# National Rail Passenger Survey:

# User Guidance Report

## Autumn 2015

*(Wave 33)*

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# 1. Background

Transport Focus (known as Passenger Focus until April 2015, and previously OPRAF and the Strategic Rail Authority) set up the National Rail Passenger Survey (NRPS) in 1999. The aim of the NRPS was to provide customer views on rail company performance on a consistent basis, so that comparisons could be made between the various companies over time. Data from the NRPS has been built into the franchising contracts with train companies, making the results an important commercial dimension of running a Train Operating Company (TOC). Given this, the sample design, fieldwork standards and accuracy of assigning journeys to specific TOCs are of the greatest importance. In addition, large enough sample sizes are required for each TOC to ensure that performance changes can be seen in the marketplace.

The first NRPS was run in Autumn 1999 and it has been run twice a year since then. The first seven waves were undertaken by The Oxford Research Agency, until the contract was offered at competitive tender in Autumn 2002. In December 2002, Continental Research (now merged to become BDRC Continental) was appointed to run the survey, and has done so since including through two further competitive tender processes.

This document provides guidance on how to use NRPS data and outlines the types of analysis that can be undertaken.  Information is also provided on the likely accuracy of results.

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# 2. Summary of advice

NRPS is designed to generate random samples of passengers for each Train Operating Company (TOC). Used at the TOC level, the normal rules for calculating sampling error for a weighted sample apply. Increasingly, the NRPS sample is selected for TOC building blocks; typically, these are operational subsets of TOC franchise areas which align with internal reporting areas. Used at building block level, the normal rules for calculating sampling error for a weighted sample also apply. All franchised TOCs now use building blocks as part of their sample design.

NRPS can be used to derive data at a station or route level, which may cover more than one TOC. The sampling error for this type of data is considerably higher, as different TOCs can have very different weights.

NRPS can also generate data at regional level and this is used extensively in the Stakeholder Report. For some regions, this involves amalgamating data from several TOCs with different weighting levels and as such this can increase sampling error.

NRPS is available as a single dataset covering the last ten waves – a full five year period. For example for the Autumn 2015 Wave (Wave 33) this covers Spring 2011 to Autumn 2015. Ad hoc analysis from this dataset is easy to produce and can typically be turned around in a few hours. It is also possible to go all the way back to Autumn 1999, when NRPS started, although analysis of this data takes slightly longer.

It is also possible to acquire NRPS data at respondent level, in SPSS format. The dataset is very large (all waves together now comprise around 870,000 records with 1000+ variables for each) and can fit onto a DVD. Users need a good understanding of analysing large datasets with weighting to be able to use this facility.

Finally, NRPS data is available on the NRPS Reportal, an online system which allows access to the basic NRPS data for the past six waves and to the verbatim comments written in by respondents for the latest wave. This system, which is available at http://www.npsreportal.org.uk/ comes with its own online guidance and help functions. Critically, the analysis system does not display any results based upon sample sizes of less than 50, to minimise inappropriate use of NRPS data.

NRPS results for the main station and train factors only for the last 10 waves for all TOCs and building blocks are also available through the NRPS online data tool at:
http://data.passengerfocus.org.uk/train/nps/question/service-overall/.

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# 3. Sample design

NRPS uses a two stage cluster sample design for each Train Operating Company building block. The first stage sampling unit is a train station, and questionnaires are distributed to passengers using that station and that train company on a particular day at a specified time. The main purpose of NRPS is to generate robust data for each TOC building block and hence for each TOC.

Different sample sizes are set for each TOC that reflect the complexity of routes and the number of passengers the company carries. The target sample sizes for the Autumn 2015 Wave range from 200 respondents for TfL Rail up to 2,750 for Great Western Railway. To arrive at a national dataset that represents all passengers' satisfaction with rail, each TOC is weighted to reflect the number of journeys that it contributes to the national rail network. Therefore TOCs that account for a relatively small number of passenger journeys are down weighted and those that account for a high number of journeys are weighted up.

| TOC | number of journeys (000's per annum) | sample size | Ratio |
|---|---|---|---|
| Abellio Greater Anglia | 76,841 | 1,588 | 48.4 |
| Arriva Trains Wales | 29,901 | 1,109 | 27.0 |
| c2c | 37,356 | 1,087 | 34.4 |
| Chiltern Railways | 22,839 | 1,074 | 21.3 |
| CrossCountry | 45,510 | 1,031 | 44.1 |
| East Midlands Trains | 24,090 | 1,063 | 22.7 |
| First Hull Trains | 773 | 576 | 1.3 |
| First TransPennine Express | 28,000 | 1,016 | 27.6 |
| Gatwick Express | 7,872 | 505 | 15.6 |
| Grand Central | 1,178 | 620 | 1.9 |
| Great Northern | 49,653 | 563 | 88.2 |
| Great Western Railway | 99,672 | 2,880 | 34.6 |
| Heathrow Connect | 2,452 | 566 | 4.3 |
| Heathrow Express | 5,841 | 548 | 10.7 |
| London Midland | 64,021 | 1,125 | 56.9 |
| London Overground | 158,422 | 1,322 | 119.8 |
| Merseyrail | 43,271 | 483 | 89.6 |
| Northern Rail | 93,834 | 1,086 | 86.4 |
| ScotRail | 86,339 | 1,064 | 81.1 |
| South West Trains | 222,620 | 1,951 | 114.1 |
| Southeastern | 168,378 | 1,580 | 106.6 |
| Southern | 173,441 | 1,538 | 112.8 |
| TfL Rail | 36,590 | 316 | 115.8 |
| Thameslink | 68,070 | 1,081 | 63.0 |
| Virgin Trains | 31,911 | 1,233 | 25.9 |
| Virgin Trains East Coast | 19,904 | 1,067 | 18.7 |

(Note that while this table includes non-franchised TOCs which take part in NRPS, only franchised TOCs contribute to national, regional or sector aggregates for normal reporting.)

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## 3.1   Weighting

Within the sample for each TOC, quotas are set by day of week, journey purpose and size of station.  The sampling plan is designed in a way to select larger stations more often and to assign days of week and times of day to selected stations to generate a random sample of passengers across a good spread of times and days during which services are operating.  The data is weighted for each TOC by journey purpose and day of week and for each TOC building block by station size. The weights do not vary greatly except in situations where a building block has been deliberately over sampled to generate a robust sample size for the building block and this means the weighting does not unduly affect the effective sample size.

## 3.2   Accuracy at TOC level

At TOC level, the normal rules for assessing 95% confidence intervals with a weighted sample can be applied. Typically these would be as in the table below, based on the worst case scenario of a 50% satisfaction level; satisfaction levels that are further away from 50% will be more accurate. This table shows the accuracy of data at TOC level, for analysis run on Autumn 2015 results only; combining waves together for analysis will increase robustness and therefore accuracy:

| TOC | Accuracy (+-%) |
|---|---|
| Abellio Greater Anglia | 3.5 |
| Arriva Trains Wales | 3.6 |
| c2c | 3.2 |
| Chiltern Railways | 3.3 |
| CrossCountry | 4.2 |
| East Midlands Trains | 3.6 |
| First Hull Trains | 5.5 |
| FirstTransPennine Express | 4.0 |
| Gatwick Express | 5.1 |
| Grand Central | 4.3 |
| Great Northern | 5.5 |
| Great Western Railway | 2.1 |
| Heathrow Connect | 4.5 |
| Heathrow Express | 5.1 |
| London Midland | 3.2 |
| London Overground | 4.1 |
| Merseyrail | 5.0 |
| Northern Rail | 3.5 |
| ScotRail | 5.0 |
| South West Trains | 2.6 |
| Southeastern | 3.0 |
| Southern | 2.7 |
| TfL Rail | 6.2 |
| Thameslink | 3.9 |
| Virgin Trains | 3.2 |
| **Grand Total** | **0.9** |

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All analyses from NRPS are undertaken on weighted data. Weighting increases sampling error and the figures above take account of the "weighting efficiency" that the weighting regime produces.

## 3.3  Accuracy at TOC building block level

The figures in the table on the next two pages show the 95% confidence intervals for each TOC building block, again showing the worst scenario for an estimate percentage of 50% satisfied, based on Autumn 2015 only. As with the accuracy figures for TOCs, these estimates take into account the weighting efficiency of the sample for each building block. Estimates closer to 0% or 100% will have tighter confidence intervals than those shown here. Typically, the range for a 70% figure will be about 90% of the figures shown here and the range for a 90% figure will be about 60% of the figures shown here:

| Building block | accuracy +- % | Building block | accuracy +- % |
|---|---|---|---|
| Abellio Greater Anglia - Intercity | 10.8 | London Overground - Gospel Oak - Barking | 7.2 |
| Abellio Greater Anglia - Mainline | 5.3 | London Overground - Highbury & Islington - Croydon/Clapham | 7.1 |
| Abellio Greater Anglia - Rural | 8.3 | London Overground - Richmond/Clapham - Stratford | 7.6 |
| Abellio Greater Anglia - Stansted Express | 8.2 | London Overground - Watford - Euston | 6.9 |
| Abellio Greater Anglia - West Anglia Outer/West Anglia | 6.9 | London Overground - West Anglia | 8.7 |
| Arriva Trains Wales - Cardiff and Valleys | 5.9 | Merseyrail - Northern | 7.1 |
| Arriva Trains Wales - Interurban | 6.9 | Merseyrail - Wirral | 6.8 |
| Arriva Trains Wales - Mid Wales and Borders | 10.8 | Northern Rail - Lancashire & Cumbria | 13.5 |
| Arriva Trains Wales - North Wales and Borders | 8.9 | Northern Rail - Manchester & Liverpool | 6.1 |
| Arriva Trains Wales - South Wales and Borders/West Wales | 8.2 | Northern Rail - South & East Yorkshire | 7.2 |
| c2c - Southend Line | 3.6 | Northern Rail - Tyne Tees & Wear | 9.2 |

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| | | | |
|---|---|---|---|
| c2c - Tilbury Line | 7.5 | Northern Rail - West & North Yorkshire | 5.8 |
| Chiltern Railways - North | 6.0 | ScotRail - Interurban | 6.3 |
| Chiltern Railways - South | 4.0 | ScotRail - Rural | 10.8 |
| CrossCountry - Birmingham - Manchester | 17.0 | ScotRail - Strathclyde | 7.5 |
| CrossCountry - Birmingham - North East & Scotland | 6.9 | ScotRail - Urban | 8.8 |
| CrossCountry - Birmingham - South Coast | 9.5 | South West Trains - Island Line | 10.4 |
| CrossCountry - Birmingham - South West | 7.9 | South West Trains - Longer distance | 4.0 |
| CrossCountry - Birmingham - Stansted | 10.7 | South West Trains - Metro | 4.9 |
| CrossCountry - Nottingham - Cardiff | 11.4 | South West Trains - Outer Suburban & Local | 4.6 |
| East Midlands Trains - Liverpool - Norwich | 6.4 | Southeastern - High Speed | 6.8 |
| East Midlands Trains - Local | 8.2 | Southeastern - Mainline | 4.5 |
| East Midlands Trains - London | 4.8 | Southeastern - Metro | 4.1 |
| First Hull Trains | 5.5 | Southern - Metro | 3.8 |
| First TransPennine Express - North | 4.7 | Southern - Sussex Coast | 3.9 |
| First TransPennine Express - North West | 8.7 | TfL Rail | 6.2 |
| First TransPennine Express - South | 14.4 | Thameslink - Loop | 6.5 |
| Gatwick Express | 5.1 | Thameslink - North | 6.1 |
| Grand Central - London - Bradford | 7.4 | Thameslink - South | 7.7 |
| Grand Central - London - Sunderland | 5.3 | Virgin Trains - London - Birmingham - Scotland | 7.2 |
| Great Northern | 5.5 | Virgin Trains - London - Liverpool | 8.5 |
| Great Western Railway - London Thames Valley | 3.5 | Virgin Trains - London - Manchester | 6.5 |
| Great Western Railway - Long Distance | 3.1 | Virgin Trains - London - North Wales | 11.0 |

| | | | |
|---|---|---|---|
| Great Western Railway - West | 4.6 | Virgin Trains - London - Scotland | 7.3 |
| Heathrow Connect | 4.5 | Virgin Trains - London - Wolverhampton | 7.4 |
| Heathrow Express | 5.1 | Virgin Trains East Coast - London - East Midlands/East of England | 7.0 |
| London Midland - London Commuter | 5.8 | Virgin Trains East Coast - London - Scotland/North East | 6.2 |
| London Midland - West Coast | 7.1 | Virgin Trains East Coast - London - Yorkshire | 7.2 |
| London Midland - West Midlands | 4.3 | Virgin Trains East Coast - Non-London Journeys | 6.3 |

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### 3.4   Minimum sample sizes

At TOC and TOC building block level, most analyses are robust enough to stand up to scrutiny. At station level, the combination of smaller sample sizes and greater variation in weights if more than one TOC is involved mean that data is substantially less robust.  Ideally, station or route analysis should be based on sample sizes of at least 100, and certainly at least 50. To reach this sample size for some stations or routes, it may be necessary to combine waves.

As an example, the data for Aylesbury in Autumn 2015 is based on 13 completed questionnaires. All the questionnaires relate to services offered by Chiltern Railways and so all will have similar weights, in this case varying from 64.0 to 73.2.  A tight range like this means that the effective sample size, on which sampling error is based, will be close to the un-weighted sample size: in fact the effective sample size for Aylesbury in wave 33 is 13 – the same as the actual number of questionnaires that were completed.  For an estimate of 50% from this station, the accuracy limits would be +- 27.2%.

At another extreme, the data for Warrington Central is based on 16 completed questionnaires but covering three different TOCs: East Midlands Trains, Northern Rail and First TransPennine Express.  Questionnaires completed at Warrington Central have weights varying from 10.0 to 216.0, so at worst one questionnaire has a weight of around 22 times that of another. These wide variations in weight will reduce the effective sample size considerably (in this case, to 8), meaning that an estimate of 50% from this station will have an accuracy limit of +- 34.3%, somewhat less robust that  that for Aylesbury even though the un-weighted sample size is actually slightly higher.

### 3.5   Route analysis

NRPS has always recorded where the passenger boarded and left the train service. Since the Spring 2006 wave the origin and destination of the train service itself have been recorded in the survey database; this information is added to the survey record when the passenger journey is checked for validity using RailPlanner. This means that line of route analysis NRPS data is available.

The same considerations about sample size apply, and waves can be amalgamated to generate analysis if required. Now that we have many waves where we have origin and destination of the train recorded the facility to produce route analysis for lower volume routes is available.  As mentioned, all TOCs are now also divided into building blocks (or routes) at the fieldwork stage. This means properly weighted data is automatically available for certain areas below TOC level.

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## 3.6 PTE area analysis

NRPS produces data for the six PTE areas (TfGM, Nexus, South Yorkshire, Strathclyde, West Midlands and West Yorkshire). From Wave 26 onwards, all data for PTE areas has been weighted to the aggregate profile by journey purpose and weekday/weekend from the preceding ten waves. Analysis of this data has confirmed that the profile obtained from NRPS journeys, using the derived weights, does not vary significantly from one wave to another and thus the use of these aggregate weights provides stability of results from one wave to another. Comparisons between waves will not be due to differences in sample profile and so conclusions can be drawn about significant changes which are likely to be due to real effects rather than variations in the sample design.

The aggregate profiles will be checked for each PTE each year to ensure that any significant trends in either journey purpose and/or weekday/weekend can be reflected in revised weights going forward.

## 3.7 Other geographies

Analysis by any other geographies requires each station to be allocated to a unit of that geography and then this new geography can be applied to the NRPS data set. We have available the Standard Region of the origin station, so this variable is available for analysis purposes.

It is not easy to superimpose any other geographies onto NRPS data. We do not hold the postcode of the origin or destination of the journey and records can therefore only be aligned with TOCs, stations or routes or combinations of these. The database does contain the Category A-F station segment definition, so analyses can be undertaken by this variable.

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