National Travel Survey

Standard Errors: 2009

1. Introduction

Standard errors for key estimates from the National Travel Survey (NTS) have previously been calculated every few years and published in a Technical Report. The most recent published results are for 2002/2003 data[1]. Since then the survey has introduced a weighting strategy to compensate for non-response, to calibrate to known population totals and to account for the observed drop-off in the recording of trips during the travel week.

During 2009 a project was conducted by the Office for National Statistics (see Appendix A) to calculate standard errors for weighted NTS estimates. Programs were written in STATA and run on the 2006 results.

On 29 July 2010, the 2009 NTS results were published on the National Travel Survey web page. This report and accompanying tables cover the results of calculating standard errors for key estimates from the 2009 NTS results using the STATA programs. Further details on the methodology can be found in the ONS report at appendix A.

2. Standard error

Sampling error in any survey arises because the variable estimates are based on a sample rather than a full census of the population. The results obtained for any single sample varies slightly from the true values for the population. The difference between the estimates derived from the sample and the true population values is referred to as the standard error.

[1] 2003/04 technical report containing 2002/03 standard errors: http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/methodology/ntstechreports/nts200304

3. NTS sample

There are two samples used in the analysis:

- The **diary sample** which includes all fully cooperating households which completed the household interview, individual interviews and seven-day travel diaries for all individuals and, where applicable, at least one completed vehicle section. The diary sample is used for analysis of travel data.

- The **interview sample** includes in addition some partially cooperating households, generally where not all household members have completed a diary. The interview sample is used for analysis at household, individual and vehicle level.

4. Weighting on the NTS

The NTS has separate sets of weights for the interview sample and the diary sample. These are built up as a series of factors reflecting the sampling and response patterns.

The interview sample weights include factors for the following:

- Selection weights for multiple households.

- Weighting for household participation, based on observed household response propensity.

- Weighting for removal of households with missing individual interviews.

- Calibration weighting.

The diary sample weights use the first three factors above, weighting for multiple households, household participation and missing individual interviews, but then have the following two factors:

- Weighting for the removal of households that did not fully respond.

- Calibration weighting.

Further detail of the sample design and weighting methodology for the NTS is described in the 2009 technical report[2].

[2] 2009 NTS Technical Report: http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/technical/nts2009technical.pdf

5. Results

Standard error calculations for key estimates from the 2009 NTS results are shown in 17 tables in an Excel file on the NTS web page.

In the tables we present for each survey estimate:

- the number of observations (or base), both in weighted and unweighted form.
- the estimate itself, a percentage, mean or ratio.
- the standard error of the survey estimate.
- the 95% confidence interval.
- the design effect.

Appendix A – Office for National Statistics report

National Travel Survey Standard Errors

Report of a project into calculating standard errors for weighted estimates, funded by the UK Statistics Authority's Quality Improvement Fund.

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January 2010

National Travel Survey Standard Errors

Charles Lound, January 2010

1 Introduction

1.1 Standard errors for key estimates from the National Travel Survey have been calculated every three to four years and published in a Technical Report. The most recent published results are for 2002/2003 data. Since then the survey has introduced a weighting strategy to compensate for non-response, to calibrate to known population totals and to account for the observed drop-off in the recording of trips during the travel week.

1.2 This report covers the results of a project to calculate standard errors that take into account the weighting. The programs, written in STATA were run on 2006 data but are now available for use on other years and across a wider range of estimates as required.

2 NTS sample design and weighting

The NTS sample

2.1 The sample design for the NTS is described in detail in the survey technical reports[1]. Households are sampled for the survey using a two-stage sample of addresses drawn from the Postcode Address File.

2.2 At the first stage of sampling a stratified sample of 684 primary sampling units (PSUs) is drawn from the PAF, with probability proportional to size. The PSUs are postcode sectors, or grouped postcode sectors where the size of the sector falls below certain thresholds. The PSU sample is regionally stratified using the NUTS2 classification and then, within these regions, stratified by census-based variables on car ownership and population density. Inner and Outer London are sampled at a higher rate to compensate for lower response rates.

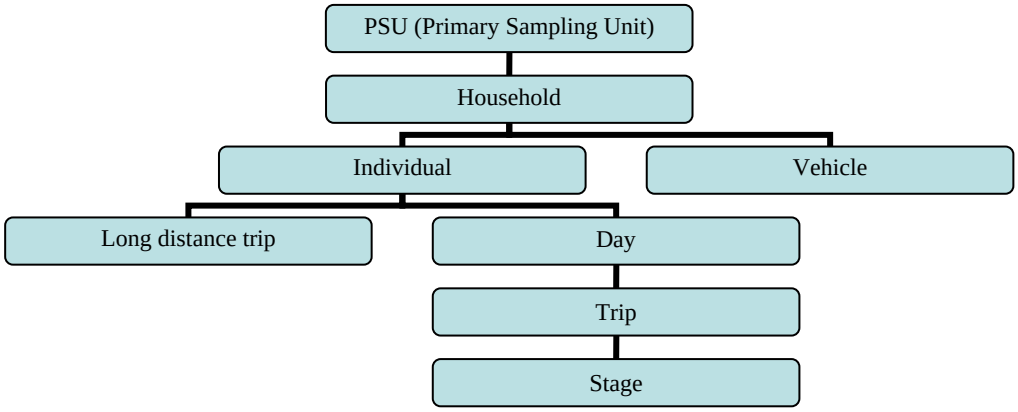
2.3 Since 2002, the NTS has employed a rotation design where half of the PSUs from one year are retained into the next in order to reduce the sampling variation in year-on-year estimates of change.

2.4 From each of the sampled PSUs, a sample of 22 addresses is drawn to give an overall set sample of 15,048 addresses. The great majority of these addresses contain just one eligible household. For multi-household addresses, up to three households are included in the sample, using random subsampling where more than three households are discovered.

2.5 The interview for the survey includes a household interview, individual questionnaires for every member of the household, vehicle questionnaires for each vehicle available for use by the household and individual travel diaries covering a week. The individual questionnaires include questions about long-distance trips. The travel diaries record information on trips for each day of the travel week and each trip may be broken down into stages. This hierarchy is illustrated in Figure 1 which is taken from the NTS User Guidance.

[1] http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/methodology/ntstechreports/

Figure 1: Levels in the NTS database



2.6 There are two samples that can be used for analysis:

- The diary sample which includes all fully cooperating households which completed the household interview, individual interviews and seven-day travel diaries for all individuals and, where applicable, at least one completed vehicle section. The diary sample is used for analysis of travel data.
- The interview sample includes in addition some partially cooperating households, generally where not all household members have completed a diary. The interview sample is used for analysis at household, individual and vehicle level.

Weighting on the NTS

2.7 The NTS has separate sets of weights for the interview sample and the diary sample. These are built up as a series of factors reflecting the sampling and response patterns.

2.8 The interview sample weights include factors for the following:

- Selection weights for multiple households. These compensate for the subsampling households where larger numbers of households are discovered at an address.
- Weighting for household participation, based on observed household response propensity modelled using features available for the whole set sample.
- Weighting for removal of households with missing individual interviews. These are intended to compensate for those households where an individual interview is not available for every household member and are based on the reciprocal of the response probability by household size.
- Calibration weighting. This stage uses population estimates broken down by sex by age group and by region to modify the weights produced so far. The resulting weights are produced at the household-level, so that the same weight is used for all individuals within the household.

2.9 The diary sample weights use the first three factors above, weighting for multiple households, household participation and missing individual interviews, but then have the following two factors:

- Weighting for the removal of households that did not fully respond. The propensity to fully respond (i.e. all diaries completed) against partial response where one or more diaries is missing is modelled, using a range of survey covariates. The reciprocal of the modelled response propensity is used as a weight factor.
- Calibration weighting. This is similar to the calibration weighting carried out for the interview survey, but rather than just using sex by age group and region, a range of controls based on the weighted interview survey are used.

2.10 For the purposes of this project we used the weights for the interview sample and for the diary sample both in their final calibrated form and in the non-calibrated form prior to calibration.

2.11 In addition to the above weights, further factors are derived for use in analysis of travel data.

- Weighting for the drop-off in reporting during the travel diary week. There is an observed drop-off in the number of trips recorded as the diary week progresses. To compensate for this weights are computed using the survey data so that the weighted total number of trips made on a particular day of the week equals the number reported for that day when it was the first day of the week. This is done separately for each trip purpose.
- Weighting for short walks. Information about short walks is collected only on the seventh day of the diary period. However, the distribution of days on which short walk data are collected is not even so a weight is calculated to compensate so that the amount of information on short walks collected on each day is equal to the weighted mean.

2.12 These weights are available both as a final weight incorporating factors from the household weight and the travel data weighting and as separate factors.

3 Estimating Standard Errors

General approach

3.1 In what follows we follow the methods and notation used in Holmes and Skinner (2000)[2].

3.2 Consider an individual denoted by *(hijk)* being the *k*th individual in the *j*th household, in the *i*th PSU, in stratum *h*. In the survey we collect information y_{hijk} from the individual, or y_{hij} from the household. This is extended further below to the lower levels of the hierarchy where data are collected about trips and stages.

[2] Variance Estimation for Labour Force Survey Estimates of Level and Change, *Holmes and Skinner* (2000), GSS Methodology Series no. 21.

3.3 For each household we assume there is a design weight, d_{hij} and a final, calibrated, weight w_{hij}. This can be used to produce a survey estimate of a *total*:

$$\hat{Y} = \sum_{hij} w_{hij} y_{hij}$$

3.4 A standard variance estimator of such a total is given as:

$$v(\hat{Y}) = \sum_{h} \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} (z_{hi} - \overline{z}_h)^2$$

where n_h is the number of PSUs sampled from stratum h, $z_{hi} = \sum_j z_{hij}$, $\overline{z}_h = \sum_i z_{hi} / n_h$ and $z_{hij} = w_{hij} y_{hij}$.

3.5 The standard error is then estimated by taking the square root of this variance estimate. Although quite complicated in form, the main point of interest here is that the calculation centres on totals for the PSUs being combined with their averages within strata. For this reason, this is sometimes referred to as the *ultimate cluster* variance estimator. Further, the same principle applies where the survey measurements are taken at a lower level, so the PSU totals can be weighted totals for all individuals within a PSU.

3.6 However, in the above estimator, the weight w_{hij} is being treated as if it were a design weight rather than a calibrated weight. The process of calibration to fixed population totals can reduce the size of the standard errors, although this can be offset by the greater variation in weights produced in combating varying levels of non-response.

3.7 In order to capture the benefit of the calibration, we can modify the above variance estimator by replacing the y_{hij} values with their residuals, $e_{y,hij}$, from a design-weighted regression of the y_{hij} values on indicator variables defining the calibration categories. If the calibration variables explain a large proportion of the variation in the survey variables, then these residuals will vary less than the raw survey variables and the standard errors will be reduced. This is described as the *jackknife linearization* variance estimator.

3.8 So far this applies to totals, but estimates from the NTS are typically ratios of the form $\hat{R} = \hat{Y} / \hat{V}$, where $\hat{V} = \sum_{hij} w_{hij} v_{hij}$ is a second total estimated from the survey, using a survey variable v_{hij}. Where the estimate is a mean or a proportion applied to the whole sample, this numerator variable is simply set to one for all cases.

3.9 Variance estimation for a ratio is carried out by now replacing the original survey variable in the standard variance estimator with:

$$r_{hij} = \frac{e_{y,hij} - \hat{R} e_{v,hij}}{\hat{V}}$$

where $e_{y,hij}$ is the regression residual as described above and $e_{v,hij}$ is the equivalent for the survey variable used in the denominator (even if this takes the value one for all cases.)

3.10 Where an estimate is required for a subgroup or *domain*, *d*, variance estimation is achieved by replacing the survey variables y_{hij} and v_{hij} with zeroes outside the domain and then applying the above formulae to the modified variables.

Design factors and misspecification factors

3.11 The stratification, multi-stage sampling and weighting employed on the NTS have an effect on the variance of the estimates. To assess the impact of these design decisions, we compare the standard errors we observe from our complex sample with those that would be achieved under a *simple random sample*. The *design effect* is the ratio of the variance of a survey estimate under the complex design to that which would be achieved under a simple random sample. The *design factor* is the same ratio, but for standard errors under the two designs and is thus the square root of the design effect. In practice these can be estimated from the survey data and we have presented these along with the standard errors estimates in the results. As the design factors show the impact of the design for existing estimates, they can also be used to predict the standard error of similar estimates, or even to predict standard errors under certain changes to the design.

3.12 The design effects look at the impact on the design on the variance of estimates from the survey. We also want to choose a method of estimating those variances. This work is looking at a variance estimation method that takes into account the weighting and, in particular, we are interested in the beneficial impact of calibration weighting, which can reduce the variance of estimates. The *misspecification effect* is the ratio of the true variance of a survey estimate to an estimate of the variance under any particular method. As above, the *misspecification factor* is the same, but for standard errors and is the square root of the misspecification effect. These can be estimated from the data.

3.13 As we are specifically interested in the beneficial impact of the calibration weighting, we have produced a misspecification factor that compares the variance of each survey estimate with what we would get with a simpler method that treats the calibration weight as a design weight. In effect, this factor gives a measure of the beneficial impact of the calibration on the precision of survey estimates. (In principle, this could be used to compare the impact of alternative ways of defining the totals used in the calibration weighting.) Also, the misspecification factor tells us by how much we would be out if we were to use a standard error estimator that ignores the calibration. This is of interest because taking account of the calibration requires extra complexity in the calculation, whereas the alternative approach can be achieved with standard commands in STATA or SAS.

Application to the NTS

3.14 In the following we describe how the above calculations of standard errors can be applied to the estimates produced for the NTS[3].

Representing the stratification

3.15 In the above formula, it is necessary to have at least two PSUs in each stratum. Typically when representing the stratification in a survey like the NTS, we pair together consecutive PSUs and regard these pairs as having been drawn from the same stratum. We have modified this approach because of the way the NTS retains half of the PSUs from the previous year and adds a new sample of PSUs.

3.16 The `P1` variable shows the order the PSU was drawn from the frame. This is coded from 101 to 442 for the 342 new PSUs and 443 to 784 for the PSUs brought forward from the previous year. Because of the way the sample is drawn, using systematic random sampling, PSUs coded 101 and 443, 102 and 444 etc should have been drawn from a similar part of the frame and so we treat each of these pairs of PSUs as having been drawn from the same stratum.

3.17 The standard errors here are for a single year of the survey. The retention of half the PSUs from one year to the next has an impact both estimates of change and on any estimates that are calculated by aggregating data over consecutive years. To capture these impacts, the representation of the strata in the standard error calculations would need to acknowledge which PSUs are retained.

Representing the weighting

3.18 The weighting strategy includes two steps which account for nonresponse: at the household participation stage and at the stage where households with missing individual interviews are removed. The diary sample has a third such step accounting for the removal of households with missing diaries. These weight factors are derived using regression modelling on the survey data and are therefore dependent on the whole sample rather than just the case to which the weight factor is applied. However, in our standard error calculations here, we treat these non-response weights as being fixed features of the case being weighted and use the product of the nonresponse weights as a design weight. We believe this will be a conservative approach in that it will if anything slightly overstate the standard errors.

3.19 The method for calculating standard errors for calibrated estimates shown above directly accounts for the calibration to population estimates used for the interview survey. It does not directly allow for the two-phase calibration used for the diary sample where the weights for the smaller sample are calibrated to totals from the larger sample. In what follows, we treat the estimates based on the diary sample as if the weights were derived by calibrating directly to population totals. It is possible that the second stage of calibration has a small beneficial impact on standard errors that we are not capturing here, so this is again conservative.

[3] See for example:
http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/mainresults/

3.20 We have treated the trip weights which are used to capture the drop off in the recording as constants. In what follows, these are used in the aggregation of trip data to form individual-level variables which can be used in the estimators described above.

Proportions of households and individuals

3.21 In the example estimates we have produced, we have calculated standard errors for the proportions of households with access to different numbers of cars, the proportion of households within 13 minutes of an hourly or better bus service and the proportions of individuals with a full driving licence. Because these rely on only the household and individual interviews, the estimates are based on the interview sample. The estimates are calculated for the whole population and for subgroups.

3.22 These are treated as ratios with an indicator variable in the numerator indicating whether the household or person has that attribute. For estimates for the whole population, the denominator is set uniformly to one. Where the estimate is for a subgroup, both the numerator and denominator are set to zero outside the domain.

Trips, miles and time per person

3.23 These estimates are of the number of trips, the total miles travelled and the total time spent on average per person per year. Since these use trip information, the estimates are based on the diary sample. The first two are presented separately by mode and by purpose[4], for all trips and for all trips by the gender and region of the person. Time spent is presented as just an overall average, but could easily be split down by subgroup as required. Although presented in a separate table, following the previous published standard errors, the estimates on distance and number of trips by bicycle are calculated as described here.

3.24 The overall approach to deriving these estimates and their standard errors is to aggregate trips, miles or time across all trips by each person, keeping a separate total for each mode and for each purpose and an overall total across all modes or purposes. The estimate is then a mean at the individual level and the standard error calculated as shown earlier, restricted to a domain where required.

3.25 For the number of trips, the aggregation for each person is weighted by the product of the variables `W5XHH` and `JJXSC`. The first of these is the trip weight excluding the household weighting as the impact of that is accounted for later in the standard error calculation process. The second factor omits trips which are a series of calls and multiplies up short walks by a factor of seven to account for their being recorded on one day only. After aggregating these to individual level those with no trips are given a value of zero and all the aggregated values are multiplied by (365/7) to translate from a weekly total to an annual equivalent.

3.26 For total miles, the individual trip distances recorded in the variable `JD` are multiplied by the trip weight excluding the household weighting, `W5XHH`, and

[4] We have presented annual distance by mode, following the tables of standard errors produced for 2002-03, but note that the NTS standard is to use stage, rather than trip, distance when presenting data by mode.

by the indicator variable J14 which identifies *series of calls* trips with the value zero. The trip distance for short walks is already multiplied by seven in the JD variable. Again, those without trips are given a value of zero and the aggregated values are multiplied up by (365/7) to translate to an annual equivalent. Distances are finally divided by ten to convert from the tenths-of-a-mile recorded in variable JD to whole miles.

3.27 The total time estimate comes from the variable JOTXSC which already excludes *series of calls* trips. As with total mileage, this is multiplied by the trip weight excluding the household weighting, aggregated, and scaled up to an annual equivalent. Values are also converted from minutes to hours.

Average trip length

3.28 The average trip length appears to be a mean taken across all trips and it is possible to calculate the estimate itself using trip-level data and the full trip weight. However, because of the method used to take into account the calibration on standard errors, we have re-cast this as a ratio calculated at the individual level. The value of the survey estimate itself is the same under either approach. Since these rely on trip information, these estimates are based on the diary sample.

3.29 One important consequence of treating the average trip length as a ratio at the individual level, rather than a mean at the trip level, is that the design factors we present here for these estimates are not comparable to those previously presented for the earlier standard errors. This is because those earlier design factors compared the standard errors with those that would have been achieved with a simple random sample of trips. Here we are comparing our standard errors with those that would have been achieved with a simple random sample of individuals. Trips taken by an individual are likely to be more similar to each other than trips in general. This extra level of clustering was reflected in the previous design factors, but is not exhibited in the current design factors.

Stages and stage distance per person per year

3.30 Since a stage will be included in the stage data if and only if the equivalent trip is included in the trip data, the trip weight is appropriate for analysis of the stage data. As with the trips and (trip) distance estimates described earlier, the stage estimates are calculated by aggregating stage information to the individual level and then creating individual-level estimates. Since these rely on trip information, these estimates are based on the diary sample.

3.31 For the number of stages, we aggregate the product of the variable SSXSC, which takes the value seven for a short walk, zero for a stage of a *series of calls* and one for all other stages, and the trip weight excluding the household weight which is stored in the stage variable W5XXHH. Individuals with no stage recorded are set to zero and the aggregated value is multiplied up to convert from a weekly to an annual total.

3.32 For the stage distance per person, the aggregated product is the product of the stage distance SD, the trip weight excluding the household weight W5XXHH and a logical condition (SSXSC>0) which serves to exclude stages which are a series of calls. The stage distance SD is already multiplied by seven for short

walks. The resulting value is set to zero for those with no recorded stage and the resulting value multiplied up to convert from a weekly to an annual total and then divided by ten to convert from tenths of a mile recorded in SD.

Trips to and from school

3.33 The distribution of trips to and from school by mode is presented as a proportion of the total such trips. The method used to calculate these estimates is essentially the same as that used for the average trip length, as a ratio at the individual level. For each mode and for all trips, the product of the trip weight excluding the household weight W5XHH and the variable JJXSC, which excludes *series of calls trips* and multiplies short walks by seven, is aggregated to individual level. The estimate of the percentage by mode is then an individual-level ratio estimate of the number of trips for a particular mode divided by total trips. The average trip length to and from school is calculated in exactly the same way as the earlier average trip length estimates.

3.34 These estimates are calculated separately for children and young people in different age-group domains, using the method described earlier.

4 Results

4.1 The results of the standard errors calculations for 2006 are shown in the attached appendices. These are in fourteen tables which as the same as the tables produced for the 2002/2003 standard errors. In the tables we present for each survey estimate: the number of observations, weighted and unweighted, the estimate itself, the standard error of the survey estimate, the design factor and the misspecification factor associated with ignoring the calibration.

4.2 Aside from the higher sampling rate in London the NTS employs an equal probability sample so the unweighted and weighted sample sizes are of a similar magnitude. The observed differences can be attributed to random variation and the impact of weighting to address differential nonresponse. Where estimates are based on the fully responding sample, the weighted sample sizes tend to be larger because the fully responding sample is weighted to the interview sample in the calibration process.

4.3 Design factors indicate the impact of the design on the variance of estimates. These are typically larger than one, showing that the impact of having a multi-stage sample is outweighing the impact of stratification. It should be noted that these design factors are themselves survey estimates and subject to random variation, particularly when based on smaller sample sizes. When using design factors to predict the impact for other survey estimates, it makes sense to borrow strength from similar estimates to reduce the impact of this random variation. In particular, we would recommend re-running the standard error programs across years to see the extent of the variation (under the same design) and also to allow for averaging across years to produce more stable factors.

4.4 Higher misspecification factors indicate that the calibration is having a beneficial impact on the variance of an estimate. For the 232 estimates here, the misspecification factors range from 0.96 to 1.22, although below 0.99 for only one of the estimates and above 1.01 for 48 estimates. The factors are larger for those estimates for the whole population rather than for subgroups. (This includes estimates of total trips, stages or distance by mode or purpose where

these are across all individuals.) This is because if, for example, an estimate is disaggregated by region, including region in the calibration has no impact on the estimate.

5 Conclusions

5.1 We have calculated the standard errors for the 2006 National Travel Survey, taking into account the impact of the weighting. We have also presented design factors which indicate the impact the survey design has on estimates and misspecification factors showing how the calibration weighting tends to reduce standard errors.

5.2 These calculations have been run in the STATA software which is now available for running on other years and for other estimates. We recommend in particular that these are used to investigate the stability of design factors over time.

Appendix: Tables of results

In the following tables of results, each estimate is shown with:

- The number of observations (or *base*), both in unweighted and weighted form.
- The estimate itself, a percentage, mean or ratio. The ratio estimates are used to calculate means or percentages, but these are labelled as ratios to emphasise the calculation method used to create standard errors.
- The estimated standard error of the estimate.
- The estimated design factor, comparing the reported standard error that takes into account the complex sample design and estimation with that which would be found for a simple random sample.
- A misspecification factor showing an estimate of the true standard error, taking into account the impact of calibration divided by a standard error that ignores the impact of calibration.

Table A1 Percentage of households by car access by GOR and country

National Travel Survey 2006

		Observations					
	Car ownership	**Unweighted**	**Weighted**	**Est (%)**	**Std Err**	**Deft**	**meft(cal)**
Government Office Region							
North East	0 cars	433	423	29.5	2.56	1.16	0.98
	1 car	433	423	48.8	2.86	1.19	0.99
	2 cars	433	423	17.8	2.52	1.39	1.00
	3+ cars	433	423	3.6	0.96	1.10	1.00
North West	0 cars	1,138	1,077	23.7	1.56	1.23	1.00
	1 car	1,138	1,077	43.8	1.42	0.97	0.99
	2 cars	1,138	1,077	27.3	1.33	1.01	0.97
	3+ cars	1,138	1,077	5.2	0.77	1.20	0.99
Yorkshire & Humberside	0 cars	815	802	27.6	2.18	1.40	0.99
	1 car	815	802	41.7	1.32	0.76	1.00
	2 cars	815	802	25.4	1.80	1.18	0.99
	3+ cars	815	802	5.2	0.91	1.18	0.99
East Midlands	0 cars	692	676	18.3	1.86	1.26	1.00
	1 car	692	676	47.3	1.91	1.01	0.96
	2 cars	692	676	28.7	2.00	1.17	0.97
	3+ cars	692	676	5.7	1.11	1.29	1.01
West Midlands	0 cars	817	819	21.3	1.79	1.25	0.99
	1 car	817	819	41.7	2.04	1.18	0.99
	2 cars	817	819	28.8	1.76	1.11	0.98
	3+ cars	817	819	8.2	0.98	1.04	1.01
Eastern	0 cars	859	850	18.9	1.50	1.12	1.01
	1 car	859	850	41.2	2.33	1.38	1.00
	2 cars	859	850	32.8	1.92	1.20	1.01
	3+ cars	859	850	7.0	0.75	0.87	1.05
Greater London	0 cars	1,061	1,204	37.6	1.64	1.11	1.02
	1 car	1,061	1,204	45.8	1.64	1.07	1.00
	2 cars	1,061	1,204	13.0	1.29	1.22	1.01
	3+ cars	1,061	1,204	3.5	0.61	1.08	1.01
South East	0 cars	1,222	1,275	18.5	1.00	0.90	1.00
	1 car	1,222	1,275	41.4	1.44	1.02	0.98
	2 cars	1,222	1,275	32.1	1.54	1.16	1.00
	3+ cars	1,222	1,275	7.9	0.69	0.91	0.98
South West	0 cars	850	828	19.3	1.63	1.20	0.99
	1 car	850	828	43.5	1.66	0.97	0.99
	2 cars	850	828	31.0	1.53	0.97	0.96
	3+ cars	850	828	6.1	1.10	1.37	0.98
Wales	0 cars	493	460	24.2	1.99	1.03	0.98
	1 car	493	460	44.6	2.35	1.05	1.00
	2 cars	493	460	24.1	2.88	1.50	0.99
	3+ cars	493	460	7.1	1.29	1.12	1.01
Scotland	0 cars	881	848	30.1	2.24	1.45	0.98
	1 car	881	848	42.8	1.75	1.05	1.00
	2 cars	881	848	22.6	1.85	1.31	0.99
	3+ cars	881	848	4.5	0.93	1.38	0.99
Great Britain	0 cars	9,261	9,261	24.6	0.51	1.15	0.94
	1 car	9,261	9,261	43.5	0.54	1.05	0.97
	2 cars	9,261	9,261	26.0	0.53	1.16	0.96
	3+ cars	9,261	9,261	5.9	0.27	1.12	1.00

Table A2 Percentage of households living within 13 minutes of an hourly or better bus service by a
National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Est (%)	Std Err	Deft	meft(cal)
Area type						
Great Britain	9,261	9,261	96.4	0.23	1.17	0.99
London Boroughs	1,061	1,204	99.0	0.30	0.98	1.00
Met built-up areas	1,345	1,362	98.5	0.30	0.90	0.99
Other urban over 250k	1,481	1,556	98.6	0.32	1.01	1.00
Urban over 25k to 250k	2,469	2,479	98.4	0.26	1.01	1.00
Urban over 10k to 25k	776	743	97.3	0.73	1.22	1.00
Urban over 3k to 10k	653	603	97.1	0.73	1.12	1.00
Rural	1,476	1,315	84.6	1.13	1.19	1.00

Table A3 Percentage of individuals with full driving licence by gender and age

National Travel Survey 2006

		Observations					
		Unweighted	Weighted	Est (%)	Std Err	Deft	meft(cal)
Gender	**Age group**						
All persons		17,346	17,513	71.9	0.49	1.44	0.94
Male		8,272	8,481	80.9	0.52	1.23	0.91
Female		9,074	9,032	63.4	0.65	1.28	0.98
Male:	17-20	514	563	36.8	2.42	1.14	1.00
	21-29	1,063	1,239	70.7	1.58	1.13	0.99
	30-39	1,415	1,617	85.9	0.99	1.07	0.99
	40-49	1,600	1,588	88.6	0.88	1.11	0.99
	50-59	1,439	1,394	90.7	0.80	1.05	1.00
	60-69	1,143	1,051	89.7	0.95	1.06	0.99
	70+	1,098	1,028	75.7	1.36	1.05	1.00
Female:	17-20	512	537	31.4	2.27	1.11	1.00
	21-29	1,153	1,246	62.7	1.59	1.11	1.00
	30-39	1,542	1,652	78.1	1.15	1.08	1.00
	40-49	1,701	1,628	79.0	0.99	1.00	1.00
	50-59	1,542	1,433	73.8	1.28	1.14	1.00
	60-69	1,182	1,118	63.0	1.49	1.06	1.01
	70+	1,442	1,419	30.7	1.31	1.07	1.00

Table A4 Percentage of individuals aged 17+ with full driving licence by GOR

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Est (%)	Std Err	Deft	meft(cal)
Government Office Region						
Great Britain	17,346	17,513	71.9	0.49	1.44	0.94
North East	797	795	63.8	1.83	1.07	1.00
North West	2,132	2,044	70.9	1.46	1.48	0.99
Yorkshire & Humberside	1,514	1,501	68.0	2.15	1.80	0.99
East Midlands	1,311	1,300	73.8	2.02	1.66	1.00
West Midlands	1,597	1,622	72.3	2.09	1.87	0.99
Eastern	1,633	1,630	78.5	1.01	0.99	1.00
Greater London	2,031	2,285	64.3	1.65	1.55	0.99
South East	2,300	2,424	77.6	0.97	1.13	1.02
South West	1,507	1,487	78.9	1.30	1.24	1.01
Wales	933	875	72.0	2.09	1.43	1.00
Scotland	1,591	1,551	67.6	2.20	1.88	0.99

Table A5 Trips per person per year by main mode and purpose

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Main mode						
Walk	19,490	19,794	249.1	4.95	1.54	0.99
Bicycle	19,490	19,794	16.1	0.88	1.34	0.99
Car/van driver	19,490	19,794	430.1	4.72	1.14	0.91
Car/van passenger	19,490	19,794	227.9	2.80	1.19	0.90
Motorcycle	19,490	19,794	3.0	0.31	1.08	0.99
Other private	19,490	19,794	7.8	0.57	1.42	0.99
London stage bus	19,490	19,794	15.7	0.97	1.49	0.86
Other stage bus	19,490	19,794	49.1	1.62	1.64	0.95
Non-local bus	19,490	19,794	0.7	0.09	1.11	1.00
LT Underground	19,490	19,794	8.3	0.67	1.52	0.88
Surface rail	19,490	19,794	16.2	0.76	1.46	0.98
Taxi/minicab	19,490	19,794	10.3	0.46	1.45	0.99
Other public	19,490	19,794	3.1	0.58	2.31	0.99
Purpose						
Commuting	19,490	19,794	159.6	1.86	1.11	0.82
Business	19,490	19,794	35.1	1.11	1.12	0.96
Education	19,490	19,794	62.1	1.57	1.27	0.82
Escort education	19,490	19,794	43.8	1.59	1.18	0.98
Shopping	19,490	19,794	218.5	2.40	1.26	0.97
Other escort	19,490	19,794	96.9	1.92	1.23	0.90
Other personal business	19,490	19,794	105.2	1.67	1.25	0.97
Visit friends at private home	19,490	19,794	118.7	2.01	1.47	0.99
Visit friends elsewhere	19,490	19,794	48.7	1.22	1.48	0.98
Entertain/ public activity	19,490	19,794	49.0	1.19	1.48	0.99
Sport: participate	19,490	19,794	16.4	0.61	1.40	1.00
Holiday: base	19,490	19,794	10.8	0.63	1.51	0.99
Day trip	19,490	19,794	27.5	1.12	1.65	0.98
Other including just walk	19,490	19,794	45.0	1.65	1.20	0.99
All trips	19,490	19,794	1037.4	7.07	1.53	0.97

Table A6 Trips per person per year by gender and GOR

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Gender						
Male	9,396	9,700	1014.2	7.62	1.20	0.97
Female	10,094	10,094	1059.8	8.64	1.29	0.98
Government Office Region						
North East	893	867	1023.2	33.07	1.51	1.00
North West	2,392	2,324	1084.3	21.82	1.65	1.00
Yorkshire & Humberside	1,662	1,715	1053.7	20.16	1.27	0.99
East Midlands	1,499	1,466	1104.5	23.60	1.36	1.00
West Midlands	1,792	1,818	1012.3	21.61	1.47	1.00
Eastern	1,828	1,873	1080.4	21.71	1.40	1.00
Greater London	2,253	2,561	896.7	21.16	1.72	1.00
South East	2,566	2,732	1052.1	23.03	1.79	1.00
South West	1,766	1,710	1123.4	19.12	1.20	1.00
Wales	1,038	1,001	1010.0	36.45	1.85	1.00
Scotland	1,801	1,727	1004.3	26.28	1.67	0.99

Table A7 Miles per person per year by purpose

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Main mode						
Walk	19,490	19,794	168.9	3.29	1.53	0.99
Bicycle	19,490	19,794	38.3	2.61	1.39	0.98
Car/van driver	19,490	19,794	3646.2	57.66	1.24	0.93
Car/van passenger	19,490	19,794	2021.8	39.76	1.34	0.98
Motorcycle	19,490	19,794	34.4	4.09	1.15	0.99
Other private	19,490	19,794	119.1	9.67	1.29	0.99
London stage bus	19,490	19,794	57.7	3.47	1.27	0.88
Other stage bus	19,490	19,794	234.5	8.16	1.38	0.96
Non-local bus	19,490	19,794	65.3	8.77	1.13	1.00
LT Underground	19,490	19,794	71.9	5.74	1.32	0.88
Surface rail	19,490	19,794	513.7	24.03	1.25	0.98
Taxi/minicab	19,490	19,794	47.4	2.88	1.18	1.00
Other public	19,490	19,794	105.6	18.48	1.40	0.99
Purpose						
Commuting	19,490	19,794	1391.3	29.60	1.21	0.93
Business	19,490	19,794	674.8	31.19	1.27	0.99
Education	19,490	19,794	205.2	8.83	1.23	0.93
Escort education	19,490	19,794	100.4	5.84	1.22	1.00
Shopping	19,490	19,794	924.8	17.37	1.62	0.95
Other escort	19,490	19,794	487.9	13.74	1.33	0.97
Other personal business	19,490	19,794	488.4	12.88	1.33	0.99
Visit friends at private home	19,490	19,794	1121.1	31.81	1.51	0.99
Visit friends elsewhere	19,490	19,794	292.9	11.69	1.58	1.00
Entertain/ public activity	19,490	19,794	371.2	13.33	1.37	0.99
Sport: participate	19,490	19,794	107.9	6.21	1.33	1.01
Holiday: base	19,490	19,794	524.8	32.45	1.60	1.00
Day trip	19,490	19,794	386.7	17.80	1.58	1.00
Other including just walk	19,490	19,794	47.5	1.91	1.31	0.99
All trips	19,490	19,794	7124.9	94.06	1.64	0.97

Table A8 Miles per person per year by gender and GOR

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Gender						
Male	9,396	9,700	7961.5	116.52	1.25	0.97
Female	10,094	10,094	6320.9	97.70	1.45	0.99
GOR						
North East	893	867	5998.7	278.86	1.19	1.00
North West	2,392	2,324	6612.4	222.36	1.48	1.00
Yorkshire & Humberside	1,662	1,715	6801.1	366.21	1.94	0.99
East Midlands	1,499	1,466	7263.0	400.21	1.92	0.99
West Midlands	1,792	1,818	6546.4	298.61	1.68	1.00
Eastern	1,828	1,873	8310.0	309.48	1.53	0.99
Greater London	2,253	2,561	5417.8	229.52	1.71	1.00
South East	2,566	2,732	8390.0	262.22	1.50	1.01
South West	1,766	1,710	8114.5	260.28	1.24	1.00
Wales	1,038	1,001	7336.5	445.25	1.93	1.00
Scotland	1,801	1,727	7334.3	429.80	2.02	0.99

Table A9 Total time per person per year

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
All trips	19,490	19,794	383.3	2.77	1.48	0.96

Table A10 Average trip length by main mode and purpose

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Ratio	Std Err	Deft*	meft(cal)
Main mode						
Walk	93,201	94,547	0.7	0.01	1.39	0.99
Bicycle	5,705	6,119	2.4	0.10	1.23	0.99
Car/van driver	162,302	163,286	8.5	0.11	1.24	0.99
Car/van passenger	86,931	86,514	8.9	0.16	1.46	0.99
Motorcycle	1,061	1,152	11.3	0.88	1.08	1.00
Other private	2,954	2,957	15.3	1.16	1.34	1.00
London stage bus	5,203	5,956	3.7	0.13	1.57	0.99
Other stage bus	18,374	18,633	4.8	0.12	1.52	1.01
Non-local bus	269	264	93.8	7.57	1.06	1.00
LT Underground	2,478	3,159	8.6	0.32	1.40	1.00
Surface rail	5,609	6,131	31.8	1.27	1.41	1.00
Taxi/minicab	3,678	3,913	4.6	0.23	1.11	0.99
Other public	1,057	1,182	33.9	7.74	1.69	1.00
Purpose						
Commuting	56,318	60,601	8.7	0.17	1.25	0.98
Business	12,946	13,319	19.2	0.73	1.19	1.01
Education	23,125	23,589	3.3	0.13	1.22	1.00
Escort education	17,077	16,634	2.3	0.12	1.22	0.99
Shopping	82,921	82,959	4.2	0.08	1.75	0.99
Other escort	36,995	36,802	5.0	0.12	1.33	0.98
Other personal business	40,176	39,922	4.6	0.12	1.35	0.99
Visit friends at private home	44,522	45,057	9.4	0.27	1.53	0.99
Visit friends elsewhere	17,792	18,489	6.0	0.23	1.58	0.99
Entertain/ public activity	18,395	18,595	7.6	0.24	1.30	1.00
Sport: participate	6,139	6,231	6.6	0.28	1.18	1.00
Holiday: base	4,144	4,106	48.5	2.75	1.49	1.00
Day trip	10,734	10,430	14.1	0.57	1.55	1.00
Other including just walk	17,537	17,079	1.1	0.03	1.17	0.99
All trips	388,822	393,812	6.9	0.09	1.64	0.98

* The design factors shown here are not equivalent to those shown in the 2003/04 technical report as these compare the impact of the design on ratio estimators at the individual level, rather than means at the trip level

Table A11 Stages per person per year by mode

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Mode						
Walk	19,490	19,794	320.8	6.27	1.63	0.98
Bicycle	19,490	19,794	16.7	0.90	1.35	0.99
All car/van	19,490	19,794	665.7	6.77	1.65	0.93
Local bus	19,490	19,794	72.4	1.99	1.62	0.94
Rail/Underground	19,490	19,794	29.1	1.09	1.29	0.86
Other	19,490	19,794	28.1	1.16	1.69	0.99
All stages	19,490	19,794	1132.8	8.58	1.62	0.98

Table A12 Stage distance per person per year by mode

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Mode						
Walk	19,490	19,794	199.1	3.66	1.58	0.98
Bicycle	19,490	19,794	39.2	2.63	1.39	0.98
All car/van	19,490	19,794	5686.7	86.20	1.65	0.95
Local bus	19,490	19,794	296.2	8.79	1.40	0.97
Rail/Underground	19,490	19,794	540.8	23.00	1.24	0.96
Other	19,490	19,794	362.9	22.74	1.38	1.00
All stages	19,490	19,794	7124.9	94.06	1.64	0.97

Table A13 Trips to and from school

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Ratio	Std Err	Deft*	meft(cal)
Age 5-10						
Walk	9,166	8,909	51.5%	2.0%	1.25	1.00
Bicycle	9,166	8,909	0.9%	0.3%	1.10	1.00
Car/Van Passenger	9,166	8,909	40.9%	1.9%	1.25	1.00
Private bus	9,166	8,909	2.3%	0.5%	1.19	1.00
Local bus	9,166	8,909	3.4%	0.6%	1.23	1.00
Rail	9,166	8,909	0.2%	0.2%	1.09	1.01
Other	9,166	8,909	0.7%	0.3%	1.14	1.00
Average length	9,166	8,909	1.5	0.09	1.20	0.99
Age 11-16						
Walk	9,374	9,504	41.4%	1.8%	1.21	1.00
Bicycle	9,374	9,504	3.3%	0.5%	1.01	1.00
Car/Van Passenger	9,374	9,504	20.3%	1.1%	1.08	1.01
Private bus	9,374	9,504	6.9%	0.9%	1.22	1.00
Local bus	9,374	9,504	24.4%	1.5%	1.17	0.99
Rail	9,374	9,504	1.7%	0.4%	1.12	1.01
Other	9,374	9,504	2.0%	0.4%	1.06	1.00
Average length	9,374	9,504	3.4	0.16	1.21	1.00
Age 5-16						
Walk	18,540	18,412	46.3%	1.5%	1.33	1.00
Bicycle	18,540	18,412	2.2%	0.3%	1.07	1.00
Car/Van Passenger	18,540	18,412	30.3%	1.1%	1.26	1.00
Private bus	18,540	18,412	4.7%	0.6%	1.30	0.99
Local bus	18,540	18,412	14.2%	0.9%	1.26	0.96
Rail	18,540	18,412	1.0%	0.2%	1.20	1.01
Other	18,540	18,412	1.4%	0.3%	1.07	1.00
Average length	18,540	18,412	2.5	0.10	1.29	0.98

* The design factors shown here are not equivalent to those shown in the 2003/04 technical report as these compare the impact of the design on ratio estimators at the individual level, rather than means at the trip level

Table A14 Bicycle travel in Great Britain and England

National Travel Survey 2006

	Observations					
	Unweighted	Weighted	Mean	Std Err	Deft	meft(cal)
Distance travelled per person per year						
Great Britain	19,490	19,794	39.2	2.63	1.39	0.98
England	18,949	17,065	42.1	3.00	1.41	0.99
Bicycle trips per person per year						
Great Britain	19,490	19,794	16.1	0.88	1.34	0.99
England	18,949	17,065	17.5	0.99	1.35	0.99