



# **West Midlands Ticketless Travel Report**

**27/06/2016**



Contents

1 Executive Summary ..... 1

    1.1 Key findings ..... 1

2 Introduction, methodology and sample collected ..... 4

    2.1 Introduction ..... 4

    2.2 On-train survey methodologies – our approach explained ..... 4

    2.3 Limitations of the on-train survey methodology ..... 4

    2.4 Alternative methodologies – station cordon-based surveys ..... 5

    2.5 Sample collected ..... 6

    2.6 Cleaning and validation of survey data ..... 7

3 Results ..... 9

    3.1 Irregularity rates by time period and service group ..... 9

    3.2 Results by type of irregularity ..... 13

    3.3 Estimated revenue at risk rates ..... 15

Appendix A

Table 1 Lower and upper bound estimates of revenue at risk, underlying assumptions ..... 1

Table 2 Lower and upper bound estimates of revenue at risk ..... 2

Table 3 Irregularities by Service route ..... 2

Table 4 Breakdown of irregularity types for passengers with invalid tickets and no tickets ..... 3

Table 5 Journeys undertaken by service route ..... 6

Table 6 Surveys conducted breakdown by AM/PM Period compared to irregularity rates. .... 7

Table 7 Irregularity rates by Service Routes by time ..... 10

Table 8 Irregularity Rates for origin stations with and without ticketing facilities ..... 11

Table 9 Irregularity types by service route ..... 13

Table 10 Assumptions on average loss of yield by irregularity type ..... 15

Table 11 Weighted revenue at risk, upper and lower bound estimates ..... 17

Figure 1 Comparison of Revenue at Risk and Irregularity rates by service group ..... 12

## 1 Executive Summary

This report contains the findings of a ticketless travel survey undertaken between 21st March and 24th April 2016 across the West Midlands franchise network. Specifically, a report on the levels of ticketless travel and revenue at risk is provided, along with an overview of the methodology adopted for the survey.

### 1.1 Key findings

The key findings of the survey are:

- A total of 21,282 observations were collected during the survey across 15 routes and 4 time periods between 6.00am and 12.00am. 50 of these surveys were discarded due to data discrepancies.
- The survey data collected has been used to produce estimates of revenue at risk which produce representative estimates by service group, time period for the West Midlands network.
- The upper bound estimate of revenue at risk is 5.7% - this is based on the assumption that all passengers surveyed without a ticket, would not purchase one on the train or at the destination station.
- The lower bound estimate of revenue at risk is 2.0% - this assumes that all passengers giving the reason for not having a ticket due to 'lack of facilities on train or at stations' eventually would have purchased a ticket during their journey.
- Both estimates assume 50% of the passengers who refused to show their ticket would have purchased a valid ticket during their journey.
- Alighters are assumed to have the same irregularity rates as the service group population and therefore have no impact on irregularity rates or revenue at risk.

Table 1 summarises the difference in lower and upper bound estimates of revenue at risk, based on proportion of revenue lost through assumptions on those without a ticket.

**Table 1 Lower and upper bound estimates of revenue at risk, underlying assumptions**

Estimate	Assumption	Change (%)	Revenue at risk rate (%)
<b>Upper bound</b>			<b>5.7%</b>
- Assumption 1	Assume those without a ticket due to the 'No time to buy a ticket' will buy a ticket later in their journey	-1.8%	
- Assumption 2	Assume those without a ticket due to 'No ticket machine/booking office at station' will buy a ticket later in their journey	-1.0%	
- Assumption 3	Assume those without a ticket due to the 'Booking office closed' will buy a ticket later in their journey	-0.5%	
- Assumption 4	Assume those without a ticket due to 'Ticket machine does not offer required ticket' or 'Ticket machine not working' will buy a valid ticket later in their journey	-0.25%	
- Assumption 5	Assume those without a ticket due to the 'Card-only ticket machine and no credit/debit card available' will buy a ticket later in their journey	-0.1%	



- Assumption 6	Assume those without a ticket due to the 'Queue at ticket machine/booking office too long' will buy a ticket later in their journey	-0.05%	
<b>Lower bound</b>			<b>2.0%</b>

Source: Tracsis, Halcrow analysis

The main difference between the two estimates is the assumption behind whether those passengers surveyed who stated that they did not have the opportunity to buy a ticket, due to lack of facilities or access at the station or on the train, will eventually buy a ticket. These passengers could have bought a ticket from the conductor or at the destination station after the survey was completed.

Table 2 illustrates upper and lower bound estimates of revenue at risk for each service group:

**Table 2 Lower and upper bound estimates of revenue at risk**

Service Group	Upper bound Potential Revenue Lost (£m)	Upper bound of Revenue Risked (% of Total Revenue)	Lower bound Potential Revenue Lost (£m)	Lower bound of Revenue Risk (% of Total Revenue)	Range (£m +/-)
EJ01 (West Midlands Snow Hill)	3.2	1.1	0.8	0.3	2.4
EJ02 (Trent Valley)	0.7	0.2	0.2	0.1	0.5
EJ03 (West Midlands New Street)	6.9	2.4	2.1	0.7	4.8
EJ04 (West Midlands Inter Urban)	2.2	0.8	0.7	0.2	1.5
EJ05 (WCML London – Northampton)	3.0	1.0	1.8	0.6	1.2
EJ06 (WCML Branches)	0.5	0.2	0.2	0.1	0.3
<b>Overall</b>	<b>£16.5m</b>	<b>5.7%</b>	<b>£5.8m</b>	<b>2.0%</b>	<b>+£10.7m</b>

Source: Tracsis, 2014/15 Lennon data, Halcrow analysis

Based on the estimates, our findings show that the service groups with the highest revenue at risk were EJ03 (0.7%-2.4%), EJ05 (0.6%-1.1%) and EJ01 (0.3%-1.1%). The lowest revenue at risk were in service groups EJ02 (0.1-0.2%) and EJ06 (0.1-0.2%).

Based on 2014/15 LENNON database, indicative revenue at risk on the West Midlands franchise is between £5.8m and £16.5m per annum (£10.7m range).

Table 3 provides details of irregularities observed by service routes.

**Table 3 Irregularities by Service route**

Service Code	Service Route	Valid (%)	Total Irregularities (%)	Assumed to be valid (%)*	Sample Size (#)
EJ01	Snow Hill-Shirley/Henley-Stratford-U-Avon	86.7%	12.9%	0.4%	698
EJ01	Snow Hill-Dorridge-L Spa-Stratford-U-Avon	82.3%	17.4%	0.3%	1,118
EJ01	Snow Hill-Stourbridge Jct-K'Minster/B'grove-Worcester	86.4%	13.2%	0.4%	2,620
EJ02	Coventry-Nuneaton	88.9%	10.6%	0.5%	324
EJ03	New Street-Wolverhampton	85.3%	14.6%	0.1%	916
EJ03	New Street-Walsall-Hednesford-Rugeley Town	83.1%	16.5%	0.4%	905



Service Code	Service Route	Valid (%)	Total Irregularities (%)	Assumed to be valid (%)*	Sample Size (#)
EJ03	Lichfield-New Street-Redditch	84.8%	14.8%	0.4%	2,275
EJ03	Hereford-Gt Malvern-Worcester-New Street	89.3%	10.7%	0.1%	868
EJ04	New Street-Wolverhampton-Wellington/Shrewsbury	73.1%	26.6%	0.3%	595
EJ03	New Street-Bhm International-Coventry-Northampton	94.5%	5.3%	0.2%	2,510
EJ04	New Street-Crewe-Liverpool Lime St	96.2%	3.5%	0.3%	3,801
EJ02	Rugby-Nuneaton-Stafford-Stoke-Crewe	96.2%	3.6%	0.3%	757
EJ05	Euston-Milton Keynes-Northampton	97.8%	1.7%	0.4%	2,449
EJ06	Bedford-Bletchley	98.2%	1.6%	0.2%	273
EJ06	Watford Junction-St Albans Abbey	63.1%	36.4%	0.5%	837
	<b>Total</b>	<b>89.3%</b>	<b>10.4%</b>	<b>0.3%</b>	<b>20,946</b>

Source: *Tracsis, Halcrow analysis*

\* Irregularities only incorporate 50% of refusals, the other half are assumed to be valid.

The survey findings show that 89.3% of passengers surveyed had a valid ticket, while 10.4% are assumed to have irregularities, the remaining 0.3% is assumed to have a valid ticket.

The highest irregularity rates at Watford Junction-St Albans Abbey (36.6%) and New Street-Wolverhampton-Wellington/Shrewsbury (26.7%) services. The lowest irregularity rates are on Bedford-Bletchley services (1.6%) and Euston-Milton Keynes-Northampton services (1.7%). Some caution needs to be taken for the low irregularity rates on the Bedford-Bletchley services, this is due to a majority of passengers who were surveyed had purchased tickets at stations where purchasing facilities were available, as such not truly reflecting the nature of this service route.

It must also be noted that these findings have not been weighted by revenue. After revenue weightings are considered, as shown in Table 2, routes on service groups EJ03 and EJ05 have the largest revenue at risk impact for the franchise.

Table 4 illustrates the top ten irregularities types surveyed on the London Midland franchise in descending order of prevalence.

**Table 4 Breakdown of irregularity types for passengers with invalid tickets and no tickets**

Description	Observations	Irregularity rate
No time to buy a ticket	689	3.29%
No ticket machine/booking office at station	390	1.86%
No ticket -Refused to give a reason	355	1.69%
Booking office closed	199	0.95%
Refusal (to participate in the survey)	135	0.64%
Ticket machine not working	120	0.557%
Lost/forgotten ticket	81	0.39%
Child impersonation	29	0.14%
Card-only ticket machine and no credit/debit card available	27	0.13%
Overriding	20	0.10%

Source: *Tracsis, Halcrow analysis*

The most prevalent reasons were due to a lack of time to purchase a ticket (3.3%) and having No ticket machine/booking office at station (1.9%).



## 2 Introduction, methodology and sample collected

This section sets out the purpose of the ticketless travel survey and the methodology that was undertaken, in particular the on-train survey methodology. This section also explains why on-train surveys were adopted instead of alternative methodologies i.e. station cordon-based surveys. A qualitative report on the reasons for individual surveys recording a limited number of interviews due to certain conditions on board trains is also provided.

### 2.1 Introduction

There are a significant number of stations on the West Midlands and West Coast routes which are ungated, unstaffed and have limited ticket purchase facilities. As such, many journeys are made by individuals without paying a fare, whether out of choice or due to a lack of opportunity to purchase a ticket at stations or on the train. The purpose of the survey is to provide an estimate of ticketless and fraudulent travel across the London Midland franchise which can be used to understand the extent of this problem.

In addition, this report provides an indication of the relative levels of ticketless travel across service groups and time period. These rates are monetised in terms of the revenue at risk for each segment.

### 2.2 On-train survey methodologies – our approach explained

On-train surveys required surveyors to board and interview passengers on a randomly selected carriage. Because conductors sell tickets on board London Midland trains, surveyors were instructed to first seek out the conductor and present a letter of authority and provide an explanation of the survey. In the event that the conductor was not located on the train, the survey was not started.

When beginning the survey, an announcement was made to all passengers in the carriage, stating that a survey looking at ticket usage was being conducted. Surveyors worked in pairs from either end of the carriage, checking each ticket until all were checked or the remaining passengers had alighted. Once a carriage was surveyed the team move to the next carriage until the entire train was surveyed or they had to alight themselves. After this, the survey is completed and the team board the next train on their schedule.

Surveys were conducted between 21 March 2016 and 24 April 2016 covering weekdays and weekends. This period included school Easter holidays, the timing of which varied by school location but covered two weeks between 21 March and 15 April. Surveys were carried out during this period in areas where schools were not on holiday.

### 2.3 Limitations of the on-train survey methodology

As indicated in our introduction, there are particular characteristics associated with the London Midland rail franchise which make it more susceptible to ticketless travel. The relatively high proportion of ungated stations without ticket purchasing facilities may encourage ticketless travel unintentionally. In order to mitigate this, London Midland trains all have a conductor who checks and sells tickets.



Our on-train survey methodology captures the presence of the conductor on board the train to a certain extent. Passengers who have already had their tickets checked or been sold a ticket by the conductor are included in the survey. Those passengers boarding a train without a ticket during the survey are recorded as ticketless travel if they are interviewed and **still have no ticket**.

Of course, it is not clear whether individuals on the train will eventually purchase a ticket from the conductor or whether they will alight before they have the opportunity to do so. Nor is it clear whether they will buy a ticket from the station they are alighting at. As such, we have sought to provide two estimates of the rate of ticketless travel:-

1. **Lower bound estimate** – this figure is based on the assumption that those stating they had no ticket because of a lack of facilities or access at the station or train will eventually buy a ticket from the conductor or at the destination station.
2. **Upper bound estimate** – this figure assumes all those without a ticket deliberately fare evade or unconscientiously do not purchase a ticket during their journey.

**Both estimates** assume 50% of the passengers who refused to show their ticket did purchase a ticket during their journey.

**Alighters** are passengers who were recorded as alighting the train without undergoing the survey. For the purposes of this report we have assumed alighters will have the same irregularity rates as the service route they alighted from. As such they will have no impact on irregularity rates or revenue at risk.

## 2.4 Alternative methodologies – station cordon-based surveys

A number of alternative methodologies could be deployed in order to measure levels of ticketless travel. An alternative methodology could draw on the use of cordon-based surveys at stations where a team of four or more surveyors check passengers' tickets on entry to and/or exit from the station. Such a methodology would acknowledge that the destination station represents the location where there is a final and last opportunity for London Midland customers to purchase a ticket for their journey. This method may result in a more accurate measure of fare evasion being captured, but there are a number of reasons why this method was not chosen:-

- **A large number of stations to be surveyed and greater resource required** – survey teams large enough to cover the entrances and exits of stations across whole of the London Midland network would be required. A significant team of surveyors would be needed to interview all passengers exiting from gated termini stations and un-gated stations which would make the survey very expensive.
- **Presence of surveyors at stations may bias results** – situating surveyors within the ticket halls of un-gated stations may bias results as would-be fare evaders would then purchase a ticket. Positioning surveyors outside the exits of stations would mitigate this risk but it could then result in a higher refusal rate and/or individuals claiming to have disposed of their ticket.

Based on the above, the methodology chosen of on-train interviews represented the most appropriate survey approach.

## 2.5 Sample collected

Between 21st March and 24th April 2016, a total of 21,282 observations were collected. The tables below detail how many times each route was covered compared to the target coverage required.

Table 5 shows the journeys undertaken for each service route compared to the coverage requirements.

**Table 5 Journeys undertaken by service route**

Service Route	Weekday		Saturday		Sunday		Total	
	Target	Collected	Target	Collected	Target	Collected	Target	Collected
Snow Hill-Shirley/Henley-Stratford-U-Avon	3	10	1	2	1	5	5	17
Snow Hill-Dorridge-L Spa-Stratford-U-Avon	3	10	1	3	1	2	5	15
Snow Hill-Stourbridge Jct-K'Minster/B'grove-Worcester	3	21	1	9	1	6	5	36
Coventry-Nuneaton	2	5	1	1	1	2	4	8
New Street-Wolverhampton	2-3	10	1	3	1	4	4-5	17
New Street-Walsall-Hednesford-Rugeley Town	3	10	1	2	1	3	5	15
Lichfield-New Street-Redditch	3	26	1	6	1	7	5	39
Hereford-Gt Malvern-Worcester-New Street	2-3	6	1	4	1	5	4-5	15
New Street-Wolverhampton-Wellington/Shrewsbury	2-3	13	1	5	0	0	3-4	18
New Street-Bhm International-Coventry-Northampton	3	31	1	4	1	12	5	47
New Street-Crewe-Liverpool Lime St	3	54	1	4	1	6	5	64
Rugby-Nuneaton-Stafford-Stoke-Crewe	2-3	6	1	1	1	6	4-5	13
Euston-Milton Keynes-Northampton	3	40	1	12	1	8	5	60
Bedford-Bletchley	2	5	1	6	0	0	3	11
Watford Junction-St Albans Abbey	2	5	1	6	1	4	4	15
<b>Total</b>	<b>38-42</b>	<b>252</b>	<b>15</b>	<b>68</b>	<b>13</b>	<b>70</b>	<b>66-70</b>	<b>390</b>

Source: Tracsis, Halcrow analysis

Table 6 shows a breakdown of journeys undertaken by AM/PM periods, which is based on the service route start times.





Table 6 Surveys conducted breakdown by AM/PM Period compared to irregularity rates.

Service Group	Service Route	Weekday			Saturday			Sunday			Total Irregularities (%)
		AM	PM	Total	AM	PM	Total	AM	PM	Total	
EJ01	Snow Hill-Shirley/Henley-Stratford-U-Avon	6	4	10	0	2	2	1	4	5	14.0
EJ01	Snow Hill-Dorridge-L Spa-Stratford-U-Avon	3	7	10	0	3	3	1	1	2	18.0
EJ01	Snow Hill-Stourbridge Jct-K'Minster/B'grove-Worcester	8	13	21	2	7	9	3	3	6	14.1
EJ02	Coventry-Nuneaton	0	5	5	0	1	1	1	1	2	11.2
EJ03	New Street-Wolverhampton	7	3	10	2	1	3	1	3	4	15.7
EJ03	New Street-Walsall-Hednesford-Rugeley Town	5	5	10	1	1	2	1	2	3	16.9
EJ03	Lichfield-New Street-Redditch	9	17	26	4	2	6	2	5	7	15.9
EJ03	Hereford-Gt Malvern-Worcester-New Street	2	4	6	1	3	4	0	5	5	11.4
EJ04	New Street-Wolverhampton-Wellington/Shrewsbury	4	9	13	3	2	5	0	0	0	26.7
EJ03	New Street-Bhm International-Coventry-Northampton	12	19	31	1	3	4	7	5	12	5.8
EJ04	New Street-Crewe-Liverpool Lime St	23	31	54	2	2	4	2	4	6	3.8
EJ02	Rugby-Nuneaton-Stafford-Stoke-Crewe	0	6	6	0	1	1	3	3	6	4.0
EJ05	Euston-Milton Keynes-Northampton	17	23	40	2	10	12	5	3	8	2.2
EJ06	Bedford-Bletchley	2	3	5	2	4	6	0	0	0	1.6
EJ06	Watford Junction-St Albans Abbey	3	2	5	3	3	6	0	4	4	36.6
	<b>Total</b>	<b>101</b>	<b>151</b>	<b>252</b>	<b>23</b>	<b>45</b>	<b>68</b>	<b>27</b>	<b>43</b>	<b>70</b>	<b>11.0%</b>

Source: Tracsis, Halcrow analysis

Surveys were conducted across 390 journeys over the four week period. 252 journeys were undertaken on Weekdays with a 40:60 AM/PM split. 138 journeys were undertaken on the Weekend, with a fairly 35:65 AM/PM split. All routes surpassed the target requirements.

## 2.6 Cleaning and validation of survey data

The quality of the data collected from the on-train surveys is subject to any input errors or failure of surveyors to identify valid and/or invalid tickets. Although all surveyors are trained to recognise and validate all types of tickets on London Midland rail network, it is still possible that



there are some incorrectly coded interviews that could subsequently affect the overall rate of ticketless travel unless the data is cleaned and validated.

A list of the types of validation undertaken are presented below:-

- All irregularities logged as 'child impersonation' if an 'Adult' ticket was in fact recorded by the surveyor, was discarded from the analysis.
- Records listed with 'other' reasons for travelling without a ticket were assessed and amended to more applicable categories, such as other category 'payment not taken by machine' re-categorised to 'Ticket machine not working'.
- 'Regions' and 'Service Groups' were amended to be consistent with the Service Group description as per the Halcrow specification.
- The validity of all irregularities logged as 'overriding' was changed to 'valid' if the origin and destination of the ticket was within the stops the passenger was being surveyed at.
- The validity of all irregularities logged as 'misuse of railcard', if the ticket did not in fact require a railcard, was discarded from the analysis.
- 'Numbers missed' category was re-categorised as 'record alighters' and added to the alighter analysis.
- All records where permission was not first approved by the conductor were discarded from the analysis.
- Records which were logged as 'valid' with 'off-peak' or 'super off-peak' tickets that were not aligning with the ticket rules (e.g. leaving Birmingham New Street on an off-peak ticket prior to 9.30am) were discarded from the analysis.
- All records categorised with 'No-Ticket' where ticket details were recorded from the surveyor, was discarded from the analysis.

In total 286 records logged as 'record alighters' were removed from the analysis as they have no impact on irregularity rates or revenue at risk. A further 50 records were discarded and 37 records were amended from the survey analysis.



## 3 Results

This section summarises the results of the ticketless travel survey, presenting the irregularity rates and revenue at risk by service group. In addition, conclusions from the survey and next steps are provided.

### 3.1 Irregularity rates by time period and service group

The irregularity rate is the proportion of passengers that have an invalid ticket or no ticket at all. The results of the survey are (i) based on specific Weekday, Saturday and Sunday time slots and (ii) weighted by the 2014/15 London Midland revenue by service group.

The Revenue at Risk survey results have been weighted so that the overall rate of ticketless travel is representative by service group. The weightings are used to apply more importance to service groups which generate more revenue so that the overall rate of ticketless travel is representative of the entire London Midland franchise.

Mindful that a certain proportion of passengers surveyed and found to have no ticket may eventually purchase one from the conductor or at the destination station, we have provided upper and lower bound estimates of irregularity rates.

Table 7 illustrates the upper bound estimates of irregularity rates by time period and service group. This is based on an assumption that all passengers surveyed with no tickets do not purchase one later in their journey.



Table 7 Irregularity rates by Service Routes by time

Service Group No.	Service Group Description	Weekday (%)				Saturday (%)				Sunday (%)				Total (%)	Sample Size (#)
		06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59	06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59	06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59		
EJ01	Snow Hill-Shirley/Henley-Stratford-U-Avon	8.4	N/A	N/A	20.1	N/A	18.8	12.1	N/A	N/A	13.1	34.8	N/A	12.9	<b>698</b>
EJ01	Snow Hill-Dorridge-L Spa-Stratford-U-Avon	11.8	10.6	9.1	35.8	N/A	30.3	10.0	20.6	N/A	23.6	11.4	N/A	17.4	<b>1,118</b>
EJ01	Snow Hill-Stourbridge Jct-K'Minster/B'grove-Worcester	9.3	9.6	11.0	24.8	9.4	6.5	6.9	14.0	33.9	26.3	24.5	44.3	13.2	<b>2,620</b>
EJ02	Coventry-Nuneaton	N/A	11.9	N/A	26.7	N/A	N/A	0.0	N/A	N/A	5.7	N/A	N/A	10.6	<b>324</b>
EJ03	New Street-Wolverhampton	7.2	N/A	N/A	26.0	0.0	15.5	N/A	5.3	2.9	19.0	N/A	40.6	14.6	<b>916</b>
EJ03	New Street-Walsall-Hednesford-Rugeley Town	8.1	14.3	N/A	24.3	19.0	34.8	N/A	54.5	0.0	15.2	N/A	15.0	16.5	<b>905</b>
EJ03	Lichfield-New Street-Redditch	10.0	17.2	13.1	20.2	11.1	7.0	13.5	N/A	7.8	28.1	23.3	30.1	14.8	<b>2,275</b>
EJ03	Hereford-Gt Malvern-Worcester-New Street	7.8	5.2	13.6	25.0	N/A	13.8	12.5	N/A	0.0	10.8	15.3	N/A	10.7	<b>868</b>
EJ04	New Street-Wolverhampton-Wellington/Shrewsbury	7.1	9.8	10.6	48.5	32.5	14.6	63.9	N/A	N/A	N/A	N/A	N/A	26.6	<b>595</b>
EJ03	New Street-Bhm International-Coventry-Northampton	5.1	3.8	1.2	8.9	0.0	N/A	11.0	15.1	3.4	2.2	8.3	N/A	5.3	<b>2,510</b>
EJ04	New Street-Crewe-Liverpool Lime St	5.1	2.3	4.0	6.3	5.0	1.2	N/A	N/A	N/A	2.3	0.0	4.8	3.5	<b>3,801</b>
EJ02	Rugby-Nuneaton-Stafford-Stoke-Crewe	N/A	N/A	2.2	1.1	N/A	N/A	2.9	N/A	N/A	5.4	11.0	3.4	3.6	<b>757</b>
EJ05	Euston-Milton Keynes-Northampton	1.3	1.1	3.2	5.0	7.9	1.5	0.0	1.0	0.0	0.0	0.0	0.0	1.7	<b>2,449</b>



Service Group No.	Service Group Description	Weekday (%)				Saturday (%)				Sunday (%)				Total (%)	Sample Size (#)
		06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59	06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59	06:00 to 09:59	10:00 to 15:59	16:00 to 18:59	19:00 to 23:59		
EJ06	Bedford-Bletchley	N/A	4.0	2.1	0.0	0.0	1.1	0.0	0.0	N/A	N/A	N/A	N/A	1.6	273
EJ06	Watford Junction-St Albans Abbey	32.7	32.4	N/A	56.7	10.0	28.0	N/A	18.0	N/A	65.0	14.3	39.1	36.4	837
	<b>Overall</b>	<b>8.22%</b>	<b>7.92%</b>	<b>7.78%</b>	<b>19.95%</b>	<b>13.57%</b>	<b>11.90%</b>	<b>10.33%</b>	<b>11.31%</b>	<b>8.18%</b>	<b>13.90%</b>	<b>18.01%</b>	<b>28.13%</b>	<b>11.0%</b>	<b>20,946</b>

Source: Tracsis, Halcrow analysis

\*N/A denotes that no surveys were conducted

The findings show the highest irregularity rates on Watford Junction-St Albans Abbey (36.4%) and New Street-Wolverhampton-Wellington/Shrewsbury (26.6 %) services. The lowest irregularity rates are on Bedford-Bletchley services (1.6%) and Euston-Milton Keynes-Northampton services (1.7%). By day period, the irregularity rate tends to be higher on weekends than weekdays, with Sunday being the highest percentage for irregular tickets recorded. By time period, the PM off-peak period from 19:00 to 23:59 has higher irregularities (11.3% – 28.1%) while the other time periods from 06:00 to 18:59 are consistently lower (7.8% - 18.0%),

Some caution needs to be taken for the low irregularity rates on the Bedford-Bletchley services. This is due to majority passengers who were surveyed had purchased tickets at stations where purchasing facilities were available, as such not truly reflecting the nature this service route.

**Error! Reference source not found.** illustrates surveys of passengers whose origin stations had ticket purchasing facilities have almost zero irregularities. In instances where ticket purchasing facilities were not available, the percentage of irregularities was substantially higher (10%).

Table 8 Irregularity Rates for origin stations with and without ticketing facilities

Service Group Description	Ticket purchasing facilities (Y/N)	Irregularity Rates (%)	Sample Size
Bedford-Bletchley	Y	0.8%	251
Bedford-Bletchley	N	10.0%	20
Bedford-Bletchley	Refusal	N/A	2

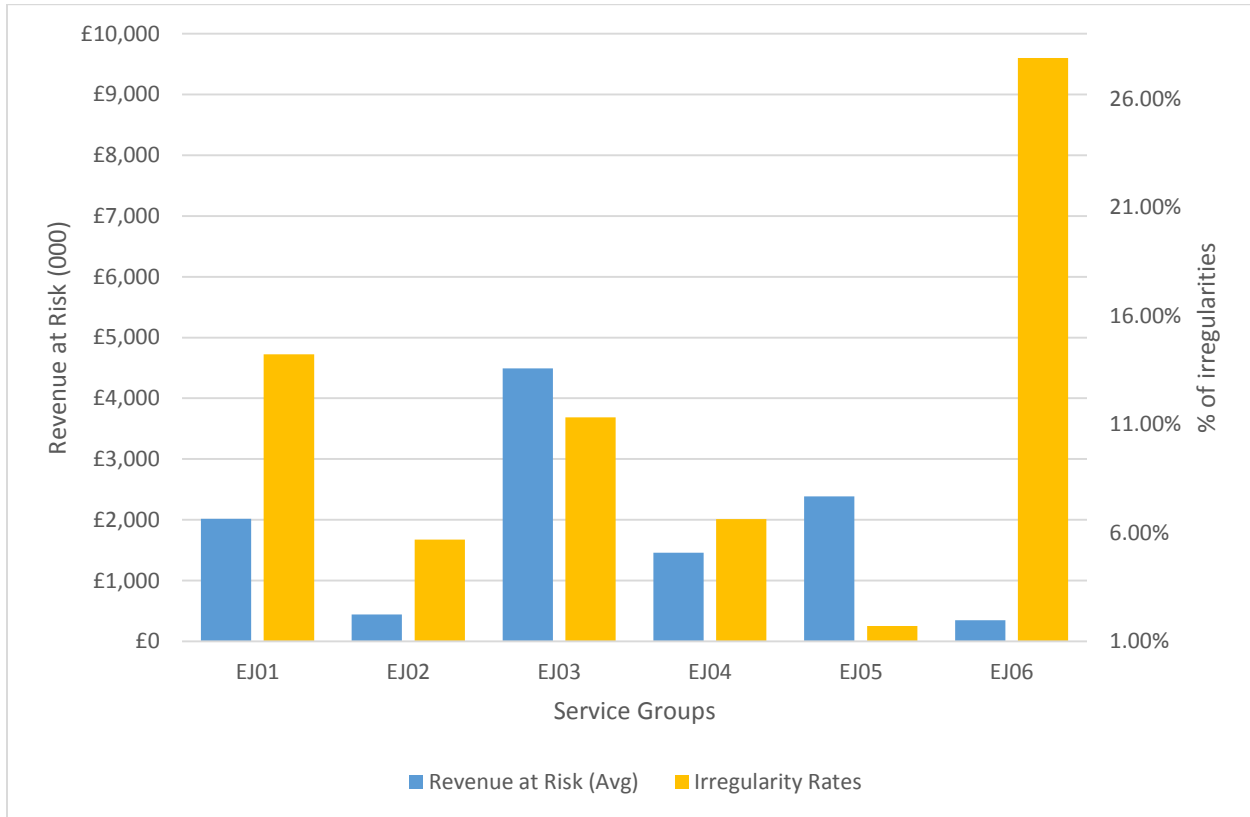


Service Group Description	Ticket purchasing facilities (Y/N)	Irregularity Rates (%)	Sample Size
Total		1.6%	273



It must be noted that these findings have not been weighted by revenue. After revenue weightings are considered, as shown in Figure 1, the proportion of irregularity rates does not always represent the Revenue at Risk. Service route EJ05 has one of the largest revenue at risk impacts for the franchise but very small irregularity rate, while EJ06 has the largest irregularity rate but small revenue impact.

Figure 1 Comparison of Revenue at Risk and Irregularity rates by service group





### 3.2 Results by type of irregularity

The survey findings in

Table 9 **Error! Reference source not found.** shows that a total of 89.3% of passengers surveyed had a valid ticket. Of the remaining passengers, the most prevalent reasons across most routes is due to was passengers having 'no of time to purchase a ticket' (3.3% total). Other major reasons are 'no ticket machine or booking office at the [origin] station' (1.9% total) and 'booking office closed' (1.0% total).

Table 9 Irregularity types by service route

Service Group No.	Service Group Description	Has a valid ticket (%)	No time to buy a ticket (%)	No ticket machine or booking office at station (%)	No Ticket Refused to give a reason (%)	Booking office closed (%)	Ticket machine not working (%)	Lost/forgot ten ticket (%)	Child impersonation (%)	Card-only ticket machine (%)	Overriding (%)	Sample Size (#)
EJ01	Snow Hill-Shirley/Henley-Stratford-U-Avon	86.7	4.4	3.0	1.7	1.6	1.0	0.1	0.1	0.0	0.0	698
EJ01	Snow Hill-Dorridge-L Spa-Stratford-U-Avon	82.3	6.9	3.5	3.0	1.3	0.8	0.7	0.0	0.4	0.0	1,118
EJ01	Snow Hill-Stourbridge Jct-K'Minster/B'grove-Worcester	86.4	3.6	3.1	2.6	1.6	0.2	0.4	0.3	0.1	0.1	2,620
EJ02	Coventry-Nuneaton	88.9	4.0	1.5	1.9	0.6	0.6	0.6	0.3	0.0	0.0	324
EJ03	New Street-Wolverhampton	85.3	4.4	2.2	4.1	0.4	0.0	0.4	0.5	0.0	0.1	916
EJ03	New Street-Walsall-Hednesford-Rugeley Town	83.1	5.3	2.4	1.2	2.7	1.4	0.4	0.1	1.4	0.1	905
EJ03	Lichfield-New Street-Redditch	84.8	4.7	1.5	2.9	2.4	0.8	0.5	0.2	0.2	0.3	2,275
EJ03	Hereford-Gt Malvern-Worcester-New Street	89.3	4.8	1.8	0.1	0.7	0.1	1.0	0.3	0.1	0.0	868





Service Group No.	Service Group Description	Has a valid ticket (%)	No time to buy a ticket (%)	No ticket machine or booking office at station (%)	No Ticket Refused to give a reason (%)	Booking office closed (%)	Ticket machine not working (%)	Lost/forgot ten ticket (%)	Child impersonation (%)	Card-only ticket machine (%)	Overriding (%)	Sample Size (#)
EJ04	New Street-Wolverhampton-Wellington/Shrewsbury	73.1	6.9	6.7	6.9	1.8	0.5	1.0	0.0	0.2	0.0	595
EJ03	New Street-Bhm International-Coventry-Northampton	94.5	1.7	0.8	0.4	0.6	0.3	0.4	0.2	0.0	0.1	2,510
EJ04	New Street-Crewe-Liverpool Lime St	96.2	1.7	0.4	0.1	0.2	0.2	0.1	0.0	0.0	0.0	3,801
EJ02	Rugby-Nuneaton-Stafford-Stoke-Crewe	96.2	1.3	0.1	0.3	0.8	0.3	0.0	0.1	0.0	0.0	757
EJ05	Euston-Milton Keynes-Northampton	97.8	0.3	0.3	0.3	0.0	0.0	0.1	0.0	0.0	0.0	2,449
EJ06	Bedford-Bletchley	98.2	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	273
EJ06	Watford Junction-St Albans Abbey	63.1	8.5	7.8	6.6	0.4	5.5	1.4	0.0	0.2	0.5	837
	<b>Overall</b>	<b>89.3%</b>	<b>3.3%</b>	<b>1.9%</b>	<b>1.7%</b>	<b>1.0%</b>	<b>0.6%</b>	<b>0.4%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>20,946</b>

Source: Tracsis, Halcrow analysis

'Other' irregularity types contribute to 1.5% of overall irregularity.



### 3.3 Estimated revenue at risk rates

The revenue at risk rate is the potential revenue estimated to be lost as a result of ticketless travel. The amount of revenue lost from each irregularity is assumed to be proportional to the average yield per passenger. A record of assumptions on the average loss of yield is presented in

Table 10.

Table 10 Assumptions on average loss of yield by irregularity type

Ticket Type	Category	Irregularity Description	% Upper Bound Revenue loss	% Lower Bound Revenue loss	Notes
Valid ticket	1	Has a valid ticket	0%	0%	
No ticket	2a	Lost/forgotten ticket	100%	100%	
	2b	No ticket machine/booking office at station	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2c	Card-only ticket machine and no credit/debit card available	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2d	No time to buy a ticket	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2e	Queue at ticket machine/booking office too long	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2f	Ticket machine does not offer required ticket	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2g	Booking office closed	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2h	Ticket machine not working	100%	0%	Considered as lack of facilities or access for lower bound estimate
	2i	Refused to give a reason	100%	100%	
	2j	Other (specify)	100%	100%	
	2k	None of the Above	100%	100%	
Invalid ticket	3a	Journey taken after valid date	100%	100%	



Ticket Type	Category	Irregularity Description	% Upper Bound Revenue loss	% Lower Bound Revenue loss	Notes
	3b	Overriding	90%	90%	Assume cheapest fare purchased in order to get through ticket gates
	3c	Misuse of railcard: cannot present appropriate card	33%	33%	Assume railcards provide a third off on average
	3d	Ticket used at invalid time	100%	100%	
	3e	Child impersonation	50%	50%	Assume yield on child ticket is half of adult
	3f	Invalid class	100%	100%	
	3g	Transferred use: using somebody else's pass	100%	100%	
	3h	Journey taken before valid date	100%	100%	
	3i	No ticket on travel card (only applicable for smartcards)	100%	100%	
	3j	Expired date (only applicable for smartcards)	100%	100%	
	3k	Invalid-Other (specify)	100%	100%	
Other	4a	Refusal (to participate in the survey)	50%	50%	Assume 50% loss @ av. yield
	4b	Record Alighters	Assume same irregularity rates as service route population		

Source: Halcrow

The results of the survey are weighted by the amount of revenue generated by service group according to 2014/15 Lennon data. The survey results have been weighted so that the overall revenue at risk is representative by service group. The revenue weightings apply more importance to service groups which generate more money so that the overall revenue at risk is representative of the entire London Midland franchise. Appendix A provides the revenue weightings used.



Table 11 illustrates the revenue weighted revenue at risk rates by service group.

**Table 11 Weighted revenue at risk, upper and lower bound estimates**

Service Group No.	LM Revenue 14/15 (£m)	Potential Loss of Revenue Upper bound (£m)	Uplift Factor Revenue at Risk (upper bound)	Potential Loss of Revenue Lower bound (£m)	Uplift Factor Revenue at Risk (lower bound)
EJ01	19,502	3,195	1.1%	841	0.3%
EJ02	11,380	675	0.2%	209	0.1%
EJ03	54,539	6,872	2.4%	2,110	0.7%
EJ04	31,320	2,213	0.8%	707	0.2%
EJ05	169,914	2,958	1.0%	1,816	0.6%
EJ06	1,400	540	0.2%	159	0.1%
<b>Overall</b>	<b>288,055</b>	<b>16,452</b>	<b>5.7%</b>	<b>5,842</b>	<b>2.0%</b>

Source: Tracsis, 2014/15 Lennon data, Halcrow analysis

The overall upper bound estimate of revenue at risk across the franchise is 5.7%. The service groups with the highest revenue at risk rates were EJ03 (0.7-2.4%), EJ05 (0.6-1.0%) and EJ01 (0.3-1.1%). The lowest revenue at risk rates EJ02 (0.1-0.2%) and EJ06 (0.1-0.2%).

Based on 2014/15 LENNON database, indicative revenue at risk on the West Midlands franchise is between £5.8m and £16.5m.



## 4 Appendix A

### Revenue weighting matrix (using 2014/15 LENNON database)

#	Service Group Description	Revenue 2014/15, (£m)	% of Revenue
ED01	EJ01	19,502	6.8%
ED02	EJ02	11,380	4.0%
ED04	EJ03	54,539	18.9%
ED05	EJ04	31,320	10.9%
ED06	EJ05	169,914	59.0%
ED07	EJ06	1,400	0.5%
	<b>Total</b>	<b>288,055</b>	<b>100.0%</b>