National Rail Travel Survey

Overview Report

Updated December 2010

**Results from a survey of rail travel
across Great Britain**

Department for Transport

in association with Transport Scotland

Symbols and Conventions

Unless otherwise stated, all tables refer to Great Britain

Symbols: the following symbols have been used throughout

..	= not available
-	= negligible (less than half the final digit shown)
*	= sample size too small for reliable estimates
.	= not applicable
0	= nil

Abbreviations used:

DfT	Department for Transport
GIS	Geographic Information System
LATS	London Area Travel Survey
NGR	National Grid References
NPS	National Passenger Survey
NRTS	National Rail Travel Survey
NTS	National Travel Survey
ORR	Office of Rail Regulation
RODS	Rolling Origin Destination Survey
SRA	Strategic Rail Authority

Contents

Executive Summary

In March 2007 a report was released which described the background to the National Rail Travel Survey (NRTS) and included provisional high-level survey results based on an interim dataset. DfT had hoped to make the NRTS data available for wider industry use in 2007, but this was not possible because of a number of data problems and methodological issues that became apparent as final database processes to reweight the station-level results were carried out.

Detailed testing and validation work was carried out in 2008, data were corrected where necessary, and a final NRTS overview report was published in May 2008. Despite the validation work carried out, as expected, the high-level results shown in the May 2008 report differed only very slightly from those preliminary results presented in March 2007.

The May 2008 report signalled the wider release of the data subject to data confidentiality restrictions and under the condition that early analysis would be recognised as feeding into a Quality Assurance (QA) process. This QA process is now complete, and as a result this updated overview report is being issued.

The high-level results shown in this report contain revised definitions of 'journey purpose' and 'ticket type'; the underlying data has not changed. Further details on the differences in definitions and the impact are included in Annex C. The table below summarises the various NRTS reports released.

Report Title	Date released	Coverage
March 2007 Provisional Report	30 March 2007	Provisional high-level survey results based on an interim dataset
Final 2008 Report	29 May 2008	High-level survey results based on a revised dataset
Overview Report	9 December 2010	High-level survey results based on a final dataset, updated following user testing with changes to the definition of journey purpose and ticket type

In addition, the London Area Travel Survey: National rail results: an introductory report was published by the Strategic Rail Authority (SRA) on 17 November 2006. This covered the London and South East contribution to NRTS.

The NRTS

The NRTS is a survey of passenger trips on the national rail system in Great Britain on weekdays outside school holidays. It was initiated by the Strategic Rail Authority (SRA) to build on the data collected in 2001 through the London Area Transport Survey (LATS), which covered rail travel originating in London and the South East. The NRTS aimed to produce a comprehensive picture of *weekday* rail travel across the whole of Great Britain, covering who uses the railways, where, when and for what purposes. Responsibility for the survey transferred to the Department for Transport (DfT) over summer 2005, as part of the Future of Rail White Paper reorganisations.

The survey data collection work was undertaken in two phases, the first being in Wales in early 2004, and the second during 2004 and 2005 covering Scotland and England (outside London and the South East). Taken together with the earlier LATS rail survey (2001), which was carried out in the same way and collected virtually the same information, the findings aim to represent all rail travel at all 2,500 stations in Great Britain on a typical weekday.

Information was collected from passengers by self-completion questionnaire, covering the following topics:
- rail stations used
- time of travel
- access and egress modes
- origin and destination addresses
- trip purposes
- ticketing information
- demographic information

Postcodes and National Grid References (NGR) for all stations and all origins and destinations were subsequently appended to the data, as were the trip length on the rail network and the estimated trip duration and arrival time.

The NRTS database combines results from Wales, Scotland and England, plus the London and South East data, into a single dataset for the whole of Great Britain. The database accounts for return trips, details of which were collected in the questionnaire, and the trips are then grossed up through a process of 'expansion' to represent all rail trips on an average weekday.

The NRTS database comprises some 436,000 original travel records. These are expanded to represent approximately 2.7 million rail trips on an average weekday. These survey results show that

- the majority of rail travel occurred in two daily peaks. 36 per cent of journeys[1] started between 6.30am and 10am and 36 per cent started between 4pm and 8pm

- Commuting to and from work or education accounted for the biggest share of all daily rail journeys (63 per cent). 13 per cent of travel was for business and 24 per cent for leisure

- Travel was concentrated in London and the South East. London alone accounted for just under half (48 per cent) of all departures

- Individual countries and regions had their own distinct travel profiles in terms of the types of journeys being undertaken and the ultimate destination of those trips

- Most commuting occurred daily. Most business and leisure trips were infrequent though a small number of these trips followed a more regular pattern

- A wide range of ticket types was used, but each passenger type bought according to their travel needs, so business travellers were much more likely to use open returns, and commuters used Travelcards and season tickets. Cheap day returns and One-day Travelcards were popular with leisure travellers

- 54 per cent of travellers were male and 46 per cent were female

- Commuters and business travellers tended to have higher household incomes than leisure travellers[2].

The full NRTS database holds rich data on many aspects of rail journeys with details of passengers' full journeys (including modes of travel used to get to and from stations, ticket usage and time of travel). The full dataset will allow catchment area analysis based on the geocodes of individual database entries. This will allow results to be derived for individual stations and analysis produced on many aspects of station usage and traveller types.

The survey will be an essential new source to support rail analysis functions such as franchise specification, the franchise bidding process, Route Utilisation Strategies, Regional Planning Assessments, rail economic models, scheme assessments and station catchment analysis. It will also provide valuable

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[1] The terms 'journeys' and 'trips' are used interchangeably throughout the report.
[2] This only refers to rail trips outside of the LATS survey area, where the question concerning income was not asked.

information required to undertake other policy analysis – for example, socio-economic research.

The information presented in this report is not intended to be comprehensive, but to give the key results and an indication of what is available. Further analysis and data can be provided by both the Department for Transport and Transport Scotland in response to requests, subject to data confidentiality restrictions.

We welcome feedback on any aspect of the data, methodology or this report. Contact details are included at the end of the report.

Department for Transport Rail Statistics team

1. Introduction

Transport needs are dynamic, reflecting changes in population size and composition, the location of employment and other social and demographic factors. The way people travel also changes to reflect the changing costs and opportunities offered by competing transport networks. Understanding the resulting travel patterns is of key importance in order to plan services to meet existing and future transport demand.

The main source of information usually used to examine rail travel patterns is ticket sales. However, this data has limitations because people do not always make the exact journey that they purchase tickets for; tickets give no information about interaction with other modes of transport and there is little detail of travel using season tickets or travel cards. Ticket data gives very limited information about the true origin and destination of the journey and it does not give any information about who is travelling, why a journey is being made or the time of travel.

This gap in understanding of rail demand has been partially filled by surveys of travel and transport in London and the South East, most recently the 2001 London Area Transport Survey (LATS). The rail element of this multi-modal survey was managed by the Strategic Rail Authority (SRA) and the results were published in a report in February 2005[1].

However, there was still a lack of understanding about rail travel elsewhere in Great Britain. The SRA needed this information in order to feed into rail planning activities, such as franchise specification, rail modelling and scheme assessments. To address this, the SRA initiated the National Rail Travel Survey project. The aim was to build on the data collected in London in 2001 to produce for the first time a comprehensive picture of weekday rail travel across the whole of Great Britain, covering who uses the railways, where, when and for what purposes.

The survey data collection work was undertaken in two phases, the first being in Wales in early 2004, and the second during 2004 and 2005 covering Scotland and England (outside London and the South East). As with the LATS work, the surveys covered rail travel on weekdays outside school holidays. Responsibility for the survey transferred to the Department for Transport over summer 2005, as part of the Future of Rail White Paper reorganisations. The Department for Transport collaborated with Transport Scotland on the survey in Scotland, which was carried out shortly after responsibility for the railways in Scotland was devolved.

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[1] London Area Transport Survey National Rail Results - An Introductory Report (SRA, Feb 2005) (see http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/statistics/datatablespublications/railways/londonareatravelsurveynation1809)

The NRTS database combines these data with the LATS data to produce a single dataset for the whole of Great Britain

The results presented in this report are given at a very high level, showing a small selection of the NRTS analysis that is possible.

The Department for Transport, Transport Scotland and the Welsh Assembly Government will all make use of the data and collaborate on any future updates to the survey work.   Over the next few months, DfT will publish further reports providing more findings from the survey.

2. Methodology

This section outlines the survey methodology, including how the data were collected and the processing procedures that were applied. Further detail is included in the annexes.

Data Collection

In principle the survey attempts to pick up all National Rail trips on a typical weekday by intercepting all passengers entering the National Rail system without sampling any trip more than once. In practice this is difficult to achieve perfectly, but the survey was designed to provide the travel estimates that would result from this ideal design.

The survey covered stations in one of two ways. All major stations were surveyed 'at-station' by intercepting passenger flows entering stations or platforms at 'Distribution Points', which were located so as to intercept all passengers, without double counting. Self-completion postal return questionnaires were issued to as many travellers as possible at each point and all passengers were counted continuously with the counts recorded in 15-minute periods. In total 1,500 stations, including all the major commuter destination stations and all stations in London and the South East, were covered in this way. The survey questionnaire is included in Annex A. Each questionnaire had a unique serial number and so the returned questionnaires could be related to the 15-minute count taken when they were handed out, using the serial number ranges that were recorded during distribution. The majority of passengers were surveyed in this way, but a significant minority were covered by on-train surveys.

On-train surveys were restricted to lines with relatively quiet stations and short trains (normally up to two carriages). Passengers joining the train at each station were counted and issued with a questionnaire that collected the same information as the at-station questionnaire. They were asked to complete and return the questionnaire on the train, although the postal option was used when this was not practicable because of short journeys or overcrowding. The on-train survey responses were re-formatted to become equivalent to at-station responses before being input to the final database. 1,000 stations were covered by on-train surveys.

Data were collected on weekdays only, excluding school holidays. The survey day, to which the output estimates apply, runs from 0600 to 2200 hours, although many of the quieter stations covered by at-station surveys were surveyed for a shorter period, for example, until 1900 hours or 1400 hours. This is because outbound traffic is concentrated during these times and very little or no travel from the station was likely to be missed. Very quiet stations with the majority of departures expected in the morning peak were surveyed during 0600-1000 only. With the on-train surveys it was possible to cover most train journeys falling within the 0600 to 2200 period, providing an efficient way to cover the whole day at many of the quieter stations.

Some of the survey work inevitably suffered disruption, either through problems on the rail network or through unforeseen difficulties with the survey fieldwork, or through other factors, such as crowding at the station following a major event. These issues were recorded and where necessary the survey was repeated to ensure a typical "average weekday" was captured.

The vast majority of stations in Great Britain have been covered, with a few exceptions of the really quiet stations, stations that could not be covered in the general scheme of survey work, or where repeated failures in surveying or data problems led to the station being omitted.

Data checking and processing

Returned questionnaires were subject to extensive checking and, where necessary, were corrected in order to create complete and correctly formatted records. Correction to journey characteristics, such as substituting outward travel with return travel, was often made possible because the time and place of questionnaire distribution is known, allowing the most common errors to be identified and corrected with confidence. A very small number of records not meeting the standard were rejected.

After checking, the returned questionnaires were grossed up or 'expanded' to represent all travellers. Counts were carried out by 15-minute period at all 2,500 stations and at multiple distribution points within each station. Serial numbers linked the questionnaires to the 15-minute period and distribution point at which they were handed out and so expansion of the questionnaire responses occurred at this detailed level. This stratification goes a very long way to avoiding error because of the strong relationships between purpose distributions, destination probabilities, ticket types, time of day and departure station.

The questionnaire asked for details of return journeys, including the time and day of departure, and this information enabled the generation of return trips, which further improve and extend survey coverage. For instance, when a station was not surveyed for the whole day, survey records for unsurveyed periods have been sourced from the return trips to that station picked up at all other stations.

Questionnaire processing yielded clean, edited and expanded survey data from the 2004 and 2005 surveys. This data was then combined with LATS data so that trips from London and the South East could feed into estimates for the rest of Great Britain, and vice versa. Some further processing was necessary to produce final estimates of travel that are complete for all stations and time periods and that are internally consistent.

Final estimates also incorporate bias correction factors derived from a study undertaken at stations during the LATS work. Further methodological details are included in Annex B.

The remaining gaps in survey coverage are a very small proportion of trips, and the majority are those between the quietest stations at the quietest times. In the first stage of the survey (London and the South East) on-train surveys could not be used and it was estimated that about one per cent of trips were missed. In the national results the use of on-train surveys will have reduced this figure.

3. Key Results

<u>Sample size and response rates</u>

Over the course of the survey 436,000 questionnaire responses were collected. 296,000 of these were collected during the LATS survey work, 10,000 in Wales, and 131,000 in Scotland and the rest of England. The counts yield an estimate of 2.7 million rail journeys on an average weekday. Overall, an estimated 1.75 million questionnaires were distributed, representing approximately a 65 per cent distribution rate and the survey achieved a 26 per cent response rate from those distributed. However, the distribution and response rates varied significantly depending on the time of day and location. The questionnaires provided details for a further 400,000 return stages, greatly enhancing survey coverage.

Typically the station surveys achieved a distribution rate between 70 per cent and 100 per cent and a response rate from the distributed questionnaires of between 20 per cent and 30 per cent. The on-train surveys achieved a higher response rate, typically between 50 per cent and 60 per cent, probably because the questionnaires were often collected by the surveyor rather than relying on respondents to return them in pre-paid envelopes.

All the analysis included in this report is based on the full dataset of 2.7 million journeys and represents rail travel in Great Britain as a whole, on an average weekday outside of school holidays.

On the 'typical' day represented in this study, 2.7 million rail journeys were recorded with the majority of travel occurring in two peaks, in the morning and evening as shown below.

Figure 1
Passenger numbers: by time of departure from station
Great Britain
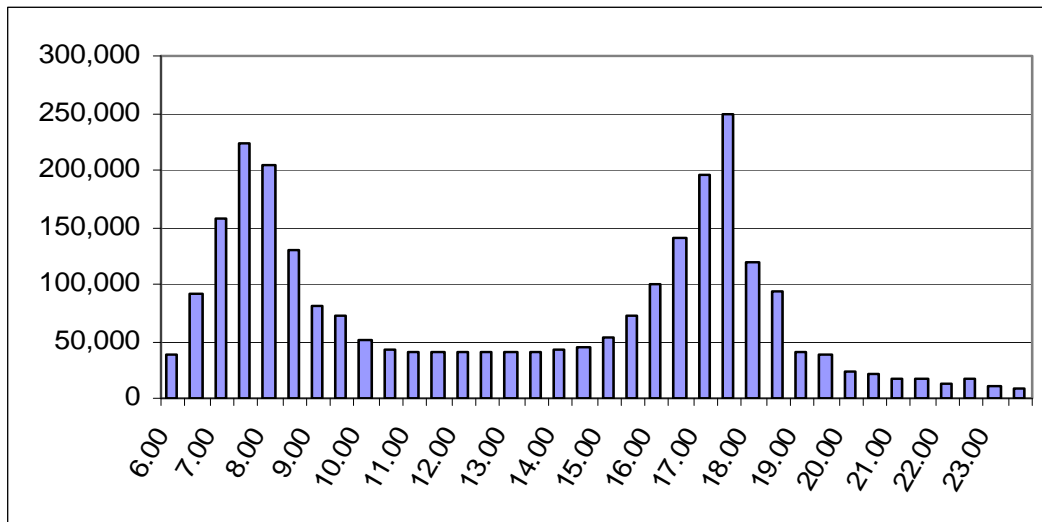
In summary:

- 36 per cent of journeys started between 6.30am and 10am
- 36 per cent of journeys started between 4pm and 8pm
- the remaining 28 per cent of travel began outside these peak periods

Travel during the morning peak was spread out more evenly than in the afternoon, where there was a very distinct peak in journeys beginning between 5.30pm and 6pm.

Reasons for travel

Journeys were grouped into three main categories: commuting, business and leisure. In addition to work-related travel, commuting also includes journeys connected with education, mainly students travelling to school or college. Leisure trips include a fairly wide mix of reasons for travel such as social visits, shopping and entertainment.

Of the 2.7 million trips included in the typical day (Table 1), commuting to and from work or education accounted for the biggest share (63 per cent) of all these journeys. Business trips represented 13 per cent and leisure travel 24 per cent of all journeys.

Table 1
Journey purpose
Great Britain

	Number of trips (000s)	Percentage
Commuting	1,693	63
Business	336	13
Leisure	653	24
Total	**2,682**	**100**

Figure 2 shows travel patterns across the typical day. As might be expected, the majority of travel to work takes place in the morning with journeys home in the afternoon/evening. Business and leisure trips are spread throughout the day and are most prevalent at the times between the commuter peaks.

Figure 2
Passenger numbers: by purpose of journey by start time of rail journey
Great Britain
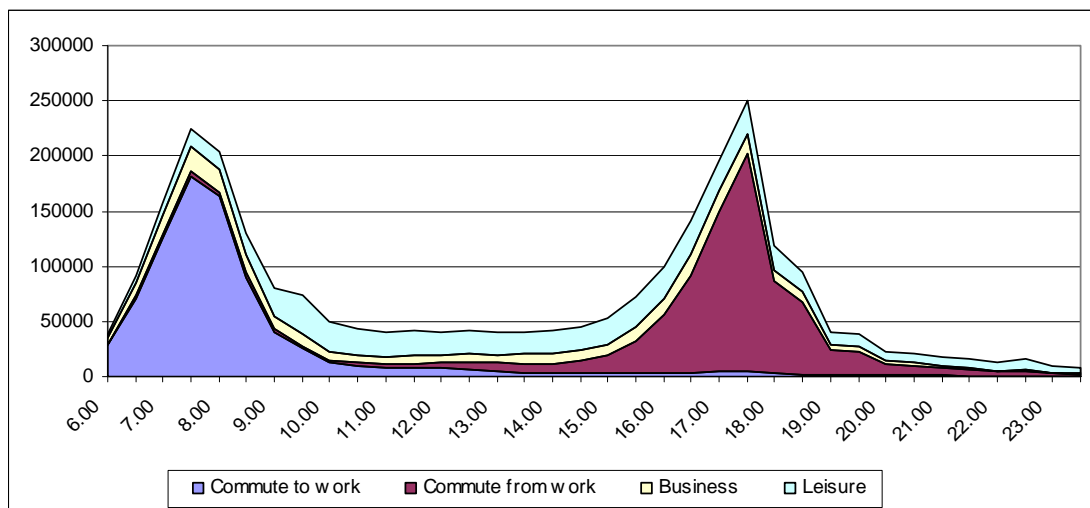
Travel is concentrated in London and the South East (Table 2). London alone accounted for just under half (48 per cent) of all departures with the South East at 14 per cent. 8 per cent of journeys were made from the East of England and 7 per cent from each of Scotland and the North West.

Table 2
Total number of journeys: by country and region of origin
Great Britain

	Number and percentage	
	000s	%
Scotland	181	7
Wales	48	2
North East	26	1
North West	198	7
Yorkshire and Humberside	127	5
East Midlands	52	2
West Midlands	121	5
East of England	209	8
London	1,275	48
South East	373	14
South West	73	3
Total	**2,682**	**100**

Percentages do not sum to 100 per cent due to rounding

Travel within and between regions is shown in Table 3.

In Scotland almost all journeys are made within the country (95 per cent). There are a number of other regions where the vast majority of travel sits within the region: North West (81 per cent), Yorkshire & Humberside (75 per cent), West Midland (75 per cent) and Wales (74 per cent).

The South East (38 per cent) and the East of England (21 per cent) have low proportions of travel within the region and high proportions of travel into London (72 per cent from the East of England and 55 per cent from the South East).

Table 3
Journey origin and destination: by country and region
Great Britain

Percentages

	Destination											
	Scotland	Wales	North East	North West	Yorkshire and Humberside	East Midlands	West Midlands	East of England	London	South East	South West	Total
Origin												
Scotland	95	-	1	1	1	-	-	-	1	-	-	**100**
Wales	-	74	-	4	1	1	3	1	6	3	7	**100**
North East	7	1	56	5	12	2	2	2	10	3	1	**100**
North West	1	1	1	81	4	2	2	1	5	1	1	**100**
Yorkshire & Humberside	1	-	3	7	75	3	1	1	6	1	1	**100**
East Midlands	1	1	1	7	8	42	9	4	21	4	2	**100**
West Midlands	-	1	-	4	1	4	75	1	8	3	2	**100**
East of England	-	-	-	1	1	1	-	21	72	3	1	**100**
London	-	-	-	1	1	1	1	12	68	16	1	**100**
South East	-	-	-	1	-	-	1	1	55	38	2	**100**
South West	-	4	-	2	1	1	3	2	18	11	57	**100**

Percentages do not sum to 100 per cent due to rounding

Each of the countries and regions has its own distinct journey profile (Table 4).

The relative volumes of commuter travel from the East of England and the South East of England into London (as shown in Table 3) is notable.

Table 4 shows London (69 per cent), the East of England (67 per cent) and the South East (63 per cent) have the highest proportions of commuter travel. The North East (40 per cent) has the lowest.

Business journeys account for a higher proportion of all journeys from the North East (21 per cent) and, the South West (19 per cent) compared to any other region, whilst leisure journeys account for the greatest proportion of rail travel in the North East (39 per cent) and Wales (38 per cent).

Table 4
Journey purpose: by country & region
Great Britain

			Percentages
	Commuting	Business	Leisure	**Total**
Scotland	59	11	30	**100**
Wales	50	12	38	**100**
North East	40	21	39	**100**
North West	53	12	35	**100**
Yorkshire and Humberside	54	14	32	**100**
East Midlands	49	17	33	**100**
West Midlands	55	14	31	**100**
East of England	67	12	21	**100**
London	69	12	19	**100**
South East	63	13	24	**100**
South West	46	19	34	**100**
Great Britain	63	13	24	**100**

Percentages do not sum to 100 per cent due to rounding

The vast majority of commuter journeys are made either every day or between 2 to 4 days each week (Table 5). Most business and leisure trips are infrequent though a small number of these journeys are made on a more regular basis.

Nearly a quarter of all business (23 per cent) and leisure (24 per cent) trips were made for the first time.

Table 5
Journey Purpose: by how often the journey is made
Great Britain

				Percentages
	Commuting	Business	Leisure	Total
5 or more days a week	77	12	8	52
2-4 days a week	17	14	11	15
Once a week	3	10	11	6
1-3 times a month	2	18	18	8
Less than once a month	1	23	28	10
First time have made this journey	1	23	24	9
Total	**100**	**100**	**100**	**100**

Percentages do not sum to 100 per cent due to rounding

To help plan railway services and provide appropriate infrastructure at stations, it is important to understand how rail journeys link with other modes of transport. The survey questionnaire asked for information about the rest of the passenger's journey before reaching their original station and after leaving their destination station.

Table 6 shows that the majority of rail travellers walk to the station as their main method of reaching the station at the start of their journey.

Business travellers are more likely to use a car to reach the station than commuters or leisure travellers. Leisure travellers were more likely to take a bus or coach.

Table 6[1]
Journey Purpose: by main mode used to travel to station of origin
Great Britain

				Percentages
	Commuting	Business	Leisure	Total
Walk	58	41	50	54
Cycle	2	1	1	2
Bus/Coach	10	7	12	10
Car[2]	16	31	23	20
Underground/Light Rail/Metro	14	19	12	14
Other	0	0	1	0
Total	**100**	**100**	**100**	**100**

Percentages do not sum to 100 per cent due to rounding
1. In the previous report published in May 2008, walk and cycle were grouped together.
2. Car includes taxi/minicab and motorcycle.

Though a range of ticket types is being used (Table 7), business travellers are much more likely to use open returns (29 per cent) than any other type of traveller.

Commuters are much more likely to use season tickets and longer term Travelcards.

Cheap day returns (28 per cent) and one day Travelcards (14 per cent) are popular with leisure travellers.

Please note that analysis with ticket type should be treated with caution. We cannot quantify the level of error, but it seems that many respondents have wrongly recorded

the type of ticket they were travelling on. This is due to these data being collected via a self completion questionnaire. More details are available on request.

Table 7
Journey purpose: by ticket type[1]
Great Britain

	Commuting	Business	Leisure	Percentages Total
Open single	4	7	9	5
Open return	9	29	12	13
Saver/Supersaver	1	8	9	4
Apex[2]	0	0	1	0
Cheap Day Return	8	18	28	14
One Day Travelcard	3	14	14	7
Weekly season	7	2	1	5
Monthly season	12	2	1	8
Annual season	14	2	1	10
Other period season	1	0	0	1
Weekly Travelcard	9	5	3	7
Monthly Travelcard	13	4	3	9
Annual Travelcard	1	0	0	1
Other period travelcard	0	1	4	1
Other	17	9	14	15
Total	**100**	**100**	**100**	**100**

Percentages do not sum to 100 per cent due to rounding
1. Where survey respondents chose a combination of ticket type (e.g. open single/return) and season ticket type for their journey, the ticket choice has been taken as the ticket type. Further details are included in Annex C.
2. The number of trips recorded using Apex (Advance tickets) is low, and is due to these data being collected via a self completion questionnaire.

Passenger Profiles

Overall, 54 per cent of travellers were male and 46 per cent were female. Figure 3 shows the age and sex profile of travellers in the study's typical day.

Figure 3
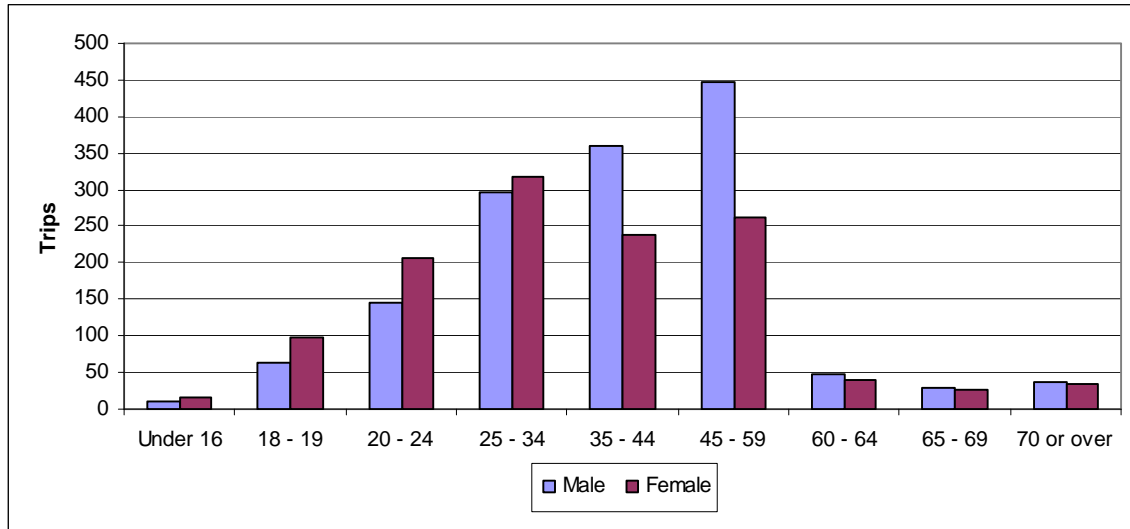**Passengers by age and sex**
Thousands

Table 8 provides more detail on the nature of the trips being made by males and females. It shows more males than females commuting and making business trips, but more females travelling for leisure reasons.

Table 8
Journey purpose: by sex
Great Britain

				Percentages
	Commuting	Business	Leisure	Total
Male	55	65	46	54
Female	45	35	54	46
Total	**100**	**100**	**100**	**100**

As would be expected, commuting occurs across all working ages (Table 9). Business travel is more common for those aged over 35 years than the younger age groups.

Table 9
Journey purpose by age
Great Britain

	Commuting	Business	Leisure	Percentages Total
Under 16	1	0.18	1	1
18 - 19	7	1	7	6
20 - 24	14	8	13	13
25 - 34	26	20	16	23
35 - 44	24	27	15	22
45 - 59	25	37	24	26
60 - 64	2	3	7	3
65 - 69	0.39	2	7	2
70 or over	0.24	1	10	3
Total	**100**	**100**	**100**	**100**

Percentages do not sum to 100 per cent due to rounding

Commuters tend to have higher household incomes (Table 10) than leisure travellers. Overall, Business travellers appeared to have the highest household incomes of all traveller types.

Table 10
Journey purpose: by household income
NRTS questionnaire areas[1]

	Commuting	Business	Leisure	Percentage Total
Below £7,000	4	3	14	7
£7,000 - £12,500	5	3	14	8
£12,501 - £17,500	8	5	13	9
£17,501 - £35,000	32	23	29	30
£35,501 - £50,000	26	24	15	22
£50,001 - £75,000	16	23	9	15
More than £75,000	8	19	6	9
Total	**100**	**100**	**100**	**100**

Percentages do not sum to 100 per cent due to rounding
1. Household income question was not asked on the LATS questionnaire

Overall, one in five passengers came from households with no access to a car or van (Table 11). Leisure travellers are less likely to have a car than any other group of passengers, and 29 per cent of these have no access to a car.

Table 11
Journey purpose: by number of cars or vans household regularly has available for use
Great Britain

	Commuting	Business	Leisure	Percentages Total
None	18	15	29	20
One	46	38	40	44
Two	28	38	24	28
Three	6	7	5	6
More than three	2	2	2	2
Total	**100**	**100**	**100**	**100**

The NRTS shows 7 per cent of rail trips outside of the LATS survey area (where the question concerning disability was not asked) were made by travellers with a disability. This is considerably lower than the 14 per cent recorded in the National Travel Survey (NTS) with a mobility difficulty. The surveys cover different populations and use very different methodologies; however, further investigation is needed.

Of interest, 14 per cent of leisure travellers say they have a disability, which compares to 6 per cent for business travellers and 5 per cent for commuters. The higher proportion of leisure travellers who say they have a disability is probably linked to the older age profile of these travellers.

For the NRTS area (again excluding LATS questionnaires where the ethnic origin question was not asked) the ethnic profile of travellers was predominantly White (95 per cent).

Confidence levels

The NRTS provides an estimate of the *number* of rail trips on a notional 'typical' day. This figure is determined by actually counting the number of passengers using railway stations at selected points in time. These totals are unaffected by bias or sample error for the time periods covered. Random error and daily variation effects at the level of individual stations are reduced when the return journey data collected at other stations is incorporated. The daily passenger count becomes the average of the count during the survey at any station and the sum of the expansion factors of the return interviews collected at all other stations.

The *characteristics* of these trips are derived from the results of the survey carried out at the time of the counts. Because estimates from sample surveys depend upon the sample chosen, they generally differ from the true values of the population. This is not usually a problem when considering large samples but may give misleading information when considering data from small samples.

Data users should be aware that estimates for smaller sub-groups within the NRTS database (such as travellers from individual stations for example or specific ethnic groups) should be treated with more caution.

When looking at some of the lowest level results from the full dataset, estimates of *numbers* of journeys should be treated with caution. When considering the *characteristics* of journeys or travellers for the smallest samples then our strong recommendation would be that data from such stations should be combined with other similar local stations to aggregate the sample size before attempting any analysis. Typically, a "small station" is one with 150 or fewer records.

4. Comparison with other sources.

The National Rail Travel Survey (NRTS) is the first survey to attempt to build a detailed, comprehensive and consistent picture of weekday rail travel across Great Britain. Whilst other similar surveys have been carried out locally, they have been undertaken on a much smaller scale and different local surveys may not be consistent. The NRTS presents a consistent source of data for the whole of the country.

However, there are other sources of information on who uses the railways across Great Britain, and here we provide an outline of these existing sources and some basic comparisons with the NRTS.

Rail Industry Ticket Database
The most comprehensive source of rail usage information is the rail industry ticket database, called LENNON. This holds information on all national rail tickets purchased in Great Britain, and its primary purpose is to allocate the revenue from ticket sales between train operators. It is a vast resource and is used as the main source of rail usage information that is the number of rail passenger journeys made and kilometres travelled. Data is available for any time period from 2001, and includes all details about rail tickets, for instance the origin and destination stations for which ticket are purchased, ticket types and costs. This is also the source of the station usage database that contains details of the number of entries and exits at each station[1].

Whilst it is effectively used as a proxy for passenger counts, in actual fact the ticket database is not counting passengers but tickets. This has limitations, as described in Section 1. These issues affect the quality and usefulness of the LENNON dataset, and survey data is often used to fill in details missing from the ticket data. Until now, this has only been possible in a consistent way around London using the LATS data, but with the NRTS data becoming available we can begin to investigate how the LENNON and NRTS data can complement each other to improve estimates for rail travel across the rest of Great Britain.

Comparing the LENNON data with initial national results from the NRTS shows there are reassuring similarities between the number of journeys measured in each. Firstly, the number of passenger journeys recorded over 2004/05 on the LENNON database was just over 1 billion. Daily data from the LENNON database typically records just over 80 per cent of this travel occurring on weekdays, so (accepting the limitations of the LENNON data) we would expect somewhere in the region of 3 million rail trips on an average weekday. This is comparable to the number counted during the NRTS.

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[1] Station usage data are published annually by the Office of Rail Regulation (see http://www.rail-reg.gov.uk/server/show/nav.1529)

The proportion of tickets sold by ticket type also shows similar results. The National Rail Trends Yearbook 2005/06 publication that uses LENNON ticket data shows 56 per cent of passenger journeys were on ordinary tickets and 44 per cent on season tickets in 2004/05. In 2003/04, 57 per cent of passenger journeys were on ordinary tickets and 43 per cent were on season tickets. The NRTS shows similar results, 59 per cent of passengers surveyed used ordinary tickets and 41 per cent used season tickets.

More information and data from the LENNON ticket database can be obtained from the Office of Rail Regulation (ORR), whose contact details appear at the end of this report.

National Travel Survey: 2005
The National Travel Survey (NTS) is a household survey designed to provide a databank of personal travel information for Great Britain. It is a continuous survey that began in July 1988, following ad hoc surveys since the mid-1960s. The survey collects information by giving household members a travel diary to complete for a week. However, the annual sample size is approximately 8,000 households and only about 7 per cent of respondents record a rail trip in their travel diary, so there is not a big enough sample of rail trips to enable much rail-specific analysis. The NTS is designed to pick up long-term trends in travel behaviour across all modes.

Comparisons between the NTS for 2005 and the NRTS are limited by the sample size of the NTS and it is also worth noting that the NTS covers only residents of Great Britain, whereas the NRTS covered all rail travellers, regardless of where they were from. However, it is possible to make comparisons across broad groups of variables. The direction of results is consistent across the two surveys. The NTS shows 63 per cent of rail travel attributed to commuting; the NRTS also places this figure at 63 per cent. The NTS places leisure travel at 23 per cent of journeys while the NRTS places it at 24 per cent. The NRTS says 54 per cent of travellers are male, whereas the NTS has the corresponding proportion as 57 per cent. Further details on the National Travel Survey are available at:

http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/

National Passenger Survey (Autumn 2006)

The National Passenger Survey (NPS) is run by Passenger Focus and collects information on passenger satisfaction with rail services. It is a large-scale survey collecting data from across Great Britain twice a year (spring and autumn) directly from passengers through self-completion questionnaires, as with the NRTS. The NPS is based on a sample of passenger journeys and respondents are asked how satisfied they were overall and with aspects of the specific journey they were making when sampled. Some details of the traveller, such as age and gender, and also ticket type and journey purpose are collected, but not how the respondent accessed the train stations or from where. In addition, the sample sizes are set in order to obtain sufficient numbers for analysis of results from each train company, rather than to obtain an accurate representation of travel across Great Britain, and no passenger counts are carried out. However, it is still possible to make some comparisons with the NRTS.

The two surveys show similar results where they overlap. The NPS shows a purpose split of 60 per cent commute (NRTS total 63 per cent), 14 per cent business (NRTS total 13 per cent) and 26 per cent leisure on weekdays (NRTS total 24 per cent).

Further details on the National Passenger Survey can be found from Passenger Focus: www.passengerfocus.org.uk

5. Data limitations

As with all statistics, it is important to give due consideration to the limitations of the data and the range of caveats that need to be taken into account. There are a number of factors that need to be borne in mind when using the NRTS.

Primarily it is important to bear in mind that the results from the survey are estimates based on a sample of weekday rail travellers. The survey has not covered every trip, but has made estimates based on the responses obtained. As such, there will be some sample error in the results.

The data represent weekday travel outside school holiday periods. No account is taken of weekend travel or holiday travel, nor of changing seasonal demand.

The results are grossed up or 'expanded' to counts carried out at stations on a typical weekday. Where the counts have been affected by disruption, such as the weather or other incidents, or have been abnormal, for example during football matches, the counts have been discarded and retaken. However, largely these are still counts on a single weekday, and the actual number of travellers will be subject to daily variability. This is addressed to some degree by the data processing, which takes into account returns and trips to each station from every other station.

Finally, as outlined in Sections 1 and 3, the newer national data were collected between 2004 and 2005, whilst the LATS data for London and the South East relates to 2001. Data users should be aware that some of these data may now be quite out-of-date. During 2010 a number of options will be explored aimed at updating the London and South East totals.

6. Access to the Data

The Department for Transport and Transport Scotland can provide data and analysis in response to requests. Contact details are included at the end of this report.

Access to the full dataset is limited to the Department for Transport, Transport Scotland and local and national government agencies for rail planning purposes, in order to protect the confidentiality of the data. However, extracts from a non-disclosive subset of the data can be made available for other users to undertake their own analysis subject to completion of data confidentiality and data request forms, which are available on request.

<u>List of available outputs</u>

The list below represents the set of information included in each travel record:

Origin and Destination Information
- Origin and destination stations
- Origin and destination addresses (NGR and postcode added to each)
- Origin and destination travel purposes
- Access and egress travel modes
- Access and egress travel durations
- Access and egress crow-fly distances (derived from address and station NGRs)

Journey Information
- Start time of train journey (from survey)
- Duration and finish time of train journey (imputed from network times)
- Interchange stations
- Distance travelled by rail (imputed from network distances)
- Travel group size by ages <5, 5-15, >15
- Frequency making identical trip
- Where bought ticket
- Ticket type and travel class
- Railcard use
- Single/return journey characteristics

Demographic Information
- Gender
- Age group
- Household car ownership
- Household size
- Household income group
- Ethnicity
- Disability
- Home address

7. Contact Information

For further information on the survey, to request data or to provide feedback, please contact either the Department for Transport or Transport Scotland. For information on other areas of rail statistics, please note that the Office of Rail Regulation is responsible for rail statistics more generally and produces the rail industry's key statistics publication National Rail Trends. Contact details for all three organisations are included below.

Department for Transport:

The DfT website covers details of the National Rail Travel Survey, including how to access the data. Future publications and technical notes will be posted on the website. Follow the Transport Statistics link from the homepage www.dft.gov.uk

Alternatively, the rail statistics team can be contacted at:

rail.stats@dft.gsi.gov.uk

020 7944 8874

Rail Statistics Team
Zone 4/33, Great Minster House
76 Marsham Street
London, SW1P 4DR

Transport Scotland:

Transport Economics, Analysis and Research
Buchanan House
58 Port Dundas Road
Glasgow, G4 0HF

info@transportscotland.gsi.gov.uk
www.transportscotland.gov.uk

Office of Rail Regulation:

www.rail-reg.gov.uk
rstats@orr.gsi.gov.uk

Annex A : NRTS Questionnaire

National Rail Travel Survey

Department for Transport

SCOTTISH EXECUTIVE

This national survey of passenger rail travel is being carried out by the Department for Transport, in collaboration with the Scottish Executive. We would be grateful if you would tell us about the journey you were making when you received this questionnaire. It will only take a short while to complete. Please return it in the post-paid envelope provided.

The information will only be used by the Department for Transport and its agents, the Scottish Executive, and national and local government agencies for planning the railway and related transport services. The information will not be used for any other purpose.

Many thanks for your help, which will assist in planning for the future and meeting passenger needs effectively.

1. Where have you just come from? *Please tick ONE box only.*

Home	○1	Other leisure activity	○8
Shopping	○2	School/college/university (as student)	○9
Normal workplace	○3	School/college (accompanying pupil)	○10
Other workplace/meeting	○4	Taking someone to the airport, station, hotel	○11
Personal business (e.g. doctor, hospital, bank)	○5	Meeting someone at airport, station, hotel	○12
Visiting friends/relatives at their home	○6	Other (please tick and write in below)	○13
Sport or entertainment (e.g. concert, theatre)	○7		

2. What was the address of this place? *Please give as much detail as possible.*

Property name (e.g. building, company)

Street name and number

Locality   Town/city

Postcode

3. How did you travel from this place to the *FIRST* National Rail station that you used?
Please tick ALL methods used.

Walked	○1	Motorcycle	○5
Bus/coach	○2	Bicycle	○6
Car (parked at or near the station)	○3	Air/sea	○7
Car (dropped off by someone)	○4	Taxi/minicab	○8

Rail or tram other than National Rail

London Underground	○9	Glasgow Underground	○14
Croydon Tramlink	○10	Manchester Metrolink	○15
West Midlands Metro	○11	Tyne and Wear Metro	○16
Sheffield Supertram	○12	Nottingham Tramlink	○18
Docklands Light Railway	○13	Other (please tick and write in below)	○17

4. How long did it take you to travel to the *FIRST* National Rail station used? Hours [ ] Minutes [ ]

5. What was the departure time of the train you caught from the *FIRST* National
Rail station? *(If you are unsure of the exact time, an approximate time is fine)* [ ] Use 24 hour clock e.g. 3pm = 15:00.

6. Please write down every National Rail (BR) station which you are using on this journey, in the order in which you use them. Include all stations where you get on or off a train.

*Please tick the station
at which you were handed this
questionnaire.*

First station: [ ] ○

Interchange station 1: [ ] ○

Interchange station 2: [ ] ○

Interchange station 3: [ ] ○

Final station: [ ]

7. How will you get from your *FINAL* National Rail station to your destination?
Please tick ALL methods used.

Walk .... ○1   Motorcycle .... ○5
Bus/coach .... ○2   Bicycle .... ○6
Car (parked at or near the station) ... ○3   Air/sea .... ○7
Car (picked up by someone) .... ○4   Taxi/minicab .... ○8

Rail or tram other than National Rail

London Underground .... ○9   Glasgow Underground .... ○14
Croydon Tramlink .... ○10   Manchester Metrolink .... ○15
West Midlands Metro .... ○11   Tyne and Wear Metro .... ○16
Sheffield Supertram .... ○12   Nottingham Tramlink .... ○18
Docklands Light Railway .... ○13   Other (please tick and write in below) ... ○17

[ ]

8. How long will it take you to travel from your *FINAL* National Rail station to your destination?

Hours [ ]   Minutes [ ]

9. What is the address of your destination? *Please give as much detail as possible.*

Property name (e.g. building, company) [ ]

Street name and number [ ]

Locality [ ]   Town/city [ ]

Postcode [ ][ ][ ][ ][ ][ ][ ][ ]

10. Why are you travelling to this place? *Please tick ONE box only.*

Going home .... ○1   Other leisure activity .... ○8
Shopping .... ○2   Going to school/college/university (as a student) ... ○9
Normal workplace .... ○3   Going to school/college (accompanying pupil) ... ○10
Other workplace/meeting .... ○4   Taking someone to airport, station, hotel ... ○11
Personal business (e.g. doctor, hospital, bank) ... ○5   Meeting someone at airport, station, hotel ... ○12
Visiting friends/relatives at their home ... ○6   Other (please tick and write in below) ... ○13
Sport or entertainment (e.g. concert, theatre) ... ○7   [ ]

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11. Are you travelling alone?

Yes ○1 *Please answer Question 13 onwards.*   No ○2 *Please answer Question 12 onwards.*

12. How many other people are travelling with you? *Please write in number.*

Adults [ ]   Children aged 5-15 [ ]   Children under 5 [ ]

13. How often do you make this journey (identical to the one you are describing)? *Please tick ONE box only.*

5 or more days a week	○1	1-3 times a month ○4
2-4 days a week	○2	Less than once a month ○5
Once a week	○3	First time have made this journey ○6

14. Where did you buy your ticket/season ticket? *Please tick ONE box only.*

At a station on the day of travel	○1	Bought for me ○5
At a station before the day of travel	○2	On the train ○6
Over the telephone	○3	At a Travel Agent (or similar) ○8
Via the Internet	○4	Other (please tick and write in below) ○7

[ ]

15. Which class were you travelling in? *Please tick ONE box only.*

First class ○1   Standard class ○2

16. What type of ticket, season ticket or pass were you using for this journey? *Please tick ALL that apply.*

Tickets

Open single ○1	Saver/Supersaver ○3	Cheap Day return ○5
Open return ○2	Apex ○4	One Day Travelcard ○6

Season Tickets   *Passes/Permits*

Weekly Season ○1	Weekly Travelcard ○5	Elderly persons permit/pass ○10
Monthly Season ○2	Monthly Travelcard ○6	Blind/disabled permit/pass ○11
Annual Season ○3	Annual Travelcard ○8	Staff Travel Pass ○12
Other Period Season ○4	Other Period Travelcard ○9	

Other (please tick and write in opposite) ○7 [ ]

17. Did you use a Railcard to buy your ticket?

Yes ○1 *Please answer Question 18 onwards.*   No ○2 *Please answer Question 19 onwards.*

18. What type of Railcard did you use? *Please tick ONE box only.*

Network Railcard	○1	Family Railcard ○4
Young Persons Railcard	○2	Other (please tick and write in below) ○5
Senior Railcard	○3	[ ]

19. What type of journey were you making when you were handed this questionnaire?

Single	○1	*Please answer Question 22 onwards.*
Outward stage of a return journey	○2	*Please answer Question 20 (a&b), then Question 22 onwards.*
Return stage of a return journey	○3	*Please answer Question 21 (a&b) onwards.*

20a. Will your return stage be...?

Later today ○1   Another weekday ○2   On a Saturday/Sunday ○3

20b. What is the departure time of the first train on your return stage? [ ]

(If you are unsure of the exact time, an approximate time is fine)   Use 24 hour clock e.g. 3pm = 15:00

21a. Was your outward stage...?

Earlier today ○1   Another weekday ○2   On a Saturday/Sunday ○3

21b. What was the departure time of the first train on your outward stage? [ ]

(If you are unsure of the exact time, an approximate time is fine)   Use 24 hour clock e.g. 3pm = 15:00

22. Are you?   Male $\bigcirc_1$ Female $\bigcirc_2$

23. What age were you on your last birthday?

Under 16 ... $\bigcirc_1$	25 - 34 ... $\bigcirc_4$	60 - 64 ... $\bigcirc_7$
16 - 19 ... $\bigcirc_2$	35 - 44 ... $\bigcirc_5$	65 - 69 ... $\bigcirc_8$
20 - 24 ... $\bigcirc_3$	45 - 59 ... $\bigcirc_6$	70 or over ... $\bigcirc_9$

24. How many cars or private vans (including company cars) does your household have regularly available for use?

None ... $\bigcirc_0$ One ... $\bigcirc_1$ Two ... $\bigcirc_2$ Three ... $\bigcirc_3$ More than three ... $\bigcirc_4$

25. How many people normally live in your household including yourself?

Total number of people [   ]   How many of these are aged under 16? [   ]

26. In which of the following groups would you place your total household income from all sources before tax and other deductions?

Below £7,000 ... $\bigcirc_1$	£17,501 - £35,000 ... $\bigcirc_4$	£50,001 - £75,000 ... $\bigcirc_6$
£7,000 - £12,500 ... $\bigcirc_2$	£35,001 - £50,000 ... $\bigcirc_5$	More than £75,000 ... $\bigcirc_7$
£12,501 - £17,500 ... $\bigcirc_3$		

27. To which of these ethnic groups do you consider you belong? Where "Any other background or group", please write in the box provided.

White	Mixed	Asian or Asian British
British ... $\bigcirc_1$	White & Black Caribbean ... $\bigcirc_4$	Indian ... $\bigcirc_8$
Irish ... $\bigcirc_2$	White & Black African ... $\bigcirc_5$	Bangladeshi ... $\bigcirc_9$
	White & Asian ... $\bigcirc_6$	Pakistani ... $\bigcirc_{10}$
Any other White background ... $\bigcirc_3$	Any other Mixed background ... $\bigcirc_7$	Any other Asian background ... $\bigcirc_{11}$
[ ]	[ ]	[ ]

Black or Black British	Chinese or other ethnic group
Caribbean ... $\bigcirc_{12}$	Chinese ... $\bigcirc_{15}$
African ... $\bigcirc_{13}$	
Any other Black background ... $\bigcirc_{14}$	Any other ethnic group ... $\bigcirc_{16}$
[ ]	[ ]

28. Do you have a disability or long term illness?   Yes $\bigcirc_1$ No $\bigcirc_2$

IF YES, is it related to any of the following? Please tick ALL that apply.

Wheelchair user ... $\bigcirc_1$	Hearing ... $\bigcirc_3$	Speech impairment ... $\bigcirc_5$
Mobility ... $\bigcirc_2$	Eyesight ... $\bigcirc_4$	Learning difficulties ... $\bigcirc_6$

29. If the journey you have described did not start or finish at your home, can you please tell us where you normally live?

Town/city [   ]   Postcode [| | | | | | |]

Country (if you normally live outside the UK) [   ]

Thank you for taking the time to complete this questionnaire
Please return it in the post-paid envelope provided
This survey is being undertaken for the Department for Transport by Count on Us, an independent
transport data collection agency. If you have any questions about the survey, please contact DfT on 020 7944 4977

Department for
Transport

Annex B: Data Processing

The data processing procedures are summarised here and are described in detail in a series of technical notes, which are too detailed for inclusion in this Report. Further details can be supplied on request.

<u>Checking and imputation</u>

Returned questionnaires were subject to extensive checking and correction in order to create complete and correctly formatted records for the next phase of processing. Around 50 per cent of the questionnaires returned by passengers needed some correction, so the correction process was vital. It was possible to correct the vast majority of records with near-certainty. This was often made possible because the time and place of questionnaire distribution was known, allowing the most significant errors, e.g. of directionality, to be identified and corrected. A few records not meeting the standard were rejected. Following the correction process, residual missing data items such as purpose codes or travel modes were imputed by drawing on 'nearest' records showing similar characteristics across other relevant variables.

Gaps in survey coverage were also addressed during data processing:
- In the <u>on-train</u> surveying, it was sometimes not possible to cover every train on a route. For the small proportion of train journeys that were omitted, trips and passenger numbers were imputed from the previous and/or next trains in the timetable.
- In the case of the missing <u>at-station</u> periods, when a station was not surveyed for the whole day, survey records for missing periods were sourced from return trips surveyed at all the other stations. Passenger numbers were obtained by summing the expansion factors of these trips. These figures were then checked against passenger counts obtained by extrapolating from the surveyed period using typical passenger flow profiles.

Such gaps in the coverage were regulated during the survey planning. The station surveys were planned with reference to expected passenger flows and local knowledge of the stations, and a part-day survey was only carried out where virtually all travel would be recorded during the survey period.

If there were gaps in coverage on an on-train route this was usually because it was a line with a high frequency of trains throughout the day, which makes it difficult to cover every single train, but simultaneously because a large number of trains are covered the imputation process is very effective.

The survey collected origin and destination addresses and these were geocoded using software initially developed as part of the LATS project. It was further developed to allow data input, edit, correction and geocoding to be undertaken in

a single pass so that edits could be considered with the questionnaire to hand. The Geographic Information System (GIS) system included Postcode Address File interrogation software adapted to NRTS needs, gazetteer data, detailed mapping and facilities such as journey displays to make editing more successful. Geocoding was to a 'point code' whenever the data allowed it: these are full postcodes or National Grid References (NGR) to 100 metre precision. When the address quality did not allow this, 'area codes' were used, that is postal geography above the full postcode level including named streets. During imputation, point codes were imputed for all the area codes, based on travellers with similar characteristics (trip purpose) and from the same area. If a suitable donor could not be found a random point within the area represented by the area code was used.

After editing, returned questionnaires were grossed up or 'expanded' to represent all travellers. Counts were carried out by 15-minute period at all 2,500 stations and even more distribution points. Expansion of the questionnaire responses occurred at this detailed level, which goes a very long way to avoiding error because of the strong relationships between purpose distributions, destination probabilities, ticket types, time of day and departure station. Where there are only a small number of records in an individual expansion period (usually fewer than five) and response rate was low, neighbouring periods were combined to ensure the expanded results are robust and undue influence is not attributed to a small number of records.

Questionnaire checking and imputation yielded clean, edited and expanded survey data. Further processing was then undertaken with the aim of producing estimates of travel that are complete for all stations and time periods and that are internally consistent. The following sections outline these remaining processing procedures.

Balancing

Return trips form the vast majority of national rail travel and for most stations the number of people departing the station is matched by the number arriving. For respondents who were making return rail trips, the survey questionnaire asked for details of both the outward and return legs of the trip. This supports two valuable data features: -

- data for each station is derived from its own survey of departures and also from the returns surveyed at all other stations in the network, thus increasing the number of records that can be drawn on for analysis at each station and covering the inherent daily variability in the data more effectively

- surveying trips as returns goes most of the way towards creating the symmetrical matrix of travel between stations that would be expected to feature in rail travel.

Consider stations A and B, and the travel between them. All *return* trips between A and B are sampled twice, once with passengers departing from Station A and once with passengers departing from Station B. By definition, the travel estimates for these return trips should be the same for A and B, but daily variability and survey sample error mean that they will not be: the stations may not be surveyed on the same day, or even the same week; the same people may not take questionnaires or fill them in. The flows are therefore equalised in a process called 'balancing'.

The first stage of the balancing process is the generation of "reverse records" for all questionnaires where respondents indicated they were making a return rail trip. The reverse records simply take the trip recorded in the original survey response and reverse the details to generate the return trip: the origin and destination stations and addresses are reversed and other fields processed accordingly. The start time for the return trip was collected in the questionnaire.

However, generating these reverse records creates new trips, and if these new trips occur at a station and time period which has already been surveyed, the new trip has effectively been sampled twice. As such the records need to be factored to account for this.

A simple illustration of the process would involve factoring all records by 0.5. This succeeds in obtaining the same number of return trips as the original survey records showed between A and B, but they are now correctly balanced, as illustrated in the following table.

Travel Direction	Original survey return trip records	Generated return trip records	Total return trip records using 0.5 factor
A -> B	100 (departure survey at A)	140 (derived from station B survey)	(240*0.5) = 120
B -> A	140 (departure survey at B)	100 (derived from station A survey)	(240*0.5) = 120

This process also serves to patch missing data at stations where the survey took place for less than a day. For example, if Station B were surveyed only until 1600 hours, the period from 1600 hours to the end of the day would be covered by generated reverse records of travel from other stations to station B. The reversed trips for the missing period would be used without the 0.5 factor because there would be no duplication.

This procedure goes a long way towards balancing the flows between stations, securing symmetry and improving estimates relating to individual stations through

the enhanced cover of the data (each response potentially gives two trips). However, a final stage of balancing is carried out to give an even more robust interpretation of the data.

Although missing periods are covered well because the vast majority of trips are returns, single trips during the week and return trips with reverse directions at weekends require further adjustments. In addition, combining the original and reversed records with a 0.5 weight will not always yield the best estimates. For instance, in the example above, if station A was based on a smaller sample size it would make sense to attach more weight to the returns from station B. The final stage in the balancing process therefore adjusts the weights within each station-pair component to reflect different confidence levels in the data, using a statistical methodology based on relative sample sizes at the survey stations and the level of variability in the data collected at each station.

Treatment of Counts

The total number of trips shown in the expanded dataset reflects a best estimate of passenger counts. For individual stations, summing the expansion factors of records in the database provides the best count profile for that station. This will not be the same as the raw counts undertaken at the station: the expansion factors incorporate the data from the returns surveyed at all other stations. As such, the counts obtained by summing the expansion factors are in fact more representative of average weekday rail travel because they are more widely sampled and are therefore less likely to be affected by the characteristics of the single survey day.

Another reason for differences between the raw counts and the sums of the expansion factors is the time period that each set of counts refers to. The count and distribution was often undertaken at station entrances and will have covered travellers entering the station before the travel time, so the time period of the raw counts is only a proxy for travel time. However, the sum of expansion factors can be related to the actual time of rail travel commencing, as recorded in the questionnaire.

Treatment of non-standard data

The NRTS is made up of three separate surveys. All three surveys were carried out using the same methodology and almost the same questionnaire, but as the survey has been developed over time there are some minor areas where they differ. During processing, records from the earlier surveys were adjusted where necessary to ensure that they were in a consistent format, to enable the records to be entered on to a single database system. However, some differences in the data remain.

The LATS did not collect information on earnings, ethnicity or disability included in the more recent surveys. The LATS data also required the addition of the start time of the rail travel itself, which was derived from the survey period. Information on the time taken to get to/from the rail station was derived from the reported journey start time and the survey period and checked against reasonable times for the distance and access mode combinations. Egress journey times all had to be calculated from distance and mode. In addition, at the time of the LATS work, some London stations could not be adequately covered by the survey, due to the complexity of separating out mainline and underground rail travel. For such stations, data was obtained from London Underground's Rolling Origin Destination Survey (RODS). The RODS survey was similar, but not identical to LATS, and so required some data processing not documented in detail here.

Bias Correction

All surveys are at risk of bias in who responds. At the time of surveying, questionnaires for the NRTS were handed out to as many rail travellers as possible, but inevitably at busier times it was not possible to give everyone a questionnaire. This is accounted for by the counts that were carried out, which enable the responses to be factored up to the count in the particular 15 minute period at the station and distribution point where the questionnaires were handed out. This goes a long way to avoiding bias, because of the strong relationships between purpose distributions, destination probabilities, ticket types, time of day and departure station. However, if there is some consistent bias in who returns questionnaires then the estimates will not accurately represent all rail travellers.

To address this, during the LATS survey a bias correction study was carried out. This involved a survey at six stations with large numbers of interviewers collecting details of travellers' age, gender, travel group size, trip purpose, ticket type and destination. Because the questionnaire was short and was interviewer-administered rather than self-completion, a high contact rate was achieved and the results can be assumed to be free from bias. A comparison with the main survey results at the stations involved indicated that there was a small but significant element of bias, which was consistent across the six stations surveyed. Since the bias appeared to be independent of the departure station it was possible to generate bias correction factors to adjust the data from the whole survey. These factors corrected for small differences in response rate by purpose, age and gender. They were large enough to be a useful corrective but not so large as to cause concern.

The current NRTS dataset continues to use the LATS bias correction factors to adjust for bias in response in the at-station survey responses, but not the on-train responses. Whilst the wider NRTS at-station surveys used exactly the same methodology as the LATS surveys, the different nature of the on-train surveys meant that response characteristics could not be expected to be the same. Whilst

it would have been preferable to have updated these factors, it proved impractical during the survey period.

Annex C: Summary of revisions since initial report published in May 2008

The most material difference between the two reports is in the definition of the variables 'journey purpose' and 'ticket type'. The underlying data has not changed.

Journey purpose

After the release of the May 2008 report the classification of journey purpose was reviewed to ensure consistency with other data sources reporting journey purpose, in particular, the National Travel Survey (NTS). This led to revisions to the categorisation of the reasons for travel in NRTS to three main journey purposes; commuting, business, and leisure.

In NRTS the purpose of the trip is normally taken to be the activity at the destination, unless that destination is 'home' in which case the purpose is defined by the origin of the trip. This is consistent with the NTS. Using this definition, origin and destination trip purposes are combined into a reason for travel for the entire trip. These have been grouped into three main reasons to travel (journey purpose); commuting, business, and leisure.

In summary, this change in journey purpose definition since the previous report has led to a 4 per cent switch in journeys from business to leisure, as shown in the table below.

Table C1
Differences between the number of trips by journey purpose in this report and in the May 2008 report

	May 2008 Report		Updated Report		Difference	
	Number (000s)	Percentage	Number (000s)	Percentage	Number (000s)	Percentage
Commute	1,693	63	1,693	63	0	0
Business	432	16	336	13	-97	-4
Leisure	556	21	653	24	97	4
Total	**2,682**	**100**	**2,682**	**100**	**0**	**0**

Ticket Type

After the release of the May 2008 report the classification of ticket type was reviewed, and the two different ticket variables contained in the database were combined into one.

In the May 2008 report, where tickets in 'TicketTypeID'[1] and 'SeasonTicketType'[1] were both selected, these were incorrectly recorded as missing, and therefore

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[1] A full description of the tickets included in 'TicketTypeID' and 'SeasonTicketType' is available on request.

not included in Table 7, Journey purpose by ticket type. These accounted for around 50,000 trips. In this report, it has been decided to classify these tickets as the 'TicketTypeID' chosen because the user has used this ticket in conjunction with their regular season ticket.

In summary, this change in ticket type definition has led to small (1 per cent) changes in 'open return', 'cheap day return' and 'other' tickets as shown in table C2.

Table C2
Differences between the number of trips by ticket type in this report and in the May 2008 report

	May 2008 Report	Updated Report	Percentage Difference
Open single	5	5	0
Open return	12	13	-1
Saver/Supersaver	4	4	0
Apex[1]	-	-	0
Cheap Day Return	13	14	-1
One Day Travelcard	7	7	0
Weekly season	5	5	0
Monthly season	8	8	0
Annual season	10	10	0
Other period season	1	1	0
Weekly Travelcard	7	7	0
Monthly Travelcard	9	9	0
Annual Travelcard	1	1	0
Other period travelcard	1	1	0
Other	17	15	1
Total	**100**	**100**	**0**

1. The number of trips recorded using Apex (Advance tickets) is low, and is due to these data being collected via a self completion questionnaire.