

Travel in London 2023

Focus report: Elizabeth line travel trends in the first year of operation

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is necessarily limited in scope since the full impacts of this transformational project will take years to embed as travel patterns settle and the wider impacts on homes, jobs, and people's lives are fully realised.

A key impact of the Elizabeth line that is not covered in this report is that which relates to unlocking development potential around station catchment areas thanks to the improved connectivity and journey time savings achieved with the new services. This is the subject of a longer-term [evaluation study](#) jointly sponsored by TfL and the Department for Transport where initial findings suggest that, between 2008 and 2021, prior to the opening of the central section, 54,725 new homes were delivered within one kilometre of future Elizabeth line stations.

The main conclusions from the present report are:

- The observed **level of demand** is broadly in line with what was expected in the latest business case update. In the first year of operation, the Elizabeth line saw 155.2 million journeys, of which 128.5 million journeys took place in financial year 2022/23. It is expected that financial year 2023/24 will see this reach 200 million journeys.
- On an **average mid-week day** in autumn 2023, the Elizabeth line sees nearly 700,000 journeys, a level similar to some of the busiest London Underground lines (like the Victoria, Jubilee, Central or District lines) and higher than that of the London Overground.
- In terms of its **temporal distribution** throughout the week and during the day, the demand on the Elizabeth line sees patterns similar to other rail services in London but slightly more aligned to London Overground and National Rail services than to the London Underground.
- **Occupancy levels** on the Elizabeth line are in line with the forecasts in terms of the location, timing and extent of on-train crowding and they indicate a well-used and busy railway but without any major crowding issues, save for some very specific links and times of the day and very rarely exceeding standing densities over three people per square metre.
- The largest **source of demand** (expressed in passenger kilometres) on the Elizabeth line is thought to be related to new trip generation and mode shift from other non-rail modes. There was also noticeable abstraction from former TfL Rail services (the former eastern and western arms, as would have been expected), London Underground and National Rail services, with much smaller abstraction from other TfL rail services like DLR and London Overground.
- In terms of its impact on **buses**, evidence suggests that rather than a net abstraction of bus demand to the Elizabeth line (which has only happened on some parallel routes), the opening of the Elizabeth line could be related to a small net generation of bus demand across the whole network of about 0.4-0.5 per cent of the total number of bus journeys across London.
- Finally, customer satisfaction data shows that since its opening the Elizabeth line has consistently been scoring levels of satisfaction that are well above the scores observed on other TfL public transport modes.

The same way that it happens on weekdays, the weekend demand profile is also very similar across the Elizabeth line, the London Underground and the London Overground, with noticeable differences mostly in the early mornings (where the Elizabeth line sees a relatively higher proportion of the daily demand) and the late evenings, where the London Underground has a higher peak related to the Night Tube services than any of the other networks and the Elizabeth line has relatively lower demand.

Train occupancy

The ideal outcome for the Elizabeth line would be a well-used but not overcrowded railway. Therefore, train occupancy is an important measure of success.

A good proxy measure for the assessment of train occupancy and crowding is standing density, which is calculated from the average number of people on board each train and the train's seating and standing capacity as the number of standing passengers per square metre. The standing density is zero when the number of passengers is below the seated capacity and therefore there are seats available. While evidence suggests that passengers start to experience discomfort once more than 60 per cent of the seats are taken, from a planning perspective it is typically considered that when the standing density exceeds two passengers per square metre there is 'crowding'.

This flexible metric can be calculated at different times of the day and by location (station-to-station link), and thus allows the identification of where and when crowding problems occur.

Overall occupancy levels

Figure 6 provides an overview of occupancy levels on the Elizabeth line during a typical mid-week day in September 2022 (once demand on the central section had settled but before the start of direct services from the outer branches to the central section) and in a recent week in October 2023, with the railway fully open.

Overall, occupancy levels on the Elizabeth line are as expected by the pre-opening forecasts in terms of the location, timing and extent of on-train crowding. These levels indicate a well-used and busy railway but without any major crowding issues save for some very specific links and times of the day, which suggests sufficient capacity both for relatively comfortable travel the large majority of the time and scope for future growth.

As expected, occupancy increased following the introduction of direct services from the outer branches to the central section in November 2022, but this is a direct result of the large increase in passenger journeys and passenger kilometres that this change enabled.

On weekends (particularly Saturdays, which on other TfL rail services are busier than some weekdays since the pandemic), crowding on the Elizabeth line does not seem to have been an issue and will thus not be considered further in this section.

Capacity provision, both on trains and within stations, will be kept under continuous review to identify opportunities for timetable changes that could lead to service optimisations as well as insights into better station management and future upgrades.

Connectivity and journey times

One of the key transformational impacts of the Elizabeth line is the improvement in public transport connectivity within the London and South East region. The new Elizabeth line services have cut journey times throughout the region and this has been followed by increases in travel demand, which have been largest where journey times have fallen the most.

Research shows that journey time is the most important driver of travel demand and the customer experience of passengers; and emerging TfL studies specifically on the Elizabeth line have shown that after nine months of operation of the Paddington to Abbey Wood services, a 10 per cent reduction in journey time led to a 6.4 per cent increase in demand (a journey time elasticity of -0.64). Furthermore, after only three months of operation on the Shenfield and Reading branches, even higher elasticities (of -0.90 and -0.92, respectively) were observed.

Reducing travel times is also a key benefit of transport projects since it allows passengers to spend their time more productively and free up time for other activities. This is particularly true for the Elizabeth line, where journey time savings and crowding relief (which also impacts generalised journey time) were the largest contributors to passenger and non-passenger benefits in the business case.

Expected journey time savings (unweighted generalised journey time)

Generalised journey time is a useful connectivity metric that provides a rounded indication of the overall customer experience of a public transport user by considering not only the in-vehicle travel time between an origin and a destination but also the interchange times, waiting times and the impact of crowding and fares (through appropriate weighting). It is therefore the preferred way of measuring journey time improvements.

At this stage the full, weighted computation of this metric is not yet available for the Elizabeth line, and it will be picked up for analysis and comparison against the forecasts by subsequent studies. However, an unweighted version exists which uses some assumptions (such as random station arrival) and includes most elements (in-vehicle time, waiting time, interchange time) but not others like crowding or the impact of fares. This version is a good proxy to provide a sense of the scale of the journey time benefits being enjoyed by Elizabeth line passengers. This section looks at the early journey time saving impacts using this metric.

As a new regional line connecting areas outside London at both its ends through the city centre, the Elizabeth line has made a huge difference to the connectivity and journey times to and from the city centre.

As an example, figure 11 shows the change in unweighted generalised journey times to and from Tottenham Court Road station (at peak service) before and after the opening of the Elizabeth line.

Demand generation and abstraction

Like in any new transport project, the demand for the Elizabeth line would have originated from two main sources:

- Firstly, the new travel choices unlocked by the new services as well as the changes to the generalised cost of travel by different modes and routes would have attracted a proportion of trips formerly made by other means, either on other public transport services or by other modes (trip abstraction). Most abstracted trips are likely to have come from parallel public transport services (buses and rail) but some would have come from other modes, and when these were private motorised modes like cars, vans or motorcycles, this abstraction would have contributed to the Mayor's overall aim for 80 per cent of journeys in London to be made by active, efficient and sustainable modes by 2041.
- Secondly, the connectivity benefits of the new service would have also prompted the realisation of new trips that would not otherwise have been made (trip generation), thus contributing to the growth and economic success of London.

A key part of the longer-term evaluation of the Elizabeth line lies in understanding to what extent (how many trips, in what proportion) the current demand on the Elizabeth line stems from trip generation and trip abstraction, and for the latter, how other public transport services have been affected, for example in terms of freed-up capacity that could be filled up by latent demand and/or provide a better customer experience to passengers (for instance in terms of lower occupancy levels).

This section provides an overview of current estimates of trip generation and abstraction on the Elizabeth line. This assessment is still evolving because time is needed for demand patterns on the new services and for background demand factors to fully settle (in particular, in relation to the recovery from the coronavirus pandemic).

Overall demand abstraction and generation estimates

Measuring generation and abstraction is not straightforward. It requires information on what passengers would have done in the absence of the new service (counter-factual), reliable data about what actually happened, and the ability to link changes to a cause.

This is further complicated by other external factors such as population change, service changes (including disruptions from industrial action and changes to fares), the ongoing recovery from the pandemic and wider macroeconomic factors (like the increased cost-of-living pressures).

Figure 13 provides our best estimates of passenger volumes on the Elizabeth line by source at various stages of the phased opening. This is expressed in terms of passenger kilometres (as opposed to passenger journeys) because it is a better measure that considers the distance travelled and is therefore more closely aligned to revenue.

These estimates are calculated looking at all possible routes between each pair of stations and assessing whether people may have switched to the Elizabeth line for these journeys. Grouping these pairs by how much they are impacted by the Elizabeth line it is then possible to estimate the proportion of journeys that have switched, how many are new and the level of background growth.

- Looking at it **over time**, it is clear that the subsequent milestones in the line's opening triggered step increases in the amount of demand generation and mode shift, which continued and consolidated up to September 2023, but much more modest change among the other sources.

In interpreting these results it is important to note that during this period overall travel demand in London continued to increase as part of the pandemic recovery and this would have concealed some of the abstraction. Furthermore, some lines (notably the Jubilee, Central and the DLR) had timetable changes at some point through this period (partly in response to demand reductions prompted by the opening of the Elizabeth line) and this would have also affected the estimates. However, all in all there is clear evidence of mostly genuine abstraction from these services.

Demand generation on the bus network

As would have been expected of a transformative project like the Elizabeth line, the connectivity and journey time improvements of the new services have attracted users from a wide catchment area around the Elizabeth line stations, many of whom have chosen to use buses as feeder services to access these stations. As such, one of the key impacts of the new line has been the observed increase in bus patronage around most Elizabeth line stations (figure I4).

Between May 2022 (before the opening of the Elizabeth line) and June 2023 (after the implementation of the final timetable), bus boardings around stations on the Woolwich branch increased by 37 per cent, and on the Reading and Shenfield branches by 21 per cent. Bus demand growth around Elizabeth line stations on the central section is lower than the network average, which suggests some abstraction.

While a certain level of demand abstraction from buses was expected, particularly on routes that run mostly parallel to the Elizabeth line, further analysis has shown that this decrease is more than compensated by increases on other bus routes (mostly those directly feeding into the Elizabeth line stations).

Figure I5 shows the change in bus patronage across the same time period on four subsets of bus routes, classified according to their relationship to the Elizabeth line into parallel routes, feeder routes, mixed routes (where the parallel/feeder distinction is blurry), and a control group of routes considered largely unaffected by the Elizabeth line.

Note that this analysis has some limitations, such as the presence of several other confounding factors like changes to bus services (some of them a consequence of the Elizabeth line), changes in bus network performance, and wider impacts from the pandemic recovery. However, some of these are partially accounted for with the use of the control group, and the results nonetheless present a clear picture, namely:

- As bus patronage continued the post-pandemic recovery (with a net increase of 6.2 per cent on the control group), demand on routes parallel to the Elizabeth line declined in relative terms (that is, has recovered less than the control group, with only a 3.9 per cent increase over the same period).
- On the flip side, there has been a much larger increase in bus patronage on feeder bus routes (8.0 per cent) and mixed routes (also 8.0 per cent), suggesting a small net bus demand generation (estimated at 0.4–0.5 per cent of current total bus journeys) related to the Elizabeth line opening.

Conclusions and next steps

The trends presented in this report cover the initial impacts on travel of what is much more than just a new railway, since the Elizabeth line will continue to have impacts on regeneration, connectivity, homes, jobs and the wider UK economy for years to come.

With a project of this scale, comprehensive monitoring, evaluation and benefits realisation work will need to be ongoing for years as the wider impacts of the scheme are fully realised and embedded.

This report should therefore be read as one of a series that TfL and the Department for Transport (partners in the Crossrail project that gave rise to the Elizabeth line) will undertake and commission over the coming years to understand all impacts of this scheme as and when these are realised and appropriate data is available for a robust evaluation.

Travel in London reports will continue to focus on the travel impacts and the evolving trends as well as on the contribution of the Elizabeth line to the Mayor's aims for transport as set out in the Mayor's Transport Strategy, such as the 2041 target for 80 per cent of trips in London to be made by active, efficient and sustainable modes, the Vision Zero for road danger and the ambition for a net zero carbon city by 2030.

TfL will also continue to keep the Elizabeth line services under constant review as demand settles following the latest timetable change in May 2023 and the ongoing recovery from the coronavirus pandemic to ensure that the benefits of this new line are optimised and enjoyed by all Londoners.