

INFECTION CONCERN ON PUBLIC TRANSPORT

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FRONTIER ECONOMICS

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EXECUTIVE SUMMARY

Background and aims

Previous research commissioned by the Department for Transport (DfT) suggests that some people are still hesitant to use public transport due to concerns about infections. For example, in DfT's Our Changing Travel survey, almost a fifth of respondents (19%) indicated that they had avoided public transport due to concerns about flu, coughs, colds and COVID-19 in November 2023 (Ipsos UK, 2023)¹.

To inform the future development of interventions that improve transport for the user, the Department for Transport (DfT) commissioned Frontier Economics and BMG Research to undertake qualitative research exploring people's concerns about infections such as flu, coughs, colds and COVID-19 in relation to their public transport use. The research objectives were:

- to understand people's infection concerns when using public transport;
- to understand the behaviour changes arising from these concerns, and what underpins them;
- to understand the impacts that these changes have on people's lives (for example, financial, social, or mental health impacts); and
- to explore how passengers with different levels of infection concern could collectively benefit from an improved user experience, and therefore either enable or increase their public transport use.

Methodology

The project involved:

- **a brief, non-systematic literature review** to provide context and background for the primary research.
- **24 in-depth interviews** with members of the public who had concerns about infections when using public transport. Interviews were conducted in January and February 2024. Through analysing these interviews, five typological categories were developed that highlight the similarities and differences between participants' infection concerns and public transport use. The categories and their descriptions (see main report) can be

¹ This reference is to a study conducted in November 2022. The November 2023 study is not yet published but follows a consistent methodology.

used to identify opportunities to enable more people to use public transport, as well as improve the experience of public transport for all users.

Findings

People's infection concerns when using public transport

The level of infection concern varied substantially across participants. Some participants had very few concerns and did not raise these in the interview until prompted, with other factors affecting their use of public transport more than infection concern. Others were very concerned about infection, generally sharing these concerns in the interviews without prompting.

Multiple causes of these concerns were identified, with the cleanliness of public transport and the amount of personal space available to users generally being most important to participants.

Behaviour changes arising from infection concerns

Some participants adjusted the way they used public transport in light of their infection concerns and the degree of adjustment varied between groups. The more substantial adjustments included travelling at different times of day to avoid busy services or avoiding public transport altogether, often switching to car travel instead (which was also seen as cheaper than public transport).

Other participants made low-level and/or inconsistent adjustments, such as using a sleeve to hold a railing or applying hand sanitiser, either because they were less concerned about infection or because they were unable to make larger adjustments (e.g. if public transport was their only transport option).

Impacts that the resulting behaviour changes have on people's lives

The qualitative research found limited evidence on the wider impacts of participants' adjustments to their public transport use beyond the immediate context of travel and transport. Where wider impacts were mentioned, they centred on health and wellbeing and financial impacts.

How passengers with different levels of infection concern could collectively benefit from an improved user experience

The research findings highlight possible measures that could enable or increase public transport use by improving passengers' user experience. These measures are:

- Cleanliness of public transport services was a key driver of people's infection concerns. Possible measures to improve the perception of cleanliness include more visible signs explaining cleaning practices, enhanced cleaning procedures, and newer vehicles.
- The importance of respecting different comfort levels among passengers should be emphasised. A publicity campaign might involve: highlighting that some passengers prefer to wear face masks and they should feel able to do so; and reminding passengers of basic hygiene principles when travelling generally and when unwell, in line with "catch it, bin it, kill it" messaging.
- Personal space was important to all participants, in some cases directly related to infection concerns and in others not. Two types of information about transport occupancy could help passengers to feel more comfortable about their personal space on public transport:
 - Transparency around which modes of transport are more 'spacious' (e.g. have high ceilings and effective ventilation).
 - Accurate, real-time information about departures and how busy services are, could allow passengers who are concerned about infection to make informed decisions about their travel and improve passengers' perceptions of public transport's reliability. However, there is a risk that sharing information about the busyness of services could instead discourage people from travelling, whether or not they have infection concerns.
- The review of the literature showed that access to open/fresh air impacted people's perceptions of infection. This was evident in some of the interviews too. Installing better ventilation systems and/or communicating ventilation standards and how those help reduce the risk of infection transmission could offer people some comfort.

These are potential solutions to infection concerns, which this research suggests are worth investigation.

1 Introduction

1.1 Background

Public transport is an important service for millions of people in the UK, enabling them to access work, education, health, leisure and social activities. There are numerous factors that affect people's use of public transport, as well as their satisfaction and wellbeing while travelling. One factor that was particularly highlighted during the COVID-19 pandemic and maintains relevance today is infection concern. While the COVID-19 pandemic was an unprecedented experience – at least in the last century – infections, such as flu, coughs, colds and COVID-19 are present in daily life. Previous research commissioned by the Department for Transport (DfT) suggests that some people are still hesitant to use public transport due to concerns about these infections. For example, in DfT's Our Changing Travel survey, almost a fifth of respondents (19%) indicated that they had avoided public transport due to concerns about infection in November 2023 (Ipsos UK, 2023)².

To deepen their understanding of this issue, in November 2023, DfT commissioned Frontier Economics and BMG Research to undertake qualitative research to explore people's concerns about infections such as flu, coughs, colds and COVID-19 in relation to their public transport use. The research also aimed to generate insights that may inform the future development of interventions to improve transport for the user.

1.2 Research objectives

The research seeks to address the following objectives:

- to understand people's infection concerns when using public transport;
- to understand the behaviour changes arising from these concerns, and what underpins them;
- to understand the impacts that these changes have on people's lives (for example, financial, social, or mental health impacts); and
- to explore how passengers with different levels of infection concern could collectively benefit from an improved user experience, and therefore either enable or increase their public transport use.

1.3 Methodology

A brief review of the literature on infection concerns and public transport was conducted. The purpose of this review was to provide context and generate topics for researchers to

² This reference is to a study conducted in November 2022. The November 2023 study is not yet published but follows a consistent methodology.

cover in the primary research, hence a non-systematic³ review was chosen as a proportionate approach. The scope of this review was literature on infection concerns and public transport. As the research centred on the qualitative interviews, a non-systematic review was chosen. An initial list of relevant sources was provided by DfT and additional sources were identified through a desk review. In total, 21 sources were reviewed, mostly consisting of academic articles and grey literature⁴. See Annex A for details on the method and Annex B for a summary of the sources included in the review.

The core of this research was 24 in-depth interviews with members of the public.

Participants were recruited via a third-party recruitment agency. To be eligible, participants had to have concerns about infection when using public transport, and have used public transport before and/or want to use it in the future. Further sampling criteria were chosen to ensure a diverse sample. See Annex C for the sampling criteria.

The interviews were conducted during January and February 2024. A topic guide was developed⁵ to ensure consistent coverage between researchers while also being flexible and responsive to participants' individual experiences. See Annex D for the full topic guide. Topics covered included:

- Current travel behaviour and experiences;
- Changes to travel behaviour and experiences; and
- Concern about infection.

Through analysing these interviews, five typological categories were developed, which highlight the similarities and differences between participants' infection concerns and public transport use. Finally, the research findings were presented at a roundtable event for discussion and reflection with DfT stakeholders.

1.4 Limitations of this research

The focus of this research was the primary qualitative data collection, and the literature review was conducted to provide the context for this. Due to resource and time constraints, the literature review is not fully comprehensive; there may have been additional relevant sources not captured in the review. The reviewed literature primarily relates to studies conducted during the COVID-19 pandemic, including when social distancing and other restrictions were in force. Additionally, while sources that were UK-based, from other European countries or countries with similar levels of economic development to the UK,

³ This review was non-systematic in that it was not an all-encompassing review of the relevant literature and did not follow a predefined protocol.

⁴ Grey literature covers publications by organisations outside of the traditional academic publishing channels, including reports, policy literature, government documents, working papers, newsletters, and speeches.

⁵ The topic guide was designed to follow the AFECTU framework (Graves, 2013). See Annex C (Data Collection) and Annex F for more detail on the AFECTU framework.

were prioritised, the literature in the review covered a range of locations that may differ from the UK. To support the interpretation of the literature review, where relevant, the COVID-19 related timeline, associated restrictions and location is noted against each source in Annex B.

The primary data collection in this research involved interviews with 24 participants who were eligible if they had infection concerns that affected their public transport use. Participants had a diverse set of characteristics and perspectives, but a larger sample size may have further developed the typology. The interviews were conducted in January and February 2024, months in which some infections are more prevalent, which could have affected participants' responses. In addition, the majority of each interview focused on a recent journey that a participant had taken. This focus could mean that participants did not have the opportunity to express all experiences and views on the research topic. These factors should be considered when determining whether the research findings are transferable to another context.

During the recruitment process, all participants reported having infection concerns, however, during the interviews, some participants described themselves as not being concerned. These participants did sometimes make adjustments (e.g. using hand sanitiser) when they travel, which could suggest they do have some concerns, even if they do not articulate them (see section 3.2.1 on 'Pragmatists'; the group of participants who described themselves as not concerned during the interviews). Future research should explore people's level of concern at the recruitment stage to maximise the relevance of the data collected to infection concern.

There was relatively little information, in either the interviews and the literature review, about the impacts of people's adjustments to their public transport use due to infection concerns. Interview participants generally found it challenging to articulate the impacts arising from any adjustments they made. It would be helpful for any further research into infection concerns on public transport to address this, in order to gain a more detailed understanding of the potential costs and benefits associated with behaviour change.

1.5 Structure of this report

The remainder of this report is structured as follows:

- Section 2 presents the brief, non-systematic review of the literature;
- Section 3 outlines the findings from the in-depth interviews, including a description of the passenger typologies identified in the research; and
- Section 4 provides the overall conclusions and discusses further work that could build upon this research.

2 Literature review

The literature review covers three areas: 1) the nature and level of concerns about contracting infections on public transport, generally and among specific sub-groups of the population; 2) how people have changed their travel-related behaviour and public transport use in response to these concerns; and 3) measures which might reduce infection concern and encourage people to use public transport. These areas correspond with of the research objectives, with the exception of the objective concerning wider impacts on people's lives of travel behaviour changes induced by infection concerns – for which insufficient sources were found.

The purpose of this review was to gather insights on infection concerns and public transport from relevant literature in order to provide context and inform the topic guide for the interviews. Details on the method are contained in Annex A and a list of the sources included in the review is in Annex B.

The majority of the recent literature reporting people's concerns about contracting infection on public transport relates to the COVID-19 pandemic (although this review included some additional sources relating to the 2009 swine flu pandemic⁶). It should be noted that findings from studies conducted during the COVID-19 pandemic are not automatically generalisable to other infections, now or in the future, given the unusual and novel nature of this pandemic. However, they do help to contextualise concerns about catching infections on public transport which may remain at the present time (early 2024) and provide insight to how such concerns might be addressed.

2.1 Nature and level of concern about infection on public transport

During the COVID-19 pandemic, concerns about infection risk on public transport were observed globally. In a review of 36 scientific publications on commuting during the pandemic (Zarabi et al., 2024), the majority of the reviewed papers (26 out of 36) referred to commuters' fears about using public transport. These fears were linked to the perceived risk of infection and the potentially life-threatening consequences of being exposed to infected air and/or surfaces, as well as proximity to other people. Concerns were not limited to transport modes themselves, but also in other travel-related areas with high human circulation, such as in waiting spaces like platforms or bus stops (Navarrete-Hernandez et al., 2023). Nor were people worried only about the infection risk to themselves. In a study conducted in four European cities, Sträuli et al. (2022) found that many people claimed to be avoiding public transport out of concern for the wellbeing of others (e.g. those who had no choice but to use public transport). Others were worried about passing an infection onto their family and friends.

⁶ The influenza virus strain A/H1N1.

Unsurprisingly, general levels of concern have fallen since the COVID-19 pandemic but were still evident among certain parts of the population in England in November 2022, when just under a third of people (30%) said they avoided public transport due to concerns about COVID-19 (Ipsos UK, 2023). This proportion had fallen since November 2021 (46%) but was still considerably higher than levels of concern had been during the previous pandemic to affect the UK – swine flu. Even at the height of the 2009 outbreak, Rubin et al. (2009 & 2010) found that between 2 and 3% of respondents to a survey in England, Scotland and Wales had reduced the amount they used public transport due to worries about swine flu.

Although a sense of (near) normality in terms of attitudes towards public transport had returned for most people by late 2022 (Ipsos UK, 2023), it is possible that the prolonged exposure to uncertainty during the COVID-19 pandemic may have had a longer-term impact on some passengers, who continue to experience discomfort when people sneeze, cough, or exhibit signs of illness around them (Navette-Hernandez et al., 2023; Zarabi et al., 2024).

The degree of concern about infection was not spread evenly across the population during, or immediately after, the COVID-19 pandemic.

Associations were found between levels of concern and some demographic characteristics. Research consistently showed that people with a physical or mental health condition or disability, or who lived in a household where at least one person was highly vulnerable, worried significantly more than average about contracting the virus on public transport (Navarrete-Hernandez et al., 2023), and were more likely to have avoided public transport for this reason (Ipsos MORI, 2022; Ipsos UK, 2023). A study conducted with a representative sample across in England in November 2022 also found that those from ethnic minority backgrounds, younger people, and those living in London⁷ were more likely than average to avoid public transport due to infection concerns (Ipsos UK, 2023), although these associations were not consistently observed across the reviewed international literature.

Individuals' degree of concern about infection on public transport during the COVID-19 pandemic was found to be associated with the extent to which they actually used public transport. Those who used public transport more frequently reported being less concerned about catching an infection than those who never used it (Sträuli et al., 2022; Kroesen et al., 2023). Similarly, a longitudinal survey conducted among a panel of train users in the Netherlands showed that people with stronger fears of infection in one wave of the pandemic tended to use the train less in the next wave. However, higher use of the train in one wave also led to reduced fear of infection in the next (Kroesen et al., 2023).

⁷ This likely reflects the large Underground system in London, which is generally perceived to have the highest risk of infection.

2.2 Travel behaviour change as a result of infection concerns

The types of travel behaviour change made in response to infection concerns on public transport, as described in the reviewed literature, can be categorised as: 1) reducing overall travel; 2) using modes of travel other than public transport; 3) avoiding travel at peak times and making adaptations while using public transport.

Overall travel reduced dramatically at certain points in the COVID-19 pandemic, but it is difficult to isolate concern about infection from other associated factors such as the restrictions on travel mandated by governments, the closure of places one would normally travel to (e.g. schools, offices, hospitality venues), and the radical increase in working from home. Kroesen et al. (2023) examined how fear of infection and working from home influence train use and the attitude towards train use, and found a series of interrelated bi-directional relationships. For example, people who continued to travel by train become less fearful of infection, while people who worked from home become more fearful of infection. People were found to align their attitudes and behaviours across multiple domains, so, for example, people who travelled more by train developed a more negative attitude towards working from home. Levels of working from home post-pandemic have remained above pre-pandemic levels (Office for National Statistics, 2023) and are positively correlated with income (Sträuli et al., 2022). The relationships between working from home, commuting by public transport, and remaining concerns about infection therefore remain complex, with underlying causal mechanisms poorly understood (Kroesen et al., 2023).

Concern about infection was observed to be an important reason to shift from public transport to car and active transport for commuting during the COVID-19 pandemic (Zarabi et al., 2024) – the other main reason being reduced service levels due to changes in public transport capacity and schedules. For example, 23% of workers in the Oslo region of Norway in 2021 had shifted to another transport mode (from public transport), of whom 37% cited worry about infection as a reason for the shifting (Nordbakke, 2022). The studies reviewed by Zarabi et al. (2024) reported a range of 9% to 90% decline in public transport use, a 5% to 42% increase in car-use, and a 3% to 33% increase in active transport use. Cycling, car use and walking were consistently ranked as safer than public transport (Sträuli et al., 2022). Bike-sharing systems also proved to be resilient (Teixeira & Lopes, 2020, cited in Zarabi et al, 2024). Intention to purchase a car also increased due to negative perceptions of public transport: a study in Boston found that 20% of zero-car households considered buying a car in response to the pandemic (Basu and Ferreira, 2021, cited in Zarabi et al., 2024).

Literature on the use of shared transport modes during and immediately after the pandemic are more sparse, but there is some evidence of an increase in the frequent (at least weekly) use of informal car-pooling (i.e. sharing lifts with people you know), taxi and app-based mini-cab services in November 2022 compared with both November 2021 and the period

immediately before the pandemic (Ipsos MORI, 2023). Car clubs⁸ tended to be considered a relatively safe option compared to public transport (Ipsos MORI, 2021b). Those who continued to use demand responsive transport during the pandemic had positive attitudes because of increased space (due to few other passengers) and perceived better vehicle design (i.e. large, well-ventilated) (Ipsos MORI, 2021b).

Transport mode share is now close to pre-pandemic levels in the UK. For example, in the week commencing 11th December 2023, daily use of National Rail was between 85-100% of a pre-COVID-19 baseline, while bus was 91-108% (DfT, 2024). However, some changes in travel behaviour might prove to have enduring effects which will only be fully understood over time – particularly those linked to the greater propensity for people to work from home.

Concern about infection led some people to change the time of their travel to avoid the busier services, and to make other adaptations whilst they used public transport (Sträuli et al., 2022). A study for DfT found that 28% of respondents reported having avoided travelling on public transport at peak times because of concerns about COVID-19 and other winter illnesses such as flu, coughs and colds (Ipsos MORI 2021a). Across the four European cities explored by Sträuli et al. (2022) respondents reported being extremely aware of everything they touched, such as stop buttons and support bars. Accordingly, some passengers developed new practices: sitting down to avoid touching bars and handles and using elbows and backs of hands when touching surfaces.

2.3 Measures that might help reduce concern about infections and encourage people to use public transport

Two elements were considered for this part of the review: 1) successes and failures of past policies and 2) future policy suggestions contained within the literature. Once more, the recent literature focuses on policy measures tested during the specific circumstances of the COVID-19 pandemic. Recommendations made at that time are not, therefore, applicable to the same degree in post-pandemic times. However, general principles, such the desire for visible cleanliness, may endure. Even in 2022, when all COVID-19 restrictions had been lifted, it was suggested that there remained a risk of disenfranchisement for those vulnerable users who needed public transport but were unlikely to do so without assurance of its safety (Beck et al., 2022).

Measures identified as improving people's perception of safety from infection on public transport included the wearing of face coverings, lower occupancy (and prior information about occupancy), cleanliness and ventilation.

- **Face coverings.** Generally, face coverings were found to be reassuring and were thought to provide an effective, additional barrier to spreading infection when people

⁸ Car clubs provide access to cars for short-term rental, including roundtrips and 'flexible' one-way trips. Vehicles may be owned by individuals and lent out on a peer-to-peer basis via an intermediary platform, or form part of a fleet owned by a single organisation.

cannot keep a physical distance (Beck et al., 2022; Ipsos MORI, 2021a; Ipsos MORI 2022). Some, however, found them uncomfortable (Ipsos MORI, 2022). Qualitative research conducted for DfT found that disabled people supported face coverings more strongly than other participants (Ipsos MORI, 2022).

- **Social distancing provided a more comfortable travel experience during the pandemic.** Social distancing was especially reassuring to women, who felt safer with more personal space, and disabled passengers, who had more room to move around public transport and find priority seating (Ipsos MORI, 2022). A study in Australia concluded that social distancing and hygiene measures were the measures most likely to encourage people to return to public transport in 2021 (Beck et al., 2022). Live information on how busy oncoming services were was welcomed, to help people avoid crowded services if they were concerned (Ipsos MORI, 2022).
- **People felt that more measures to improve visible hygiene measures would be reassuring** but reflected that there had not been a noticeable improvement during the pandemic (Ipsos MORI, 2021b; Ipsos MORI, 2022; Britain Thinks, 2022; Ipsos UK, 2023). Hand sanitising stations were valued by some people, in particular disabled passengers who rely on handrails, and some felt that more hand sanitiser points would have been helpful, especially on buses (Ipsos MORI, 2022). In contrast, others felt hand sanitiser was not effective because it is not possible to monitor other people's use of it (Navarrete-Hernandez et al., 2022).
- **People reacted positively to ventilation on transport**, particularly at peak travel times (Ipsos UK, 2023). However, some people were concerned about confrontation with other passengers if some passengers preferred windows closed (Ipsos MORI, 2022).

Most of these studies were undertaken in the UK, but an international literature review of factors influencing the effectiveness of COVID-19 transport measures also found that improving the quality and safety of public transport reduced psychological distress among users (Shortall et al., 2022). This global review concluded that the effectiveness of measures is very context-dependent, but that learning from experiences with previous viruses appeared to have made a positive contribution to policies that were successful at containing the virus.

Aside from measures described above, a broader suggestion from the literature is that general incentives to use public transport (e.g. free tickets) might help some people overcome anxieties simply by using it, which might lead them to use more public transport in future as their attitudes become more positive. This is based on the evidence of how changing a behaviour can lead individuals to change their attitudes (Kroesen et al. 2023).

3 Findings from the in-depth interviews

This section describes the typological categories that were developed by analysing the 24 in-depth interviews carried out in January and February 2024.

Five categories were developed: the Pragmatist, Daytripper, Concerned Commuter, Advocate and Carer. These five categories highlight the similarities and differences between participants' infection concerns and public transport use. The categories and their descriptions can be used to identify opportunities to enable more people to use public transport, as well as improve the experience of public transport for all users.

As discussed in section 1.4, all participants reported having infection concerns during the recruitment process. However, during the interviews, some described themselves as not being concerned. These participants described making low-level adjustments when travelling, which could suggest they do have some concerns, even if they do not articulate them as such. This is worth considering when determining whether the research findings are transferable to another context.

3.1 Overview of the five categories

Infection concerns were more pronounced in some categories than others, but all participants adjusted their behaviour to some extent. The adjustments ranged from changes participants perceived as low-level (like using a sleeve to hold a railing) and/or made inconsistently (like applying hand sanitiser); to avoiding public transport by either not travelling or using a different mode of transport.

The five typological categories differed in their self-concept; that is, how they viewed themselves. These self-concepts were a factor that underpinned each categories' infection concerns and any subsequent behaviour change. Each category adopted one of three positions:

- **That they are invulnerable or less vulnerable to illness, but make small adjustments,** either out of habit (the Pragmatist and Daytripper) or when they feel a little more vulnerable (the Daytripper). The adjustments they made had little impact on their lives more broadly.
- **That they are vulnerable to illness, and need to protect themselves and their capacity to earn** (the Concerned Commuter). They make adjustments while travelling, but again these had little impact on their lives more broadly, apart from sometimes deciding to avoid public transport. However, this choice was only possible for those who had the option to work from home.
- **That they are responsible for protecting others who are vulnerable so avoid public transport if necessary and possible** (the Advocate and Carer). The

adjustments they make, whether avoiding or continuing to use public transport, have more of an impact on their lives, by helping them to feel less anxious about potentially transmitting infection to their loved ones. Using their car instead of public transport was felt to have the additional impact of saving money.

As infection concerns increase, so do the number of ‘features’ they require when using public transport. For example, the Pragmatist, who describes themselves as not concerned about infection (even if some of their behaviours suggest they might be), only prioritises the speed of their journey. Whereas the Carer, who is most concerned about infection, requires all features apart from enjoyment (they avoid public transport where possible). Table 1 shows a summary of the key features of using public transport for the five categories.

Table 1 Key features of using public transport, by typological category

Typological category	Key features					
	Infection concerns*	Responsibility for others	Speed and/or convenience	Cleanliness	Enjoyment	Travelling off-peak
Pragmatist	✗	✗	✓	✗	✗	✗
Daytripper	✗	✗	✗	✗	✓	✓
Concerned Commuter	✓	✗	✓	✓	✗	✗
Advocate	✓	✓	✗	✓	✗	✓
Carer	✓	✓	✓	✓	✗	✓

Source: Interviews

Note: The Pragmatist and Daytripper have a ‘X’ for infection concerns, to indicate that this was not a key feature for them when using public transport.

Participants could potentially move between typological categories during their lifetime. For example, an individual may move between Advocate and Carer as they gain or lose caring responsibilities.

3.2 The five typological categories

The categories are presented in order of least to most concerned about infection when using public transport. Each category describes participants interviewed for this research only and should not be extrapolated to the wider population. Findings are illustrated with verbatim quotations throughout.

3.2.1 The Pragmatist

Participants in the Pragmatist category were under 60 and lived in urban or suburban areas. They used public transport for a range of reasons, including commuting and travelling to see family and friends. They were not reliant on public transport as they had a car but believed public transport “serves a purpose”. They had a range of public transport modes available to them where they live, which were easily accessible to them.

Pragmatists described themselves as not concerned about getting ill when using public transport. Ultimately, they believed that catching colds and flu when using public transport is unavoidable, and that concerns about infection should not impact on how people live their lives, including use of public transport. They might make adjustments when they travel, such as using hand sanitiser, not touching buttons (to open train doors) directly, and turning away from people who are coughing, and have made these adjustments since the COVID-19 pandemic. Making these adjustments could suggest that Pragmatists did have some concerns, but they described them as “nothing significant”, easy to make (and so proportionate to the perceived risk) and were not making them consistently.

“Everyone’s going to get a cold at some point. You can’t help it! It’s the season. I just try to travel at not-so-busy times⁹, don’t touch anything, and the risk is in the hands of God.” (Female, 45-59, urban)

Pragmatists largely followed government guidance during the COVID-19 pandemic and felt anxious about being infected with COVID-19 during that time. This was because they did not know what to expect from contracting the virus or were worried about infecting loved ones. However, catching COVID-19 and not feeling as unwell as they had anticipated, alongside restrictions being removed, meant that these concerns had dissipated (“if I get it again, fine”). This attitude was also seen among Pragmatists with physical health conditions.

“I’ve pushed [concerns] to one side [...] For a long time, we were in this mentality of ‘contact is dangerous’. That was the rhetoric we were all told [...] I probably carried on feeling like that longer after most of the population went back to ‘normal’ [due to shielding]. [...] I think it’s one of those things, when you’re worried about doing something, you do it and it’s okay, you think, ‘oh, well nothing happened’. You do that a few times then it eases off.” (Female, 18-29, suburban)

Instead of spending time and effort actively avoiding possible infection, the Pragmatist’s priority when travelling was reaching their destination as quickly as possible because “time is precious”. For some, this was combined with conserving their own energy (for people with physical health conditions), either by choosing the train over driving, or choosing the mode of public transport which dropped them nearest to their destination.

⁹ This participant’s preference to travel at “not-so-busy times” was driven by her wish for “space” and “serenity” when travelling, rather than concerns around infection.

“On my smartphone [...] I oscillate between Google Maps and Citymapper, because sometimes they will show comparable journey routes but other times they’ll show different ones. I always try to go with one that gets me there the fastest, right, because time and energy are finite. I don’t want to waste time.” (Female, 45-59, urban)

“I’ve got chronic fatigue, [...] so one of the ways that I find it helpful to my health in that sense, if I get the train rather than drive, I have a bit more energy. I can conserve a bit of energy that way.” (Female, 18-29, suburban)

Pragmatists also valued their “space” when using public transport and opted for quieter train or Underground carriages, or seats with an empty seat next to them on buses. This was because other passengers could be “annoying” and “rowdy”. While Pragmatists described themselves as not concerned about getting ill when using public transport, they did note a “lack of respect for hygiene” among other passengers, and wished they would cover their mouths when coughing and sneezing. Pragmatists saw this type of precaution as both common sense and polite.

3.2.2 The Daytripper

Participants in the Daytripper category were over 30 and lived in a range of areas – urban, suburban or rural. Their main reason for using public transport was for leisure purposes, such as shopping, and/or a ‘day out’ for hobbies or meeting friends. Using public transport was “enjoyable” for the most part, due to ease of use, and being able to enjoy the passing scenery and “people-watch”. Their journeys tended to involve an element of routine. For example, one participant got the same bus to explore his local beach most Saturdays, while another regularly travelled to various places in England by train to attend beer festivals at weekends.

Another aspect of routine for Daytrippers was having a preferred seat or sitting in a similar area of the bus or train (such as the least crowded train carriage or sitting next to an empty seat on the bus). They might choose off-peak services in the week or travel earlier in the morning on weekends. They made these decisions because they like “space” and wanted to avoid public transport users who behave in an anti-social way. For example, people arguing while on their phone, people being intimidating or aggressive towards the bus driver, people not covering their mouths when they cough, “laddish” football fans, or, “rowdy” young people. However, Daytrippers generally relaxed these ‘rules of thumb’ if they considered the journey by public transport to be a short one.

“I suppose that’s another reason why I like to get an earlier train [at the weekend] because I feel as though there’s a greater chance of there being some more free seats and things like that [...] If you get an earlier train you might miss a bit of rush hour weekend crowds.” (Male, 30-44, urban)

Daytrippers had slight concerns about infection, but these concerns did not impact on their use – or enjoyment – of public transport, including those with physical or mental health conditions. They made similar adjustments to Pragmatists when they travel but were more likely than Pragmatists to make these consciously and consistently since the COVID-19 pandemic. These adjustments included using hand sanitiser, not touching handles or buttons (to open train doors or to stop the bus) directly, turning away from people who are coughing, or sitting in quieter train carriages. However, their views about ventilation on public transport were mixed, with one participant describing how he finds the draft “annoying” when windows are opened on buses, whereas others believed a lack of ventilation on public transport is a “breeding ground” for infection, and that it feels “more healthy” to have a window open. By contrast, Pragmatists did not raise the issue of ventilation in their interviews.

“Perhaps before COVID we wouldn’t have been so fussy, but now we tend to go for the quieter places. We don’t want to be in with coughing and sneezing in busy carriages. Especially if it’s raining or it’s damp or something. The train just fills up with condensation and moisture, and germs breed in that. That’s in the back of our minds. [...] So yes, we tend to go more to the front of the train. It’s just quieter.” (Male, 45-59, rural)

“We got scare-mongered by the media surrounding COVID and that, [...] so I do worry about touching surfaces now where other people have been touching it [...] I pull my sleeve down, and I do that when I’m in public, you know, pressing pelican crossings, opening toilet doors, opening any doors. I won’t touch the [bus] handles now, unless I’ve got gloves on, or I pull my sleeve down.” (Male, 60-74, urban)

A sub-group of Daytrippers was over 60, (semi) retired and had a concessionary bus pass. They were very enthusiastic about being able to use the bus “for free” and had reduced their car use considerably as a result, as “parking is so expensive”, and also not driving meant they can “have a pint or two” on their trip. One participant had sold their car upon getting their bus pass. This sub-group of Daytrippers travelled off-peak (after 9:30am) when it was free, and because of the nature of their trips were not concerned about punctuality.

“I’m retired and I’m lucky enough to have time on my hands. It’s very nice to be able to get on a bus, because there are several places I can go apart from the shopping centre, and I think public transport is a great asset. Because I don’t have to pay, it’s just wonderful! You can go from one end of the country to the other if you want to, and just plan your journey a bit. I don’t have many complaints [...] Although sometimes the buses could be a bit cleaner, but that’s down to the passengers, isn’t it.” (Female, over 75, suburban)

3.2.3 The Concerned Commuter

Participants in the Concerned Commuter category lived in urban, suburban or semi-rural areas and travelled either to an office in the city or for work purposes across the country. This category also included one semi-retired person who “loves to work”; and a student who

lived in London and commuted to university by Docklands Light Railway (DLR) for learning and teaching purposes. Concerned Commuters' primary concerns are convenience and reliability and so they are the most likely to travel at peak times on mainline services. They prefer to travel by intercity train and will use urban buses for speed and convenience but avoid rural buses due to long travel times and unreliability. When they need to travel to rural areas, driving by car is the most convenient mode of transport.

Concerned Commuters expressed infection concerns around public transport without being prompted.

"I'm certainly more conscious of it [getting ill] during these months of coughing."
(Female, 60-74, rural)

A sub-group of the Concerned Commuters who travelled on crowded peak-time trains described taking proactive measures to avoid visibly ill passengers such as moving away, turning away, or choosing another seat. They also anticipated the risk of potential infection and took measures to avoid that risk. For example, some stood in the vestibules during shorter journeys where there were fewer people, or chose aisle seats to avoid uncomfortable situations with other passengers who may be unwell, noisy, or distracting. Another participant, reflecting on the changes she had made following the COVID-19 pandemic, described how they now avoid sitting on public transport altogether.

"Ever since the pandemic, there's just been a thing about [...] sitting down, and then as a habit, I just stopped doing that [...] Even a couple of months back I was even more cautious, because apparently there was a bedbug infestation going on in Paris and they were saying that it might spread to the Underground as well. Just as a matter of rule I just stand, and now I always have the specific spot that I like to stand at one corner, if I end up in that specific compartment in the middle." (Female, 18-29, urban)

Some Concerned Commuters avoided public transport entirely if they needed to stay healthy. However, that choice was only possible for those who could work from home.

"I would not use it [public transport] if there's something I need to go to [...] It's a shame because I should be able to trust going on to any train, regardless, and feel comfortable that I'm not going to get ill." (Male, 30-44, rural)

Concerned Commuters felt justified in their wariness and proactive behaviour, such as avoiding sitting on public transport or moving away from someone who coughs. This was closely linked with their frustrations that people do not have the same norms around illness and etiquette when travelling.

"I got a cold from someone on the train [...] I was sitting and there were a couple of students coughing and spluttering incessantly. No protection, no mask, no nothing

[...] You could clearly see that they're not well and they shouldn't really be on a train." (Male, 30-44, rural)

Concerned Commuters aimed to minimise avoidable illness and sick leave. Some Concerned Commuters connected their own recent illnesses and subsequent sick leave to travelling with visibly unwell people on public transport. One self-employed participant noted that illness had a direct impact on their earning potential.

"[I avoid] people who are obviously ill; you know, coughing and sneezing. I'm self-employed, and if I don't work, I don't earn. [...] I have to look after me and it [getting ill] interferes with my ability to work." (Female, 60-74, rural)

Outside of London and the South East, Concerned Commuters complained about the slower commuter trains as they were perceived as being much older and unclean.

One participant who was particularly concerned about infection mentioned the importance of clean train stations and the inconsistent provision of services to get clean (i.e., a pharmacy to buy sanitiser, or toilets to wash hands). Concerned Commuters tended to commute to and from large stations with accessible toilets and sinks to wash their hands, which helped them feel clean after travelling for a long time on public transport. In more rural areas, participants pointed out that frequently there are no toilets, or they are locked. Some mainline stations were described as "dusty".

Concerned Commuters believed that public transport was unclean partly due to other passengers littering and their poor hygiene practices, as well as inadequate cleaning schedules.

"I feel like we're going back to where it was before where lots of dirt is around. You don't see anyone keeping the train itself clean. They may be keeping the platforms clean but that doesn't really matter because it's so transient [...] Every time you go into the Underground and you come out, and if you blow your nose it's always grey snot. Sorry. [...] That's always the case, whereas if you take the DLR, you take the rail service, it's fine. There's nothing whatsoever. It's just weird for me. Sorry if that's too much information!" (Female, 18-29, urban)

While some modes of transport – such as the fast intercity trains – were considered cleaner, by virtue of being more spacious, newer and having fewer stops for passengers to board the train, they were still believed to be unclean compared to driving. That being said, Concerned Commuters liked being able to work on the train which gave it a distinct advantage over driving.

"I virtually always travel by public transport because you can travel and work, and arrive fresh." (Female, 60-74, rural)

Concerned Commuters had clear norms around travelling in shared spaces, and emphasised practising good hygiene and “taking responsibility” for keeping themselves healthy. As discussed previously, they took proactive measures that might be less comfortable but kept them healthy and productive. This mindset informed the way they acted when travelling too, which included keeping themselves and the area around them clean.

“After sitting down [...] I will then pull the thing [tray] down and wipe it, if I’ve got wet wipes with me.” (Female, 60-74, rural)

If someone nearby was constantly coughing, Concerned Commuters described getting up and moving away, although always “quietly” and without drawing attention to themselves. This was perceived as “taking responsibility” for their health, while not being rude towards other passengers.

“If someone was to sit down next to me and start coughing then I think it’s my obligation [to move], not theirs. I’ve certainly done that. I think it would be an imposition to turn around to them and say, ‘You must do something.’ That’s my choice, not theirs.” (Female, 60-74, rural)

[Some?] Concerned Commuters wanted all passengers to show etiquette to others by wearing a face mask or avoiding public transport when ill, or at least covering their mouths when coughing and using tissues. They wanted others to acknowledge the consequences of their actions and be more considerate when travelling, to improve everyone’s experience. One recommendation was to provide hand sanitiser on board and increase “catch it, bin it, kill it” messaging as a nudge to remind people to act in a way that will minimise transmission of illnesses.

3.2.4 The Advocate

Participants in the Advocate category lived in a one- or two-person household. They were strong supporters of public transport and used it as a point of principle, having the option of driving but choosing not to. They also used active modes of travel, like walking and cycling. They were community-minded and wished that other passengers were more considerate. They assumed a sense of mutual responsibility for making public transport feel safe and comfortable for everyone.

“We should all take personal responsibility to make it nice for everyone to travel [...], ensuring that trains are sufficiently clean, tidy, well-looked-after.” (Male, 30-44, rural)

Advocates were very concerned about infection and hygiene, believing that no one “wants to get a cold” (in contrast to the Pragmatist). Like Carers, they took the responsibility of trying not to spread COVID-19 during the pandemic seriously, and adhered to government restrictions and guidance, to protect themselves, loved ones and others who may have vulnerabilities or (hidden) disabilities. They often described how they continued to wear face

masks for a time after it stopped being mandatory. They felt frustrated at ongoing attitudes that they find to be “selfish” about infection concerns.

“There’s a tendency of people not really caring and saying, ‘Well if you get it, you get it. You’ll be fine.’ That’s not the point because no one really wants to get it. No one really wants to get COVID; no one really wants to get a cold.” (Male, 30-44, rural)

However, Advocates recognised that their concerns were atypical and so they tended to minimise their anxieties, worried that they might come across as paranoid or over-reactive. One participant described himself repeatedly and apologetically as a “germaphobe”, while another said her concerns were irrational and “emotionally driven”.

“Since I got COVID so badly, I feel definitely an anxiety with it. I feel like my anxiety is not rational for the actual risk [...] The irrationality of it, how much it bothers me, isn’t consistent with actual reality.” (Female, 18-29, suburban)

Advocates were well-prepared for travelling on public transport, taking actions that made them feel more protected against infection. These tended to be continuations of habits formed during the COVID-19 pandemic, such as wearing face masks. Some participants advocated for all public transport users to wear face masks when unwell and were more likely to explain the scientific reasoning behind doing so. It is not that they liked wearing masks, more that they were driven by a sense of social conscience and doing the “right thing” over personal comfort.

“As much as I hated wearing masks, there was a benefit: it stops, or it assists in the slowdown of, passing those germs.” (Male, 30-44, rural)

However, one participant raised concerns about mask-wearing, and how it can sometimes feel unsafe to do so due to other passengers’ negative reactions to it.

“I am nervous to do that because I just feel like there are some crazy people out there who would have a go at you for wearing a mask. It’s not happened so I don’t know if it’s just an irrational fear [...] I have some videos of people where they’re just wearing a mask and then someone is harassing them.” (Female, 18-29, suburban)

Advocates want to feel more in control over their experience of public transport – to feel safe, uncrowded, and clean. They made adjustments to try to achieve this, such as travelling outside of peak times, choosing modes of transport that are better ventilated, and avoiding people who are visibly unwell. However, ultimately, they believed their efforts were compromised by a number of factors. These included:

- Other passengers’ **lack of hygiene when ill**, such as coughing without covering their mouths.

- A **lack of hygiene more generally**, such as passengers not washing their hands after using the toilet.
- A **perception that the transport network is not regularly cleaned**, due to poor funding.
- **Overcrowding and poor ventilation**, particularly on buses.
- The threat of **harassment or bullying for taking precautions** such as wearing a face mask or opening a window to improve ventilation.

“Opening the window [on public transport] is still an issue. If you want to open the window because someone is coughing and spluttering, someone will come and close it [...] We have had stand-up battles about, ‘No, no. It’s too cold...’ My wife said: ‘too much infection here. We need fresh air.’ [They respond]: ‘Oh... You won’t catch COVID.’” (Male, 75+, rural)

Advocates were strong supporters of public transport and wanted to see it normalised and viewed positively by the public. They believed that the government is not investing in public transport infrastructure, and that a well-funded, safe and reliable transport network would reduce dependency on private car travel, positively impacting society by lowering carbon emissions and air pollution.

“I would say it [the bus] is my own private taxi. There are two of them every hour for you to take advantage of. I have described that to people who gnash their teeth at me and go off and get into their cars. They don’t see it that way at all but that’s how I describe it. It’s there waiting for people to use it.” (Male, 75+, rural)

“I think we live in an age of climate change [...] There’s that girl in London who they officially said had been killed by air pollution. It’s taking how many hundreds of communal years off the life of people living in a city. It’s crazy to me that there is such an obvious solution that’s been successfully implemented in numerous other countries [...] I just don’t think it’s viewed with the reality that it should be viewed, which is that you’re killing people. If there was a single silver bullet for all these problems in society – I think a well-functioning public transport network and cycling network would solve a lot.” (Female, 18-29, suburban)

However, they agreed that in its current form, public transport does not incentivise people to reduce their reliance on their cars. To counter this, participants suggested making public transport feel more hygienic, and specifically, better ventilated.

“I just feel like everything is really germey and gross and there is condensation dripping down the insides of the windows [...] There must be a way to better ventilate buses.” (Female, 18-29, suburban)

3.2.5 The Carer

Participants in the Carer category had children and/or other caring responsibilities, such as for elderly parents or grandchildren. Some had a disability or long-term health condition, and/or cared for someone that did.

Carers were generally more concerned about infection than other groups, particularly if they had elderly parents, and were more likely to raise these concerns spontaneously in interviews. Like Advocates, some Carers had a self-concept that included a sense of responsibility and duty that extended beyond their own self-interest and influenced their decision-making. However, the Advocates' sense of responsibility was directed at society more generally, while the Carers' responsibility was for loved ones, particularly those who were vulnerable to infection. For example, one Carer wore a face mask when out with an immune-suppressed relative, while another would delay seeing parents if they had recently used public transport in London.

“If I’m out with my mum [diagnosed breast cancer and immune-suppressed], she wears a mask still. So, if I’m out with her, she encourages me to wear one. If I’m not with her, I tend not to, but then she does tell me off. She says, ‘If you get a cough or a cold, then what will you do? How will you look after the kids?’ Like I said, it does impact us.” (Female, 30-44, urban)

When using public transport, some Carers preferred to travel off-peak as it made them feel less anxious.

“I would strategically not go during the rush hour if I can help it. I’ll try and go at an earlier time if I can [...] I’ll be honest, it [rush hour] triggers a bit of anxiety within me.” (Female, 45-59, urban)

Some chose to move to a quieter and less crowded carriage when they were travelling by train. They also preferred to choose seats where they were not sitting opposite another person, to minimise their risk of exposure. When travelling, many would bring personal hygiene products with them such as tissues and hand sanitiser, and this was considered particularly important when travelling with children, to minimise their risk of infection.

“I always take the little hand sanitiser with me [...] On the bus, I will do it as a matter of fact, get on, clean their hands. Especially the railings. They try to bite them and stuff.” (Female, 30-44, urban)

However, some Carers were not overly concerned about infection, and any concerns they had during the COVID-19 pandemic had abated. One participant described how she might avoid public transport if face masks were made mandatory; this was due to how face masks feel, rather than the principle of wearing them to reduce spread of infection, which she “wouldn’t be averse to”. Their preference to sit alone, or to travel at less crowded times, was linked to wanting “personal space” and “serenity” rather than to avoid contracting an illness.

“COVID and general coughs and colds, they feel no different to me than what they probably did in 2017 [...] If I’m on the tube now, and I see someone wearing a mask [...] I look at them, I’m like, ‘Why are you bothering?’” (Female, 30-44, rural)

Carers tended to prefer using cars or taxis over public transport, even when travelling alone. This was due to one or more reasons:

- **Wanting to protect children or parents from infection**, as discussed above.
- **Living in areas with less connected public transport.** This included a lack of integrated modal hubs (where bus stops and schedules are not linked up with rail), fewer marked-out active travel routes, and infrastructure that is car-centred. The transport system was perceived to favour commuters working full-time in a city, rather than journeys between lower-density areas. Unreliable and delayed journeys added further frustration.
- **Convenience**, due to the type of journeys taken by the Carer. They typically involved travelling between and across lower-density areas to take children to/from school, run errands, visit the doctor, meet friends, or commute to local part-time jobs. They usually needed to carry more items around with them, such as groceries for larger households, sports equipment for teenagers, or bags containing baby essentials. It was also more difficult to keep children safe on public transport, and manage their behaviour, both of which were stressful for Carers.

“With the bus, I find with the pushchair, it just causes more havoc. [...] You can’t just fold it with things already in there. [...] So, if you’re going to park it up somewhere and you’re folding it, you’ve got to remove all of that stuff. Like I said, I’ve got three [children] and they’re all a flight risk. They’re not going to stand there while I’m folding, unfolding, or taking things out. So, before we leave [the house], anything that will fit on my backpack, I’ll take that. Tissues and hand sanitisers or wipes. [...] In the car, I don’t mind how many bags I have. It doesn’t all have to fit in the backpack, and I know that I can also have the pushchair.” (Female, 30-44, urban)

- **Minimising costs.** Carers believed that travelling by car is less expensive than using public transport, as many do not qualify for concessionary pricing or passes that might otherwise encourage them to use it. They were also more likely to combine multiple trips in a day (such as visiting parents, running errands, doing the school run), which meant paying for multiple single journeys, which can add up. When travelling with their family, driving is considerably cheaper, as well as more flexible and convenient.

Most Carers occasionally used public transport to commute or travel into larger urban areas for leisure or holidays, but not for day-to-day activities. They also used public transport when there is no alternative, or the perceived advantages of driving were heavily outweighed by convenience and cost.

However, some Carers were entirely reliant on public transport, due to physical disability, long-term health conditions and low incomes, and would much prefer to use private vehicles if they had the option. These Carers disliked the experience of using public transport, as it could exacerbate their health concerns. For example, one participant described having to walk a long way to her nearest bus stop with heavy shopping bags, leaving her feeling “frustrated” and “stuck”.

“When the bus is late, you’re standing in the cold longer, and then that makes me ill. [...] I’ve got an underlying condition – like a weak immune system [...] I’m prone to getting colds and flu quite easily.” (Female, 44-59, urban)

Carers tended to view public transport as unclean and not cleaned frequently enough. When travelling on public transport, they preferred newer modes of transport that appeared cleaner and more spacious. This included high-speed intercity trains where they could pre-book seats, and the newer lines in London, such as the Elizabeth Line.

“It just seemed that the hygiene on the train wasn’t enough for times when there’s a lot of coughs, colds, flu, COVID. There are a lot of surfaces to be touched that don’t seem to be ever cleaned [...] I just felt very unhealthy on that train.” (Female, 60-74, rural)

Like other groups, Carers felt uncomfortable travelling due to their perception of others being unhygienic. They described the value of “personal space”, which was linked to not regularly spending time in crowded public spaces.

“There’s nothing else that I do in my day-to-day life where I am that physically close to people that I don’t know. So, I try and avoid it [public transport].” (Female, 30-44, urban)

4 Conclusions

Through a brief review of the literature and 24 in-depth interviews, this research aimed to explore people's concerns about infections such as flu, coughs, colds and COVID-19 in relation to their public transport use. The research also aimed to generate insights that may inform the future development of interventions to improve transport for the user and further research into infection concern around public transport.

This research addressed four objectives:

- to understand people's infection concerns when using public transport;
- to understand the behaviour changes arising from these concerns, and what underpins them;
- to understand the impacts that these changes have on people's lives (for example, financial, social, or mental health impacts); and
- to explore how passengers with different levels of infection concern could collectively benefit from an improved user experience, and therefore either enable or increase their public transport use.

The following sections summarise the main findings for each of these research objectives and identify issues that might require further investigation.

4.1 People's infection concerns when using public transport

Some participants were concerned about catching infection on public transport, for fear of either themselves and/or others (who may be vulnerable) becoming ill as a result. Infection concerns were more pronounced in some groups than others. For example, people in vulnerable circumstances, such as those with respiratory conditions, were particularly concerned that catching an infection such as flu or COVID-19 would exacerbate their pre-existing conditions. This corresponds with the greater concerns expressed by people with underlying health conditions during the pandemic (Navarrete-Hernandez et al., 2023; Ipsos UK, 2023). Although all participants reported having infection concerns during recruitment, some participants only mentioned these concerns when prompted, which may suggest that their concerns are less material or not at the forefront of their minds on public transport.

Three main factors influenced participant's perceptions of safety from infection on public transport:

- Firstly, a key concern was the cleanliness of public transport and the implications a lack of cleanliness had for infection transmission. Participants were unsure about the frequency and type of cleaning that takes place and would sometimes take their own

measures to improve cleanliness, for example using hand sanitiser and hand washing. There is a possible distinction between actual cleanliness and people's perceived cleanliness. For example, the new Elizabeth Line in London was perceived as being clean, however this may have been conflated with the newness of the service. Older modes of transport may appear uncared for, unpainted, and dented, and this could translate into perceptions that public transport is not being regularly cleaned.

- Secondly, a priority for all participants in this study was personal space on public transport, whether or not it was related to infection concerns.
- Thirdly, access to open/fresh air impacted people's perceptions of infection. Interview participants' perspectives on this varied; some disliked open windows on buses due to the draft, while others believed a lack of ventilation on public transport is a "breeding ground" for infection.

This suggests that the reassurance that had been offered by cleaning, physical distancing and ventilation during the pandemic (e.g. Ipsos MORI, 2022; Beck et al., 2022) remains important for some passengers, although the wearing of face coverings may now have become more problematic (see below). The behaviour of other passengers also exacerbated infection concerns. For example, unhygienic behaviour from other passengers, either when ill, such as coughing without covering their mouths, or more generally, such as not washing their hands after using the toilet, was considered concerning. Some participants (in particular, the Advocates) were worried about other people's perceptions of them, if they showed signs of infection concern. The interviews also suggested that some people were concerned about confrontation if they continued to wear a face mask on public transport.

4.2 Behaviour changes arising from these infection concerns

Participants reported making various adjustments to their public transport travel in light of their infection concerns:

- Some people made low-level adjustments, like using a sleeve to hold a railing or applying hand sanitiser, but often did so unconsciously and/or inconsistently.
- In instances where participants had the flexibility to do so, some changed the time at which they travelled, for example switching to a less busy, off-peak service instead of travelling at peak commuting times.
- Some participants in vulnerable circumstances had resorted to 'avoidance coping' and avoided public transport altogether. This was due to the perceived increased risk of infection on public transport (either for themselves or a vulnerable loved one), having to share space with strangers, and its unpredictability. They used their cars instead, as they found driving to be a safer and less stressful option. It will be challenging to break the psychological cycle of 'avoidance coping', seen in groups like the Carers. This corresponds with conclusions from some of the COVID-19 literature that people who

continued to travel by public transport become less fearful of infection, and vice versa (Kroesen, et al. 2023), and that vulnerable users might struggle to return to public transport after the pandemic (Beck et al., 2022).

- The review of the literature found that some people switched to active travel in response to infection concerns (e.g. Zarabi, 2024), although this was during COVID-19 when there were restrictions on all forms of travel. While this was not reported explicitly by interview participants, Advocates, who were concerned about infection, were more likely to describe active modes of travel, like walking and cycling. However, this could have been for environmental reasons rather the infection concerns.

4.3 Impacts that the resulting behaviour changes have on people's lives

There was relatively little information, both in the interviews and the review of the literature, about the impacts of people's adjustments to their public transport use due to infection concerns (these impacts could be, for example, financial, social or health-related). Participants generally found it challenging to articulate the impacts arising from any adjustments they made. Where impacts were raised, they included the following:

- **Health and wellbeing:** The adjustments participants made to protect either themselves if they had a health condition, or others if they were vulnerable, had an impact on participants' overall wellbeing, by helping them to feel less anxious about potentially catching an infection or transmitting to their loved ones.
- **Financial:** Those who decided to use their car instead of public transport described how it saved them money. In addition, a self-employed participant tried to avoid visibly unwell people on public transport to maintain their income, as if they became ill it had a direct and negative impact on their earning potential.

It would be helpful for any further research into infection concerns on public transport to address this, in order to gain a more detailed understanding of the potential costs and benefits associated with behaviour change.

4.4 Options for enabling or increasing public transport use

Options for improving the user experience of passengers with different levels of infection concern, and either enabling or increasing public transport use, are outlined below. These recommendations come from interview participants, roundtable attendees, and implications drawn from the research team.

- Potential measures to improve the perception of cleanliness include more visible signs explaining cleaning practices, enhanced cleaning procedures, and newer vehicles. The review of the literature found that cleaning being demonstrated as taking place regularly,

for example by publishing cleaning schedules or explaining what ‘cleaning’ means in practice, could help to myth-bust and potentially provide reassurance to passengers.

- Publicity campaigns to promote consideration for other passengers by, for example, not travelling by public transport when ill or wearing a face mask, could help reduce passengers’ fear of infection by reducing the display of unhygienic behaviours that were reported as being concerning. A publicity campaign might involve: highlighting that some passengers prefer to wear face masks and they should feel able to do so; reminding passengers of basic hygiene principles when travelling, in line with “catch it, bin it, kill it” messaging. Such publicity campaigns could also help to reduce fear of confrontation about passenger’s own adjustments, for example opening windows or mask wearing, because a wider set of people would recognise the effectiveness of those adjustments at reducing infection transmission. However, it should be noted that publicity campaigns could remind passengers that some people travel when ill, which could have the unintended consequence of increasing infection concerns. In addition, efforts should be made to understand how the ‘illusion of invulnerability’ (which can lead people to [incorrectly] assume they are not at risk of infection – (Grant and Hofmann, 2011)) works for groups like the Pragmatists, and a campaign developed for shifting mindsets from an ‘I’m travelling’ approach to a more collective ‘we are travelling’ one, where they view their journey as a shared experience.

- More spacious public transport would enable people to have more space, and simultaneously help mitigate the risk of infection for those who are concerned. Regardless of how spacious public transport is, access to better information could enable passengers to feel they have more personal space in two respects:
 - Transparency around which modes of transport are more ‘spacious’, for example those that have high ceilings, and more effective ventilation, may help support concerned passengers to make more informed choices.

 - Participants, whether concerned about infection or not, consider convenience key when deciding whether to travel by public transport. Greater promotion of public transport apps, which provide accurate, real-time departure information, might help people view public transport as a reliable option and so increase their use – particularly for buses. Information about how busy services are could also allow passengers who are concerned about infection to make informed choices before they travel. However, it should be noted that sharing information about the busyness of services could have the unintended consequence of discouraging people, both those with and without infection concerns, from travelling.

- The review of the literature showed that access to open/fresh air impacted people’s perceptions of infection. This was evident in some of the interviews too. Installing better ventilation systems and/or communicating ventilation standards and how those help reduce the risk of infection transmission could offer people some comfort.

4.5 Topics for further research

Future research into people's concerns about infections in relation to their public transport use might include:

- The review of the literature focused predominantly on periods affected by COVID-19, which was an exceptional time in terms of infection risk and resulting behaviour change. This research has been successful in achieving an insight into the research questions outside the COVID-19 lens but it would be helpful to understand how these infection concerns evolve in the future, further on from the direct effects of the pandemic.
- As mentioned in Section 4.3, the interviews and the review of the literature found limited information about the wider impacts of people's travel adjustments in light of their infection concerns when using public transport. It would be helpful for future research to address this.
- During the recruitment process, all participants reported having infection concerns, however, during the interviews, some participants described themselves as not being concerned (even if some of their travel behaviours suggested they might be). Future qualitative research in this area could usefully explore people's level of concern at the recruitment stage.

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Annex A Literature review method

Scope

A brief, non-systematic review of existing literature on infection concern and public transport was conducted to provide context and inform the primary research. More specifically, the research questions for the review of the literature were as follows:

- Are people concerned about infection on public transport? If so, what are people concerned about and are any sub-groups of the population more concerned than others?
- How have people changed their travel-related behaviour and public transport use in response to these infection concerns?
- Has people's behaviour change in response to their infection concerns impacted their lives, including any mental health, physical health, professional, or financial impacts?
- What measures might reduce infection concern and encourage people to use public transport? For this question, two elements were considered i) implemented policies, drawing upon their successes and failures, and ii) any policy suggestions that study participants or authors made. The literature review also tried to capture any potential unanticipated consequences that each of the policies may (or did) have.

Searches

The review started with a list of sources provided by DfT at the outset of the project. This list included academic articles and government research reports. After reviewing those sources in detail, evidence gaps in the research questions were identified. Literature to fill those gaps was then found using a combination of keyword searches related to the research questions on databases (e.g. Google, Google Scholar, JSTOR, and ScienceDirect), 'snowballing' (manually screening the reference lists of literature already reviewed) and reading executive summaries. Relevance to the research question was assessed by reading the titles, abstracts, and executive summaries of sources.

There were no strict limitations on study location but where available, literature from European countries or countries with similar levels of economic development to the UK was prioritised. Similarly, there were no date limitations, but more recent literature was prioritised. It was also noted when the study was conducted relative to the COVID-19 restrictions in each country; if the evidence was specific to a time with restrictions, it was noted that it may limit the extent to which the conclusions from the research were relevant today.

The majority of recent sources were specifically focused on COVID-19; therefore, specific searches were also conducted to identify pre-COVID-19 sources.

Extraction and synthesis

In total, 19 sources were reviewed, mostly consisting of journal articles and grey literature¹⁰ and covering a range of primary research, systematic reviews and discussion articles. For each of the sources, information relevant to the research questions was extracted and summarised in matrix form to allow for easy comparison across sources. See Annex B for details of the sources reviewed.

In addition to understanding the existing literature, the literature review was also used to identify any gaps in the evidence and generated insights useful for informing the design of the in-depth interviews. For example, by identifying the types of behaviour change that might occur when people are concerned about infections, the interviews were designed to explore this in more detail. Finally, the review of the literature, together with the findings from the in-depth interviews, informed the design and discussion of the roundtable.

¹⁰ Grey literature covers publications by organisations outside of the traditional academic publishing channels, including reports, policy literature, government documents, working papers, newsletters, and speeches.

Annex B Literature review sources

Reference	Data collection	Location	Data collection timeline relative to COVID-19
Beck, M.J., Nelson, J.D. and Hensher, D.A. (2023) 'Attitudes toward public transport post Delta COVID-19 lockdowns: Identifying user segments and policies to restore confidence', <i>International Journal of Sustainable Transportation</i> , 17(8), pp. 827–844. Available at: https://doi.org/10.1080/15568318.2022.2109083 .	5 to 7 July 2021	Australia (Greater Sydney Metropolitan Area and South East Queensland)	Delta variant emerging. Greater Sydney Metropolitan Area had been in lockdown for a week. South East Queensland was in a circuit breaker lockdown from 29 June to 3 July 2021.
Britain Thinks (2022) 'Coronavirus (COVID-19) vaccination and confidence in travel'. Available at: https://www.gov.uk/government/publications/coronavirus-covid-19-vaccination-and-confidence-in-travel .	20 to 25 January 2021	England	UK in a national lockdown and daily deaths from COVID-19 were reaching some of the highest numbers of the pandemic. New variants emerging. Vaccinations underway.
DfT (2023) 'Increasing bus patronage through an audience strategy'. Available at: https://www.gov.uk/government/publications/increasing-bus-patronage-through-an-audience-strategy .	October 2021	England	Nearly 3 months after legal restrictions on social contact were removed.
Goscé, L. and Johansson, A. (2018) 'Analysing the link between public transport use and airborne transmission: mobility and contagion in the London underground', <i>Environmental Health</i> , 17(1), p. 84. Available at: https://doi.org/10.1186/s12940-018-0427-5 .	November 2009	London	Not applicable – data collected before COVID-19.

Reference	Data collection	Location	Data collection timeline relative to COVID-19
Ipsos MORI (2021) ‘Shared mobility: User attitudes during COVID-19’. Available at: https://www.gov.uk/government/publications/shared-mobility-user-attitudes .	7 to 18 December 2020	UK	UK had entered second national lockdown. Christmas relaxation of restrictions had been announced, as had the successful development of a vaccine. Fieldwork was completed before the surge in cases at the very end of 2020 and start of 2021.
Ipsos MORI (2022) ‘All Change? Longitudinal travel tracker: Wave 6’. Available at: https://www.gov.uk/government/publications/covid-19-travel-behaviour-during-the-lockdown .	4 to 29 November 2021	England, Scotland, Wales and Northern Ireland	All restrictions on social contact eased but concerns about the Omicron variant were covered in the media on 25 November, just before the data collection ended on 29 November.
Ipsos MORI (2022). ‘Confidence in Public Transport: Summer 2021’. Available at: https://www.gov.uk/government/publications/confidence-in-using-public-transport-during-coronavirus-covid-19 .	26 May to 10 June 2021	England	Restrictions in place included ‘rule of six’ for indoor social gatherings and some indoor venues (e.g. pubs, restaurants, cinemas) were open. Further lifting of restrictions was expected on 21 June but this was delayed. The announcement of the delay to restrictions being lifted was made on 14th June, just after data collection ended.
Ipsos UK (2023) ‘Our Changing Travel: Research into how people’s travel choices are changing, November 2022’. Available at: https://www.gov.uk/government/publications/our-changing-travel-how-peoples-travel-choices-are-changing .	Survey and focus groups November 2022. Interviews February 2023	England	All restrictions eased.

Reference	Data collection	Location	Data collection timeline relative to COVID-19
Kantar Public Behavioural Practice (2022) 'Covid-19 Behavioural Studies for the Department for Transport'. Available at: https://www.gov.uk/government/publications/message-testing-studies-on-transport-and-coronavirus-covid-19 .	Autumn 2020, Spring 2021, Summer 2021	England	Various restrictions in place.
Kroesen, M. et al. (2023) 'Exploring attitude-behaviour dynamics during COVID-19: How fear of infection and working from home influence train use and the attitude toward this mode', <i>Transportation Research Part A: Policy and Practice</i> , 167, p. 103560. Available at: https://doi.org/10.1016/j.tra.2022.103560 .	April, June, September and December 2020	Netherlands	April 2020: train travel was only allowed for people working in essential sectors; June 2020: end of lockdown but still many limitations; September 2020: more working allowed in the office; December 2020: second COVID-19 wave and news about vaccine.
Navarrete-Hernandez, P., Rennert, L. and Balducci, A. (2023) 'An evaluation of the impact of COVID-19 safety measures in public transit spaces on riders' Worry of virus contraction', <i>Transport Policy</i> , 131, pp. 1–12. Available at: https://doi.org/10.1016/j.tranpol.2022.11.011 .	10 November 2020 to 10 January 2021	UK (London), Italy (Milan), Chile (Santiago)	In the UK, national lockdown. In Italy, some restrictions on people's movement, mostly online schooling, hospitality closed. In Chile, phased re-opening. In all countries, face masks were compulsory and social distancing was encouraged.
Nordbakke, S.T.D. (2022) 'Changes in travel behaviour during the pandemic: Exploring why public transport is not back to pre-pandemic levels', <i>Findings</i> . Available at https://doi.org/10.32866/001c.37378 .	25 November to 5 December 2021	Norway (Oslo region)	All restrictions eased.
Rubin, G.J. et al. (2009) 'Public perceptions, anxiety, and behaviour change in relation to the swine flu outbreak: cross sectional telephone survey', <i>BMJ</i> , 339, p. b2651. Available at: https://doi.org/10.1136/bmj.b2651 .	8 to 12 May 2009	England, Scotland and Wales	Data collected during the swine flu pandemic. In the UK, media reporting on swine flu started at the end April 2009, and first two cases were confirmed on 27 April. By the end of the data collection period, 65 people in the UK were confirmed to have swine flu and several schools closed.

Reference	Data collection	Location	Data collection timeline relative to COVID-19
Rubin, G.J., Potts, H.W.W. and Michie, S. (2010) 'The impact of communications about swine flu (influenza A H1N1v) on public responses to the outbreak: results from 36 national telephone surveys in the UK', Health technology assessment, 14(34), pp. 183–266. Available at: https://doi.org/10.3310/hta14340-03 .	1 May 2009 to 10 January 2010	UK	Data collected during the swine flu pandemic.
Shortall, R., Mouter, N. and Van Wee, B. (2022) 'COVID-19 and transport. A review of factors of relevance to the design of measures and their effects worldwide', European Journal of Transport and Infrastructure Research, 22(1), pp. 118–130. Available at: https://journals.open.tudelft.nl/ejtir/article/view/5597 .	Not applicable – no primary data collection	Includes sources from a range of countries.	Not applicable – no primary data collection.
Sträuli, L. et al. (2022) 'Beyond fear and abandonment: Public transport resilience during the COVID-19 pandemic', Transportation research interdisciplinary perspectives, 16, p. 100711. Available at: https://doi.org/10.1016/j.trip.2022.100711 .	March to August 2020	Germany (Berlin), Belgium (Brussels), Sweden (Stockholm), Estonia (Tallinn)	Local movement restrictions and social distancing rules.
Transport Focus (2021) 'COVID-19 travel segmentation'. Available at: https://www.transportfocus.org.uk/publication/covid-19-travel-segmentation/ .	12 to 14 and 19 to 21 February 2021	England, Scotland and Wales	All travel restrictions eased, but Omicron just beginning at the time of finishing the analysis, which led to mandatory face coverings on public transport.
Vickerman, R. (2021) 'Will Covid-19 put the public back in public transport? A UK perspective', Transport Policy, 103, pp. 95–102. Available at: https://doi.org/10.1016/j.tranpol.2021.01.005 .	Not applicable – no primary data collection	UK	Not applicable – no primary data collection.

Reference	Data collection	Location	Data collection timeline relative to COVID-19
Zarabi, Z., Waygood, E.O.D. and Schwanen, T. (2024) 'Understanding travel mode choice through the lens of COVID-19: a systematic review of pandemic commuters', <i>Transport Reviews</i> , 44(2), pp. 368–404. Available at: https://doi.org/10.1080/01441647.2023.2280190 .	Not applicable – no primary data collection.	Includes sources from a range of countries	Not applicable – no primary data collection.

Annex C Interview method

The research involved primary data collection through 24 in-depth interviews, carried out by BMG Research between January and February 2024.

Sampling and recruitment

Purposive sampling was used to recruit participants for this research. Purposive sampling involves selecting participants to ensure range and diversity of characteristics and experiences, relevant to the study's research questions (Ritchie et al., 2014). A sample size of 24 allowed for sufficient range and diversity of characteristics and experiences to respond to the research questions, while also being achievable in the time available for the project.

For this research, the eligibility criteria were that participants had to have concerns about infection when using public transport, and have used public transport before and/or want to use it in the future. In addition to these criteria, the criteria and sub-groups in Table C1 were used for sampling. These criteria were determined through the project team's expertise and insights from the literature review.

Due to the relatively large number of sample criteria, ensuring the quota for a particular sample criteria sub-group was met, meant that a sub-group under another sample criterion sometimes was not. Despite this, a diverse interview sample was achieved overall.

Table C1 Achieved interview sample

Sample criteria	Criteria sub-groups	Target quotas	Achieved quotas
Current public transport use	Avoiding due to concerns	9	8
	Using with adjustments	9	10
	Using with no adjustments	6	6
Conditions and concessions*	Physical health condition	Min. 5	8
	Mental health condition	Min. 5	5
	Concessionary bus pass users	Min. 5	9
	None	8	9
Main public transport use (previously, if currently avoiding)*	Trains (overground)	Min. 9	18
	Buses	Min. 9	15
	Other (London Underground, trams, demand responsive transport)	Min. 3	3
Reason(s) for use*	Commuting or education	Min. 8	16
	Leisure (shopping, social, entertainment)	Min. 8	14

Sample criteria	Criteria sub-groups	Target quotas	Achieved quotas
Locality	Personal business (visits to services like GP or bank)	Max. 4	13
	Caring responsibilities or escort trips	Max. 4	3
	Urban	8	8
	Suburban	8	9
	Rural	8	7
Gender	Male	Max. 12	10
	Female	Max. 12	13
	Non-binary		1
Age	18-29	4	3
	30-44	4	8
	45-59	4	4
	60-74	6	6
	75 and over	6	3
Ethnicity	White	18	17
	Ethnic minority (Asian, Black, mixed/multiple, other ethnic group)	6	7

Note: Totals more than 24 as participants could select more than one.

Participants were recruited via a trusted third-party recruitment agency, who advertised the research to their panel (of around 8,000 people) as well as using free-find approaches through a national network of ‘field agents’ embedded in local communities. Participants were given information on the background and aims of the study, including what taking part in the research would involve (see Annex E for the information sheet given to potential participants). People who were interested in taking part answered questions in a screening document to assess their eligibility to take part.

Data collection

Interviews were carried out using a topic guide. The topic guide comprised four key areas, each containing a series of sub-topics and prompts, to enable the two researchers to have a consistent interview approach, while allowing for flexibility and responsiveness to the individual participant. The topic guide was reviewed and approved by DfT before interviewing began. After the first few interviews, the interviewers revised the topic guide to aid participant understanding of some areas of the guide. A summary of the topic guide is provided in Annex D.

The topic guide was informed by the AFECTU framework (Graves, 2013)¹¹, which aims to understand people's behaviour in a way that attempts to minimise the individual's post-rationalisation of it. AFECTU stands for Analysis of behaviour, Frame of mind, Environment, Covert research, Timeframe realistic and Unconscious mind. The framework is presented in full in Annex F.

Applying AFECTU to this research required participants to describe their experience of a regular and recent journey on public transport (if they currently use it) or by an alternative mode (if they currently avoid it), including their behaviours preparing for the journey and during the journey itself. Focusing on a recent journey enabled an understanding of when and to what extent infection concerns featured in participants' decision-making, both before and during their journey. The participant described their chosen journey in detail, before discussing whether and how these behaviours change for different journeys and over time. Questions specifically about infection concerns when using public transport were asked towards the end of the interview, to minimise the risk that participants would overstate their current concerns (i.e. tell the researcher what they think they want to hear). However, it is important to note that information given to (potential) participants during recruitment, including questions asked during screening, was transparent about the aims of the research and so the topic of infection concerns was raised with participants at this stage.

Interviewers did not specifically ask about COVID-19 during the interview, unless it was raised spontaneously by the participant. This was for two reasons: again to minimise the risk that participants would overstate their current infection concerns; and to avoid the participant talking about COVID-19 to the exclusion of other infections, given the recency of the pandemic and its likely significance in participants' lives.

Interviews were carried out online (via Zoom or Microsoft Teams) or by phone, depending on the participant's preference, by two BMG researchers. They lasted between 35 and 60 minutes. Participants were given a £45 e-voucher to thank them for taking part.

Ethical governance

DfT gave ethical approval for this research. Participants were given an information sheet during recruitment explaining the aims and objectives of the research; that participation was voluntary and they could opt out at any time; and confidentiality, anonymity and caveats (if a safeguarding issue arose). This information was reiterated at the start of the interview.

Participants were also given a second information sheet at the end of the interview, which gave details of support organisations in case the interview raised any issues for them, such as health, wellbeing, or bereavement.

¹¹ Phil Graves is an independent expert in consumer psychology and an associate of Frontier Economics.

Analysis and reporting

With participants' permission, interviews were audio recorded and transcribed verbatim¹² by a professional transcription agency to facilitate detailed analysis. The transcripts were the main sources used for analysis, but the researchers also returned to the audio recordings if needed; for example, to check how something was said (not solely what was said).

The first stage of analysis involved reading all interview transcripts, from which emerged four key themes (below). Each interview was given a low to high 'rating' per theme. This produced an initial 'heat map' which enabled the researchers to identify preliminary constructs as well as initial links between the four themes. Table C2 shows the four themes and the associated ratings.

Table C2 Early analytical themes

Rating	Key themes			
	Level of infection concern	Adjustments made	Decision-making about adjustments	Infection concerns prompted or unprompted
0	No concern	Minor behavioural changes or no adjustments	No or very few adjustments, and all reactive	Even when prompted, no concerns
1	Slight concern	Some adjustments to travel behaviour	Most decisions are reactive and context specific	Concerns more likely to arise when prompted
2	Medium concern	Some adjustments to behaviour when travelling, and when and how	Most decisions are proactive and planned/anticipated in advance	Concerns more likely to arise unprompted
3	High concern	Major adjustments to behaviour when travelling, when and how, and avoidance	Decisions are proactive, usually to limit travel entirely or minimise perceived risk	Concerns arise unprompted, and more likely to be explicitly linked to explanation of behaviour

Source: Interviews

¹² The transcription was 'intelligent verbatim', which allows for filler words like 'um', 'ah' and 'hmm' to be omitted, to improve the reader's experience. Intelligent verbatim does not impact on the quality of thematic analysis, as the focus is on *what* is said, not *how*.

This early analysis process provided a starting point for the more rigorous analysis, and helped the researchers agree a set of constructs which were then used to code the transcripts. They included: travel behaviour, facilitating conditions and situational constraints, habits, self-concept, norms and evaluation of outcomes.

Each interview was then summarised into a thematic matrix. Columns in each matrix represented the key themes and sub-themes and the rows represented the individual interview participants. This allowed for comparison between participants, while also retaining the whole of each participant's account, and how different aspects of their views and experiences were connected.

The summarised data was reviewed in detail, with the researchers drawing out the range of experiences and views, identifying similarities and differences, developing and testing hypotheses, and interrogating data to seek to explain emergent patterns and findings. This method allowed researchers to identify and explain differences between individual participants and to see connections between themes and sub-themes, for example, links between certain types of self-concept and behaviour when using public transport. Researchers explored and tested these potential connections for all 24 participants across the dataset. This allowed them to build a multi-linkage typology (Spencer et al., 2014). Typologies can be a useful analytical tool to explore relationships between different parts of the dataset and how they interact, so that the analysis builds upon the initial descriptive and thematic analysis, to become explanatory too.

The typology had five categories (the Pragmatist, Daytripper, Concerned Commuter, Advocate and Carer). In a multi-linkage typology, a construct category might appear in more than one typological category, but the combination of positions across constructs is unique for each typological category. For example, both the Concerned Commuter and Carer have a self-concept of "I can't get ill", but the combination of constructs overall is unique.

The two BMG researchers who analysed the qualitative data discussed the emerging findings and typology on an ongoing basis. The researchers also met with partners at Frontier and DfT as a form of internal peer review, to share, discuss and refine the typological categories. The typology was also sense-checked and refined at an expert roundtable, attended by DfT stakeholders.

Annex D Topic Guide Overview

■ Introduction

- Researcher introduction
- Aims and objectives
- Voluntary nature of participation
- Anonymity, confidentiality, and withdrawing involvement
- Audio recording

■ Participant background

- Who they live with
- What they do day-to-day
- Hobbies and interests

■ Current travel behaviour and experiences

- For what purposes(s) do they use public transport
- Detailed walk-through of regular journey, taken recently:
 - Reason for journey
 - Preparation
 - Travelling to first station/stop
 - Boarding
 - Finding where to sit/stand
 - What they do on the journey itself
 - Preparing for and disembarking
 - Last/next leg of journey
- Difference made by travelling on public transport
- Experiences of changes to journey (delays, interruptions, crowding) and impact
- How have they been travelling if not using public transport:
 - Describe journey
 - Impact on travelling by this mode/not travelling

■ Changes to travel behaviours and experiences

- Recent changes to public transport use – reasons
- Any changes made in situ/mid-journey
- Awareness of changes for other people

■ Concern about infection

- Their 'rules of thumb' when using public transport
- Explore infection concerns (may have mentioned earlier in interview)
- How long they have had them

- Changes over time
 - Impact of own/other's vulnerability
 - Priority placed on health when deciding if/how to travel
 - Overall attitudes towards public transport in light of infection concerns
- **Thanks and close**

Annex E Participant Information Sheet

Using Public Transport Research: Participant Information

Research background

The Department for Transport (DfT) is aware that some people are concerned about illnesses such as coughs, colds and viruses, and these concerns can affect their use of public transport. DfT would like to explore this topic with people who have such concerns. DfT also want to explore what can be done to address any concerns that people have, and what might improve people's experience of public transport.

The DfT have commissioned BMG Research (with Frontier Economics) to speak with people in England about their experiences.

What does taking part in the research involve?

BMG are inviting people to take part in an interview that will last around one hour. The interview can take place online by video call, over the phone, or in-person (in your home or other place where you feel comfortable) – whichever you prefer. You won't need to prepare anything in advance. You will receive a £45 Love2Shop voucher to thank you for taking part.

During the interview, a researcher will ask you questions about your current travel patterns, what concerns you about using public transport, and how you might make public transport more comfortable for yourself. There are no right or wrong answers; we are interested in your experiences.

With your consent, we would like to audio record your interview so that we have an accurate account of the discussion. We will delete all recordings once the research report has been approved by DfT at the end of March 2024 (see below). Again, with your permission, the audio recording will be written up word-for-word (a transcript), for analytical purposes, with anonymised transcripts given to the DfT project team for quality assurance purposes. You can still take part if you don't consent to this.

What will happen to my data?

You can find out more information about BMG, and what we do with the information we collect in our Privacy Notice, here: <http://www.bmgresearch.co.uk/privacy>.

All data for this project will be stored on a secure server at BMG, with access given solely to the BMG project team.

If you have consented to transcription, audio recordings will be transcribed by a third-party transcription company. The recording, and resulting transcript, will be securely transferred between BMG and the company. BMG will also securely transfer anonymised transcripts to DfT.

Data will be anonymised when writing up the findings, as will any interview transcripts that are transferred to DfT. That means we won't include any information that could identify you such as your name or location; or any information that could identify you when combined with *other* information, for example, your job combined with your age.

Will anyone know I took part?

Not unless you tell them. What we discuss will be confidential, so no one other than you and the BMG research team will know it was you who said something. We will not share any identifiable information with DfT.

Research findings will go into a report that will be published online on the gov.uk website, and might be used in an academic publication too. We won't include anything in the report or any other publication that will identify you. We may use quotations to illustrate our findings, but they will be anonymised (see above for what anonymisation involves in this context).

Do I have to take part?

No. Taking part is entirely voluntary, and you are free to withdraw, without giving a reason. This includes withdrawing *after* you've taken part in an interview, which you can do by contacting us on the BMG email address below, by the 19th February 2024. After this date, it will not be possible to withdraw your participation.

If you withdraw after taking part, your personal data, audio recording and transcript (if you've consented to these processes) will be securely deleted within 72 hours of your request.

How do I take part?

To opt-in to the research, or for queries about the project, contact the BMG project team by emailing us at [email address].

DfT's privacy policy has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer. You can view it at: <https://www.gov.uk/government/organisations/department-for-transport/about/personal-information-charter>.

Annex F AFECTU Framework

Source: Phil Graves - AFECTU Framework

A – Analysis of behaviour

We want the analysis to focus on behaviours of interest, and what was actually done, to reduce post-rationalisation of behaviours. To ensure this is the case, we will focus the in-depth interviews on actual experiences, asking about what people did regarding travel behaviours and how these behaviours have changed or been adapted for different journeys.

F- Frame of mind

To promote a **realistic frame of mind**, we will set the scene of the interview on the individual's day-to-day activities over the recent past and **walk through that experience**.

E - Environment

As this will be an online/phone interview, it will not be feasible to do it in the same environment as the behaviour that is being studied. We will try to minimise this factor by having the conversation **done from home**, the place where we expect most of the individual's regular travelling to start.

C – Covert research

We will not be able to conduct the research covertly. Despite needing to do the selection based on individual's declared health concerns, we will try to reduce the potential impact of this initial priming by asking about actual behaviours and **only focus on the sources of health concerns at the end of the interview**.

T – Timeframe realistic

We will focus on recent actions, avoiding questioning actions distant in time (people tend to recollect less precisely). When asking about distant actions, we will focus on observed changes in behaviours (i.e. used to commute to work by bus but now uses their own car), the moments these happened, implications for day-to-day life, what friends/family were doing, and avoiding "why" questions.

U - Unconscious mind encompassed

We will gain insight into potential unconscious drivers by recollecting recent experiences, but we will not ask individuals to rationalise these unconscious elements that may have played a role in their decisions.



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The views expressed in this document are a combination of those from the interview participants, Frontier Economics Ltd, and BMG Research and do not necessarily reflect those of the Department for Transport.

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