Department for Transport

Rail passenger numbers and crowding statistics: *Notes and definitions*

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Contents

This document provides a range of background information on the Department for Transport's (DfT) rail passenger numbers and crowding statistics. It also details some of the factors that may affect the accuracy of the statistics. The latest statistics can be found on the DfT rail statistics webpage.

Background

In line with arrangements specified in the contracts between train operators and DfT, the train operating companies carry out periodic counts of the number of passengers travelling on their services and provide data on passenger numbers and capacity provision to DfT to permit the monitoring of train crowding levels. In the past DfT monitored crowding for London commuter services under a regime known as 'passengers in excess of capacity' (PiXC) and, over time, the PiXC measure formed the basis of the crowding statistics that are published. Until 2010, summary statistics on crowding were published by the Office of Rail and Road (ORR).

In recent years, the amount of passenger count data being collected has increased. In addition to the PiXC measure on London commuter services, a wider range of information has been made available on passenger numbers and crowding for major stations in London and for other major cities in England and Wales.

The statistics show trends in passenger numbers throughout the day and PiXC during the peaks for cities outside London, to allow crowding to be compared between cities on a consistent basis. These statistics cover franchised train operators' services, as well as the services of concession operators, on the National Rail network. They do not include non-franchised train operators, London Underground, or light rail or tram networks.

RESPONSIBLE STATISTICIAN: **Kelly Edwards** rail.stats@dft.gov.uk

FURTHER INFORMATION: Media: **020 7944 3021;** Public: **020 7944 2419**

Definitions

Afternoon (PM) peak	All services that depart from a city centre in the 3-hour period from 16:00 to 18:59. The 1-hour PM peak includes all departures between 17:00 and 17:59.
Automatic passenger count	A passenger count collected by electronic equipment fitted to a train, for example 'infra-red' or 'load weighing' systems.
Autumn count period	The period from mid-September to mid-December, excluding school holidays and bank holidays.
City centre	One or more selected railway stations in the centre of the city. In London this includes all stations within Zone 1 of the Transport for London (TfL) Travelcard area.
Cordon point	For arrivals this is the first city centre station that a service calls at or passes. For departures it is the last city centre station that a service calls at or passes.
Critical load point	The station where the standard class passenger load on a service is highest on arrival at (AM peak) or on departure from (PM peak) a city centre. Critical load points can vary each time a service runs but will usually be at the same location for services on the same route.
Franchised train operator	A train operator that is franchised by DfT or another government body. Non-franchised train operators' services are not included in these statistics.
Manual passenger count	A passenger count carried out without the use of electronic counting equipment, either on board a train (often by the train guard) or on a platform.
Morning (AM) peak	All services arriving at a city centre in the 3-hour period from 07:00 to 09:59. The 1-hour AM peak includes all arrivals between 08:00 and 08:59.
Number of passengers	Includes all standard and first class passengers on services when they arrive at or depart from the city centre.
Number of services	The number of services that the statistics are based on. This includes all train operators' services timetabled to run during the autumn period.
Passengers in excess of capacity (PiXC)	The number of standard class passengers on a service that are in excess of the standard class capacity, which may include a 'standing allowance', at the critical load point.
Passengers standing	The number of standard class passengers on a service that are in excess of the number of standard class seats at the critical load point.
Total seats	Includes all standard and first class seats on services when they arrive at or depart from the city centre.
Service	A train service is a specific train that operates routinely during the autumn timetable period, for example, the 10:00 King's Cross to Aberdeen 17:06 service.
Standard class capacity	Includes the number of standard class seats on the service and may include a standing allowance.
Standing allowance	The standard class capacity of the service will include an allowance for standing passengers when the time between the station before (AM) or after (PM) the critical load point is 20 minutes or less.
'Typical' weekday	A midweek (usually Tuesday to Thursday) weekday during school term-time on which services are not disrupted and passenger numbers are not affected by any unusual events.

Methodology

Passenger counts

The statistics are based on passenger counts carried out on weekdays during the autumn period. The autumn period is used because it is the time of year when commuter demand is generally at its greatest, and is relatively stable across the period. For each train service there will usually be more than one count carried out during the count period, so an average passenger load is calculated for each service and this is used in the statistics. The statistics are designed to represent passenger numbers on a 'typical' midweek day in the autumn period, therefore counts from days when there was disruption leading to abnormal passenger loads, for example resulting from bad weather or engineering work, are excluded where possible. Counts from Friday afternoons and Monday mornings are also generally not included, as there can be different patterns in passenger travel on these days compared to the rest of the week.

Data sources

These are counts carried out by train operators on the numbers of passengers on board their trains at certain points along their routes. These counts are either collected manually or by electronic counting equipment fitted to the train. There are currently two main types of electronic count equipment used, and two types of manual count. These are detailed below.

Automatic counts

- 'Load weighing' – this is equipment fitted to trains that 'weighs' the train at certain points, estimating the number of passengers on board by assuming an average weight per passenger.

- 'Infra-red' – this uses infra-red sensors fitted around each door on the train to count the numbers of passengers boarding and alighting at each station. From these it can be calculated how many passengers are on board the train at any point along its route.

Manual counts

- On board ("guard") counts – on Long Distance services where there is a sufficiently long gap between stations manual counts can be carried out on board the train. These will often be carried out by train guards.

- Platform counts – these are counts carried out by people on platforms at stations counting the number of passengers boarding and alighting each train. For through trains this can also involve making an assessment of the number of passengers in each carriage through the train windows.

The train operators that use automatic counting equipment typically only have a proportion of their rolling stock fleet fitted with the equipment, so depending on how the rolling stock is rotated, in a very small number of cases individual services may not be counted in the survey period. If this occurs then suitable counts from outside the count period will be used. In exceptional circumstances where there are no previous counts for a service, for example as a result of a timetable change, modelled data may be used.

In some cases it is possible for first and standard class passengers to be counted separately, but often the count methods used are not able to distinguish between first and standard class passengers and instead only provide a total. This is particularly the case when using automatic counting equipment or when counts are carried out on platforms rather than on the train. In these cases it is necessary to make an assumption about the proportion of all passengers that are in each class. The method used to split the total between first and standard class varies between train operators, but will typically be based on a factor derived from historic passenger counts or ticket sales on each route.

Each service has seating and total capacities based on the planned booked formation for that service. The booked formation is the type of rolling stock that will typically operate the service.

Passenger number statistics

Passenger number statistics for each city are based on passenger counts carried out on services on arrival into and departure from the city centre station(s). In London this includes all stations in the Zone 1 boundary of the TfL Travelcard area. A list of the stations included for each city is shown on page 10.

Where a city has more than one station in the city centre along the same route, the number of passengers arriving into the city centre is the total number on arrival at the first city centre station the train called at, and the number of passengers departing from the city centre is the total number on the service on departure from the final city centre station the train called at. For example, for a service travelling to London Waterloo, the first Zone 1 station it might call at is Vauxhall before calling at London Waterloo. The passenger numbers on arrival into London for this train will therefore be the number of passengers on arrival at Vauxhall.

For London, the service's cordon point is defined as when it first arrives at the Zone 1 boundary for arriving services and when it last departs the Zone 1 boundary for departing services. The cordon point can potentially be a station it passes through rather than stops at, for example the cordon point could be Elephant & Castle for services arriving into or departing from London Blackfriars even if Elephant & Castle is not a station that the service calls at.

To produce statistics for passenger numbers and total seats by hour of the day, the data for individual services are aggregated together. The timetabled arrival time at the first city centre station the service called at determines the time band the service is included in for arrivals, and the timetabled departure time from the final city centre station the service called at determines the time band for departures. The figures for passengers and total seats include both standard and first class combined.

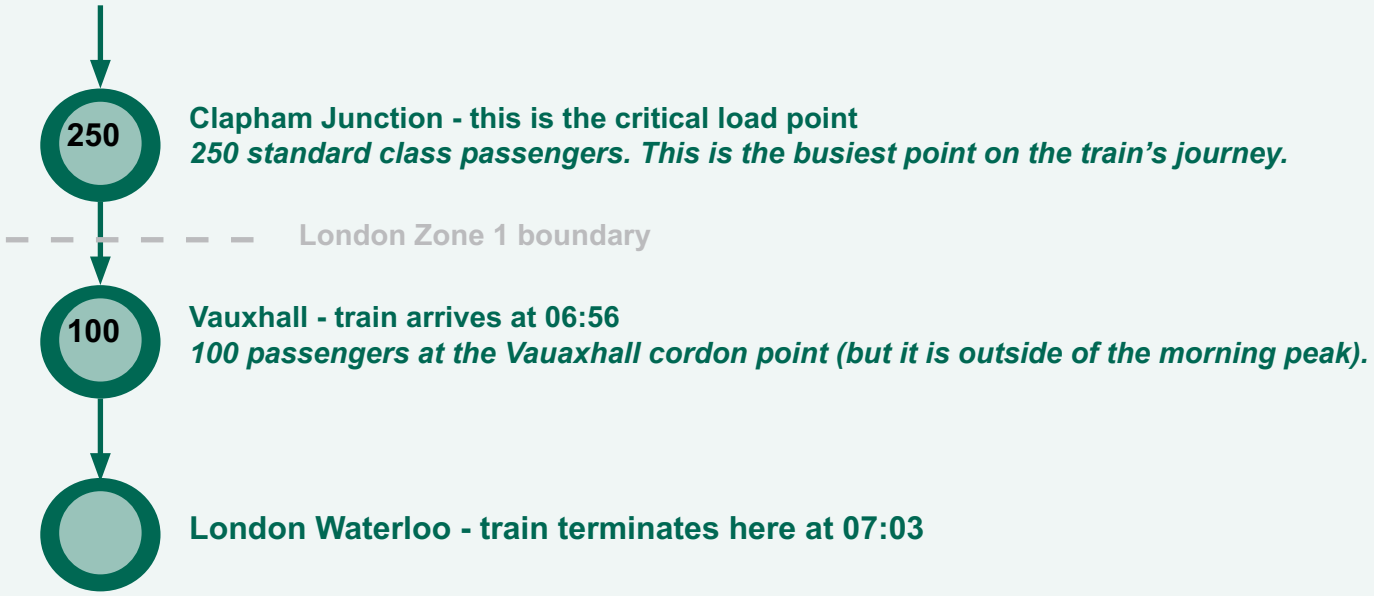
Note that where a service travels through a city but does not start or finish there, passengers travelling through the city will be included in both the arrival and departure counts for that city, despite not boarding or alighting there. Therefore, these statistics show the number of passengers on board services arriving at and departing from each city, rather than the numbers boarding or alighting there. The exception to this is for terminal stations where all passengers on services at those points will have boarded or alighted at that station.

Crowding statistics

Rail traffic in the UK is heavily dominated by passengers travelling at peak times, and a large proportion of the industry's resources are required to provide solely for peak time flows. Therefore, there is a need to clearly identify loadings during peak periods.

The crowding statistics are based on services arriving into cities in the 3-hour morning peak (07:00 to 09:59) and departing from cities in the 3-hour afternoon peak (16:00 to 18:59). The 1-hour high peaks are 08:00 to 08:59 in the morning and 17:00 to 17:59 in the afternoon. In London, services are included in the peaks in the crowding statistics depending on their arrival/departure times at their terminus/origin rather than at the Zone 1 boundary, which in some cases leads to slight differences in which services are included in the peaks compared to the passenger number statistics. Thameslink services travelling through London which call at both London Blackfriars and St. Pancras International are included in the AM peak based on their calling time at the first station they call at, and in the PM peak based on their departure time from the final one of these stations they call at. In other cities there is no difference in the services included in the peaks compared to the passenger number statistics.

Example of a morning peak service arriving into London Waterloo



This service would be included in the AM peak (07:00-09:59) crowding statistics because it arrives at Waterloo during the 3-hour morning peak. The critical load point would be Clapham Junction, as the station with the greatest number of passengers on arrival. Vauxhall would be the cordon point (city centre), but the passengers at Vauxhall would not be counted as AM peak arrivals in the passenger numbers statistics because the service arrives at Vauxhall outside the morning peak.

Published crowding statistics are calculated using a different base to those in the passenger numbers statistics section in that they only include standard class passengers, and are based on passenger counts at the critical load point (see box below).

Critical load points and standard class critical loads

The critical load point is the location where the passenger load on a service is highest on route into (AM peak) or out of (PM peak) a city centre. The number of standard class passengers on the service at this point is called the standard class critical load, and this is the passenger load upon which the crowding statistics are based. For example, for a service arriving into Manchester Victoria in the morning peak the critical load point might be on arrival at Salford Crescent or Salford Central rather than at Manchester Victoria.

In London, critical load points tend to be at interchanges with London Underground or other rail services rather than at the major terminals. In other cities the cordon point is usually the same as the critical load point on most routes.

Standard class capacities and standing allowances

Crowding is measured by comparing the standard class critical load with the standard class capacity of the service. The standard class capacity includes the number of standard class seats on the service and may include an allowance for standing room. No allowance for standing is made on a service when the time between stations before (AM) or after (PM) the critical load point is more than 20 minutes, but it is allowed when it is 20 minutes or less.

The allowance for standing varies with the type of rolling stock. For most train operators the standing allowance is based on an allowance of 0.45m^2 of floor space per passenger. However, a figure of 0.4m^2 is used for Great Western Railway's stock, 0.35m^2 is used for Southeastern's class 376 'metro' style stock, London Overground's 'metro' style stock and South Western Railway commuter stock (0.25m^2 prior to autumn 2017).

In some cases train operators do not have standing capacities calculated for their rolling stock based on the available floor area. In these cases the standing capacities have been estimated as 20 per cent of the number of standard class seats for long distance rolling stock, and 35 per cent of the number of standard class seats for commuter rolling stock (rounded down to the nearest integer if this calculation gives a decimal figure). These estimates have been used for Arriva Trains Wales, CrossCountry, East Midlands Trains, London North Eastern Railway and Virgin Trains West Coast.

For each service the number of passengers standing is calculated as the difference between the standard class critical load and the number of standard class seats (or zero if the number of passengers is lower than the number of seats). The number of passengers in excess of capacity (PiXC) is the difference between the standard class critical load and the standard class capacity (or zero if the number of passengers is lower than the capacity). For each train operator the number of passengers standing and the number of PiXC are aggregated for all services at each city and are expressed as a percentage of the total standard class critical load.

Calculation of PiXC

For an individual service:

PiXC=Standard class critical load - Standard class capacity (or zero if this is negative)

For a train operator or at a city / London station:

$$\text{PiXC percentage} = \frac{\sum_{\text{All services}} \text{PiXC}}{\sum_{\text{All services}} \text{Standard class critical load}} \times 100\%$$

An example of how PiXC and passengers standing are calculated is shown below:

Example of how PiXC and passengers standing are calculated

Service	Standard class seats	Standard class capacity	Standard class critical load	Passengers standing	PiXC
Service 1	150	150	160	10	10
Service 2	150	200	240	90	40
Service 3	150	200	100	0	0
Total	**450**	**550**	**500**	**100**	**50**

In this example Service 1 has the same number of standard class seats and standard class capacity, meaning that it has no standing allowance, but Service 2 and Service 3 do have a standing allowance. This means that for Service 1 PiXC and passengers standing are both 10 (160 minus 150), but for Service 2 they are different, with 90 passengers standing (240 minus 150) and 40 PiXC (240 minus 200). Service 3 has no passengers standing or PiXC as the 100 passengers on board are within both the number of standard class seats and the standard class capacity.

The numbers of passengers standing on each service are added up to give a total of 100 passenger standing across the three services, and the numbers of PiXC are added up to give a total of 50. In the published statistics these figures would be expressed as a percentage of the total standard class critical load (500), so in the published tables passengers standing would be 20 per cent (100 out of 500) and PiXC would be 10 per cent (50 out of 500).

Cities, stations and train operators included in statistics

The tables on the following page show which cities and stations are included in the statistics, and which train operators' services are included at each one. The train operators listed in these tables are those that were current at the time that the most recent statistics were collected. Statistics for previous years include data collected by previous train operating companies where appropriate. In some instances services have been excluded from the statistics to prevent the identification of passenger loads on individual train services, in order to protect the confidentiality of the passenger count data for individual services.

Prior to 2010, when statistics for cities outside London were published for the first time, the only statistics that were published were PiXC statistics for London & South East sector train operators' peak services at London. These statistics continue to be published in Tables RAI0210 and RAI0211. As the totals in these tables do not include those operators that only operate long distance services at London, they differ slightly from the London PiXC totals that appear in other tables. In autumn 2019, these long distance operators were East Midlands Trains, London North Eastern Railway and Virgin Trains West Coast.

The London statistics include services on routes into major stations in Zone 1 of the TfL Travelcard area. This does not include London Overground services calling at Hoxton and Shoreditch High Street on the East London Line, even though these stations are within Zone 1. Only franchised train operators are included in these statistics and as responsibility for rail in Scotland is devolved to Transport Scotland, Caledonian Sleeper and ScotRail services are not included.

We would caution against comparing operator-specific crowding statistics between years (Tables RAI0211, RAI0214 and RAI0215), as there may have been changes of services between operators during the time series. This was most notable in the autumn 2015 statistics where some Greater Anglia services were transferred to London Overground and TfL Rail. In autumn 2016, some services were transferred from TransPennine Express to Northern so the crowding statistics at Manchester for these operators cannot be directly compared to the previous years.

London stations included in statistics during autumn 2019:

Station	Zone 1 boundary	Train operators
Blackfriars (via Elephant & Castle)	Elephant & Castle	Thameslink, Southeastern
Euston	Euston	West Midlands Trains, London Overground, Virgin Trains West Coast (Caledonian Sleeper trains that start or end at Euston are not included)
Fenchurch Street	Fenchurch Street	c2c
Kings Cross	Kings Cross	Great Northern, London North Eastern Railway
Liverpool Street	Liverpool Street	Greater Anglia, London Overground, TfL Rail
London Bridge, Charing Cross or Cannon Street	London Bridge	Thameslink, Southeastern, Southern (includes services that stop or go through London Bridge on their way to either Charing Cross or Cannon Street)
Marylebone	Marylebone	Chiltern Railways
Moorgate	Old Street	Great Northern
Paddington	Paddington	Great Western Railway (including Heathrow Connect), TfL Rail
St. Pancras International	St. Pancras International	East Midlands Railway, Thameslink, Southeastern (HS1)
Victoria	Victoria	Southeastern, Southern (including Gatwick Express)
Waterloo	Vauxhall	South Western Railway

Cities outside London included in statistics during autumn 2019

City	City centre stations	Train operators
Birmingham	Birmingham Moor Street	Chiltern Railways, West Midlands Trains
	Birmingham New Street	Transport for Wales Rail, CrossCountry, Virgin Trains West Coast, West Midlands Trains
	Birmingham Snow Hill	Chiltern Railways, West Midlands Trains
Brighton	Brighton	Great Western Railway, Southern, Thameslink
Bristol	Bristol Temple Meads	Cross Country, Great Western Railway, South Western Railway
Cambridge	Cambridge	Great Northern, Greater Anglia, Thameslink
Cardiff	Cardiff Central	Transport for Wales Rail, CrossCountry, Great Western Railway
	Cardiff Queen Street	Transport for Wales Rail
Leeds	Leeds	CrossCountry, East Midlands Railway, London North Eastern Railway, Northern, TransPennine Express
Leicester	Leicester	CrossCountry, East Midlands Railway
Liverpool	Liverpool James Street	Merseyrail
	Liverpool Lime Street	East Midlands Railway, Northern, TransPennine Express, Virgin Trains West Coast, West Midlands Trains
	Liverpool Central	Merseyrail
	Moorfields	Merseyrail
Manchester	Manchester Oxford Road	Transport for Wales Rail, East Midlands Railway, Northern,TransPennine Express
	Manchester Piccadilly	Transport for Wales Rail, CrossCountry, East Midlands Railway, Northern, TransPennine Express, Virgin Trains West Coast
	Manchester Victoria	Northern, TransPennine Express
Newcastle	Newcastle	CrossCountry, London North Eastern Railway, Northern, TransPennine Express (ScotRail trains that start or end at Newcastle are not included)
Nottingham	Nottingham	CrossCountry, East Midlands Railway, Northern
Reading	Reading	CrossCountry, Great Western Railway, South Western Railway, TfL Rail
Sheffield	Sheffield	CrossCountry, East Midlands Railway, Northern, TransPennine Express

Sampling and measurement error

Passenger numbers statistics are based on average counts for individual rail services. Some services are counted only once, whereas other services can be counted multiple times. Passenger numbers can fluctuate from day to day and may vary across the autumn period, so the average passenger count will not necessarily reflect a typical loading on that service throughout the autumn period.

This sampling error will particularly affect services that are more prone to fluctuations in passenger numbers such as long distance services, although as most loadings on long distance services are based on a large number of guards' counts the relatively high sample size should generally reduce this effect.

Figures for train operators that only carry out a small number of counts are also likely to be affected more, in particular those that rely on a single set of manual counts on some or all of their routes. Until the mid-2000s the majority of train operators relied on a single set of manual counts on their services. As more automatic counting equipment has been introduced across the network the number of operators where this is the case has reduced, but there are still a small number that do rely on single manual counts. This means that these counts will reflect the number of passengers on the day that they are counted, which may not be representative of passenger numbers across the whole autumn period. The statistics based on very few counts are marked in the published tables and the figures should be treated with some caution.

Passenger counts can be subject to measurement errors, for example with manual counts there is a risk of human error leading to incorrect counts, particularly on busy trains. Load-weighing equipment calculates the passenger load by assuming an average weight per passenger, which may not always be representative of the passengers on every train, and all automatic counting equipment can sometimes develop faults. Counts from days with unusually high or low passenger numbers may also sometimes be included in the average for a service, which can distort the figures, particularly in cases where a service only has a small number of counts. In most cases counts from days when there was disruption are excluded from the statistics, but it will not always be possible to do this, and some train operators are unable to do this with the systems they have.

Because the statistics are aggregated for a number of train services, if a service has an atypical average passenger load due to sampling or measurement error this will usually only have a limited impact on the overall passenger numbers at a city. Therefore the magnitude of these figures is likely to be reliable, although small differences between the figures for different routes or when looking at trends over time should not be given too much weight. However, the crowding figures are more susceptible to distortion as a small number of services can have a large impact on the PiXC and passengers standing totals. Therefore small differences in the crowding figures between routes or when comparing different years should be treated with some caution.

Seasonality

As the statistics represent a 'typical' weekday during school term time in the autumn they will not necessarily be representative of passenger numbers and crowding at other times of year, or on particular days of the week. The autumn period is used because it is the time of year when commuter demand is generally at its greatest, but this will not necessarily be the case for long

distance operators, for whom demand may be greater during holiday periods or on particular days of the week such as Fridays and at weekends, which will not be reflected in these statistics.

Counts from days when there was more likely to be abnormal passenger numbers are excluded where possible, for example when caused by bad weather or disruption caused by engineering work, and counts from Friday afternoons and Monday mornings are also generally not included, as there can be different patterns in passenger travel on these days compared to the rest of the week. Therefore the statistics will not reflect any differences in the level of crowding occurring on such days.

Because the statistics reflect passenger numbers on autumn weekdays this can affect comparisons with annual data, such as the rail usage estimates published by the Office of Rail and Road, which are based on annual ticket sales. Statistics based on autumn weekdays are likely to produce a higher average daily number of passengers on commuter routes than an annual average would.

Sometimes there can be a specific factor that affects the statistics for a particular location, such as long term engineering or building work that affects when and where passengers travel throughout an autumn period. Where this is the case the statistics for that year may not reflect the level of passenger demand that would have occurred otherwise. The 2015 statistics for London Bridge due to the Thameslink engineering works fall into this category.

Some operators introduce a ‘leaf fall’ timetable part way through the autumn period when passenger counts are carried out. As it can vary from year to year whether the operator carries out counts before or after this timetable change, this can affect annual comparisons.

Aggregation

The published statistics are aggregated by city or major London station, with crowding statistics further broken down by train operator. This aggregation means that differences between routes can be hidden, so it is not possible to identify crowding on a particular train service or route from the statistics, except in cases where a train operator only operates on one route at a particular city or major London station.

Most of the published tables of crowding statistics include a column showing the number of services that the figures are based on, which should be taken into account when comparing the figures for different operators.

Capacity measures

The basis on which standing allowances for different types of rolling stock are calculated can vary between train operators, usually because of the types of rolling stock in their fleets and the types of passenger services they provide, and the method for calculating them has also varied over time. This will affect the PiXC figure for different operators, meaning that one train operator can have a higher PiXC percentage than another, but in reality their services can seem just as crowded for the passengers. It also means that historic figures may not be directly comparable with more recent ones.

Standard class capacities only include a standing allowance on services where the time between stations at the critical load point is 20 minutes or less. This means that standard class capacities on long distance services and longer distance commuter services typically only include the

number of standard class seats, whereas on local stopping services standing will usually be allowed. If these longer distance services are being used by commuters this can sometimes produce a high PiXC percentage, while the proportion of passengers standing may still be relatively low compared to other commuter routes.

Therefore the nature of PiXC on longer distance services is different to PiXC on routes where standing is allowed, as on these services it represents passengers having to stand for more than 20 minutes, whereas when a standing allowance is included it represents passengers standing in cramped conditions. It should be noted that in cases where a standing allowance is included the number of PiXC will only be the number of passengers that are in excess of the standard class capacity, even though all standing passengers on the service will be experiencing the cramped conditions.

First and standard class

In some cases it is possible for first and standard class passengers to be counted separately, but often the count methods used are not able to distinguish between first and standard class passengers and instead only provide a total. This is particularly the case when using automatic counting equipment or when counts are carried out on platforms rather than on the train. In these cases it is necessary to make an assumption about the proportion of all passengers that are in each class. The method used to split the total between first and standard class varies between train operators, but will typically be based on a first class reduction factor derived from historic passenger counts or ticket sales on each route.

For the autumn 2015 publication the methodology used for calculating PiXC where first class reduction factors are used was changed. Previously, a first class reduction factor was applied to the total load and only the calculated standard class load was used in the PiXC calculation. This led to instances where there were more first class passengers than the given first class capacity, and this would not be reflected in the PiXC totals. For the autumn 2015 publication revisions to the PiXC series were introduced and back-dated to 2011, so that the calculated first class loads are capped at the number of first class seats, and any excess first class passengers are added to the standard class load for that service.

Further details regarding this revision in February 2017 can be found with the following correction note: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/590534/rail-passengers-crowding-2015-revision-note.pdf.

First Class passenger cap example

A service has 500 seats, made up of 480 standard class seats and 20 first class seats. It is counted using automatic passenger counting equipment and has a total passenger load of 550. This is apportioned using a first class reduction factor, which for this service is 6%. The counted load then becomes 517 standard class passengers and 33 first class passengers.

As there are 13 more first class passenger than first class seats, 13 passengers would be subtracted from the first class load and added to the standard class load, leaving 530 standard class passengers and 20 first class passengers. This service would therefore have 30 passengers in excess of capacity.

Why the statistics may differ from passenger perceptions

There are a number of reasons, other than the accuracy of the statistics, why the PiXC and standing statistics may not always reflect public perceptions of crowding on the rail network. Passengers have a variety of different rail travel experiences and these will not all be reflected in the overall statistics. An individual's experience of a crowded train or route may or may not affect the aggregate statistics although it will certainly colour the passenger's view of rail travel.

The figures are based on average passenger loads for each service which will not capture the day-to-day variations that occur, so if a service occasionally has crowding this will not necessarily be reflected in the statistics. Also, the statistics are based on the passenger numbers and capacity of the whole train, so will not reflect the variations that can occur between carriages on the same train, as passenger loadings can vary from carriage to carriage. For example, at major terminals passenger numbers are often higher at the end of a train that is closest to the entrance/exit on the platform, meaning that passengers travelling at one end of a train can perceive a higher level of crowding than those at the other end, and that passengers can be standing in one carriage when there are empty seats in another.

Passengers will have differing views on when it is acceptable to stand, which may depend on if they are using the train for commuting or leisure purposes, and how many passengers it is acceptable to have standing on a train which may differ from the assumptions made about the standing allowances used in the PiXC measure. The PiXC measure allows passengers to stand for up to 20 minutes at the critical load point, but in reality in some places passengers may stand for longer than this on these services, which will not be reflected in the PiXC measure. It is known that in some cases passengers may choose to stand for longer than 20 minutes on a fast train rather than catch a slower train where they could have a seat.

Because a standing allowance is included on some services but not others this can lead to a large difference in the PiXC figures between routes when passengers may not perceive the routes to be very different. Because standing allowances are included if the time between stations at the critical load point is 20 minutes or less, this means that a busy route where the gap is just over 20 minutes will have a much higher PiXC figure than an equally busy route where the stations are within 20 minutes of each other at the critical load point.

The figures for passengers standing compare the number of passengers with the number of seats on each service, so they represent the number of people forced to stand because there are insufficient seats. In reality passengers often choose to stand even if seats are available, so the numbers of passengers standing may well be higher than the numbers shown in the statistics.

Passenger views on crowding may be influenced by days on which there is disruption, when delays, cancellations and services operating with fewer carriages than normal can lead to higher than usual levels of crowding. As these statistics reflect a 'typical' weekday in autumn (not affected by disruption) they will not reflect this crowding.

Uses of these statistics

These statistics are the best source of information available showing day-to-day passenger numbers and crowding levels at particular points across the rail network, and how passenger numbers vary throughout the day. The Office of Rail and Road (ORR) publishes statistics showing the number of passenger journeys and passenger kilometres travelled on the rail network each quarter, based on ticket sales. The ORR statistics are the best source of information on the overall level of rail travel across the country and trends in rail travel over time.

Over the period July 2012 to May 2013 DfT consulted users of the passenger numbers and crowding statistics. Feedback from the consultation and DfT's responses to the issues raised have been published in a separate document that can be found on the DfT rail statistics notes and guidance webpage: https://www.gov.uk/transport-statistics-notes-and-guidance-rail-statistics.

The consultation confirmed that the passenger numbers and crowding statistics and the underlying passenger counts are used within Government and across the rail industry for a wide variety of tasks. Within DfT these include:

- Informing Government policy on rail, including decisions on infrastructure, station and rolling stock investment.
- As part of the rail franchising process, informing the specification of new franchises and the models used in the assessment of franchise bids.
- Validating models of passenger demand used by DfT.
- Assessing train plans and projects proposed by train operators.
- Monitoring crowding and the impact of previous policy and investment decisions.
- As part of ministerial briefings and to respond to ad hoc queries.

Outside the Department for Transport uses include:

- In the day to day running of train operating companies, including planning timetables and rolling stock deployment.
- Understanding current levels of passenger demand and informing future planning.
- Validation of other data sources such as ORR's station usage estimates.
- Understanding and reporting on crowding levels.

In the past DfT monitored crowding for London commuter services under a regime known as 'passengers in excess of capacity' (PiXC) and this has formed the basis of the crowding statistics published. Under the historic PiXC regime, DfT set limits on the level of acceptable PiXC at 4.5 per cent in one peak (morning or afternoon) and 3.0 per cent across both peaks. DfT now specifies for most of its franchisees that the levels of overcrowding are minimised and not unduly concentrated on particular railway passenger services or routes.

Confidentiality of passenger counts

Passenger count data are provided to DfT by train operators under terms of commercial confidentiality. The passenger loads and train capacities for individual train services that underlie these statistics and smaller aggregations than those that are published cannot be released, apart from the ten most overcrowded train services. These are included within section 7 of the publication. Prior to autumn 2018, this list was published separately as the 'Top 10 overcrowded train services: England and Wales', but has since been subsumed into the main publication.

Where passenger numbers are shown in one-hour time bands in the statistics, in a very small number of cases where it is possible for one train operator to calculate the passenger load for a group of one or two services run by another operator, the figures for these services may have been altered to prevent the calculation of the original figures. This has been achieved by grouping these services with services from other time bands, and using the average loads and seats for each of these services instead of the original figures. The overall daily and peak totals were maintained during this alternative groupings where possible. Furthermore, if there are fewer than three peak services for a single train operator at a city, these crowding statistics may not be shown in Table RAI0214, but are included in the overall crowding statistics for that city. If the train operator has fewer than three services arriving at or departing from a city or major London station across the whole day then the affected services have been excluded from the statistics, such as Chiltern Railways' parliamentary services to and from London Paddington.

Timeliness of the statistics

These statistics are based on passenger counts carried out each year by train operators between mid-September and the timetable change in mid-December. Train operators provide this data to DfT approximately two months after the end of the count period and DfT publishes these statistics approximately five months later in July. The length of time taken reflects the time it takes for train operators to receive and compile the data, and for DfT to carry out quality assurance and correspond with train operators to correct any issues that arise.

While the aggregate statistics published by DfT take a number of months to quality assure and compile, the underlying data are available to the train operators to use for timetabling and other purposes soon after the data are collected, typically within a few days. Once DfT has received the data from the train operators it becomes available for use within DfT on a gradual basis, as quality assurance work is carried out.

National Statistics

It is not anticipated that the length of time it takes between data collection and publication of the statistics will change in the near future. However, DfT is in the process of developing a Rail Passengers Counts Database for use by DfT and the train operators which will automate much of this process in future, and will allow these statistics to be produced more quickly.

The United Kingdom Statistics Authority has designated the passenger number and crowding statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics.

Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs;
- are well explained and readily accessible;
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest.

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

Symbols and conventions used

Rounding of figures: In tables where figures have been rounded, there may be an apparent slight discrepancy between the sum of the constituent items and the total as shown.

Symbols: The following symbols have been used throughout:

0 = nil or negligible (less than half the final digit shown)

R = revised

.. = not available/applicable

* = figure not shown for reasons of confidentiality

-- = figure not currently available

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Other sources of rail statistics

In addition to the DfT rail passenger number and crowding statistics there are a number of other sources of information about rail passenger numbers in the UK.

Office of Rail and Road

The Office of Rail and Road (ORR) is the lead publisher of official statistics for the rail industry in Great Britain and publishes annual and quarterly rail usage statistics. These show estimates for the number of journeys and passenger kilometres on the rail network based on ticket sales, primarily those recorded in the rail industry's LENNON ticketing database. As well as national totals, estimates are produced for individual train operators, regions and stations. The ORR statistics are the best source of information on the overall level of rail travel across the country and trends in rail travel over time. The DfT passenger numbers and crowding statistics are the best source of information available showing day-to-day passenger numbers and crowding levels at particular cities, and how passenger numbers vary throughout the day.

As the ORR estimates are annual or quarterly they are not directly comparable with the DfT statistics that represent a 'typical' weekday in the autumn. It should also be noted that the ORR station usage statistics show the number of entries and exits at each station whereas the DfT statistics show the number of passengers on board trains, therefore include passengers on trains passing through a station as well as those that board or alight there.

ORR rail usage statistics can be found via the following webpages:

- National estimates of journeys and passenger kilometres in Great Britain: http://dataportal.orr.gov.uk/browsereports/12
- Regional usage estimates: http://dataportal.orr.gov.uk/browsereports/15
- Station usage estimates: http://orr.gov.uk/statistics/published-stats/station-usage-estimates

Scotland

Rail statistics for Scotland are published by Transport Scotland in the rail chapter of Scottish Transport Statistics: https://www.transport.gov.scot/publications/?publicationtype=1271. These include information about rail usage, but do not include up to date comparable statistics to those in the DfT rail passenger number and crowding statistics.

Statistics showing the percentage of passengers in excess of capacity on weekdays on Edinburgh commuter services across the Forth Bridge operated by ScotRail were published for 2001 to 2003. However, this information has not been collected for subsequent years as from the start of the First ScotRail franchise in 2004 crowding was no longer monitored using this measure.

In May 2018, Transport Scotland published a list of Scotrail's Top Ten Busiest Trains in 2017. The report is available here: https://www.transport.gov.scot/media/42251/scotrails-top-10-busiest-trains-may-2018.pdf . As per Scotrail's franchise terms, crowding is measured after 10 minutes of boarding a train, where passengers should have a reasonable expectation of getting a seat.

Wales
The DfT rail passenger numbers and crowding statistics include information about services in Cardiff. Other rail statistics for Wales are published by the Welsh Government (http://wales.gov.uk/statistics-and-research/). These include information about annual rail usage within Wales by local authority and for individual stations.

Northern Ireland
Rail statistics for Northern Ireland are published by the Department for Regional Development, Northern Ireland (https://www.infrastructure-ni.gov.uk/topics/dfi-statistics-and-research). These include information about annual and quarterly rail usage, but do not include comparable statistics to those in the DfT rail passenger number and crowding statistics.

London
Transport for London (TfL) publishes statistics providing information about transport in London (http://www.tfl.gov.uk/corporate/publications-and-reports/travel-in-london-reports). This includes the Central Area Peak Count (CAPC), which uses DfT rail passenger number statistics alongside statistics for other modes of transport to provide information about the number of people travelling into central London on weekdays. Other TfL statistics include information about passengers' onward travel patterns from central London rail termini.

National Travel Survey
DfT publishes the National Travel Survey, a household survey that collects information about personal travel patterns in Great Britain. It provides information about how, why, when and where people travel, including information about rail travel. It can be found at the following webpage: https://www.gov.uk/government/organisations/department-for-transport/series/national-travel-survey-statistics.

Transport Statistics Great Britain (TSGB)
DfT publishes a summary of other rail and transport statistics at the following webpage: https://www.gov.uk/government/collections/transport-statistics-great-britain.

Eurostat
Eurostat publish a selection of comparable rail statistics across European countries at the following webpage: http://ec.europa.eu/eurostat/web/transport/data/database.

National Rail Passenger Survey
Transport Focus publishes the National Rail Passenger Survey (NRPS), a biannual survey that collects information about passenger satisfaction each spring and autumn. It includes information about passenger satisfaction with the available space to sit/stand on trains for each train operator and on particular routes. It can be found at the following link: http://www.transportfocus.org.uk/research/national-passenger-survey-introduction.