHICLE LICENSING AGENCY

1. Acceptable to respondent - continue
2. Not acceptable - change RegIntr

IF this is acceptable (RegExpl = 1)

VRegNo1

ENTER REGISTRATION NUMBER FOR THE [VEHICLE]

INTERVIEWER: PLEASE USE CAPITAL LETTERS AND DO NOT USE SPACES BETWEEN PARTS OF THE CODE.

NO DK, NO REFUSAL

IF this is acceptable (RegExpl = 1)

RFormat

INTERVIEWER: CODE FORMAT OF REGISTRATION NUMBER. (HOW REGISTRATION YEAR OF VEHICLE IS IDENTIFIED).

1. AB **12** CDE (new format 2001 onwards, with registration year shown by 2 numbers)."
2. **A**123CDE, **A**12BCD, **A**1BCD (old format 1983-2001 with registration year letter at the **start**).
3. ABC12**3D**, ABC12**D**, ABC1**D** (old pre-1983 format with registration year letter at the **end**).
4. None of these

IF this is acceptable (RegExpl = 1)

RegNo

Can I ask you to repeat your registration number, so I can check it is recorded correctly.

INTERVIEWER: ENTER REGISTRATION NUMBER FOR THE [VEHICLE] AGAIN TO CONFIRM.

PLEASE USE CAPITAL LETTERS AND DO NOT USE SPACES BETWEEN PARTS OF THE CODE.

READ NUMBER BACK TO RESPONDENT TO VERIFY.

THEN PRESS <ENTER> & <END> TO GO TO THE NEXT PICK-UP QUESTION

NO DK, NO REFUSAL

IF Registration number not given (RegNo <> Response)

FuelTyp

VEHICLE

What fuel does the [VEHICLE]'s engine use?

1. Petrol (INCLUDES LEAD FREE AND TWO STROKE)
2. Diesel
3. Electric/Battery
4. Liquefied Petroleum Gas (LPG)
5. Bi-fuel (petrol/gas)
97. Other (SPECIFY)

IF Some other fuel type is used (FuelTyp = 97)

XFuelTyp

VEHICLE

PLEASE SPECIFY THE OTHER ANSWER.

BVMake / QVMake.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK AND THE FUEL TYPE IS NOT ELECTRIC (Numveh > 0 AND WhenAcq=1 or 2 AND FuelTyp <> Electric)

IF Registration number not given (RegNo <> Response)

LogBook2

VEHICLE

INTERVIEWER IF THE RESPONDENT STRUGGLES TO ANSWER QUESTIONS ON THEIR VEHICLE SUGGEST THAT THE RESPONDENT GETS THE LOG BOOK (OR VEHICLE REGISTRATION DOCUMENT). THIS MAY HELP THEM ANSWER SOME OF THE QUESTIONS ON THEIR VEHICLE Press 1 and <Enter> to continue.

1. Continue

IF Registration number not given (RegNo <> Response):

Personal

VEHICLE

Is the registration number for this vehicle a personalised or cherished number?

1. Yes
2. No

IF Registration number is not personalised or cherished (Personal = 2)

SimReg

SHOW CARD AH

VEHICLE

I would like to know the registration year of the [VEHICLE]. To help with this, can you tell me which of the numbers on this card looks similar to the [VEHICLE]'s registration number?

POINT TO EACH AND SAY: Is it like this with two letters, then two numbers, or like this with a letter at the start, or like this with a letter at the end?

1. AB12CDE
2. A123 CDE, A12 BCD, A1 BCD
3. ABC 123D, ABC 12D, ABC 1A
4. None of these

IF Registration number is not in any given pattern (NOT (SimReg =4)

LookReg

VEHICLE

Could I look at the registration number to find out which letter denotes the year in your registration number? I will not enter the whole number into the computer

INTERVIEWER: Please refer to CHECK CARD

1. Yes
2. No

IF Registration number follows format 1 above (SimReg = 1)

WhatNum

VEHICLE

SHOW CARD AH

What is the number in the middle of the registration number that denotes the year? RECORD THE RELEVANT NUMBER

If registration number follows format 2 or 3 above or respondent showed registration number (SimReg=2 or 3 OR LookReg=1)

Letter

VEHICLE

SHOW CARD AH

Which letter denotes the year (that is what is the first/last letter of your registration number)?

INTERVIEWER: IF PATTERN SELECTED AT QUESTION SimReg POINT TO THE REGISTRATION SEQUENCE SELECTED ON SHOW CARD, AND ASK WHAT REGISTRATION LETTER IS IN THE SAME

POSITION AS THE LETTER **IN COLOUR**
ON THE CARD.

INTERVIEWER: Please refer to CHECK
CARD 1.
RECORD THE RELEVANT LETTER

*If respondent has given a letter that denotes
year of registration and respondent showed
the registration (Letter=response AND
Lookreg=1)*

Numba
VEHICLE

Does the letter come at the beginning or the
end of the registration number?

ASK OR RECORD AND CHECK

1. Letter before number
2. Letter after number

*IF Registration number not given (RegNo <>
Response)*

RegYear
VEHICLE

ASK OR RECORD AND CHECK.

Could you tell me the exact year and month
in which the vehicle was first registered?

IF THE REGISTRATION LETTER/NUMBER
IS [LETTER/NUMBER] THEN THE VEHICLE
WILL HAVE BEEN REGISTERED
BETWEEN [MONTH/YEAR] AND
[MONTH/YEAR].

ENTER YEAR HERE

*IF Registration number not given (RegNo <>
Response)*

RegMon
VEHICLE

MONTH OF FIRST REGISTRATION

VEHICLE DETAILS

*IF Vehicle is a 4-wheeled car or a light van
(TypeVcl2 = 1 or 5) AND Vehicle was
manufactured since 1983 (LVMake1 IN
[1983..2012])*

CarCoding

INTERVIEWER: Please code car make and
model

PRESS <SPACE BAR> TO START CODING

Car make, model and mods spec are:

VEHICLE

[Vehicle make] [Vehicle model].Modspec

If you can't find the right code type <Ctrl+K>
for 'don't know'

ON EXITING THE CODING FRAME PRESS

ENTER TO MOVE TO THE NEXT

QUESTION

Helpscreen:

Press <SPACE BAR> to start coding

The car make and model will be
automatically inserted into Input box
Move up and down the selections shown
using the arrow keys

When the correct car make, model and
specification is highlighted press ENTER to
select and save

If you can't find a good match you can

- edit the description

- swap to alphabetic coding by pressing

<Alt+A>

- swap back to trigram coding by pressing

<Alt+T>

If you still have problems finding a match

there may be an error in the registration year

- only cars valid for the registration year are

shown

If you can't assign a code then press

<Ctrl+K> for don't know

BEngFTS / QEngFts.NTS

*ASKED OF RESPONDENT WHO BEST
KNOWS ABOUT VEHICLE IF THERE IS A
VEHICLE IN THE HOUSEHOLD WHICH
WAS ACQUIRED BEFORE OR DURING
THE TRAVEL WEEK AND THE FUEL TYPE
IS NOT ELECTRIC (Numveh > 0 AND
WhenAcq=1 or 2 AND FuelTyp <> Electric)*

*IF Registration number not given (RegNo <>
Response)*

EnSize

VEHICLE

ASK OR RECORD AND CHECK

What is the size of the [Vehicles]'s engine in
cc's?

(1 litre = 1000 cc)

PROBE IF ANSWER IS GIVEN TO

NEAREST 100cc.....(Help <F9>)

Helpscreen:

MOPEDS: have a maximum engine size of
50cc.

IF engine size is not known (EnSize = DK)

BenSize

SHOW CARD AI

VEHICLE

Taking your answer from this card, what is
the engine size?

1. up to 50cc
2. 51 to 125cc
3. 126 to 250cc
4. 251 to 700cc
5. 701 to 1000cc (0.7 to 1 litre)

6. 1001 to 1300cc (1.0 to 1.3 litres)
7. 1301 to 1400cc (1.3 to 1.4 litres)
8. 1401 to 1500cc (1.4 to 1.5 litres)
9. 1501 to 1800cc (1.5 to 1.8 litres)
10. 1801 to 2000cc (1.8 to 2.0 litres)
11. 2001 to 2500cc (2.0 to 2.5 litres)
12. 2501 to 3000cc (2.5 to 3.0 litres)
13. 3001cc and over (3 litres and over)

If registration year is before 1984 or the letter or number denoting registration year is refused or not known (RegYear < 1984 or Letter=DK or Refusal or WhatNum=DK or Refusal)

IntQust

VEHICLE

Can you tell me the exact size of the vehicles fuel tank in litres or gallons?

INTERVIEWER: ENTER WHETHER LITRES OR GALLONS OR DK HERE AND ENTER THE AMOUNT IN THE NEXT QUESTION.

1. Amount given in litres
2. Amount given in gallons

If Fuel tank size given in Litres (IntQust=1)

TankLtr

VEHICLE

ENTER THE AMOUNT IN LITRES

If Fuel tank size given in gallons (IntQust=2)

TankGal

VEHICLE

ENTER THE AMOUNT IN GALLONS.

GIVE ANSWER TO ONE DECIMAL PLACE

PARKING

BPark / QPark.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK AND THE FUEL TYPE IS NOT ELECTRIC (Numveh > 0 AND WhenAcq=1 or 2 AND FuelTyp <> Electric)

ASK ALWAYS

WherePk

VEHICLE

Where is the VEHICLE usually parked overnight?

Is it ... READ OUT

1. ...in the garage (at this address),
2. not garaged but still on the property of this address,
3. on the street or public highway,

4. or, elsewhere (at or near your home)? (Specify)
5. (DOES NOT USUALLY PARK AT/NEAR HOME)

IF Respondent parks elsewhere at or near their home (WherePk = 4)

XWherePk

Please specify other answer.

COMPANY CAR

BComCar / QComCar.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK AND THE FUEL TYPE IS NOT ELECTRIC (Numveh > 0 AND WhenAcq=1 or 2 AND FuelTyp <> Electric)

Asked of all vehicles

HHReg

Is the VEHICLE registered in the name of a member of this household?

INTERVIEWER: UNREGISTERED & YET-TO-BE REGISTERED VEHICLES SHOULD BE CODED TO THE APPROPRIATE OWNER.

1. Yes
2. No

IF the vehicle is not registered in a household member's name (HHReg = 2)

OthReg

SHOW CARD AJ

VEHICLE

(May I just check) In whose name is the VEHICLE registered? Please choose your answer from this card.

INTERVIEWER: UNREGISTERED & YET-TO-BE REGISTERED VEHICLES SHOULD BE CODED TO THE APPROPRIATE OWNER.

1. Someone outside household
2. Employer/firm for whom household member works
3. Own business
4. Other firm or organization

IF the vehicle is registered by someone outside the household, or the person to whom the vehicle is registered is unknown (OthReg = 1 OR DK OR HHReg = DK)

WhoOwn

VEHICLE

Who owns the vehicle?

1. Household member

2. Someone outside household
3. Employer/firm for whom household member works
4. Own business
5. Other firm or organization

IF the vehicle is registered by someone outside the household, or the person to whom the vehicle is registered is unknown (OthReg=1 or DK OR HHRReg=DK)

WhyUse

VEHICLE

Why do you have use of the vehicle?

INTERVIEWER: INCLUDE AS 'BORROWED', VEHICLES OWNED BY NON-HOUSEHOLD MEMBER BUT WHICH ARE AVAILABLE FOR USE FOR THE WHOLE OF THE TRAVEL WEEK.

1. Borrowed
2. Other (Specify)

IF Respondent has use of vehicle for a reason other than the vehicle is borrowed (WhyUse = 2)

XWhyUse

PLEASE SPECIFY OTHER ANSWER.

IF the vehicle is registered/owned by an employer/firm for whom the household member works (OthReg =2 OR WhoOwn =3)

VehHire

VEHICLE

Is the vehicle on hire or lease?

IF 'NO' SPECIFY WHY NOT IN A NOTE

1. Yes
2. No

IF the vehicle is on hire or lease (VehHire = 1)

WhoHire

VEHICLE

Who has hired or leased the vehicle?

1. Household member
2. Employer/firm for whom household member works
3. Own business

If vehicle is privately owned AND hired by a household member or not known who hires it (privvcl=1, DK or Ref AND WhoHire=1 or DK)

CostHir

VEHICLE

Are any of the costs of hiring or leasing paid for by the employer of a member of your household?

1. Yes
2. No

IF vehicle is is privately owned AND registered by household member (Privvcl=1, DK or Ref AND HHRReg=1 AND WhOwn = 1)

VehCost

VEHICLE

Were any of the purchase costs of the vehicle paid for by a firm or organization?

1. Yes
2. No
3. (Costs paid for by Disability Living Allowance)

IF the purchase costs of the vehicle were paid for by a firm or organisation (VehCost = 1)

ComTax95

VEHICLE

For some people, having a vehicle means that they have to pay company car tax. Do you have to pay company car tax?

1. Yes
2. No

IF privately owned vehicle

AND

(vehicle is registered/owned/leased or hired by respondent's own business OR the purchase costs of the vehicle are not paid for by a firm or organisation or costs paid by Disability Living Allowance AND the respondent is self-employed and does not have to pay company car tax) (Privvcl=1, DK, Ref AND ((WhoOwn=4 or OthRe=3 or WhoHire=3) OR (VehCost=2 or 3 AND ComTax95=2)))

CapAll

VEHICLE

(May I check) Can you claim capital allowances for your vehicle and/or tax refunds for costs of business mileage?

1. Yes
2. No

If privately owned four wheel car or van AND ((resp is employed AND registered by household member AND doesn't pay company car tax) OR (registered to own business AND Does not claim capital allowances for vehicle tax)).

(IF Privvcl=1, DK or Ref

AND Typvcl2 = 1 or 5 AND ((lchemp = 1 AND (HHRReg = 1 OR WhoOwn = 1 OR WhoHire = 1) AND ComTax95 =2) OR ((OthReg = 3 OR WhoOwn = 4 OR WhoHire = 3) AND CapAll = 2)))

CourWk95

VEHICLE

(May I check) Do 'you' use the vehicle in the course of your work?

1. Yes

2. No

If respondent uses vehicle in the course of work (CourWk95=1)

Allow95
VEHICLE

For the mileage that 'you' do in the course of work do 'you' receive... READ OUT ...a mileage allowance only, a mileage allowance and some other allowance, or do you receive nothing and have to pay yourself?"

1. A mileage allowance only
2. A mileage allowance and some other allowance
3. Receive nothing and have to pay yourself?
4. Other.

If respondent receives an other type of assistance or mileage done 'in course of work (Allow95=4)

XAllow95
VEHICLE

INTERVIEWER: PLEASE DESCRIBE IN DETAIL EXACTLY WHAT KIND OF ASSISTANCE THE INFORMANT RECEIVES FOR MILEAGE DONE 'IN COURSE OF WORK'.

IF ((company vehicle OR company leases or has registered the vehicle)) AND the vehicle is a car or light van (IF privvcl=2 OR (Whoown=3 OR OthReg=4 or DK, OR WhoHire=2 or Dk) OR (CostHir=1)) AND Typevcl2=1 or 5)

PrivMi95
VEHICLE

(May I check) for your private mileage, including commuting mileage, do you receive any free fuel?

1. Yes
2. No

IF Respondent receives free fuel for their private mileage (PrivMi95 = 1)

FTax95
VEHICLE

(May I check) do you pay the tax on free fuel?

1. Yes
2. No

MILEAGE

BMILEAG / QMileag.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK AND THE FUEL TYPE IS NOT ELECTRIC (Numveh > 0 AND WhenAcq=1 or 2 AND FuelTyp <> Electric)

ASK ALWAYS

AnMiles
VEHICLE

I would like to get a figure for the approximate annual mileage of the VEHICLE. Can you please estimate for me the total miles the vehicle has been driven in the last 12 months, (that is since DATE)?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE.

IF NECESSARY OBTAIN TO NEAREST THOUSAND.

OBTAIN EXPECTED MILEAGE IF VEHICLE ACQUIRED LESS THAN A YEAR AGO.

IF NIL ENTER 0

If annual number of miles is not known (AnMiles=DK)

BAnMiles

SHOW CARD AK
VEHICLE

Taking your answer from this card, approximately how many MILES has this vehicle been driven in the last 12 months, (that is since [date])?

INTERVIEWER: IF DK ENCOURAGE ESTIMATE. OBTAIN EXPECTED MILEAGE IF VEHICLE ACQUIRED LESS THAN A YEAR AGO.

1. 0 - 499 miles
2. 500 - 999 miles
3. 1,000 - 1,999 miles
4. 2,000 - 2,999 miles
5. 3,000 - 3,999 miles
6. 4,000 - 4,999 miles
7. 5,000 - 6,999 miles
8. 7,000 - 8,999 miles
9. 9,000 - 11,999 miles
10. 12,000 - 14,999 miles
11. 15,000 - 17,999 miles
12. 18,000 - 20,999 miles
13. 21,000 - 29,999 miles
14. 30,000 miles and over

IF Respondent has given the annual mileage of their vehicle (AnMiles > 0)

KmOrMile
VEHICLE

INTERVIEWER ASK OR CODE:

WAS THE ANSWER TO 'AnMiles' IN MILES OR KILOMETRES?

1. Miles
2. Kilometres

*If ((annual mileage has been given in miles)
OR (vehicle is a 4 wheel car or light van AND
annual miles not given))*

*AND someone in house is in work (Ichemp=1
AND ((KmOrMile=1) OR (Typevccl2=1 or 5
AND Anmiles <> response)))*

UsualWk

VEHICLE

Can you please estimate how many of the total annual miles, if any, are driven by anyone in the household in getting to or from a usual place of work, either all of the way or part of the way?

IF NIL ENTER 0

If someone in house is working AND annual mileage has been given in kilometres (Ichemp=1 AND kmOrMile=2)

UsualKm

VEHICLE

Can you please estimate how many of the total annual kilometres, if any, are driven by anyone in the household in getting to or from a usual place of work, either all of the way or part of the way?

IF NIL ENTER 0

*If ((annual mileage has been given in miles)
OR (vehicle is a 4 wheel car or light van AND
annual miles not given))*

*AND someone in house is in work (Ichemp=1
AND ((KmOrMile=1) OR (Typevccl2=1 or 5
AND Anmiles <> response)))*

CoursWk

VEHICLE

Leaving aside these journeys, can you estimate how many of the total annual miles, if any, are driven by anyone in the household in the course of work?

IF NIL ENTER 0

If someone in house is working AND annual mileage has been given in kilometres (Ichemp=1 AND kmOrMile=2)

CoursKm

VEHICLE

Leaving aside these journeys, can you estimate how many of the total annual kilometres, if any, are driven by anyone in the household in the course of work?

IF NIL ENTER 0

*If ((annual mileage has been given in miles)
OR (vehicle is a 4 wheel car or light van AND
annual miles not given))*

AND someone in house is in work AND some of that mileage is driven in the course of work

*(Ichemp=1 AND Courswk>0 ((KmOrMile=1)
OR (Typevccl2=1 or 5 AND Anmiles <>
response)))*

GoodsWk

VEHICLE

And can you estimate how many of these [Number of miles driven in the course of work] miles are driven by anyone in the household whilst carrying goods in the course of work?

IF NIL ENTER 0

If someone in house is working AND annual mileage has been given in kilometres and some of that mileage is in the course of work (Ichemp=1 AND kmOrMile=2 AND Courskm>0)

GoodsKM

VEHICLE

And can you estimate how many of these [Number of kilometres driven in the course of work] kilometres are driven by anyone in the household whilst carrying goods in the course of work?

IF NIL ENTER 0

If mileage in miles AND mileage has been given for all mileage, mileage to work and mileage in course of work (KMorMiles=1) AND (AnMiles= response AND usualwk=response AND Courswk=response)

OthMile

VEHICLE

So that means that the vehicle is driven about [Number of total annual miles minus the number of miles driven to and from work and in the course of work] miles a year for all other journeys?

PRESS <ENTER> IF THE NUMBER SHOWN IS CORRECT, OR CHANGE TO THE CORRECT NUMBER.

INTERVIEWER: IF THE NUMBER IS CHANGED IT WILL BRING UP AN ERROR MESSAGE - YOU WILL NEED TO MODIFY PREVIOUS ANSWERS

If mileage in km AND mileage has been given for all mileage, mileage to work and mileage in course of work (KMorMiles=2) AND (AnMiles= response AND usualkm=response AND Courskm=response)

Othkm

VEHICLE

So that means that the vehicle is driven about [Number of total annual kilometres minus the number of kilometres driven to and

from work and in the course of work] kilometres a year for all other journeys. PRESS ENTER IF THE NUMBER SHOWN IS CORRECT OR CHANGE TO THE CORRECT NUMBER INTERVIEWER: IF THE ANSWER IS CHANGED IT WILL BRING UP AN ERROR MESSAGE - YOU WILL NEED TO MODIFY PREVIOUS ANSWERS.

MODULE A ONLY

OutGB

VEHICLE

Has the vehicle been driven OUTSIDE of Great Britain in the last year, (that is since DATE), by anyone in the household? INCLUDE TRAVEL IN NORTHERN IRELAND, THE ISLE OF MAN & CHANNEL ISLANDS

1. Yes
2. No

Helpscreen:

Outside GB means outside of England, Wales and Scotland. Include travel in the Isle of Man, Channel islands and Northern Ireland

MODULE A ONLY

If some miles have been driven outside Great Britain (OutGB=1)

MileGB

VEHICLE

What was the vehicle's total mileage OUTSIDE GB on the last trip that was made? INCLUDE MILEAGE REGARDLESS OF WHO WAS DRIVING, INCLUDE MILEAGE IN NORTHERN IRELAND, THE ISLE OF MAN & CHANNEL ISLANDS

MODULE A ONLY

If some miles have been driven outside Great Britain (OutGB=1)

PurpGB

VEHICLE

What was the main purpose of the trip?

1. A holiday
2. A business trip
3. A shopping trip
4. Visiting friends or relations
5. Another reason

MODULE A ONLY

If trip outside Great Britain made for some other purpose (PurpGB=5)

OthPurp

VEHICLE

What was the reason for the trip?

ASK ALL

SecCyc

VEHICLE

(May I just check) Is the milometer on its second cycle, in other words has it reached its maximum figure and been through zero again?

1. Yes
2. No

ASK ALL

MiloRep

VEHICLE

Has the milometer been replaced since the vehicle was new?

THEN PRESS <ENTER> & <END> TO GO TO THE NEXT PICK-UP QUESTION

1. Yes
2. No

BVehInt / QVehInt.NTS

ASKED OF RESPONDENT WHO BEST KNOWS ABOUT VEHICLE IF THERE IS A VEHICLE IN THE HOUSEHOLD WHICH WAS ACQUIRED BEFORE OR DURING THE TRAVEL WEEK (Numveh > 0 AND WhenAcq=1 or 2)

SatNav

Does [this vehicle] have satellite navigation/SatNav technology?

INTERVIEWER: Makes of satellite navigation technology include TomTom, Garmin, Traffic Master and Navman.

1. Yes
2. No

Vehicle Pick Up Interview

TVPickU / QTVPickU.NTS
BVPickU

ASKED OF ALL VEHICLES IN THE PICK UP INTERVIEW IF NOT ACQUIRED AFTER THE PLACEMENT INTERVIEW AND NOT DISPOSED OF BEFORE THE START OF THE TRAVEL WEEK AND OF THOSE VEHICLES THAT THE HOUSEHOLD STILL HAS AFTER THE TRAVEL WEEK.(WhenAcq=1 or 2 AND StillGot = 1)

ASK ALWAYS

FuelNow

VEHICLE

INTERVIEWER: DO YOU WANT TO COMPLETE THE FUEL GAUGE DETAILS NOW OR LATER?

IF THE FIRST OR LAST GAUGE READING WAS 'FULL' OR 'EMPTY', YOU MUST CODE 'NOW' AS YOU WILL NEED TO ASK SOME EXTRA QUESTIONS.

NOTE. IF VEHICLE ACQUIRED SINCE PLACEMENT, ASK RESPONDENT TO **ESTIMATE** FUEL AND MILEAGE DETAIL

1. Now
2. Later

NO DK, NO REFUSAL

If fuel gauge details are to be completed later (FuelNow=2)

LStop

VEHICLE

INTERVIEWER: Please remember to come back to these fuel gauge questions. Each time you exit then re-enter The questionnaire and move through it by hitting the END key you will stop at this question.

Go back to the previous question and change 'later' to 'now' when you are ready to complete the missing questions. Press 1 and <Enter> to continue.

1. Continue

ASK ALWAYS

VFuelNow

SECURITY COPY

1. Now
2. Later

If Respondent would like to complete the fuel gauge details now (FuelNow = 1)

AnyFuel

VEHICLE

INTERVIEWER: CHECK FUEL GRID IN FUEL AND MILEAGE CHART, AND CODE WHETHER ANY FUEL WAS PUT IN TANK IN TRAVEL WEEK

1. Fuel put in
2. No fuel put in

If any fuel was put in the tank during the Travel Week (AnyFuel = 1)

IntQust1

VEHICLE

INTERVIEWER: IN THE NEXT QUESTIONS CODE THE TOTAL QUANTITY PUT IN AND CHECK TOTAL WITH RESPONDENT.

FIRST CODE IF AMOUNT IN LITRES OR GALLONS

1. Litres
2. Gallons

If Fuel quantity is entered in litres (IntQust1 = 1)

FuelLtr

VEHICLE

QUANTITY OF FUEL PUT IN, IN LITRES (TO NEAREST WHOLE LITRE)

If Fuel quantity is entered in gallons (InQust1 = 2)

FuelGal

VEHICLE

QUANTITY OF FUEL PUT IN, IN GALLONS (TO ONE DECIMAL POINT)

If any fuel was put in the tank during the Travel Week (AnyFuel = 1)

FuelPds

VEHICLE

ENTER AMOUNT HOUSEHOLD PAID IN POUNDS AND PENCE FOR THIS FUEL AND CHECK SUM WITH RESPONDENT

If fuel gauge details are to be completed now (FuelNow=1)

FGauge

VEHICLE

CHECK FIRST FUEL GAUGE READING ON FUEL AND MILEAGE CHART.

'FIRST' FUEL READING WAS:

1. Recorded from fuel gauge
2. Estimated (including when fuel gauge faulty or absent)
3. Not Available

NO DK, NO REFUSAL

If First fuel reading was recorded from fuel gauge or estimated (FGauge = 1 OR 2)

FFGRead

VEHICLE

ENTER 'FIRST' FUEL GAUGE READING (enter box no.)

NO DK, NO REFUSAL

If fuel gauge details are to be completed now (FuelNow=1)

LGauge

VEHICLE

CHECK LAST FUEL GAUGE READING ON FUEL AND MILEAGE CHART. 'LAST' FUEL READING WAS:

1. Recorded from fuel gauge
2. Estimated (including when fuel gauge faulty or absent)
3. Not Available

NO DK, NO REFUSAL

Last fuel reading was recorded from fuel gauge or estimated (LGauge = 1 OR 2) :

LFGRead

VEHICLE

ENTER LAST FUEL GAUGE READING (enter box no.)

NO DK, NO REFUSAL

*If first fuel gauge reading is '9' (full)
(FFGRead=9)*

StikFul

VEHICLE

(This may not apply to your vehicle but in some vehicles the fuel gauge indicator tends to stick for a while at 'full').

I notice that your fuel gauge reading shows that your fuel tank was 'full' or 'nearly full' at the start of your Travel Week.

Do you remember - had you driven for 20 miles or more without the needle changing position?

1. Yes
2. No
3. DK/Can't remember

NO DK, NO REFUSAL

*If first fuel gauge reading is '1' (empty)
(FFGRead=1)*

Stikem1

VEHICLE

(In some vehicles the fuel gauge indicator shows 'empty' when there is still quite a lot of fuel in the tank.)

I notice that your tank was 'empty' or 'nearly empty' at the start of your Travel Week. So far as you can remember, was there enough fuel left to do at least another 20 miles?"

1. Yes
2. No
3. DK/Can't remember

NO DK, NO REFUSAL

*If last fuel gauge reading is recorded or estimate AND last fuel reading is '9' (full)
(LGuage = 1 or 2 AND LFGRead=9)*

StikFu2

VEHICLE

(This may not apply to your vehicle but in some vehicles the fuel gauge indicator tends to stick for a while at 'full').

I notice that your fuel gauge reading shows that your fuel tank was 'full' or 'nearly full' at the end of your Travel Week. Do you remember - had you driven for 20 miles or more without the needle changing position?"

1. Yes
2. No
3. DK/Can't remember

NO DK, NO REFUSAL

*If last fuel gauge reading is estimated or recorded and last fuel reading is '1' (empty)
(Lguage = 1 or 2 AND LFGRead=1)*

StikEm2

VEHICLE

(In some vehicles the fuel gauge indicator shows 'empty' when there is still quite a lot of fuel in the tank.)

I notice that your tank was 'empty' or 'nearly empty' at the end of your Travel Week. So far as you can remember, was there enough fuel left to do at least another 20 miles?

1. Yes
2. No
3. DK/Can't remember

NO DK, NO REFUSAL

ASK ALWAYS

FMilo

VEHICLE

CHECK MILOMETER READING IN FUEL AND MILEAGE CHART. 'FIRST'

MILOMETER READING WAS:

1. Recorded from milometer
2. Estimated
3. Not available

NO DK, NO REFUSAL

ASK ALWAYS

IntQust2

VEHICLE

INTERVIEWER: FOR THE NEXT QUESTIONS YOU NEED TO CODE THE MILOMETER READING FROM THE FUEL AND MILEAGE CHART.

ENTER WHETHER THE READING IS IN MILES OR KILOMETRES

1. Miles
2. kilometres

IF first milometer reading is estimated or recorded and first reading is in miles (FMilo = 1 or 2 AND IntQust2=1)

MilesF

VEHICLE

ENTER THE 'FIRST' MILEAGE (TO THE NEAREST WHOLE MILE)

IF First milometer reading is estimated or recorded and reading is in kilometres (FMilo = 1 or 2 AND IntQust2=2)

KmF

VEHICLE

ENTER THE 'FIRST' READING IN KILOMETRES (TO THE NEAREST WHOLE KILOMETRE)

ASK ALWAYS

LMilo

VEHICLE

LAST MILOMETER READING WAS:

1. Recorded from milometer
2. Estimated
3. Not available

NO DK, NO REFUSAL

If last milometer reading is estimated or recorded and reading in miles (LMilo = 1 or 2 AND IntQust2=1)

MilesL

VEHICLE

ENTER THE 'LAST' MILEAGE (TO THE NEAREST WHOLE MILE)

If last milometer reading is estimated or recorded and reading is in kilometres (LMilo = 1 or 2 AND IntQust2=2)

KmL

VEHICLE

ENTER THE 'LAST' READING IN KILOMETRES (TO THE NEAREST WHOLE KILOMETRE)

If vehicle was not driven during the travel week (MilesF=MilesL or KmF=K mL)

WhyNUse

VEHICLE

Why was the vehicle not used during the Travel Week?

CODE FIRST THAT APPLIES.

ENTER THE RESPONSE AND PRESS <END> TO GO TO THE NEXT PICK-UP QUESTION (OR THE END OF THE QUESTIONNAIRE IF THERE ARE NO MORE VEHICLES)

1. Vehicle not insured/not taxed
2. Vehicle being repaired/serviced
3. Driver sick/on holiday
4. Driver disqualified
5. Vehicle not in everyday use
97. Other (Specify)

If 'other' reason is given for vehicle not being used during the Travel Week (WhyNUse = 97)

XWhyNUse

VEHICLE

PLEASE SPECIFY OTHER ANSWER.

If the vehicle was driven during the travel week (MilesF<MilesL or KmF<K mL)

InElm1

VEHICLE

May I just check:

Were any of the [Total number of miles/kilometres] driven by someone outside the household?

1. Yes
2. No

If the vehicle was driven by someone outside the household (InElm1 = 1)

InElmA1

VEHICLE

How many miles/kilometres were driven by someone outside the household?

If the vehicle was driven during the travel week (MilesF<MilesL or KmF<K mL)

InElm2

VEHICLE

(Were any of the [Total number of miles/kilometres] driven in order) to carry goods in the course of work?

1. Yes
2. No

If the vehicle was driven to carry goods in the course of work (InElm2 = 1)

InElmA2

VEHICLE

How many miles/kilometres were driven in order to carry goods in the course of work?

If the vehicle was driven during the travel week (MilesF<MilesL or KmF<K mL)

InElm3

VEHICLE

(Were any of the [Total number of miles/kilometres] driven) off the public road?

1. Yes
2. No

If the vehicle was driven off the public road (InElm3 = 1)

InElmA3

VEHICLE

How many miles/kilometres were driven off the public road?

If the vehicle was driven during the travel week (MilesF<MilesL or KmF<K mL)

InElm4

VEHICLE

(Were any of the [Total number of miles/kilometres] driven) outside Great Britain?

1. Yes
2. No

If the vehicle was driven outside Great Britain (InElm4 = 1)

InElmA4

VEHICLE

How many miles/kilometres were driven outside Great Britain?

If the vehicle was driven outside Great Britain (InElm4=1)

InElm5

VEHICLE

(Were any of the [Total number of miles/kilometres] driven) using the vehicle as a taxi or hire car?

1. Yes

2. No

*If the vehicle was used as a taxi or hire car
(InElm5 = 1)*

InElmA5

VEHICLE

How many miles/kilometres were driven using the vehicle as a taxi or hire car?

INTERVIEWER: PRESS <END> TO GO TO NEXT PICK-UP QUESTION OR THE END OF THE QUESTIONNAIRE IF THERE ARE NO MORE VEHICLES

*If any mileage driven travel week AND
(if any miles driven for ineligible purposes OR
if no miles driven for ineligible purposes)
((MilesF<MilesL or KmF<Kml)AND
((InelmA1= response OR InelmA2 =
response OR InelmA3 = response OR
InelmA3 = response OR InelmA4 = response
OR InelmA5 = response) OR (Inelm1 =2
AND Inelm2 =2 AND inelm3=2 AND
inelm4=2 AND inelm5=2))*

TotInel

VEHICLE

TOTAL INELIGIBLE MILEAGE: [total number of miles/kilometres driven by non-household members plus any miles/kilometres driven in the course of work, off the public road or outside Great Britain]

INTERVIEWER: PRESS ENTER TO CONFIRM OR GO BACK AND CHECK InElm QUESTIONS

Derived variable from TotInel

TotElig

VEHICLE

TOTAL ELIGIBLE MILES

Admin Block

BPenult

Tconname/Bconname

*If Placement Interview completed
(StatusQ=1)*

Thank

THIS IS THE END OF THE PLACEMENT INTERVIEW.

Press 1 and <Enter> to continue.

*If Placement Interview completed
(StatusQ=1)*

ConIntro

INTERVIEWER: YOU NOW NEED TO ENTER THE FULL NAMES OF ALL THE RESPONDENTS THAT AGREED TO TAKE PART IN A FOLLOW UP STUDY. YOU MAY ALREADY HAVE THIS INFORMATION.

Press 1 and <Enter> to continue.

*If respondent agreed to be followed up
(Followup=1)*

Ttl

INTERVIEWER ASK OR CODE: And if we were to contact you to take part in a follow-up study, what name should we ask for. First what title should we use.

IF THE TITLE IS NOT KNOWN PRESS <CTRL K>.

1. Mr
2. Mrs
3. Ms
4. Miss
5. Other title

If respondent had other title (Ttl=5)

TtlX

INTERVIEWER: CODE OR ASK

Enter the title

*If respondent agreed to be followed up
(Followup=1)*

ForNam

INTERVIEWER ASK OR CODE: And the first name?

IF THE FIRST NAME IS NOT KNOWN PRESS <CTRL K>

*If respondent agreed to be followed up
(Followup=1)*

SurNam

INTERVIEWER ASK OR CODE: And the surname?

IF THE SURNAME IS NOT KNOWN PRESS <CTRL K>

IF Placement Interview completed (StatusQ = 1)

Penult

INTERVIEWER: NOW INTRODUCE AND EXPLAIN THE DIARY
PREPARE ADULT (BLUE) DIARIES FOR:
[Names]
Diary start day is [DAY, DATE], and end day is [DAY, DATE]
CIRCLE THE DAYS OF THE WEEK AND WRITE YOUR OWN NAME AND THE DATE YOU WILL BE CALLING BACK AT THE BOTTOM OF THE DIARIES
Press 1 and <Enter> to continue.

GPSYes

INTERVIEWER: CODE WHICH HOUSEHOLD MEMBERS ACCEPTED A GPS DEVICE.
CODE ALL THAT APPLY

FOR EACH HOUSEHOLD MEMBER CODED AT GPSYes

GPSSer

Name
INTERVIEWER: PLEASE ENTER THE SERIAL NUMBER OF THE GPS LOGGER GIVEN TO THIS RESPONDENT AND LABEL THIS LOGGER WITH THE RESPONDENTS NAME: 10000...19999

IF Placement Interview completed (StatusQ = 1)

AnyCom

INTERVIEWER: THE FOLLOWING OPEN QUESTION IS OPTIONAL AND IS FOR USE AT YOUR OWN DISCRETION. IT ASKS ABOUT GENERAL TRAVEL ISSUES.
Would you like to ask the respondent a general open question?
1. Yes
2. No

IF Interviewer asks general open question (Anycom= 1)

AnyComX

Are there any travel related issues you would like to raise that we have not already talked about.

IF Placment Interview completed and respondent has a vehicle (StatusQ =1 AND DMNOVEH > 0)

Penult3

NOW PLACE A FUEL AND MILEAGE CHART FOR EACH VEHICLE. DON'T FORGET TO FILL IN READING DATES AND VEHICLE NUMBERS:

Reading dates are before first use on [Travel week start date] and after last use on [Travel week end date]
SN: [Serial number] : [Name]
Press 1 and <Enter> to continue.

IF Placement Interview completed (StatusQ = 1)

Penult4

INTERVIEWER: HOW LONG DID IT TAKE TO PLACE AND EXPLAIN THE DIARY AND OTHER DOCUMENTS (EXCLUDING THE GPS DEVICE)?
INCLUDE ANY TIME SPENT PREPARING THE DIARIES BEFOREHAND (E.G. FILLING IN THE FRONT).
RECORD TO NEAREST MINUTE

ASK ALWAYS

GPSTime

"INTERVIEWER: HOW LONG DID IT TAKE YOU TO EXPLAIN THE GPS MONITOR AND HOW TO USE IT? ENTER NUMBER OF MINUTES: 1..97

ASK ALWAYS

GPSEasy

"INTERVIEWER: HOW EASY OR DIFFICULT TO UNDERSTAND DO YOU THINK THE RESPONDENT FOUND THE GPS EXPLANATION/INSTRUCTIONS?
1. Very easy
2. Fairly easy
3. Fairy difficult
4. Very difficult

ASK ALWAYS

GPSSconc

"INTERVIEWER: PLEASE ENTER DETAILS ON ANY CONCERNS RAISED BY THE RESPONDENTS ABOUT USING THE GPS MONITOR.

IF Pickup Interview completed (StatusQ = 2)

Penult5

INTERVIEWER: HOW LONG DID IT TAKE TO PICK UP AND CHECK THE DIARY(IES)?
RECORD TO NEAREST MINUTE

BSOC2000/QT SOC.INC

All questions asked of editors If job details collected

SOC2000

Standard Occupational Classification (SOC2000)
Person: [Name]
Job Title: [Job Title]
Job Description: [Job Description]
Responsibility: [Responsibility for staff]
Industry: [Industry]
Summary: [Summary]
EDITOR: press space bar to start coding

SOCDisp

JobTitle has been coded into:
SOC2000 :[SOC code]
EDITOR: PRESS '1' AND <ENTER> TO ACCEPT
Press 1 and <Enter> to continue.

XSOC2000

Standard Occupational Classification - SOC2000 - WITHOUT DOTS.

SEG

Socio-economic Group (old scheme)

SC

Social Class (old scheme)

SIC92

EDITOR: Review industry details and assign 2-digit SIC92 code for: [Industry]

SICConf

EDITOR: Industry is now coded into SIC92 group:[SIC group]
Is that what you intended?
1. Yes
2. No

IndexNo

Index number of SOC2000 entry selected in coding index

ES2000

Full employment status - derived from Job block questions and SOC2000

1. Self-employed : large establishment (25+ employees)
2. Self-employed : small establishment (1-24 employees)
3. Self-employed : no employees
4. Manager : large establishment (25+ employees)
5. Manager : small establishment (1-24 employees)
6. Foreman or supervisor
7. Employee (not elsewhere classified)
8. No employment status info given - for use in this program only

NSSEC

NS-SEC Socio-economic Class (full classification)- derived variable

SECFlag

Indicator for status of SEC
0 - valid combination of SEC and ES2000 1 - invalid combination 2 - no employment status info - simplified SEC used

BADMIN

Tlout/Blout

ALWAYS RECORD

Status

Current Interview Status
UPDATE THIS BEFORE EACH TRANSMISSION TO HEAD OFFICE.

0. No work done yet
1. Calls made but no contact
2. Contact made
3. Interview started/Any interviewing done.
4. Other - no interviewing required (eg. ineligible, refusal)

ALWAYS RECORD

MENUNOTE

REMINDER/NOTE FOR THE OPENING MENU (OPTIONAL)
IF NOTHING TO SAY, JUST PRESS <Enter>.
ENTER IN HERE ANY USEFUL DETAILS YOU WISH TO APPEAR ON THE ADDRESS MENU

ALWAYS RECORD

Choice

INTERVIEWER: DO YOU NOW WANT TO...
INTERVIEWER: DON'T SELECT CODE 5 UNTIL ALL OTHER WORK ON THIS HOUSEHOLD IS COMPLETED.

1. LEAVE THIS QUESTIONNAIRE - without filling in the admin details?
5. FILL IN THE ADMIN DETAILS - and prepare this household for transmission to Head Office?

NO DON'T KNOW,NO REFUSAL

IF Interviewer has selected to enter admin details and has not conducted a pickup interview (Choice = 5) AND (Penult = RESPONSE) AND (StatusQ = 1)

NoPU

Please explain why you did not conduct the pick up interview.

ALWAYS RECORD

CallTot

INTERVIEWER: Enter the **total number of personal visits** made.

IF Household number equals 1 (HHold = 1)

FindDU

How many dwelling units did you find at this address?

INTERVIEWER: TAKE THE ANSWER AS RECORDED AT A2 ON THE A.R.F. FOR THIS ADDRESS.

IF ADDRESS IS INELIGIBLE, OR NUMBER OF DWELLING UNITS NOT ESTABLISHED, ENTER '0'

IF Household number equals 1 (HHold = 1)

DUCode

Please enter code of selected DUs from A5 on the ARF

IF Household number equals 1 (HHold = 1)

FindHH

How many households did you find in the selected DU?

INTERVIEWER: TAKE THE ANSWER AS RECORDED AT C1 ON THE A.R.F. FOR THIS ADDRESS.

IF ADDRESS IS INELIGIBLE, OR NUMBER OF HOUSEHOLDS NOT ESTABLISHED, ENTER '0'

IF More than one household at address

(FindHH > 1)

HHSel

And how many households did you SELECT for interview? (May not be the same as the number actually interviewed)

Record number selected from C4 on the ARF.

ENTER THE NUMBER **SELECTED** FOR INTERVIEW

RECORDED FOR ALL

PIOut

Placement interview outcome (computed)

1. Full
2. Started
3. NoInt

ALWAYS RECORD FOR EACH PERSON IN TURN

Diary

Did you collect a completed diary for [Name]?

Full/started/No PLACEMENT INTERVIEW FULLY COMPLETED = FILLED IN FOR ALL 7 DAYS (DAYS WHEN NO JOURNEYS MADE COUNT AS FILLED IN).

PARTIALLY COMPLETED = AT LEAST ONE JOURNEY RECORDED BUT ONE OR MORE DAYS NOT FILLED IN.

NO DIARY = NO JOURNEYS COMPLETED AT ALL.

1. Yes - fully completed diary
2. Yes - partially completed diary
3. No - no diary completed for this person

IF fully/partially completed diary for respondent (Diary=1 ro 2)

WhoFill

Who filled in the diary for [Name]?

1. Respondent filled it in themselves
2. Respondent filled it in with help from another household member
3. Another household member filled it in on respondent's behalf
4. Respondent filled it in with help from the interviewer
5. Interviewer filled it in on respondent's behalf

IF Respondent filled in diary with help from the interviewer OR Interviewer filled it in on respondent's behalf (WhoFill= 4 or 5)

DaysInt

Which day(s) did you (ie INTERVIEWER) fill in.

CODE ALL THAT APPLY

1. Day 1
2. Day 2
3. Day 3
4. Day 4
5. Day 5
6. Day 6
7. Day 7

ALWAYS RECORD

(Asked Jan 2008 to Aug 2008)

Holiday

INTERVIEWER: PLEASE RECORD WHETHER [Name] WAS ABROAD (i.e OUTSIDE GREAT BRITAIN) FOR THE WHOLE OF THE TRAVEL WEEK AND THEREFORE HAS BLANK TRAVEL RECORDS.

IF THEY WERE ABROAD FOR ONLY PART OF THE TRAVEL WEEK CODE 'NO'.

1. Yes, abroad for the whole of the travel week
2. No

ALWAYS RECORD

BlnkDry

INTERVIEWER: IS [Name]'S TRAVEL RECORD BLANK (I.E. NO TRIPS ARE RECORDED ON ANY DAY)?

1. Yes
2. No

IF respondent's diary is blank (BlnkDry = 1)

BlnkWhy

INTERVIEWER: PLEASE RECORD THE REASON FOR NO TRIPS DURING THE TRAVEL WEEK.

1. Abroad all week
2. Housebound due to longstanding illness/disability
3. (Temporarily) unwell all week
4. Only did short walks on Days 1-6
5. Other

NO DON'T KNOW, NO REFUSAL

GPSUse

Did Name use the GPS monitor, as far as you are aware?

1. Yes
2. No

(Ask for each individual at pick-up)

GPSCh0

INTERVIEWER: CODE FROM DAILY RECORD SHEET WHETHER RESPONDENT CHARGED THE GPS MONITOR ON DAY 0 (I.E. THE DAY BEFORE THE START OF THE TRAVEL WEEK).

1. Yes
2. No

(Ask for each individual at pick-up)

GPSCh1

INTERVIEWER: CODE FROM DAILY RECORD SHEET WHETHER RESPONDENT CHARGED THE GPS MONITOR ON DAY 1.

- 1 Yes
- 2 No

(ask same for Days 2-7)

GPSUs1

INTERVIEWER: CODE FROM DAILY RECORD SHEET WHETHER RESPONDENT USED THE GPS MONITOR ON DAY 1.

- 1 Used for all journeys
- 2 Used for some journeys
- 3 Not used at all (but did make journeys)
- 4 Did not travel

(ask same for Days 2-7)

If GPSPrb1=1

GPSPbY1

INTERVIEWER: CODE FROM GPS USE SHEET WHAT PROBLEM/S THE RESPONDENT EXPERIENCED WITH THE GPS MONITOR ON DAY 1.

CODE ALL THAT APPLY

1. No problems
2. Forgot to carry
3. Inconvenient to carry

4. Battery ran out
5. Problem charging
6. Monitor talking
7. Other problem (SPECIFY)
(ask same for Days 2-7)

If GPSPrbY1 = other

GPSP1X

INTERVIEWER: WHAT OTHER PROBLEM DID THE RESPONDENT ENCOUNTER WITH THE MONITOR ON DAY 1 [OPEN]
(ask same for Days 2-7)

ALWAYS RECORD

NFDiary

Number of full Diaries collected (derived variable)

ALWAYS RECORD

NDiary

Number of full/part Diaries collected (derived variable)

ALWAYS RECORD

NGPS

Record number of GPS devices collected

ALWAYS RECORD

NFull

Number of full productive interviews – GPS and diary"

ALWAYS RECORD

NpartDry

Number of partial productive interviews – diary only"

ALWAYS RECORD

NPartGPS

Number of partial productive interviews – GPS only"

ALWAYS RECORD

NProxy

Number of full proxy interviews (derived variable)

ALWAYS RECORD

VStart

Saved start date

ALWAYS RECORD

Outcome

FINAL OUTCOME FOR HOUSEHOLD INTERVIEW = Computed OR UnOut

IF outcome is not productive (Outcome <> 110,120,130,210,211,220,221,230,231)

UnOut

ENTER OUTCOME CODE FROM ARF.

UnOutChk

You have entered:

[outcome code] Is this correct?

1. Yes
2. No

NO DON'T KNOW, NO REFUSAL

If Interviewer entered outcome cods 670 or 790 (Unout = 670 or 790)

ARFB3

RECORD REASON FOR USING Code 670 or Code 790

ALWAYS RECORD

If productive outcome (Outcome= 110,120,130,210,211,220,221,230,231)

PractDia

Did you complete the practice page of the travel record at the placement interview?

- 1 Yes
- 2 No

If interviewer did not use practice page (PractDia=2)

PracNo

Please explain why you didn't use the practice page of the travel record

If productive outcome (Outcome= 110,120,130,210,211,220,221,230,231)

CallPlac

THE OUTCOME CODE IS [Outcome code] INTERVIEWER: Enter the *total number of calls* up to (but NOT including) Diary placement.

If outcome code is productive, non contact, refusal or other unproductive and first household from ARF (Outcome = 110,120,130,210,211,220,221,230,231, 310,320,330, 410,420,431,432,440,450, 510,520,530,540,550,560,641,642,651, 652,670 AND QID.HHold = 1)

ObsDone

Have you filled in the Observation form details the ARF?

1. Yes
2. No

BAdmin

Bobs

If Observation details have been completed on ARF (ObsDone = 1)

Obs1

Please enter the Observation form details from the ARF ?

What kind of accommodation is it?

1. House or bungalow : detached
2. House or bungalow : semi-detached
3. **House or bungalow : terraced / end of terrace**
4. Flat or maisonette : in a purpose-built block
5. Flat or maisonette : part of a converted house/other kind of building
6. Room or rooms
7. A caravan or mobile home
8. Houseboat
9. Some other kind of accommodation

IF Observation details have been completed on ARF (ObsDone = 1)

Obs2

Did you - at any visit - observe a car in the drive?

1. Yes, car in driveway
2. No car in driveway
3. No driveway

If Observation details have been completed on ARF (ObsDone = 1)

Obs3

Does the house/bungalow have a garage or car port?

1. Yes
2. No
3. Not sure

If Respondent lives in a House or Bungalow, Flat or Maisonette, OR a room or rooms (Obs1 =1, 2, 3, 4, 5 OR 6)

Obs4

Are the houses/flats in this immediate area in a good or bad physical state?

1. Mainly good
2. Mainly fair
3. Mainly bad
4. Mainly very bad

If Respondent lives in a House or Bungalow, Flat or Maisonette, OR a room or rooms (Obs1 =1, 2, 3, 4, 5 OR 6)

Obs5

Is the sampled house/flat in a better or worse condition outside than the others in this area?

1. Better
2. Worse
3. About the same
4. Does not apply (no other properties nearby)

If Respondent lives in a House or Bungalow, Flat or Maisonette, OR a room or rooms (Obs1 =1, 2, 3, 4, 5 OR 6)

Obs6

Are there any physical barriers to entry to the house/flat/accommodation? CODE ALL THAT APPLY

1. Locked common entrance
2. Locked gates
3. Security staff or other gatekeeper
4. Entry phone access
5. None

BADMIN

QAdmin

IF productive outcome (Outcome =110,120,130,210,211,220,221,230,231)

RemCall

Did you make a reminder call or send a reminder card between placing the diaries and the start of the Travel Week?

SEE FRONT PAGE OF ARF - Purpose* COLUMN OF CALLS RECORD

1. Yes, reminder call
2. Yes, reminder card
3. No reminder call or card

IF a reminder call was made between placing the diaries and the start of the Travel Week (RemCall = 1)

RemTime

How long did this reminder call take?
RECORD TO NEAREST MINUTE

IF productive outcome (Outcome =110,120,130,210,211,220,221,230,231)

MidWeek

Did you make a mid-week check-call during the Travel Week ?

SEE FRONT PAGE OF ARF - - **Call Status Column

1. Yes - by phone
2. Yes - in person
3. No

IF a Mid-week call has been made either by phone or in person (MidWeek = 1 OR 2)

MidTime

How long did this mid-week check-call take?
RECORD TO NEAREST MINUTE

RECORD ALWAYS

Feetype

Pay fee items

IF an outcome code has been entered (Outcome = RESPONSE)

IntDone

OUTCOME CODE: [CODE]
HAVE YOU COMPLETED ALL PICK UP INTERVIEWING, CHECKING AND NOTES?

CODE 1 (Yes) SIGNALS THAT THIS INTERVIEW IS READY FOR RETURN OF WORK TO HEAD OFFICE

1. Yes, completed all coding etc.
2. Not yet

IF edit version of the program

EdDone

HAVE YOU FINISHED EDITING THIS HOUSEHOLD ?

1. Yes
2. No

NO DON'T KNOW, NO REFUSAL

IF edit completed

INFOED

THAT COMPLETES THE EDIT. USE THE F7 FUNCTION KEY TO EDIT THE NEXT SERIAL NUMBER. USE THE Ctrl KEY AND F7 FUNCTION KEY TOGETHER TO BRING UP THE BROWSER MENU. USE Alt X TO FINISH EDITING

IF edit completed

INFO

PRESS <Enter> TO LEAVE THE QUESTIONNAIRE

BPeople / BSAdmin.NTS

ALWAYS RECORD

Intro

INTERVIEWER: You should now enter details for the people. Details already recorded for people who agreed to be followed up will be copied automatically. These can only be changed by going back to the original Questions (ForNam, SurNam) at the end of the main NTS block of questions. Press <Enter> to continue.

If age 16 or over.

Ask or compute from household block

SARNTi

INTERVIEWER: Code the title of the [1st. 2nd, 3rd etc] person interviewed or selected for interview but not interviewed.

if the title is not known or no contact made, press <Ctrl K>.

1. Mr
2. Mrs
3. Ms
4. Miss
5. Other title

If age 16 or over.

Ask or compute from household block

SARNTxt

INTERVIEWER: Enter the title of the [1st, 2nd, 2rd etc] person interviewed or selected for interview but not interviewed.

If age 16 or over.

Ask or compute from household block

SARNFor

INTERVIEWER: Enter the first name of the [1st, 2nd, 3rd etc] person interviewed or selected for interview but not interviewed.

If the first name is not known or no contact made, press <Ctrl K>.

If age 16 or over.

Ask or compute from household block

SARNSur

INTERVIEWER: Enter the surname of the [1st, 2^{ns}, 3rd etc] person interviewed or selected for interview but not interviewed.

If the surname is not known or no contact made, press <Ctrl K>.

Derived variable

SARInt

Whether [name] was interviewed?

1. Yes
2. No

SACNWho

INTERVIEWER: Who is the main contact person for this serial number? Select from the list below.

If the details for the main contact have already been recorded at the end of the individual interview they will be copied over. These can only be changed by going back to original questions (ForNam, SurNam, TelNoH, TelNoM) near the end of the individual sessions. Else code 5 for "Someone else" and enter the details at the following questions.

1. Person 1
2. Person 2
3. Person 3
4. Person 4
5. Someone else

NO DON'T KNOW, NO REFUSAL

Ask or compute from household block

SACNTtl

INTERVIEWER: Code the title of the main contact person. If the title is not known or no contact made, press <Ctrl K>.

1. Mr
2. Mrs
3. Ms
4. Miss
5. Other title

If other title (SACNTtl=5)

SACNTxt

INTERVIEWER: Enter the title of the main contact person.

Ask or compute from household block

SACNFor

INTERVIEWER: Enter the first name of the main contact person. If the first name is not known or no contact made, press <Ctrl K>.

ALWAYS RECORD

SACNSur

INTERVIEWER: Enter the surname of the main contact person. If the surname is not known or no contact made, press <Ctrl K>.

ALWAYS RECORD

SA1Tel

INTERVIEWER: Enter the main telephone number. Include standard code.

If not obtained, press <Ctrl K>.

ALWAYS RECORD

SA2Tel

INTERVIEWER: Enter the alternative telephone number. Include standard code.

If not obtained, press <Ctrl K>.

ALWAYS RECORD

SASRF

INTERVIEWER: Has a Special Report Form (SRF) been filed for this address / serial number case or are you intending to do so?

A Special Report Form should be filed without delay if you think there is a risk to interviewer safety at this address.

This question must only be answered Yes if an SRF has been sent or will be sent promptly.

- 1.Special report form
- 2.Yes, report already filed
- 3.Yes, not yet filed but intending to
- 4.No, not intending to file report

NO DON'T KNOW, NO REFUSAL

ALWAYS RECORD

SAAdInf

INTERVIEWER: Please enter any information which may be useful at recontact or reissue.

This may be at quality control (recall), reissue or follow-up interview.

Ensure that any important points you have noted on the ARF are entered here.

(Enter the information here - not in a memo (remark).) If no info, press <Enter> to leave empty.

If Special Report Form required (SASRF=1 or 2)

ConfSRF

INTERVIEWER: Please confirm by typing 'C' that a Special Report Form has already been sent or will be sent to the office promptly.

ALWAYS RECORD**SAS1Act**

INTERVIEWER: Is any special action required on receipt in the office for this address / serial number / case, e.g. to make a correction to the information collected that you are unable to make yourself for some reason?

1. Yes
2. No

NO DON'T KNOW, NO REFUSAL

If Special Action required (SAS1Act =1)

SAS2Act

INTERVIEWER: Please enter details of the special action required. Enter the information here - not in a memo (remark).

If Special action required (SAS1Act=1)

ConfSAS

INTERVIEWER: You have answered Yes at SAS1Act, indicating that special action is required in the office for this case but you have not entered any details of such action at SAS2Act. Please type 'C' if you now wish to enter such details.

RECORD ALWAYS**SAAdCon**

INTERVIEWER: Was the address on the ARF label correct and complete for the house/flat/building/dwelling unit to which this serial number relates? Answer No if you have noted any address amendment on the ARF or if you have identified multiple dwelling units within the issued address. Enter the required changes at the next question.

1. Yes
2. No

NO DON'T KNOW, NO REFUSAL

If address on ARF not correct Saadcom=2)

SAAdCor1

INTERVIEWER: Please enter the correct address First line...

If address on ARF not correct Saadcom=2)

SAAdCor2

(Please enter the correct address.) Second line...

If address on ARF not correct Saadcom=2)

SAAdCor3

Please enter the correct address. Third line...

(Just press <Enter> if no more to add.)

If address on ARF not correct Saadcom=2)

SAAdCor4

(Please enter the correct address.) Fourth line...

(Just press <Enter> if no more to add.)

If address on ARF not correct Saadcom=2)

SAAdCor5

(Please enter the correct address.) Fifth line...

(Just press <Enter> if no more to add.)

If address on ARF not correct Saadcom=2)

SAPCCor

(Please enter the correct address.)|Postcode...

If address on ARF not correct Saadcom=2)

SAConfm

INTERVIEWER: Please check the details you have entered

1. Continue

IF productive outcome (Outcome =110,120,130,210,211,220,221,230,231)

SASupFlg

INTERVIEWER: Was a supervisor present for all or part of this interview?

1. Yes - present for all or part
2. No - not present

NO DON'T KNOW, NO REFUSAL

ALWAYS RECORD**ConfAll**

INTERVIEWER: Please confirm that you have entered all relevant information from the ARF that is requested at preceding questions.

1. Yes, done
2. Will do so later

NO DON'T KNOW, NO REFUSAL

Diary data

Record always

SerNo

Household Serial Number

Record always

JpersNo

Person number

1..10

Ask for every journey

TravDay

Travel day
1..7

Ask for every journey

Journum

Journey number
1..30

Ask for every journey

PurFrom

Purpose from (i.e. purpose of previous journey)

1. Home
2. Work
3. In course of work
4. Education
5. Food/grocery shopping
6. All other types of shopping
7. Personal business – medical
8. Personal business – other
9. Eat/drink – alone or at work
10. Eat/drink – other occasions
11. Visit friends/relatives at home
12. Other social
13. Entertainment/public social activities
14. Sport – participate
15. Holiday base
16. (Day) journey/just walk
17. Other non-escort
18. Escort home (not own)
19. Escort work
20. Escort in course of work
21. Escort education
22. Escort shopping/personal business

Ask for every journey

PurTo

Purpose to

1. Home
2. Work
3. In course of work
4. Education
5. Food/grocery shopping
6. All other types of shopping
7. Personal business – medical
8. Personal business – other
9. Eat/drink – alone or at work
10. Eat/drink – other occasions
11. Visit friends/relatives at home
12. Other social
13. Entertainment/public social activities
14. Sport – participate
15. Holiday base
16. (Day) journey/just walk
17. Other non-escort
18. Escort home (not own)
19. Escort work

20. Escort in course of work
21. Escort education
22. Escort shopping/personal business
23. Escort other

Ask for every journey

Timeleft

Time left (12 hour clock)
0..12

Ask for every journey

LeftMin

Time left (minutes)
00..59

Ask for every journey

TimeArr

Time arrived (12 hour clock)
0..12

Ask for every journey

Arrmin

Time arrived (minutes)
00..59

Ask for every journey

OrigCnty

County code for journey origin

Ask for every journey

OriginUa

Unitary authority code for journey origin

Ask for every journey

OriginUr

Urban rural code for journey origin

Ask for every journey

DestCnty

County code for journey destination

Ask for every journey

DestinUa

Unitary authority code for journey destination

Ask for every journey

DestinUR

Urban rural code for journey destination

Ask for every journey

Series

Was the journey a series of calls?
0 Not a series of calls (default setting)
1 Journey was a series of calls

Ask for every journey

NextDay

Was the arrival time after midnight on the next day?

0 Arrival time before midnight (default setting)

1 Arrival time past midnight

Ask for every journey

NumStag

Number of stages in journey

1..10

Ask for every journey

ldiscov

Interviewer discovered journey

Interviewer did not discover journey (default setting)

Interviewer discovered journey

Ask for every journey

Inelig

Is the journey ineligible?

Eligible journey (default setting)

Ineligible journey (but journey is included for information, e.g. to link two eligible journeys)

Ask if diary day is blank

Blank

Why is day blank?

1 No journeys made

2 Day not filled in

Rjday

Repeat journey (same person, same/different day)

Enter travel day of original journey 1..7

Rjnum

Repeat journey number (same person, same/different journey number)

Enter journey number of original journey

1..29

Djpnum

Duplicate journey (another person)

Enter journey number of original journey

1..29

Djjnum

Duplicate journey (another person, same/different journey number)

Enter person number of original journey

1..9

IF travday = 7

Origpnam

Origin placename

IF travday = 7

Destpnam

Destination placename

IF travday = 7

Origad1

First line of origin address

IF travday = 7

Origad2

Second line of origin address

IF travday = 7

Origad3

Third line of origin address

IF travday = 7

Origpc

Post code of origin

IF travday = 7

Destad1

First line of destination address

IF travday = 7

Destad2

Second line of destination address

IF travday = 7

Destad3

Third line of destination address

IF travday = 7

Destpc

Post code of destination

Stages

Ask for each stage

Stagenum

Number of journey stage

1.. 10

Ask for each stage

Method

Method of travel

1. Walk
2. Bicycle
3. Private (hire) Bus
4. Car
5. Motorcycle combination
6. Van or lorry
7. Other private transport
8. Ordinary Bus (London)
9. Ordinary Bus (Elsewhere)
10. Coach/Express Bus
11. Excursion/Tour Bus
12. LT underground
13. Train (formerly BR)
14. Light rail
15. Aircraft (public)
16. Taxi
17. Minicab/private hire vehicle

- 18. Other public transport
- 19. Unspecified (private)
- 20. Unspecified (public)

Ask for each stage

Dunits

Distance in miles

0.25..500

Ask for each stage

Dtenths

Distance in tenths of miles

Ask for each stage in young person's diary

PartyNoa

Number of adults in party

1..30

Ask for each stage in young person's diary

PartyNoc

Number of children in party

1..30

Ask for each stage in adult diary

Partynum

Number of people in party

1..30

Ask for each stage

Travmins

Time travelling in minutes

1..600

Ask for each stage involving ordinary bus London OR ordinary bus elsewhere OR coach/express bus, OR excursion/tour bus, OR LT underground OR train OR light rail OR aircraft public OR other public OR unspecified public

Ticktype

Type of ticket (Season ticket information gathered during the CAPI placement and pick up interviewers are coded 1-6).

7 Ordinary ticket – adult

8 Ordinary ticket – child

9 Reduced (Off-peak) - adult

10 Reduced (Off-peak) – child

11 Special category reduced

12 Other

Ticktype

TickType 1 = TickTyp2 1

TickType 2 = TickTyp2 2

TickType 3 = TickTyp2 3

TickType 4 = TickTyp2 4

TickType 5 = TickTyp2 5

TickType 6 = TickTyp2 6

TickType 7 = TickTyp2 7 + 13

TickType 8 = TickTyp2 8 + 14

TickType 9 = TickTyp2 9

TickType 10 = TickTyp2 10

TickType 11 = TickTyp2 11

TickType 12 = TickTyp2 12

Ask for each stage involving ordinary bus London OR ordinary bus elsewhere OR coach/express bus, OR excursion/tour bus, OR LT underground OR train OR light rail OR aircraft public OR other public OR unspecified public

TickTyp2

1. Special ticket 1

2. Special ticket 2

3. Special ticket 3

4. Special ticket 4

5. Special ticket 5

6. Special Ticket 6

7. Ordinary adult excl 1 day TCard

8. Ordinary child excl 1 day Tcard

9. Reduced off peak adult

10. Reduced off peak child

11. Reduced special category

12. Other special category

13. Adult one day travelcard

14. Child one day travelcard

Ask for each stage involving public transport (Method = ordinary bus London OR ordinary bus elsewhere OR coach/express bus, OR excursion/tour bus, OR LT underground OR train OR light rail OR aircraft public OR Taxi OR minicab OR other public OR unspecified public)

CostPds

Stage cost in pounds

0.. 300

Ask for each stage involving public transport (Method = ordinary bus London OR ordinary bus elsewhere OR coach/express bus, OR excursion/tour bus, OR LT underground OR train OR light rail OR aircraft public OR Taxi OR minicab OR other public OR unspecified public)

CostPen

Stage cost in pence

0.. 99

Ask for each stage involving public transport (Method = ordinary bus London OR ordinary bus elsewhere OR coach/express bus, OR excursion/tour bus, OR LT underground OR train OR light rail OR aircraft public OR Taxi OR minicab OR other public OR unspecified public)

Numboard

Number of boardings

1..10

Ask for each stage involving car OR motorcycle combination OR van/lorry

WhichVeh

Household vehicle number

1..10

Ask for each stage involving car OR motorcycle combination OR van/lorry

Dripas

Whether driver or passenger

- 1 Driver (only if adult diary)
- 2 Front passenger
- 3 Rear passenger
- 4 Passenger position unknown

Ask for each stage involving car OR motorcycle combination OR van/lorry

Parkpds

Parking cost in pounds

0..50

Ask for each stage involving car OR motorcycle combination OR van/lorry

Parkpen

Parking cost in pence

0.. 99

Ask for each stage involving car OR motorcycle combination OR van/lorry

Cong

Congestion charge cost in pounds:

00.00 (appears by default if outside of zone or in zone by method other than car)

00.50 (London resident)

02.00 (Durham charge)

02.50

05.00

07.00

10.00

12.00

95.00 (queries)

96.00 (exempt)

98.00 (don't know)

99.00 (missing)

Appendix F GPS Logging Frequency Analysis

The state of practice for household travel surveys and physical activity studies using wearable GPS technology is that the GPS data loggers are configured using a time logging interval ranging from one and six seconds (depending on number of days deployed, device storage capacity, and study needs) with a one-mile per hour speed screen enabled (meaning that points with speeds below this threshold are not captured). With this in mind, GeoStats recommended that the logging frequency for the seven-day UK Pilot Study be set to a four-second logging frequency with the speed screen enabled. Due to a bug in the vendor software (possibly introduced by new configuration software and device firmware provided after the pre-test) for the Atmel BTT08, 32 participants in the study were deployed with GPS devices which were configured improperly. This bug reset the configuration to the factory default (100 metre distance-based logging) after the configuration parameters were confirmed.

This configuration error occurred for seven of the 55 Wave 1 participants and 25 of the 49 Wave 2 participants. The problem was not discovered during Wave 1 data processing since it was somewhat infrequent, several analysts were involved with the processing, and the broader spacing of the points was attributed to other possibilities such as signal blockage and improper equipment use. With the higher frequency of log by distance files in Wave 2, the discrepancy was discovered. Logging by a minimum 100 metre distance rather than by a four-second time interval did result in larger time and distance gaps between the points logged, especially when travelling at lower speeds. This also translates to significantly less points collected per trip when logging by 100 metre minimum distance compared to logging at four second frequencies.

As a result of larger gaps between points and less points collected per trip and per trip stage, it is likely that some short walks trips and trip segments were not detected in half of the Wave 2 files. The increase in the number of single mode trips and decrease in multi-modal trips between Wave 1 and Wave 2 were also likely caused by the higher occurrence of this configuration error in Wave 2 (i.e. it was difficult or impossible to identify the short walk trip stages that occur at the start and end of multimodal trips).

In addition to the reduced number of trips captured, the logging interval affected data processing as well. Table F presents the data processing results and includes percentages of edits (based on initial trip counts) made in each wave. The analysts did not edit most of the trips in the GPS files which were logged by distance because of the difficulty in differentiating between a suspicious delay and a true stop. The decrease in the percentage of trip ends added/deleted and in the smaller percentage of trips blocked between the two waves is also a result of the distance logging rule, because the noise that is typically present at the beginning and end of trips was not present for trips logged by distance.

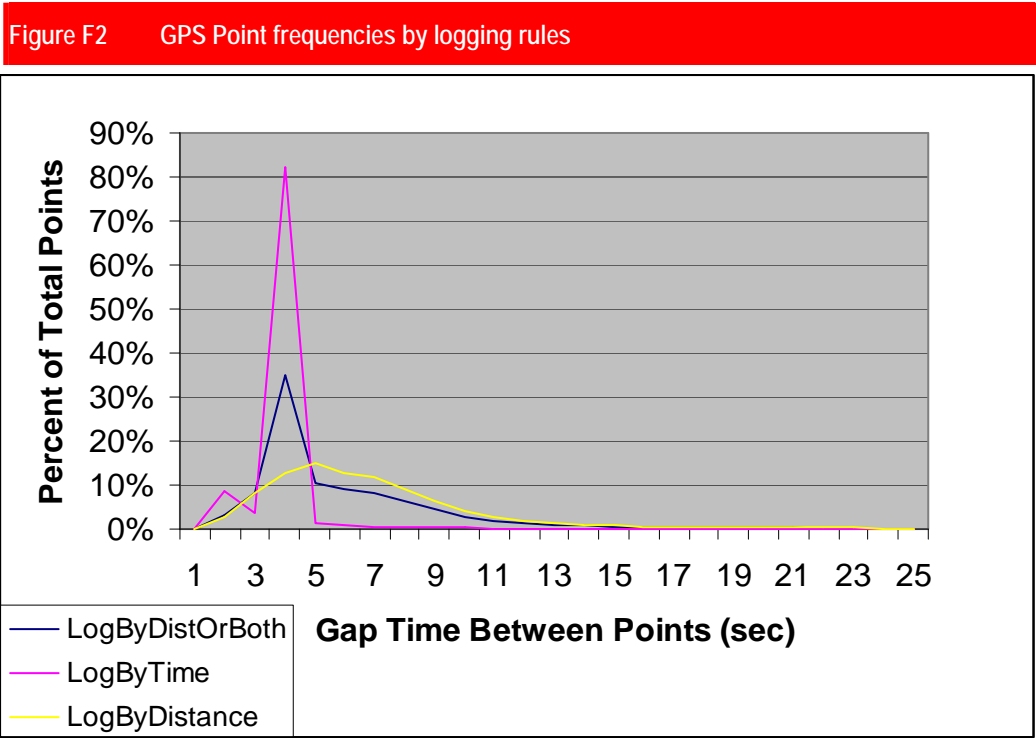
Table F1 GPS Trip End Analysis by Wave (with percentages)

Stage	Wave 1		Wave 2		Combined GPS Trips
	GPS Trips	% Initial Count	GPS Trips	% Initial Count	
Initial Count	1,289		851		2,139
Trip Ends Added	592	46	209	25	801
Trip Ends Deleted	155	12	69	8	224
Trips Blocked	398	31	90	11	487
Final Count	1,328		901		2229

Once the configuration error was discovered in the GPS data, the data analysts were instructed to flag each file encountered with the distance logging characteristics. (This flag (logbydist) appears in the persons table of the data deliverable.) GeoStats also performed a frequency analysis on all GPS files to verify that the analysts had flagged the 'logged by distance' files correctly and to further analyse the affect of the logging rule differences. This analysis resulted in the discovery of several other anomalies.

First, three of the files flagged as logged by distance were logged by distance only part of the time. Examination of these files within TIAS indicates that when the participant was travelling above a certain speed threshold (estimated between 10-20 mph), the GPS device collected points at a distance interval. However, when the participant travelled below this threshold, points were logged at a three or four second time interval. Although some GPS data loggers do support a combination of distance and time logging rules, it is not clear how this occurred with the Atmel; a review of the software documentation specifies that multiple logging parameters are not supported by this device and GeoStats was unable to select both rules in the configuration software it has in house.

Figure F2 contains a frequency chart for the two sets of GPS files as flagged in the final dataset, (logged by time and logged by distance or both), with a third line showing what happens when the three 'hybrid' files are removed from the log by distance or both group (showed as logged by distance in the chart). It is clear that the log by distance rule had a major impact in GPS point frequencies. This chart also helps to show that the time-based logging rules do not guarantee that a GPS point is logged every X seconds (where X is the configuration setting value); the speed screen rule, sky blockage, and other factors could cause larger gaps between points.



As mentioned previously, the log by distance rule caused significantly less points to be collected for a given trip, especially those made at slower speeds. Table F3 shows the frequencies of points logged per trip based on the three sets of logging rules detected in the GPS data (by time, by distance, and by a combination of time and distance).

Table F3 Frequency of Points per Trip by Logging Rule

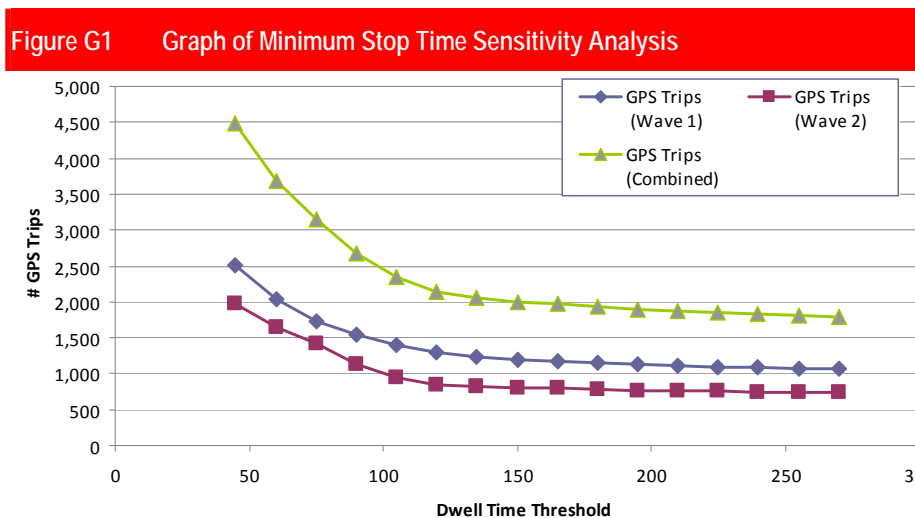
# Points / Trip	Logged By Time	Logged By Distance	Logged By Both
1 - 100	11	23	0
101 - 200	29	5	2
201 - 300	20	1	1
301 - 400	4	0	0
401 - 500	3	0	0
<i>Total</i>	67	29	3

The second data irregularity that was uncovered as part of the distance logging analysis was the somewhat high frequencies of points logged at two or three second intervals. For the log by distance or log by both distance and time files, it is reasonable that points could be logged at these frequencies when travelling at high speeds. However, in the log by time files there were several that had two-second frequencies (one of which had 26,872 points logged at a two-second frequency) and all but a few files had points logged at three second frequencies. In these files, 9 per cent of the points were logged at two-second frequencies (most in the one file mentioned previously), 3 per cent at three-second frequencies, and 82 per cent at four-second frequencies. Logging points more frequently than needed is not a problem when storage capacity is not an issue; it is only mentioned here because the logging frequency observed in these files did not match what was expected based on the recommended configuration settings.

Appendix G Sensitivity Analysis on Initial Stop Time Threshold

A sensitivity analysis was performed on the Wave 1 and Wave 2 GPS data to evaluate the 120-second rule and its impact on initial trip end determination. TIAS uses 120 seconds as its initial dwell time (or stop time) threshold; analysts then make adjustments to these trip ends based on the rules described in the GPS Data Processing section. Table G1 contains the initial number of GPS trips that would have been identified based on a range of stop times. Figure G1 shows the same information in graph form, which makes it easier to see how the impact of the initial stop time threshold diminishes after the 120-second threshold is reached.

Minimum Stop Time	GPS Trips (Wave 1)	GPS Trips (Wave 2)	GPS Trips (Combined)
45	2,508	1,970	4,478
60	2,042	1,639	3,681
75	1,732	1,415	3,147
90	1,537	1,136	2,673
105	1,397	952	2,349
120	1,288	851	2,139
135	1,234	826	2,060
150	1,200	805	2,005
165	1,180	794	1,974
180	1,158	785	1,943
195	1,132	771	1,903
210	1,113	762	1,875
225	1,098	758	1,856
240	1,087	751	1,838
255	1,072	741	1,813
270	1,063	736	1,799



Although the initial number of GPS trip ends identified using the 120-second threshold was 2,139 and the final number of GPS trips after all reviews and matching were complete was 2,229 (as seen in Table 26), this should not be interpreted as only 90 additional trip ends were found.

In fact, after the initial 2,139 trip ends were identified, analysts added another 801 trip ends, deleted 244 trip ends, and blocked 487 trips to arrive at the final 2,229 GPS trips. (A breakdown of these totals by wave appears in Table G2.) This level of adjustment is typical and is required so that trip ends are added at locations where the dwell times were less than 120 seconds (the TIAS

default value for the initial trip end locations), to delete false trip ends caused by congestion conditions that exceeded 120 seconds, and to accommodate the cleaning of trip ends (i.e. to remove much of the GPS noise typical at the arrival of a location, trip ends are inserted at the point of arrival and the remaining trip 'fragment' is blocked.) The TIAS user interface allows these modifications to be done quickly during the trip end review process.

Table G2 Frequency of Points per Trip by Logging Rule			
Stage	GPS Trips (Wave 1)	GPS Trips (Wave 2)	GPS Trips (Combined)
Initial Count	1,289	851	2,139
Trip Ends Added	592	209	801
Trip Ends Deleted	155	69	224
Trips Blocked	398	90	487
Final Count	1,328	901	2,229

Appendix H GeoCoding Background

The Gazetteer

The National Travel Survey (NTS) Gazetteer is used to capture origin and destination information. The main source was the Ordnance Survey Gazetteer which contains a list of over 70,000 places and corresponding name and place type together with grid references to identify the location as a point in Great Britain.

Methodology

A layering technique was used within the ArcView software package to code information about the type of urban area, local authority, NTS boundary classification and NTM classification in which the location resides. The Ordnance Survey Gazetteer codes location points to the nearest 100m and although this resolution is accurate enough for most purposes, places close to zone boundaries may be coded to wrong side of the boundary being considered. To correct for this a buffer zone of 141m was created around each boundary and points within this buffer were checked manually against an Ordnance Survey map. Any points on the wrong side of a boundary were moved.

GPS Coding

As the Ordnance Survey source data used in creating the Gazetteer is a zero dimensional point representing a two dimensional area the Gazetteer is not an ideal source for checking the GPS trace co-ordinates. In urban areas each point may represent several square kilometres and be several kilometres from the boundary. For example the Gazetteer point Swindon represents an area of approximately 40km² and is on average 3 kilometres from the Swindon town boundary.

Data sources

The location information comes from a number of sources as follows:

- Ordnance Survey: 1:50000 Gazetteer
- Meridian
- Strategi
- CodePoint
- Transport for London: London Underground stations
- DfT: Location classifications

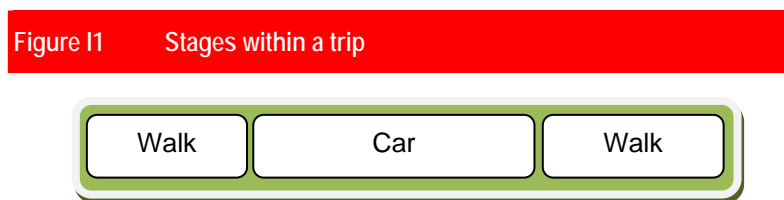
And boundary sources are as follows:

- Ordnance Survey: Boundary Line
- Office for National Statistics: Urban Settlement boundaries for England and Wales, boundary classifications
- Scottish Executive: Urban Settlement boundaries for Scotland
- DfT: NTS and NTM classifications

Appendix I Mode assignment within GPS processing

TIAS performs mode assignments to groups of points within a GPS trip using an algorithm. These groups are called stages and contain a sequence of GPS points that represent a single mode; mode transitions occur at the stage end points.

Figure I1 illustrates the relationship between a GPS trip, shown as the outer green rectangle, and its stages, which are the inner white rectangles.



The algorithm works in two steps; the first identifies mode transitions within a GPS trip, while the second step selects a mode from TIAS' database for each stage of the trip. The key variable used in mode assignment processing is the instantaneous GPS point speed within the GPS data stream. This variable was chosen because speed can be used very effectively to discern which travel mode was most likely used during a sequence of points.

Mode Transition Detection

TIAS uses GPS point speeds to determine if and where mode transitions flags should be placed. Mode transitions signal a change between motorized and non-motorized modes. The main assumptions in the mode stage split algorithm are that motorized modes are capable of achieving higher acceleration rates, while non-motorized modes exhibit more stable, lower speed values. The logic implemented follows an approach similar to the one proposed by Tsui and Shalaby (2006)³⁰.

The algorithm uses a moving window to detect if a mode transition exists in a short sequence of ten points within a trip using average point speeds and the standard deviation of the points' speed. For each point, values for average point speed and standard deviation are calculated based on its assigned window (which starts at the current point). These are then used to determine whether or not the window's mode is motorized and whether or not it is likely to contain a mode transition point.

If the average speed is above 16 metres/second (or 36 MPH), the window is classified motorized; it is classified as non-motorized otherwise. TIAS places a mode transition flag if the current window's motorized flag is different that of the last window and the standard deviation of point speed is

³⁰ Tsui, Sheung Yuen Amy; Shalaby, Amer S. Enhanced System for Link and Mode Identification for Personal Travel Surveys Based on Global Positioning Systems. *Transportation Research Record: Journal of the Transportation Research Board*. No. 1972, TRB, National Research Council, Washington, D.C., 2006, pp. 38-45.

greater than 2.25 metres/second. The exact point where the transition is placed is determined by walking the window and checking for the last point either below or above the non-motorized mode speed threshold, depending on what the last computed motorized flag value was.

Mode Assignment

For each group of points, TIAS selects the travel mode that most closely matches its average point speed and standard deviation, while still having its 95th percentile speed (assuming a normal distribution) lower than or equal to the mode's maximum speed. The mode assignment process uses the point speed summary parameters about each travel mode, as listed in Table I1. Table I2 shows the values used for intra-trip mode assignments.

Table I1 Mode point speed statistics

Field name	Description
MAX_SPEED	Mode's maximum attainable point speed (in the TIAS project's speed units)
AVG_SPEED	Mode's average speed (in the TIAS project's speed units)
STD_SPEED	Mode's standard deviation of point speed (in the TIAS project's speed units)

Table I2 Mode parameter values

CODE	MODE	MAX_SPEED	AVG_SPEED	STD_SPEED
1	Walk	9.32	2.81	1.06
2	Bicycle	35.79	10.44	5.07
3	Bus	39.77	8.27	7.39
4	Car	65.48	15.92	10.66

TIAS performs mode assignments as part of its trip calculation process. The algorithm processes trip stages (i.e. groups of points between mode transitions points and the trip's end point) in sequence, looping over and comparing each one with the mode parameters. TIAS uses the following rules to determining if a trip stage should be assigned a given mode:

- Is the average speed within 1.96 standard deviations of the mode's average speed (using the trip's standard deviations)?
- Is the estimated 95th percentile speed less than or equal to the mode's maximum speed?

If a trip stage already has been assigned a mode (as part of a previous pass), then the following rules are applied to determine if the current mode should replace the previously assigned mode:

- Is the number of mode speed standard deviations between the trip's average speed and the mode's average speed smaller than that of the previous assignment?
- Is the absolute difference between the mode standard deviation of speed and the trip's standard deviation of speed smaller than that of the previous trip?

GeoStats has submitted a paper on the mode assignment process as implemented for this feasibility study; a copy of this paper is available through GeoStats by emailing info@geostats.com

Appendix J GPS and Travel Diary Trip Matching Results

As mentioned in Chapter 7, the GPS and diary data for six respondents could not be reconciled and they were therefore excluded from the trip matching. Among the 98 respondents with matchable data, a total of 1,733 trips were reported in travel diary and 2,137 GPS trips recorded.

Trips that would not have been included in the travel diary data as a result of the NTS rules regarding exclusion were flagged during GPS data processing and/or GPS/Travel Diary trip matching. In total 243 GPS trips were flagged as such: 218 were short walk trips, nine were off-road (non-short walk) trips, and 16 were reported as a series of calls in the Travel Diary journey data. The return stages of the round trips reported in the diary data are also excluded from the following analysis, as this would be recorded as one trip within the GPS trip data. The final comparable trip count for respondents with matchable data is therefore 1,726 diary trips and 1,894 GPS trips.

Table J1 shows the total number of trips missing of each type across the full travel week. Of the 98 respondents with 'matchable' data, there were five who had no missing GPS trips and no missing diary trips, with weeklong trip totals of 0, 2, 10, 10, and 37. These five participants could be considered to be perfect reporters assuming that they carried a powered GPS device with them throughout the assigned travel week.

Table J1 Frequency of Missing GPS and Missing Travel Diary Trips

Number of missing trips (x)	Respondents with x missing GPS trips		Respondents with x missing travel diary trips	
	N	%	N	%
0	23	23	20	20
1	16	16	8	8
2	11	11	11	11
3	9	9	11	11
4	6	6	11	11
5	5	5	5	5
6	6	6	1	1
7	3	3	6	6
8	1	1	7	7
9	6	6	4	4
10	1	1	0	0
11-20	10	10	9	9
21 or more	1	1	5	5
<i>Total</i>	98	100	98	100

Table J2 provides a summary of the total number of GPS trips recorded and Travel Diary trips reported for each day of the travel week, including the percentages of total GPS trips not recorded and Travel Diary trips not reported. (The percentage not captured is calculated as the number of missing Travel Diary trips divided by the sum of the reported Travel Diary trips and missing Travel Diary trips. A similar formula was used to calculate the percentage not recorded by GPS.)

Table J2 Missed Trip Analysis Summary by Day

Travel Day	All Trips			Without Exclusions			Missing Trips			
	Number of GPS trips	Number of diary trips	Raw diff	Number of GPS trips	Number of diary trips	Raw diff	Trips not recorded by GPS		Trips not reported in diary	
							N	%	N	%
Day 1	329	237	92	277	236	41	48	15	89	27
Day 2	285	248	37	255	248	7	53	17	60	20
Day 3	355	274	81	320	274	46	51	14	97	26
Day 4	295	223	72	246	221	25	46	16	71	24
Day 5	338	230	108	288	230	58	44	13	102	31
Day 6	265	250	15	250	247	3	64	20	67	21
Day 7	270	271	-1	258	270	-12	101	28	89	25
<i>Totals</i>	2137	1733	404	1894	1726	168	407	18	575	25

Even though some respondents reported using their GPS devices, no trip data was recorded. Similarly for some respondents there was no travel diary data. For some analysis it was appropriate to exclude such cases. Tables J3 and J4 provide the same summaries excluding these cases.

Table J3 Frequency of Missing GPS and Missing Travel Diary Trips (Fully compliant cases only)

Number of missing trips (x)	Respondents with x missing GPS trips		Respondents with x missing travel diary trips	
	N	%	N	%
0	22	24	15	16
1	16	17	8	9
2	10	11	11	12
3	9	10	10	11
4	6	7	11	12
5	5	5	5	5
6	5	5	1	1
7	3	3	6	7
8	1	1	7	8
9	6	7	4	4
10	0	0	0	0
11-20	8	9	9	10
21 or more	1	1	5	5
<i>Total</i>	92	100	92	100

Table J4 Missed Trip Analysis Summary by Day

Travel Day	All Trips			Without Exclusions			Missing Trips			
	Number of GPS trips	Number of diary trips	Raw diff	Number of GPS trips	Number of diary trips	Raw diff	Trips not recorded by GPS		Trips not reported in diary	
							N	%	N	%
Day 1	328	227	101	276	226	50	39	12	89	28
Day 2	282	241	41	252	241	11	46	15	57	19
Day 3	355	267	88	320	267	53	44	12	97	27
Day 4	295	218	77	246	216	30	41	14	71	25
Day 5	338	222	116	288	222	66	36	11	102	32
Day 6	265	243	22	250	240	10	57	19	67	22
Day 7	270	261	9	258	260	-2	91	26	89	26
<i>Totals</i>	2133	1679	454	1890	1672	218	354	16	572	26

Observations

Eighteen per cent of trips were not recorded by GPS (or 16 per cent if non-compliant respondents are excluded). It is interesting to note that the proportion of trips not recorded by GPS increased markedly on Days 6 and 7, having been relatively stable prior to that. Since Day 1 of the assigned travel week varied across all days of the week, this increase in missing trips is not related to weekday versus weekend behavioural differences. Instead, it is likely to reflect the ongoing respondent burden and the point at which carrying and charging the devices becomes too burdensome. (GeoStats has observed similar patterns at travel day 5 in the one-week Chicago study with wearable devices performed in late 2007.)

Regarding the travel diary, it seems that around one quarter of trips are not reported, although there is no discernible pattern across the days of the travel week. One person alone had 55 unreported trips, this accounted for 10 per cent of all unreported diary trips. On the other hand, there were 20 participants who had no missing diary trips and 19 others who only missed one or two trips for the week. This is similar to the experience on other studies of this nature where significant under-reporting of trips by a relatively small number of participants may contribute greatly to the overall under-reporting rates observed.

Additional analysis of both the matched and unreported trips can be found in Chapter 8.

Work-related trips

As previously noted, analysts flagged 123 suspected work-related trips while processing the GPS data. These were made by five respondents, one of whom accounted for 54 suspected work-related trips.

Respondents in certain occupations are instructed not to report trips made in the course of work in the travel diary. Analysis of the GPS trips flagged as potentially work related found that 97 (79 per cent) had been identified as missing diary trips. It therefore seems likely at least some of these were in fact correctly excluded from the travel diary – although others may have been omitted due to respondent burden. Table J5 provides a revised trip analysis summary excluding these 97 trips. As expected, the removal of these trips reduces the daily and overall missing diary trip rates.

Table J5 Missed Trip Analysis Summary - Excluding Unreported Work-related Trips

Travel Day	All Trips			Without Exclusions			Missing Trips			
	Number of GPS trips	Number of diary trips	Raw diff	Number of GPS trips	Number of diary trips	Raw diff	Trips not recorded by GPS		Trips not reported in diary	
							N	%	N	%
Day 1	328	227	101	263	226	37	39	13	76	25
Day 2	282	241	41	252	241	11	46	15	57	19
Day 3	355	267	88	308	267	41	44	13	85	24
Day 4	295	218	77	231	216	15	41	15	56	21
Day 5	338	222	116	248	222	26	36	13	62	22
Day 6	265	243	22	246	240	6	57	19	63	21
Day 7	270	261	9	245	260	-15	91	27	76	23
<i>Totals</i>	2133	1679	454	1793	1672	121	354	17	475	22