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University College London

Faculty of the Built Environment

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How do fears, perception and the reality of a pandemic impact on an individual's travel behaviour and choice - a case study of the Covid-19 outbreak in London

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Being a dissertation submitted to the Faculty of the Built Environment as part of the requirements for the award of MSc Transport and City Planning at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced

Signature: Nick Milford

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Contents

List of Figures

List of tables

Abbreviations and acronyms

DfT   Department for Transport

DHSC   Department of Health and Social Care

MTA   Metropolitan Transportation Authority

OECD   Organisation for Economic Co-operation and Development

PHE   Public Health England

TfL   Transport for London

WHO   World Health Organization

Abstract

Transport and public health are inextricably linked, from access to health services to the effects transport has on physical and mental health.

In 2020 the link between transport and public health became the focus of worldwide attention with the outbreak of a pandemic, known as Covid-19. It led to limitations on social interaction and mobility. The use of public transport was actively discouraged, with the general public told to avoid using it. Combined with the risk of infection and discourse on how public transport may be a vector for the disease, it led to increased fears, stress and anxiety. Public transport saw a sudden and sharp decline in usage, with an immediate impact on how it was perceived.

Primary research undertaken for this paper highlights the scale of behaviour change as a result of Covid-19 with a substantial shift to active travel and private motor vehicles. It highlights perceptions of public transport have been radically changed with large numbers having a negative perception with increased levels of stress and anxiety. Analysis shows a majority of those surveyed would use public transport less in the future compared to before the pandemic. Despite additional measures to safeguard public transport, analysis highlights an unwillingness to pay more for this. Considering these factors, the paper outlines policy measures aimed at encouraging the uptake of public transport in the short and long term. These will require investment and innovation in the sector.

1. Introduction

1.1 Research context

Pandemics create social, political and economic earthquakes, causing immense disruption to everyday life for hundreds of millions of people, result in increased illness and deaths; and create widespread economic damage (World Bank, 2019). The likelihood of pandemics is increasing with greater human-wildlife interactions, increased urbanisation and greater global travel and trade (Smith et al, 2014). As a result, governments and research institutions around the world are focused on identifying high-risk pathogens and planning ahead for the next outbreak (Madhev et al, 2018; Smolinsky et al, 2003).

In late 2019 numerous cases of pneumonia were confirmed in Wuhan, China. Further studies identified this as a new novel coronavirus (2019-nCoV, more commonly referred to as Covid-19), which had been transmitted from wildlife to humans and then by respiratory droplets from human to human (Gaythorpe, 2020). The disease spread rapidly around the world. The World Health Organization (WHO) declared a pandemic on 11 March 2020 (WHO, 2020a). By 30 August 2020 Covid-19 cases had increased to over 25m worldwide (Statistica, 2020) (Figure 1).
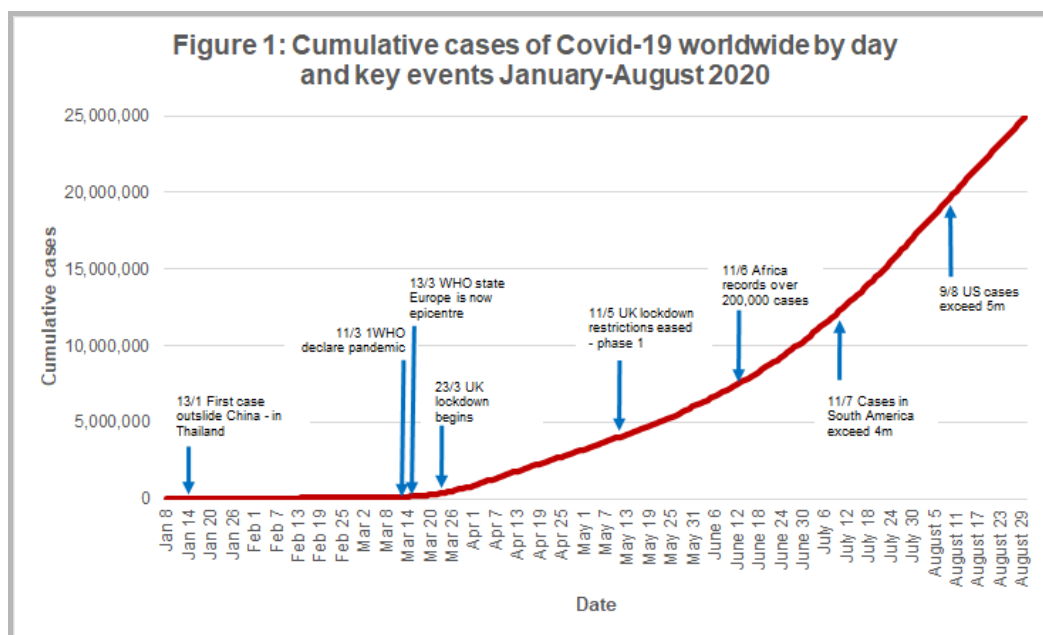
(Source: Statistica, 2020 and WHO, 2020a)

In the UK the situation dramatically escalated on 23 March 2020 when Prime Minister Boris Johnson announced that individuals must stay at home to reduce the risk of infection. Much of the economy was temporarily closed down, social interactions were curtailed, and individuals asked to quarantine if they had symptoms.

Figure 2: New UK Covid-19 cases by day and 7-day rolling average compared with number of passenger journeys in London March-August 2020
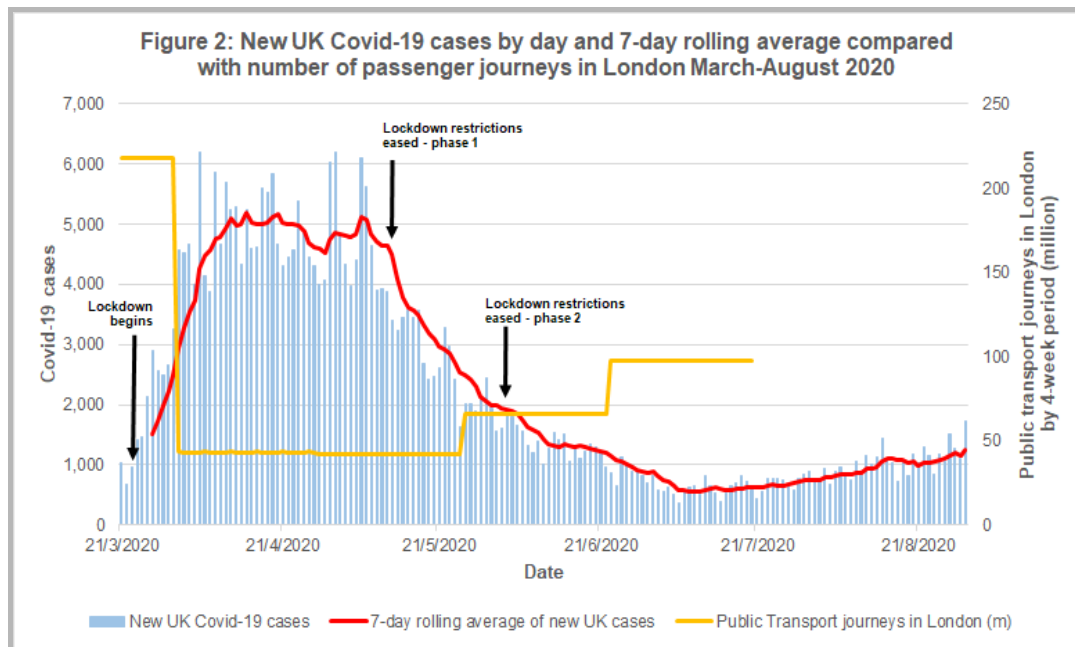
(Source: DHSC and TfL, 2020a[1])

New cases of Covid-19 peaked in April and May 2020 (Figure 2). Discourse focussed on public transport being a vector for the disease, putting individuals at greater risk (Rodrigue et al, 2020). Government advice was to avoid public transport and to walk, cycle or drive (Figure 3; Annex A). The Mayor of London said, '*Don't use public transport unless you absolutely have to. Only go out to buy basic necessities or exercise once a day. Keep at least two metres distance between you and anyone else at all times*' (Mayor of London, 2020b). There was a sharp fall in

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[1] Phase 1 began on 11 May and included encouraging people back to their workplaces if they cannot work from home. Unlimited exercise was allowed and people could meet with others outside. Phase 2 began on 1 June with people allowed to leave the house for any reason and up to six people from different households allowed to meet outside subject to social distancing rules. Some schools reopened to certain year groups. All shops which were still subject to closure were permitted to reopen from 15 June.

public transport usage[2]. Survey data from May 2020 highlighted that 61% of people were *'not very comfortable'* or '*not at all comfortable'* in using public transport (Ipsos MORI, 2020a)*.*

Figure 3: UK Government messaging from April 2020

(Source: Gov.uk, 2020)

With a sharp decline in passenger numbers, the focus of public transport changed from moving millions of people around the city to keeping the transport system safe and secure, in doing so operating with a reduced service to enable those that needed to to continue to access employment and essential services (Deloitte, 2020).

Messaging in June 2020 continued to ask people to avoid non-essential travel on public transport as restrictions eased (Figure 4). For many individuals the thought of using public transport was unappealing, stressful and led to anxiety. Survey data indicated 78% of people thought social distancing on London Underground or London rail services was not possible and 71% believed this to be the case on London's buses (Transport Focus, 2020a).

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[2] Public transport passenger journey data is recorded by Transport for London in 4-week periods. Data covers all journeys on London buses, London Underground, London Overground, Croydon Tramlink and Docklands Light Railway. Data beyond 20 July 2020 was not available at the time of submission.

Figure 4: UK Government messaging from June 2020

(Source: Transport for West Midlands, 2020)

Increased levels of stress and anxiety have been two of the main psychological impacts of Covid-19 (Anxiety UK, 2020; WHO, 2020b, Forbes, 2020). Such feelings are exacerbated through mainstream and social media reporting on the scale and pace of infections and deaths, combined with an individual's own concerns about themselves, family and friends, plus wider worries about the economy, jobs, social interaction and travel. One academic argued in May 2020 that the stay at home messaging used by the Government may have been too successful (Figure 5) and could result in longer-term psychological effects which may take years to recover from.

Figure 5: Article from The Times Newspaper, 1 May 2020

The UK will need a campaign to "get out and start living again", said Sir David Spiegelhalter, a statistician at the University of Cambridge

(Source: The Times, 2020)

This paper investigates how usage and perceptions of public transport changed as a result of Covid-19 and how this impacted on travel choice and behaviour. It looks ahead at what measures may need to be taken to encourage public transport once again. London is used as a case study. The city saw a rapid escalation of cases during late March and April (Figure 6) which reached over 39,000 by 30 August with over 6,000 deaths (Public Health England (PHE), 2020a). Over 40 of these have been transport workers (Evening Standard, 2020a).

Figure 6: Daily new Covid-19 cases/deaths in London and cumulative new cases/deaths from February to August 2020
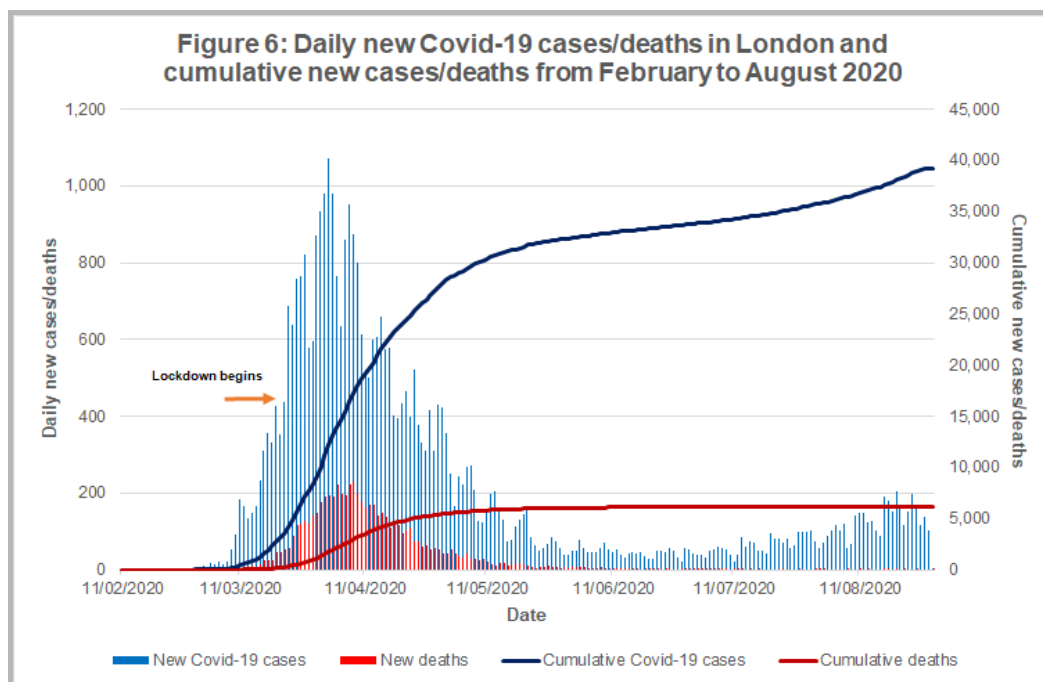
(Source: PHE, 2020a)

1.2 Rationale for the research

Academic literature on transport and public health exists, as does studies looking at perceptions of public transport. However there is space in understanding specifically how a pandemic, like Covid-19, can impact on the perception of public transport and its usage, including in thinking through measures that may need to be taken to encourage its uptake once again.

1.3 Research aim

The aim of the research is to consider the impact of Covid-19 on individuals' perceptions of public transport and how this may have affected behaviour and choice.

Primary research has been undertaken through an online survey on perceptions of public transport before and during the pandemic and looking ahead to post-pandemic. Analysis is presented in Chapter 4.

1.4 Research objectives

Three research objectives (RO) were identified:

Objective 1 - establish how public transport has been affected by Covid-19 in London, what advice has been provided to citizens and what mitigations have been put in place.

Objective 2 - establish perceptions of public transport before and during the pandemic and looking ahead to post-pandemic.

Objective 3 - discuss the longer-term effects of COVID-19 on public transport and the measures that could be taken to encourage its uptake once again.

1.5 Research Structure

The dissertation is structured into chapters. Chapter 2 presents a review of literature focussing on transport and public health, including transport as a vector during a pandemic and the economic, social and health impacts of a pandemic. Chapter 3 explains the research strategy, study area, the primary research undertaken and ethical considerations. Chapter 4 includes analysis from the primary research, including reference to literature. Chapter 5 concludes with policy options to encourage public transport usage post the Covid-19 pandemic.

2. Literature Review

2.1 Transport and public health

Transport and public health are inextricably linked. For health professionals and the general public at large, transport provides the means to access hospitals, healthcare facilities, GP surgeries and care homes (DfT, 2019). Discourse often focuses on the effects of transport on public health, particularly increased car ownership, through increased illness and mortality as a result of poor air quality, increased noise pollution and accidents. However, the links between transport and public health go much wider both in terms of physical and mental health. This includes how public transport can impact on levels of physical activity, how it enables access to healthy food and how it can prevent social exclusion and isolation (Meyer and Elrahman, 2019).

A number of academics (Geurs et al, 2008; Cohen et al, 2014 and Cavoli et al, 2017) have written about the benefits of different forms of public transport in increasing levels of physical activity, particularly through walking and cycling. Recent policy initiatives like 'walkable neighbourhoods' focus on the physical and mental health benefits of well-designed streets, reduced speed limits, good public transport infrastructure and encouraging active travel. Such measures can help in combating heart disease, obesity, diabetes and provide mental health benefits (PHE, 2014).

For many sections of society use of public transport is also a form of social engagement and interaction which can improve mental wellbeing (Reinhard, 2018). For others it results in the opposite effect. Research (Singer et al, 1978; Wener et al, 2005) has also examined how public transport can lead to increased levels of stress and anxiety. Cheng (2020) explored how overcrowding and delays on public transport can result in an uncomfortable, stressful journey. This in turn impacts on the travelling experience and can lead to growing anxiety. In such cases individuals can be put off from using public transport in a city.

Much of the discourse on transport and public health focuses on transport's impact on public health, with less written about public health's impact on transport. This

changed in 2020 as the role of transport in potentially being a vector for disease, in this case through the Covid-19 pandemic, entered public discourse.

Pandemics are public health emergencies with an immediate threat to human health (Smolinsky et al, 2003). A pandemic is defined as, '*An epidemic occurring worldwide, or over a very wide area, crossing international boundaries, and usually affecting a large number of people*' (Harris, 2020). Pandemics occur when new diseases develop the ability to spread rapidly within populations. Most new pandemics are the result of pathogens passing from wildlife to humans, known as 'zoonotic' transmissions (Murphy 1998). There is little or no immunity to fight these diseases resulting in increasing numbers of people falling ill and dying. Governments and public health authorities work to minimise infections through measures such as lockdowns and social distancing; and invest in treatments such as vaccines to try to prevent further transmission (Madhev et al, 2018). Pandemics result in immense pressure being put on healthcare systems and services until such treatments are available (West et al, 2020).

The last global pandemic was Spanish Influenza (1916-20) which killed approximately 40 million people and caused acute illness in 25-30% of the world's population (Taubenberger, 2006). Since then smaller epidemics have emerged in specific regions, most notably the Severe Acute Respiratory Syndrome (SARS) and the Middle East Respiratory Syndrome (MERS).

The World Bank (2019) outlines that there are few natural hazards other than a pandemic that cause more loss of life and economic damage. Pandemics can lead to increased sickness and mortality, but also create a sense of fear, stress and anxiety that can lead to behavioural change (Madhev et al, 2018). Such behaviour change, as seen through the Covid-19 pandemic, is a result of individuals feeling they are at risk of imminent harm and taking action to reduce the risk of infection.

2.2 Transport as a vector during a pandemic

Transport has an integral part to play in supporting health services and our everyday lives (Milne, 2012). Transport has played an important role during the Covid-19

pandemic in ensuring key workers have been able to get to and from work (Weller and Avelleda, 2020). In discourse public transport has been seen as a vector, helping to spread the virus and putting passengers and transport workers at risk (Rodrigue et al, 2020). Public transport, where people share facilities and vehicles, is seen to be especially risky in spreading the disease (Tirachini, 2020).

Many individuals who contract Covid-19 are asymptomatic and as such are unaware they have it. Whilst they continue to use the public transport system they are propagating the disease and enabling it to be spread further (Budd and Ison, 2020). Discourse focuses on widely publicised research. Shen et al. (2020) reported how 22 passengers were infected on two bus trips in Ningbo, China from one asymptomatic infection person. Fa-Chun et al (2020) and van Doremalen et al (2020) have highlighted how the virus remains infectious on different types of surfaces from hours to days. In New York, Harris (2020a), compared subway data to the rate of positive Covid-19 infections. The study identified, *'the parallel between the continued high ridership on MTA subways and the rapid, exponential surge in infections during the first two weeks of March [which] supports the hypothesis that the subways played a role'.* Harris' analysis showed that the flattening of the infection rate appeared to follow a rapid decline in subway usage as citizens responded to advice and stayed off the metro system. It also suggested that the rate and spread of infection early on could have been exacerbated as the transport authority reduced service levels, leading to crowding and making social distancing near impossible.

Measures taken to combat Covid-19 have included stay at home messaging and national and local lockdowns. It has led to increasing numbers of people being furloughed or made redundant, increased levels of working from home and a sharp decline in public transport usage (Budd and Ison, 2020). In London, the Government and Mayor requested in March 2020 to avoid public transport and where this had to be used for people to adhere to social distancing rules. These measures resulted in a substantial reduction in the number of trips (Figure 7) as many people worked from home, were furloughed, made redundant or instead chose to walk, cycle or take the car (De Vos, 2020).

Figure 7: Journeys by mode in London in each 4-week period from 14 Sept 2019 to 20 Jul 2020 (million)
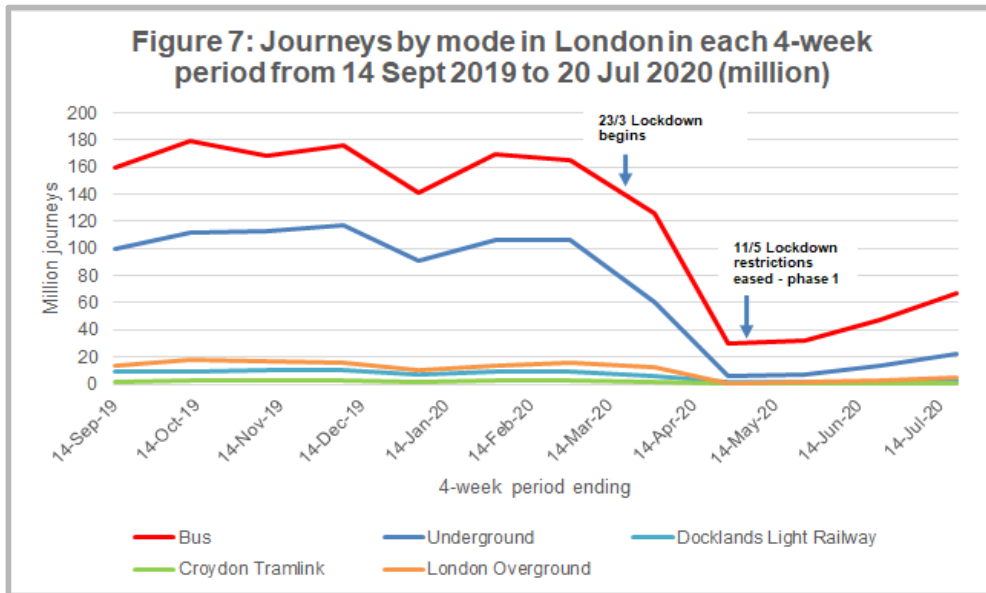
(Source: TfL, 2020a[3])

In London increasing numbers of people took to the streets to walk or cycle with local authorities responding by temporarily increasing road space for both modes (The Guardian, 2020). Transport for London (TfL) introduced pop-up infrastructure and in parallel began to communicate how it was keeping the transport system safe, including through more stringent cleaning regimes, the introduction of hand sanitizer at stations, altering entry/exit points; and through the introduction of mandatory face coverings (TfL, 2020c).

Concern around transport being a vector for Covid-19 continued as lockdown measures eased in June 2020. From this point, by law, passengers were required to wear face coverings on public transport. This was made compulsory through the Health Protection (Coronavirus, Wearing of Face Coverings on Public Transport) (England) Regulations 2020, made under an emergency procedure of the Public Health (Control of Disease) Act 1984. The Explanatory Memorandum for the new regulations stated, *'Social distancing is likely to be increasingly difficult to manage at all times on public transport as restrictions are relaxed and demand for transport services increases. Mandating the use of face coverings, when used alongside other measures, therefore offers a reasonable protective measure to reduce the risk of*

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[3] Public transport passenger journey data is recorded by Transport for London in 4-week periods. Data beyond 20 July 2020 was not available at the time of submission.

infection on contamination by a virus that presents a significant harm to public health'
(DfT, 2020c).

The Secretary of State for Transport confirmed on 2 July 2020 that ONS data indicated compliance with face coverings stood at 86% (House of Commons, 2020). Academics such as Van Bavel et al (2020) argued that making face coverings mandatory results in a false sense of security with individuals underestimating the threat of the disease and which could result in them potentially ignoring further health warnings.

In addition to mandatory face coverings, the introduction of social distancing on public transport resulted in a sharp drop in the capacity of services. With a two-metre social distancing requirement in place it resulted in TfL capacity dropping to 13-15% of previous levels on bus and tube services (TfL, 2020c). It resulted in individuals' having to find alternative means of transport and had a direct impact on the revenue of TfL. Badger (2020) argues that the cumulative economic effect on public transport authorities and service providers could be greater than that of the 2008 financial crisis.

2.3 Economic impacts on transport

Pandemics have widespread economic effects. Prior to the outbreak of Covid-19 the World Bank estimated that an influenza pandemic would cost $800bn to the world economy and kill tens-of-millions of people (Brahmbhatt, 2005). The Organisation for Economic Co-operation and Development (OECD) (2020) has said it expects Covid-19 to create the deepest recession since the 1930s with UK GDP estimated to fall by 12-14%. Data from quarter 1 2020/21 showed that GDP fell in nearly all sectors of the UK economy, with hospitality and transport amongst those most impacted (Resolution Foundation, 2020). By 16 August 2020 over 9.6m people had been furloughed from 1.2m employers, costing the Government £35.4bn (HMRC, 2020).

The economic impacts have extended to public transport authorities and operators who continue to operate largely 'ghost' services during the pandemic (Rodridgue et al, 2020). Following government advice, large-scale behavioural change led to a

sharp drop in passenger numbers and revenue. Data from the Citymapper (2020) Mobility Index highlights between early March and late June movements substantially fell as result of lockdown restrictions being imposed (Figure 8).

Figure 8: Percentage of London moving per day March to August 2020
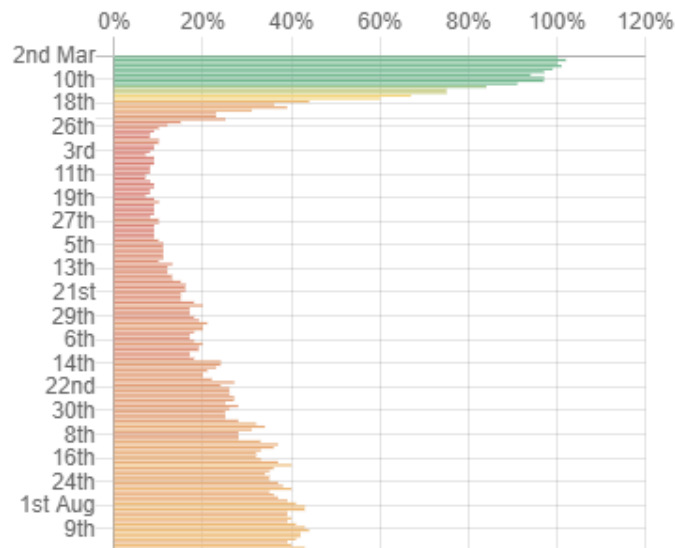
(Source: Citymapper, 2020)

As a result of the sharp decrease in passenger numbers, TfL lost 90% of its income and was on the verge of cutting services to avoid bankruptcy (ITV News, 2020). It furloughed approximately 7,000 staff or 25% of its workforce in April 2020 (Bloomberg, 2020). The Secretary of State for Transport agreed to a £1.6bn funding and finance settlement for TfL to enable services to continue until October 2020 (DfT, 2020a). This deal came with conditions including increasing the number of services to pre-lockdown levels and a need for the Mayor to scrap his flagship fare freeze policy, in place since 2016.

2.4 Health and social impacts of a pandemic

Covid-19 has not just had economic impacts, but also health and social impacts. The introduction of lockdown, in addition to quarantine and social distancing measures, has affected all sections of society. Overnight interactions with family and friends, which typically help in managing day-to-day emotions and stress, became restricted (van Bavel et al, 2020). It led to increased levels of stress and depression which

could have long lasting effects (De Vos, 2020; van Bavel, 2020; Brooks et al, 2020). ONS (2020) identified that 19.2% of people experienced some form of depression in June 2020, double the percentage from the nine-month period to March 2020. It also highlighted that nearly 85% of those who experienced depression traced it back to increased stress and/or anxiety.

Anxiety is typically associated with what isn't yet known in the surrounding environment. Ipsos MORI (2020b) survey data from May 2020 highlighted that 28% of people in the UK had anxiety under lockdown, more than any other health concern and a higher rate than the global average. Anxiety is not new though and is a condition that many individuals experience in using public transport and which has been amplified through the pandemic (The Health Foundation, 2020). For those that experience it public transport can be fraught with issues, often centred around crowding, seat availability, cleanliness and/or air conditioning (Cheng, 2010; Li, 2013).

From a physical health perspective, the pandemic has disproportionately affected certain sections of society. Older people are more at risk than the young, as are Black, Asian or Ethnic Minorities (BAME) (PHE, 2020b). In urban centres these groups are more likely to live-in high-density neighbourhoods and/or in multi-generational, high occupancy housing which presents additional risk (Nathan, 2020). Mayoral data also highlights that these two groups use public transport more than other sections of society as a way to get around the city for work and/or leisure (Mayor of London, 2020a). It has impacted workers too, often older and from a BAME background, with 42 having died from the disease to date (Evening Standard, 2020a).

An opportunity that may emerge from the pandemic is the shift to walking and cycling. TfL data suggests that whilst the number of bike hires through its cycle scheme dropped as people stayed at home, those who needed to get around the city turned to the city's bike hire scheme in increasing numbers (Figure 9).

Figure 9: Daily cycle hires using Santander bike scheme in London from 1 January - 31 July 2020
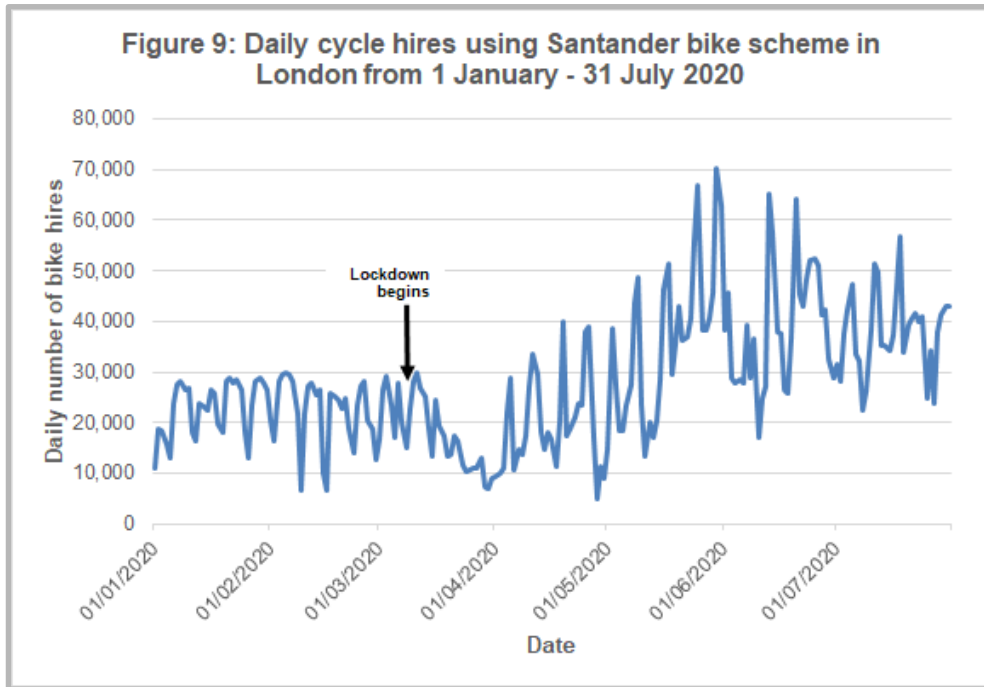
(Source: TfL, 2020d)

TfL reported that May saw the highest number of rentals in the cycle scheme's 10-year history (Intelligent Transport, 2020). Similarly, the national retailer Halfords reported it's cycling business saw strong growth (+57%) between April-June 2020 (Halfords, 2020). Changing behaviour could lead to a different urban transport mix in future with health benefits for those using these modes.

3. Methodology

3.1 Introduction

This chapter outlines the research strategy, defines the study area and sets out the primary and secondary research undertaken in addressing the research objectives. It also considers the ethics of the research.

3.2 Research strategy

As outlined in Chapter 1 the aim of this paper is to consider the effect Covid-19 has had on individuals' perceptions of public transport and how this may impact it in the long term. In order to consider this a number of research objectives (RO) were set out.

RO1 - establish how public transport has been affected by Covid-19 in London, what advice has been provided to citizens and what mitigations have been put in place.

The first objective seeks to provide context, understanding how Covid-19 impacted London's public transport system and what the transport authority did in response. In addressing the objective, Public Health England data on the number of Covid-19 cases in London was presented in Chapter 1. This highlighted the exponential growth of the disease and the context to a rapidly evolving situation that authorities were contending with. Chapters 1 and 2 included data from TfL showing how passenger numbers dropped sharply as the Government advised individuals to avoid public transport. Chapter 2 also outlined the measures taken by TfL to reassure the public (as lockdown restrictions were eased) that public transport was safe to use and the mitigations it had put in place to protect passengers and employees.

RO2 - establish perceptions of public transport before and during the pandemic and looking ahead to post-pandemic.

The second research objective uses primary research data, via an online survey, to identify the perception of public transport before and during the Covid-19 pandemic.

It also looks ahead to perceptions post-pandemic and what measures could be taken to encourage public transport uptake.

Government restrictions during Summer 2020 prevented face to face questioning of individuals or group discussions due to the risks associated with the disease and the need to maintain social distance. An online survey was therefore undertaken using Google Forms. The design of the survey and identification of participants are discussed later in this chapter. Annex B provides a copy of the survey and analysis of it is provided in Chapter 4.

RO3 - discuss the longer-term effects of COVID-19 on public transport and the measures that could be taken to encourage its uptake once again.

The third research objective focuses on the longer-term effects on public transport and what may need to be done to encourage uptake in future. This objective is addressed firstly in the analysis of the survey results presented in Chapter 4. This provides an understanding from those questioned on their thoughts as to what measures may need to be taken. In addition, Chapter 5 builds on this and the literature review to consider what other measures could be taken to build confidence in public transport once again.

3.3 Definition of study area

The area of research for this study is Greater London, defined by the boundaries of the 32 constituent boroughs (Figure 10) and to which data on Covid-19 cases presented in Chapter 1 relates.

Greater London's population stood at 12.1m in 2017 (Eurostat, 2020). London is a centre for finance and trade, as well as tourism. In 2019 over 21m visitors from abroad visited the capital, spending over £15.7bn (Visit Britain, 2020). Many of those visiting London, like it's citizens, rely on its public transport system to move around.

Figure 10: Map of London Boroughs
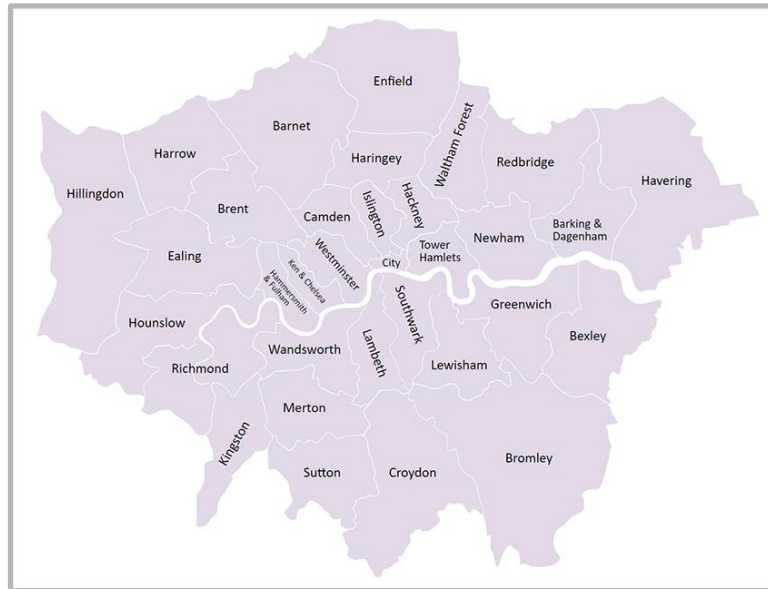
(Source: London Councils, 2020)

Transport in London's boroughs is the responsibility of the Mayor of London, managed through his/her transport authority - TfL. Its responsibilities include the management of principal roads, as well as the London Underground, London bus network, Docklands Light Railway, Croydon Tramlink and some suburban rail services, largely in the boundaries of Greater London.

3.4 Primary research

Primary research has been undertaken through an online survey. The survey was designed so that it could be completed without the need for face to face support given restrictions in place in summer 2020. To aid respondents the introduction of the survey set out its purpose, the number of questions that would be asked and the likely time needed to complete it.

The aim of the survey was to understand transport usage and whether perceptions of public transport changed during the pandemic. It also sought views on likely perceptions towards public transport post-pandemic and what measures could be taken to encourage uptake.

The survey included questions which required respondents to provide a response based on a range of descriptors provided. It also included a number of open-ended questions which enabled respondents to outline answers in their own words. This provided qualitative data, to accompany quantitative data obtained from other questions.

The survey was sent out to a number of community groups and forums in the capital. These focussed principally on West London and South London and included Bankside Residents Forum, Brixton Neighbourhood Forum, East Dulwich Forum, Palmers Green Community Forum, SE23 (Forest Hill and Honor Oak) Forum and Westbourne Forum.

The survey was also posted on LinkedIn and shared with friends, family and work colleagues at both the Department for Transport and the Department for Business, Energy and Industrial Strategy. Many individuals who completed the survey also encouraged their own contacts to complete it too.

Analysis is provided in Chapter 4. A variety of techniques were used in analysing the data including correlation analysis, anova analysis, descriptive analysis and frequency word analysis. Overall, the analysis highlights how different groups (for example by age or by income) responded to questions and cross-refers responses to provide additional analysis and understanding.

3.5 Secondary research

Secondary research data is included in this paper to provide additional context. This includes:
- Public health data from Public Health England (PHE), the Department of Health and Social Care (DHSC), Statistica and John Hopkins University highlighting the numbers of new and cumulative Covid-19 cases and deaths in London and the UK - presented in Chapter 1.;
- TfL public transport usage numbers by 4-week period before and during the pandemic, as well as the number of bike rentals in London - presented in Chapters 1 and 2; and

- Ipsos MORI and Transport Focus survey data on the impacts of the pandemic - presented in Chapters 1 and 2.

3.6 Limitations of the methodology

The primary research undertaken has been limited to an online survey, with no face to face interviews taking place as a result of the Government restrictions. Similarly, no group discussions were held given the risks in bringing individuals together which limits the analysis of the primary research and it's depth.

As a result of no face to face questioning there are limitations to the research with no supplementary or exploratory follow-on questions asked which could have gauged a better understanding of an individual's thoughts. In addition, as some questions were hypothetical and looked ahead to the post-pandemic world - an individual's response given at the time of the survey may change over time, especially given the fast moving nature of the pandemic.

3.7 Research ethics

In undertaking research, the highest ethical standards have been followed. No names or contact details were requested in the online survey meaning an individual's identity was not recorded, respecting anonymity. Data presented has been aggregated. All communication with individuals was undertaken in an honest and open manner.

4. Analysis

This chapter outlines the findings from the primary research and analyses the responses.

An online survey was distributed to a number of community forums and groups, as well as individual contacts as set out in Chapter 3. The survey was split into three sections - (i) before the pandemic; (ii) during the pandemic; and (iii) looking ahead to post-pandemic. It ran for three weeks from Sunday 28 June to Sunday 16 July 2020. In total 230 responses were received. Of these, 5 were discounted for being incomplete. The total number of responses used in analysis is from 225 individuals.

About the respondents

In total 57% of respondents were female and 42% male. The remaining 1% did not wish to say (Figure 11).
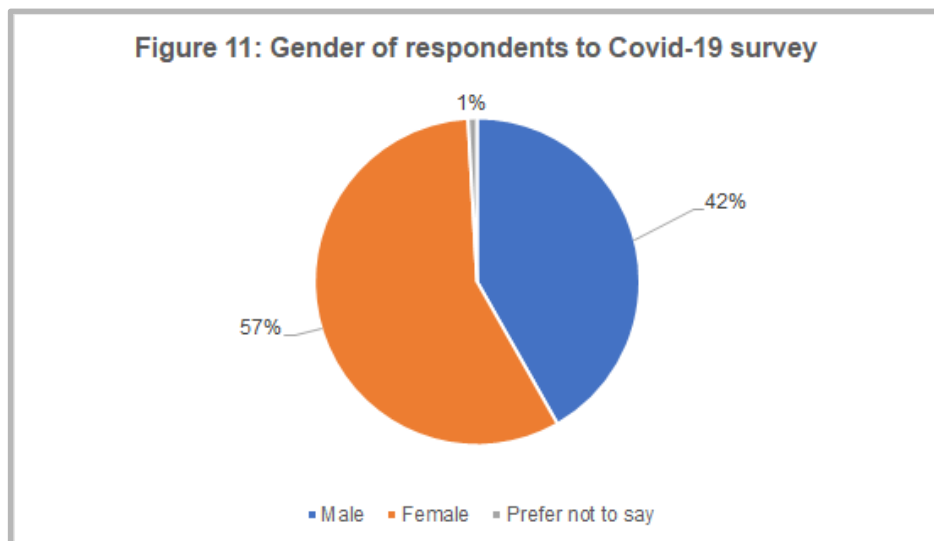
The range of ages of those responding to the survey was between 20 and 83 years old. The median age for all respondents was 41 years old and the mean was 43. Figure 12 shows that the youngest age of respondents for both male and female was 20. The oldest female was 83 years old and the oldest male 73. The first quartile for females was 34 and the third quartile 51 years old. The median age for females was

41 and the mean was 43. For males the median age was also 41 and the mean was 42 years old. The first quartile for males was slightly lower than females at 33 years old. The third quartile was slightly higher at 52. There were three individual female outliers at 77, 79 and 83 years old. The sample for those who preferred not to give their gender was small - just two respondents and with ages of 30 and 74 respectively. The mean for this group is 52.

Figure 12: Age and Gender of survey respondents
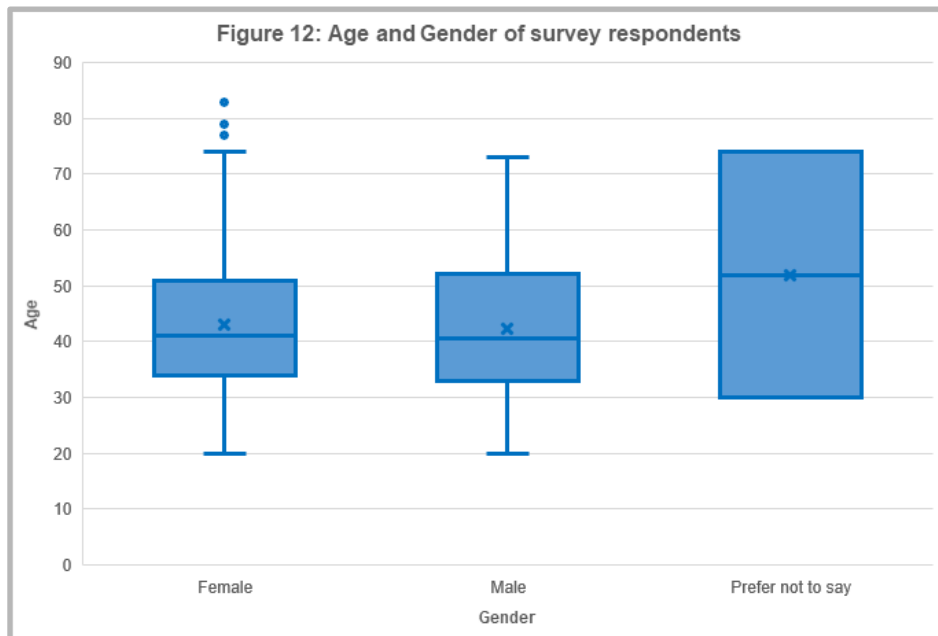
The majority of those surveyed (53% male and 52% female) reported income of between £20,001-£50,000 (Figure 13). In other income brackets there were differences between genders. A higher proportion of females were in the 'up to £20,000' income bracket (12% compared to 7% of males). At the other end of the income scale there were slightly more males (26% compared to 24% females) in the £50,001-£75,000 income bracket and also in the £75,000+ (14% males compared to 12% females) income bracket.

Figure 13: Percentage of respondents in income brackets by gender
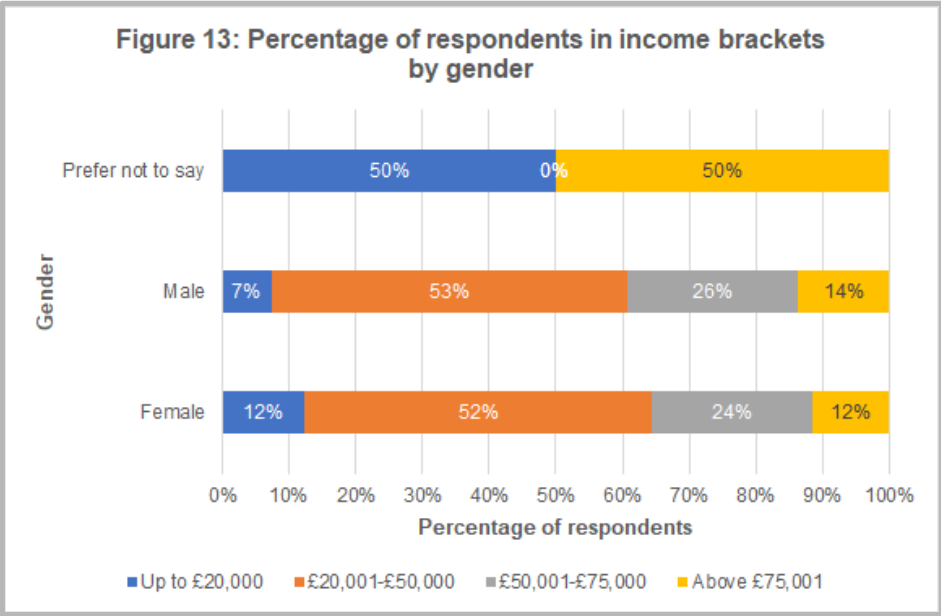
In total 80% of respondents lived in Greater London postcodes (Figure 14). Large numbers of respondents were from South and South East London (60 respondents from SE, BR and CR postcodes), North and North East London (43 respondents from N and NW postcodes) and South West London (23 respondents from SW, SM, KT and TW postcodes). Some postcodes shown in Figure 14 cross administrative boundaries for Greater London but are a useful way of identifying where respondents live.

Figure 14: Location of respondents in Greater London postcodes
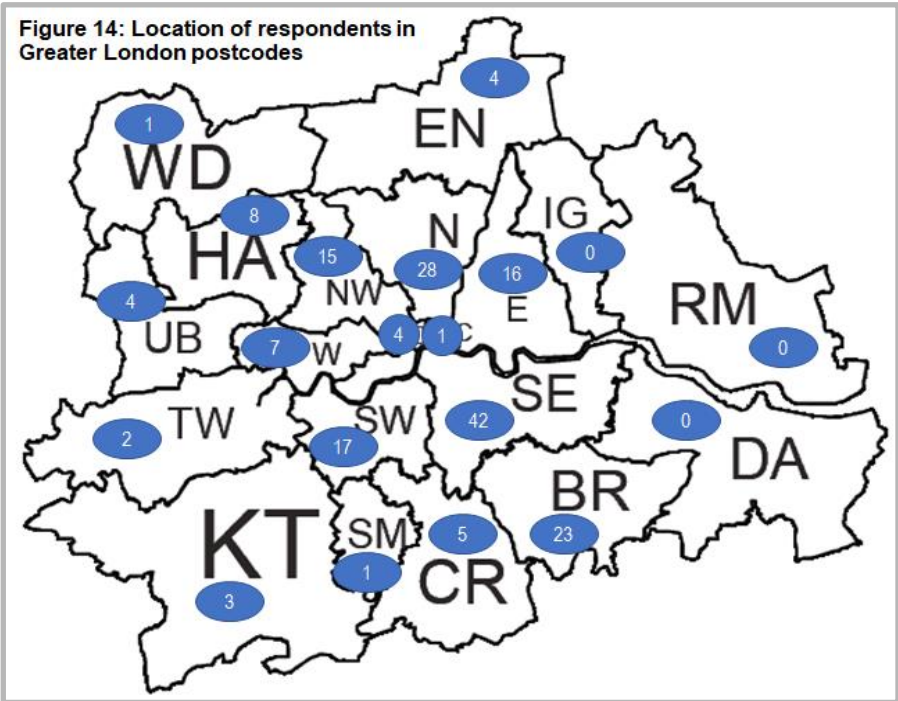
Twenty percent of respondents reported living in postcodes outside of Greater London. The majority of these were in the South East, in particular from CM (7 respondents) and TN (5 respondents) postcodes (Figure 15). A total of 9 respondents were from outside London and South East postcodes.

Figure 15: Location of respondents in South East England (outside of Greater London) postcodes
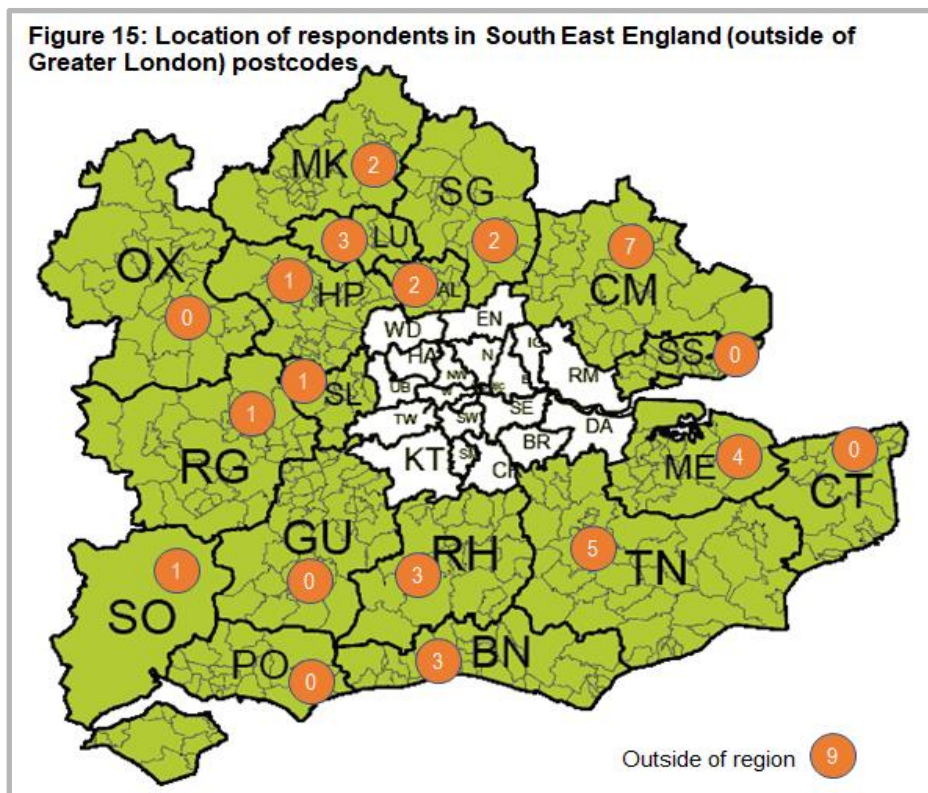
Primary mode of transport

The survey aimed to ascertain the primary mode of transport used by respondents before and during the pandemic and to consider how this relates to perceptions of public transport.

The most frequent primary mode of transport before the pandemic was the train (32%), followed by London Underground (28%), private motor vehicles (14%) and active travel (14%) (Table 1). The high numbers of respondents using the train may reflect those responding from South London using the London Overground and National Rail, as well as those outside of London - in both cases where the London Underground is unavailable. Survey data highlights that active travellers perceive

public transport most positively (81%), followed by bus/coach users (75%) and train users (73%). Private motor vehicle users had the lowest positive perception of public transport (66%).

Table 1: Primary mode of transport used in London before the Covid-19 pandemic and percentage of users who had a positive perception of public transport		
Primary Mode	*% of responses*	*% of mode respondents with a positive perception of public transport*
Train	32%	73%
Tube	28%	69%
Private motor vehicle (car/motorcycle)	14%	66%
Active travel (cycling/walking)	14%	81%
Bus/Coach	12%	75%

The median and mean age of those using different forms of primary transport highlights the mean age of private motor vehicle users is higher than other modes at 51 years old (Figure 16). It also shows how small the interquartile range is for active travel with a mean age of 37.

Figure 16: Primary mode of transport used in London before Covid-19 pandemic by age
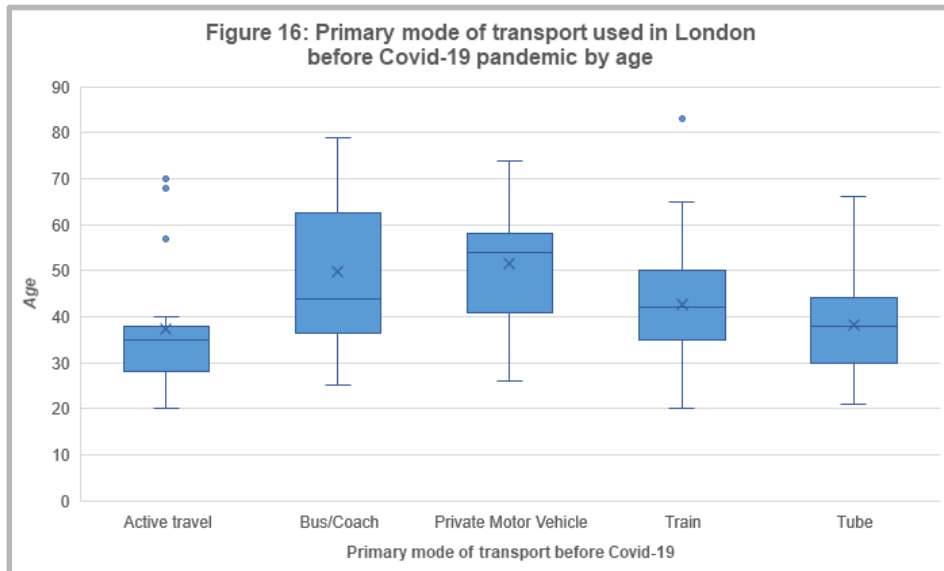
For those in the lowest income group the bus/coach was the most frequent form of primary transport used before the pandemic, accounting for 38% of responses (Figure 17). Active travel (25%) and the London Underground (17%) were the second and third most used forms. For those in the £20,001-£50,000 income group, the tube (30%) was the primary form of transport, closely followed by the train (27%). In the top two income groups the train was the most frequently used form, accounting for 44% of those in the £50,001-£75,000 group and 45% of those in the £75,001+ group. None of those surveyed from the top income group said the bus/coach was their primary form of transport. The group did have the highest percentage (28%) of active travellers within any income group.

Figure 17: Primary mode of transport used in London before the Covid-19 pandemic by income group
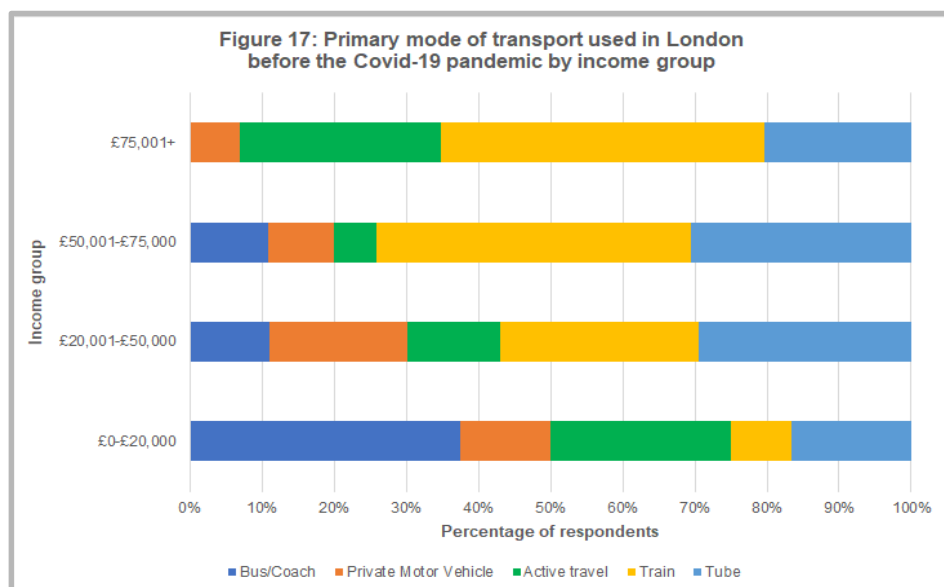
Comparing the responses on primary mode of transport before the pandemic to during the pandemic highlights the growth of active travel as individuals followed the Government's advice to stay at home, avoid public transport and non-essential travel. Active travel was the primary mode for 66% of respondents, with private motor vehicles the second most used form at 28% (Figure 18).

Figure 18: Primary mode of transport used in London during the Covid-19 pandemic
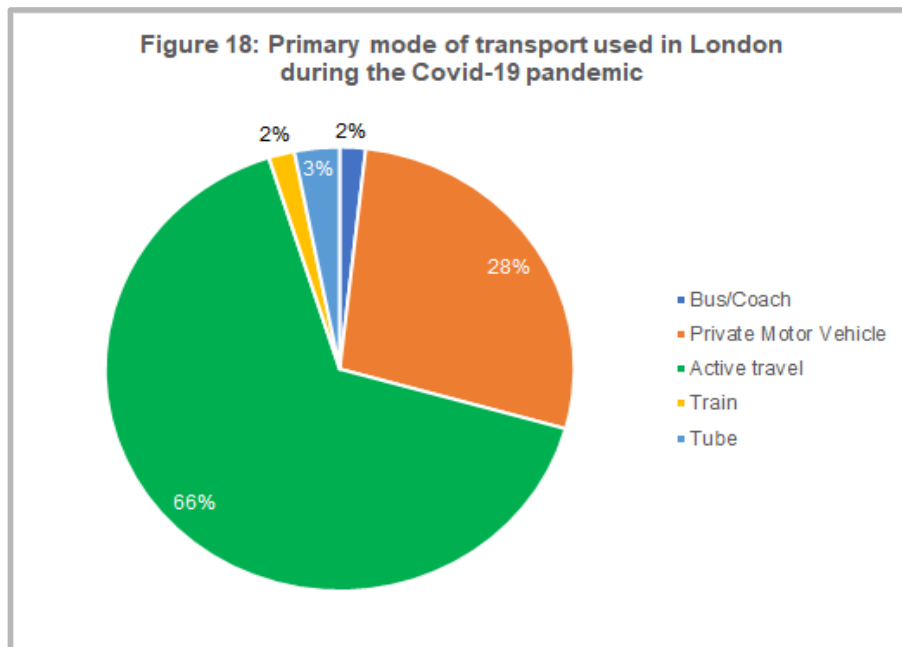
Active travel respondents covered a large age range from 20 to 79 years old, with the interquartile range being between 31 and 51 years old (Figure 19). The age range of those using private motor vehicles, the second most used primary transport mode, was similar to active walking. For those using the tube, albeit a small number, the data suggests a relatively low median but with a mean that is higher.

Figure 19: Primary mode of transport in London during the Covid-19 pandemic by age
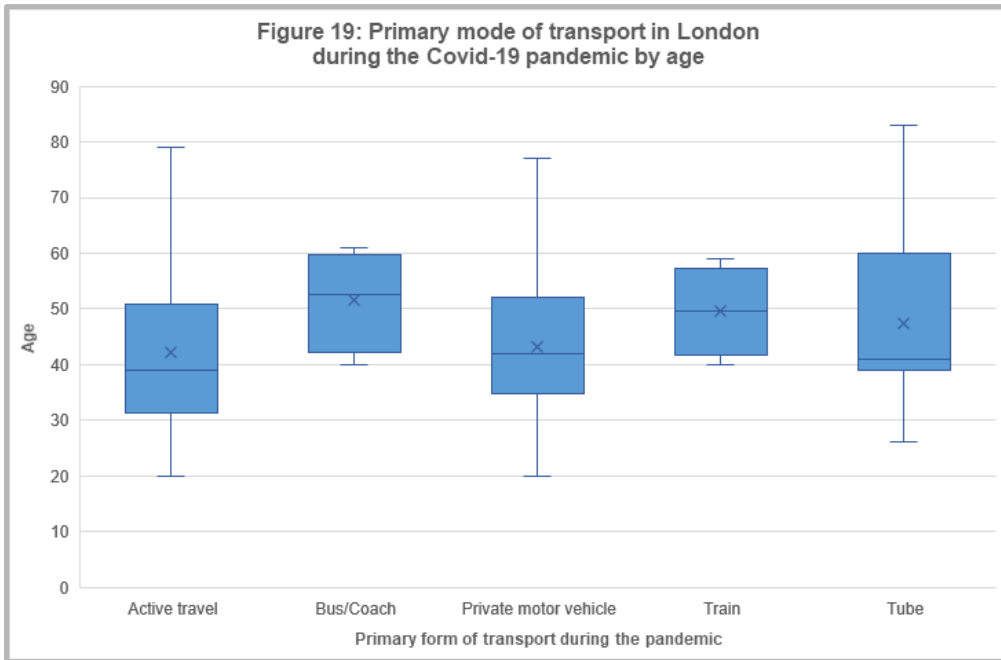
Overall active travel increased from 14% of respondents before the pandemic to 66% during it (Figure 20). Private motor vehicle use similarly increased from 14% to 28%. Conversely bus/coach, tube and train use all declined to single digits reflecting people following government advice.

Figure 20: Primary mode of transport used in London before and during the Covid-19 pandemic
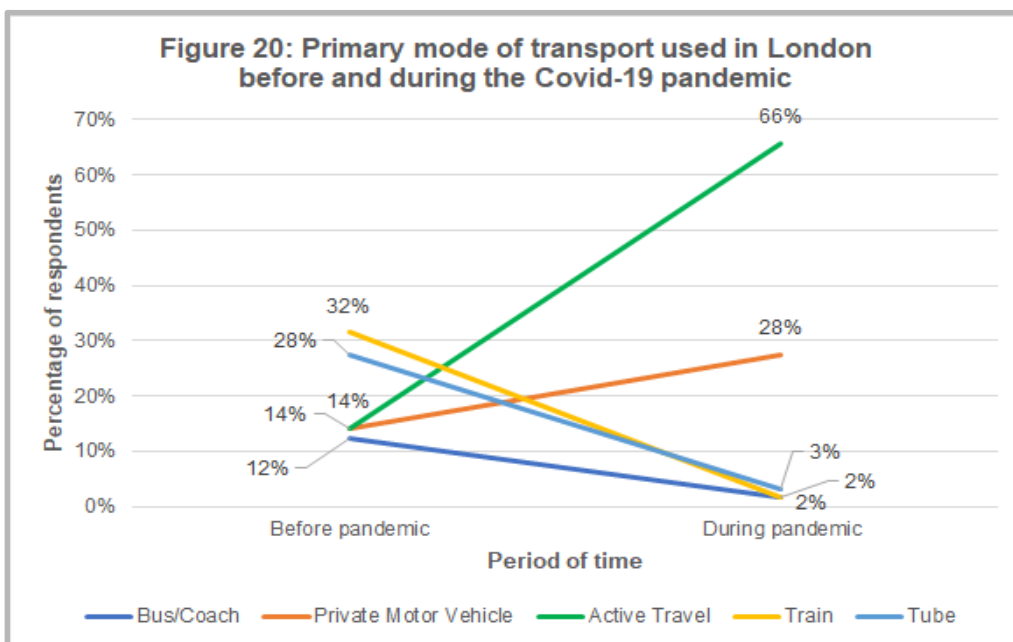
In percentage change terms active travel increased significantly (+363%), as did private motor vehicle use (+94%) (Figure 21). Data shows the sharp decline in train

(-94%), tube (-89%) and bus/coach use (-86%). This mirrors the data from TfL shown in Chapters 1 and 2 which highlighted the sudden and dramatic drop in public transport usage as lockdown began. The changes in mode highlights just how effective the Government's advice, as set out in Chapter 1, was in changing behaviour with messaging to avoid public transport and non-essential travel.

Figure 21: Percentage change in primary mode of transport used in London from before to during the pandemic
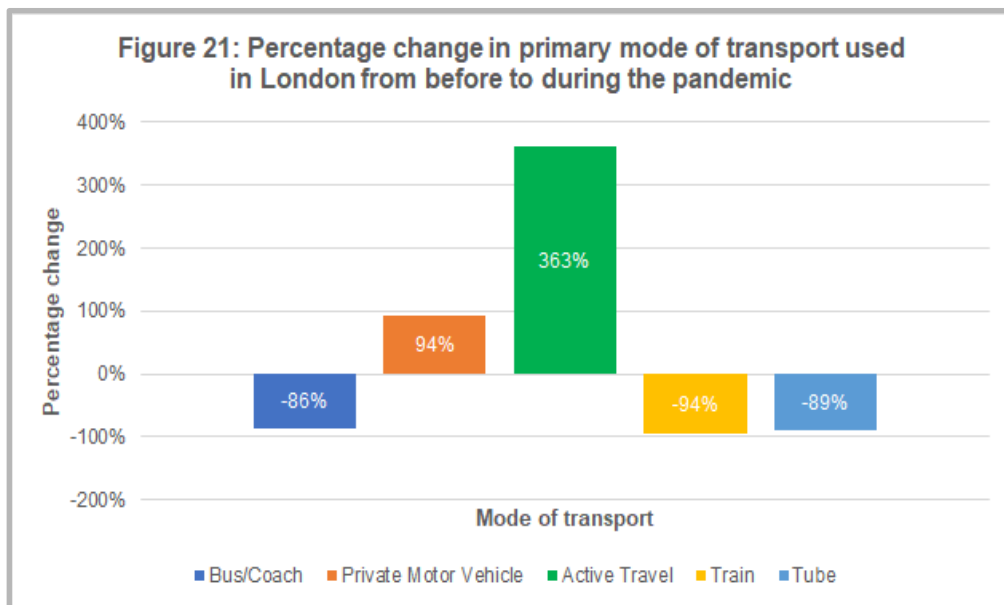
Perceptions of public transport

The online survey also sought to understand how individuals perceive public transport - this included before the pandemic, during it and in a post-pandemic world. This was designed to identify how perception may have changed as a result of Covid-19 and the discourse (Rodrigue et al, 2020; Budd and Ison, 2020; Shen et al, 2020; Fa-Chun et al, 2020; van Doremalen et al, 2020; and Harris, 2020a) which has focused on public transport as a vector. Individuals were asked to use a four-point scale to provide responses on perception - very negative, negative, positive and very positive.

In total 72% of all respondents had a positive or very positive perception of public transport before the pandemic. From a gender perspective there was a higher proportion of positive responses from males (78%) compared to females (68%) (Figure 22). Only 4 respondents (1.8%) had a 'very negative' perception of public

transport, of these 75% were female and used the car as their primary transport mode.

Figure 22: Perception of public transport in London before the Covid-19 pandemic by gender
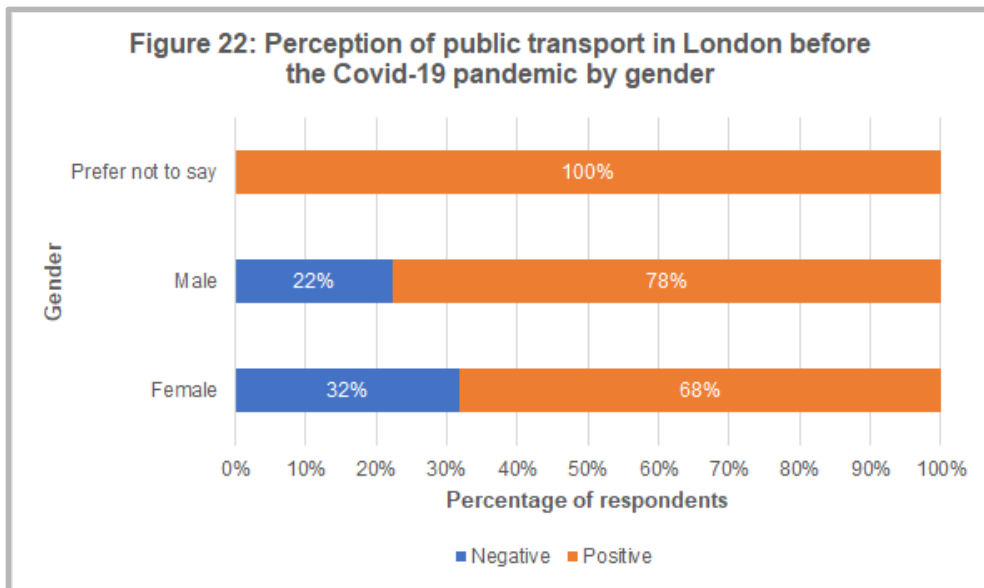
The age range of those with a positive or very positive perception was much greater than the age range of those who had a negative or very negative perception (Figure 23). The first and third quartile age of those with a negative perception was the lowest of any category at 31 and 48 years old. The chart also highlights the median age of those with a positive perception is lower within the interquartile range suggesting there were more respondents at the younger end of the range shown.

Figure 23: Perception of public transport in London before the Covid-19 pandemic by age
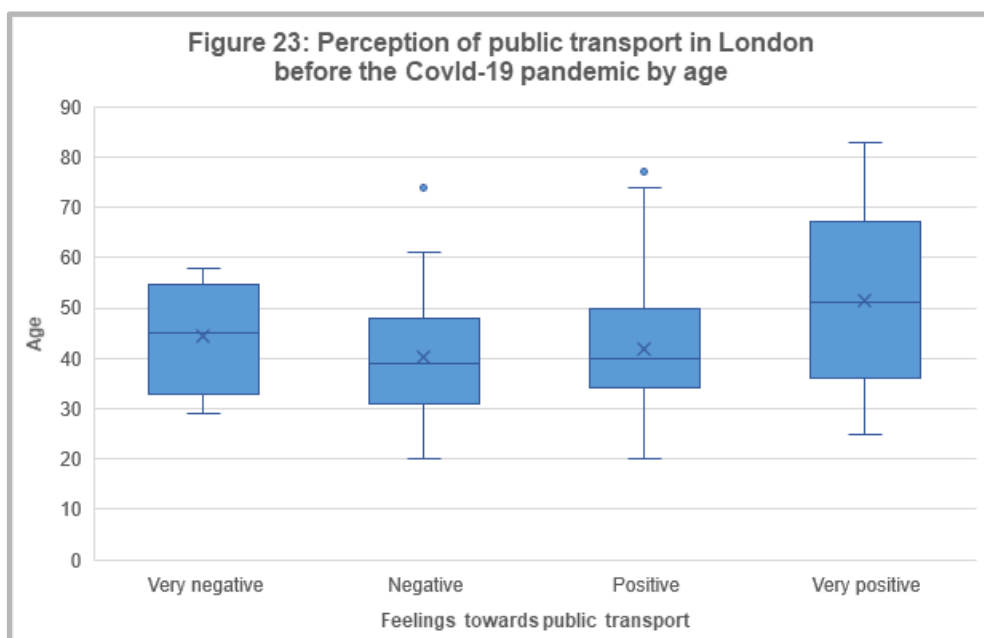
For individuals who had a 'negative' or 'very negative' perception of public transport before the pandemic (28% of responses) there were four main themes in the responses given. These were:

- an unreliable service;
- public transport being unhygienic;
- public transport being expensive; and
- public transport being crowded.

In total 56% of those who had a negative perception said crowding was the main reason (Table 2). This was the number one reason for both genders, followed by an unreliable service. For females, the hygiene of public transport was the third most mentioned reason, but did not feature in male responses.

Table 2: Reason for perceiving public transport in London in a negative way before the Covid-19 pandemic			
Reason	*Male*	*Female*	*Total*
Crowded	67%	52%	56%
Unreliable service	19%	24%	23%
Unhygienic	0%	17%	11%
Expensive	14%	7%	10%

A greater proportion of respondents (72%) said they had a 'positive' or 'very positive' perception of public transport before the pandemic. There were five main reasons - public transport was seen as:

- safe;
- punctual/reliable;
- environmentally friendly;
- affordable; and
- accessible and convenient.

Over half of all respondents said accessibility/convenience was the main reason for their positive view of public transport (Table 3). Punctuality and reliability were mentioned more by females. The perception of public transport being environmentally friendly was not commonly referred to, compared to other reasons, but for those that did refer to it there were a greater proportion of males than females.

Table 3: Reason for perceiving public transport in London in a positive way before the Covid-19 pandemic			
Reason	*Male*	*Female*	*Total*
Accessible/Convenient	52%	51%	52%
Punctual/reliable	25%	35%	31%
Affordable	10%	9%	9%
Environmentally friendly	6%	2%	4%
Safe	7%	3%	4%

Analysis of the survey data highlights that perceptions of public transport radically changed during the pandemic, likely influenced by messaging to avoid using it and discourse on public transport being a vector for disease (Rodrigue et al, 2020; Budd and Ison, 2020; Shen et al, 2020; Fa-Chun et al, 2020; van Doremalen et al, 2020; and Harris, 2020a). Previously 72% perceived public transport in a positive or very positive way before the pandemic, but this fell substantially to 27% during the pandemic (Figure 24). Conversely those who perceived public transport in a negative or very negative way grew from 28% before the pandemic to 73% during it.

Figure 24: Perception of public transport in London before and during the Covid-19 pandemic
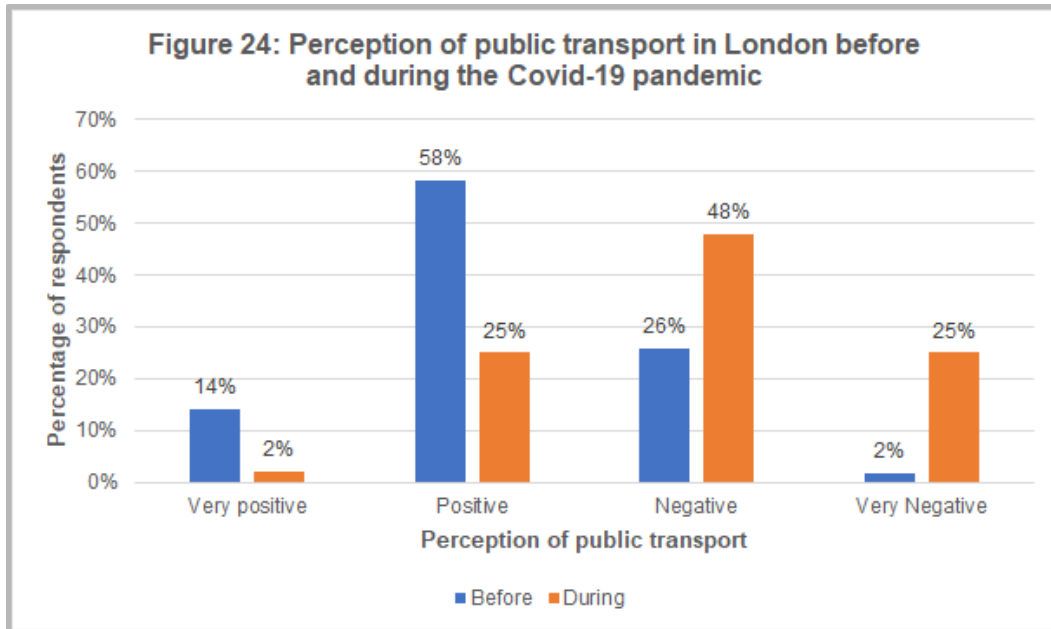
Reviewing the reasons for these perceptions there are a number of common themes. For those who perceived public transport in a negative or very negative way, the reasons related to five broad categories:

    i.   anxiety/risk of exposure (in using public transport);

    ii.   being unable to social distance on public transport;

    iii.   public transport is unhygienic;

    iv.   a social responsibility to avoid public transport; and

    v.   not using public transport at present.

Across all age and gender groups, bar one individual in the 'prefer not to say' category, anxiety and the risk of exposure to Covid-19 was the dominant reason for perceiving public transport in a negative or very negative way (Table 4). This confirms that messaging to avoid public transport, along with discourse on the potential risk of exposure in using it, has clearly been heard by the general public. It also ties back to data from Chapter 1 which highlighted the dramatic decline in public transport use.

Being unable to socially distance on public transport was the second most common reason. Negative perceptions focussed on unreliability and cost which featured before the pandemic, did not feature during it. Perceptions on public transport being unhygienic featured before and during the pandemic, but only from female

respondents. The number of female respondents stating this as a reason increased when compared to before the pandemic, but given greater numbers perceived public transport in a negative way during the pandemic as a percentage of the total it is shown to have declined.

Table 4: Reason for perceiving public transport in London in a negative way during the Covid-19 pandemic			
Reason	*Male*	*Female*	*Total*
Anxiety/risk of exposure	57%	48%	52%
Unable to social distance	21%	27%	24%
Not using public transport at present	15%	12%	13%
Social responsibility to avoid public transport	7%	4%	6%
Unhygienic	0%	9%	5%

For those individuals who had a positive or very positive perception (27% of the total), reasons given related to four categories (Table 5):

    i.   face coverings/social distancing is in operation;

    ii.   public transport is not crowded;

    iii.   public transport isn't currently being used; and

    iv.   public transport is safe/best form of transport.

Table 5: Reason for perceiving public transport in London in a positive way during the Covid-19 pandemic			
Reason	*Male*	*Female*	*Total*
Not using public transport at present	32%	33%	33%
Best from of transport to use	39%	24%	31%
Public transport is not crowded	15%	25%	20%
Face coverings/social distancing in operation	14%	18%	16%

A large proportion of those who had a positive perception were not using public transport (33%). The second most frequent reason for males was that public transport was the best form of transport to use, whilst for females less crowding was highlighted. This is a vast difference from before the pandemic where crowding was the number one reason given for a negative perception of public transport.

Whilst public transport is perceived largely negatively during the pandemic, positive perception scores increased when respondents were asked hypothetically about their likely perception of it post-pandemic (Figure 25). Negative perceptions grew from 26% before the pandemic to 48% during it, but are only slightly reduced post-pandemic to 43%. Similarly, the 2% of respondents who perceived public transport in a very negative way before the pandemic grew to 25% during it. Looking ahead to post-pandemic this falls back to 14%. Together the negative and very negative perceptions in a post-pandemic world account for a substantial 57% of the total. It can of course be argued that it's difficult to predict how an individual will feel in the future and as such this is hypothetical and only a guide as to how people may feel at the time. If true though, it presents a serious challenge in encouraging individuals back on to public transport.

Figure 25: Perception of public transport in London before, during and looking ahead to post Covid-19 pandemic
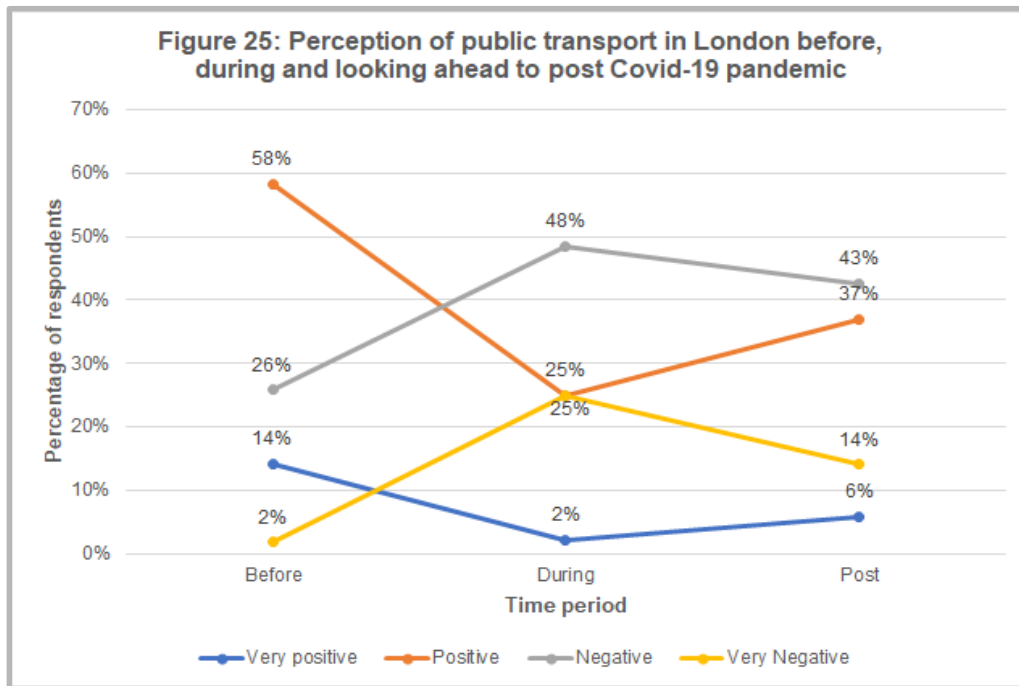
Negative perceptions of public transport in a post-pandemic world were held by 60% of females and 54% of males. From an income perspective 52% of those earning over £75,001 were likely to have a positive perception. In other income bands a negative perception was more prevalent.

Reasons given for having a negative perception of public transport in a post-pandemic world related to five themes:
  i.   Stress/anxiety of using public transport;
  ii.   Preference to not use public transport;
  iii. Health and safety concerns around using public transport;
  iv.   Delays and overcrowding on services; and
  v.   Cost of public transport.

Health and safety concerns were the most common reason overall (51%) (Figure 26), followed by delays/overcrowding - the number one reason before the pandemic. Stress and anxiety featured more highly for females, perhaps reflecting ongoing fears around the pandemic and future outbreaks.

Figure 26: Reason for having a negative perception of public transport in London post Covid-19 pandemic
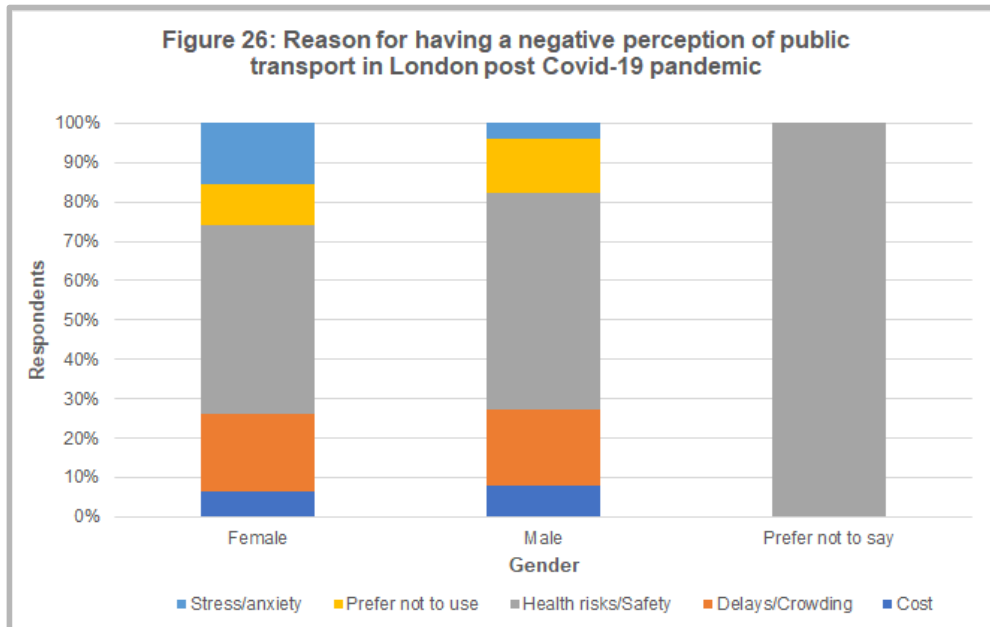
For respondents who said they would likely have a positive or very positive perception of public transport in a post-pandemic world, there were six main reasons. These were:

  i.   A desire to cycle more or stay local;
 ii.   Public transport will be safe/hygienic;
iii.   Public transport is punctual, reliable and/or will be less crowded;
 iv.   Public transport is environmentally friendly;
  v.   Public transport is accessible and convenient; and
 vi.   No reason given.

The most common reason for both genders was public transport will be safe and hygienic, closely followed by it being accessible and convenient (Figure 27). Data by age group highlights that public transport being safe and hygienic is the sole reason given by those in the 18-24 age group. Perhaps surprisingly given recent events in relation to climate change largely led by younger people, the environmental benefits of public transport were mentioned by all age groups, bar the 18-24 age group.

Figure 27: Reason for having a positive perception of public transport in London post Covid-19 pandemic
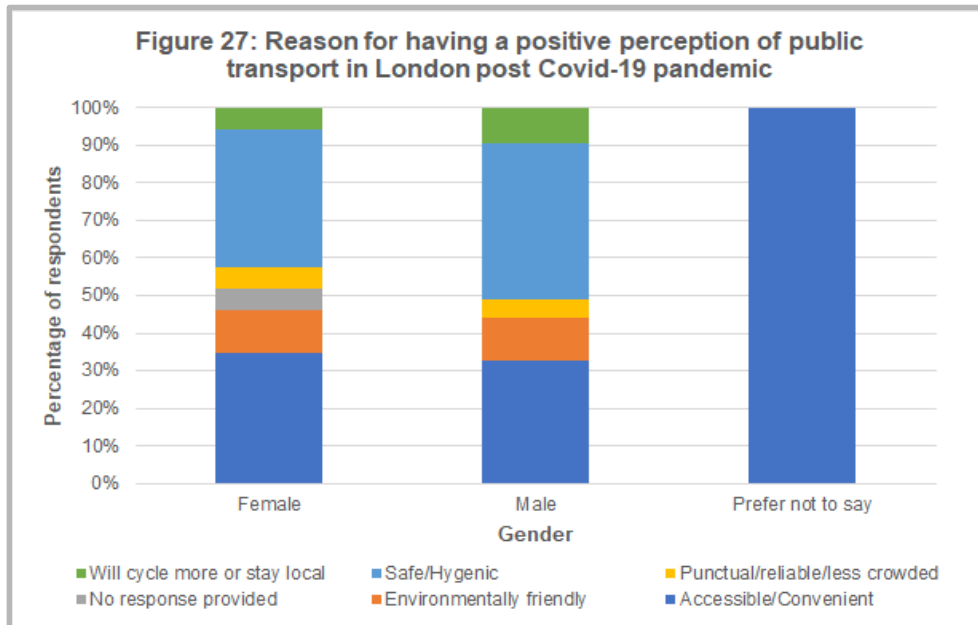
Frequency word analysis undertaken on the reasons given for perceiving public transport in a positive or negative way before, during and post-pandemic highlight many of the themes shown. Words such as 'crowding', 'unreliability', 'convenience' and 'service' are mentioned before the pandemic, whilst words used for perceptions during the pandemic included 'Covid-19', 'distancing', 'masks' and 'risk' (Figure 28). In the post-pandemic responses, the words 'social' and 'distancing' feature heavily, as do 'pandemic', 'people', 'use', 'will' and 'safe'.

Figure 28: Frequency word analysis on how individuals perceive public transport before (left), during (centre) and post (right) Covid-19 pandemic
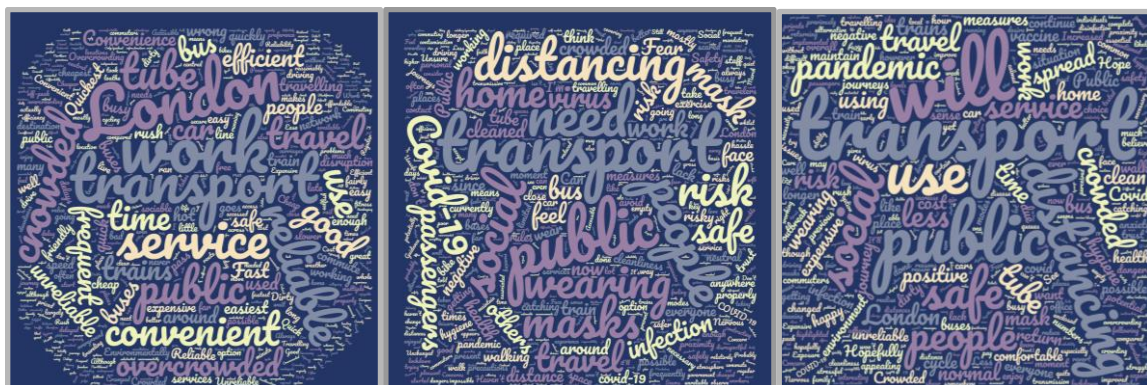
Responding to the pandemic

Those surveyed were asked about their likely usage of public transport after the Covid-19 pandemic. Survey data highlights that usage of public transport may decline with substantial numbers suggesting they will use it a little less (50%) or a lot less (30%) compared to before the pandemic (Figure 29). Earlier analysis on perceptions of public transport highlighted that whilst positive perceptions increase post-pandemic, they don't recover to pre-pandemic levels. Many of the reasons set out in the earlier analysis as to why individuals have a negative view will need to be addressed to encourage the take-up of public transport once again.

Figure 29: Respondent views on using public transport in London post Covid-19 compared to before the pandemic
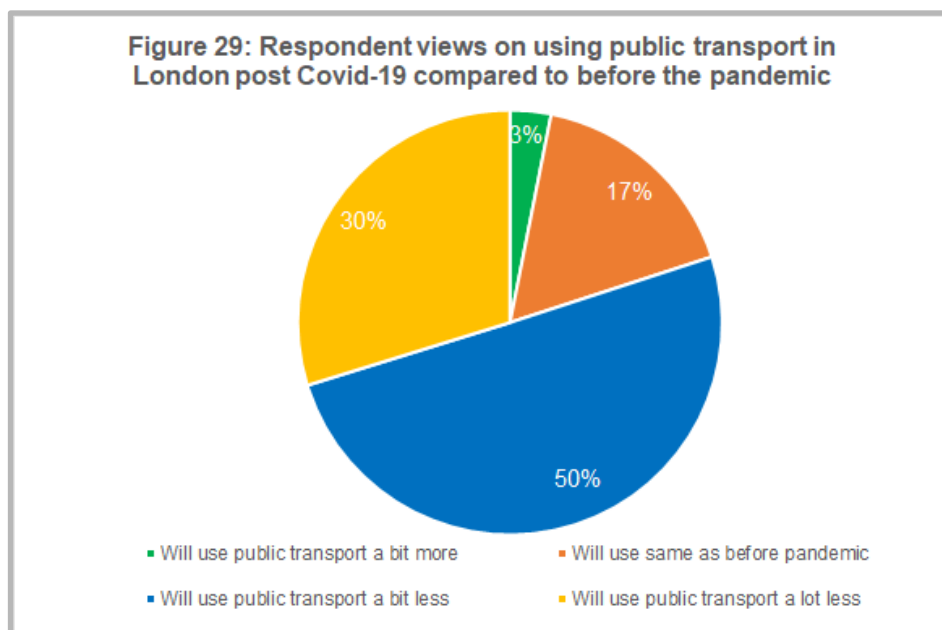
The survey asked if individuals would be willing to pay more for public transport to maintain safe levels of social distance (Figure 30). Analysis highlights that 32% would be willing to pay more, with 68% saying they would not be willing to pay more. The percentage of females willing to pay more was higher than males (39% v 23%).

Figure 30: Willingness of respondents to pay more for public transport in London to maintain social distance

- Not willing to pay more
- Willing to pay more
- Very willing to pay more
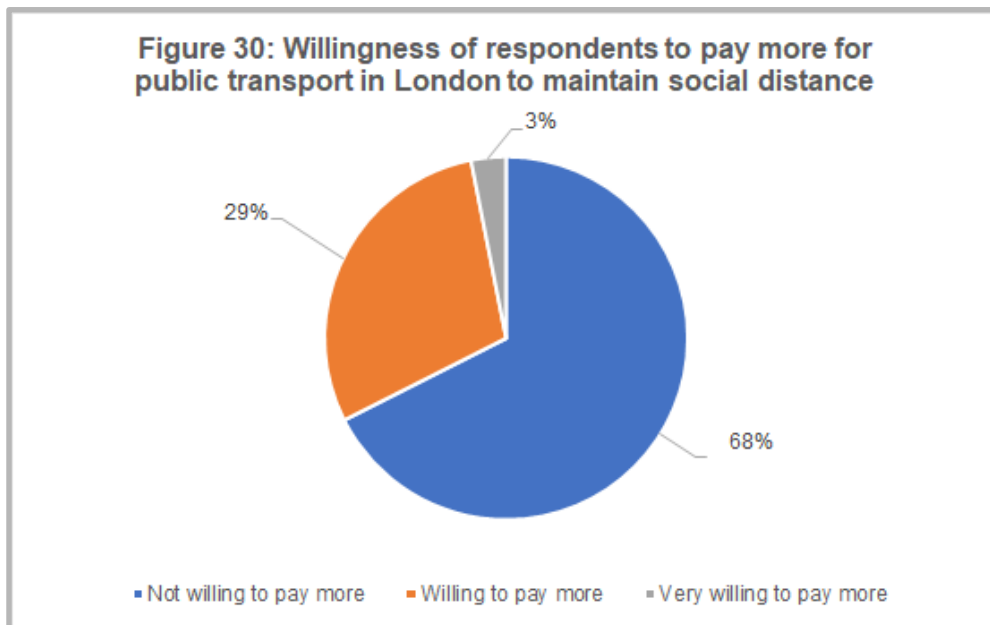
In comparing willingness to pay with perceptions of public transport during the pandemic, it highlights that 72% of those not willing to pay more have a current negative perception and 28% have a positive perception. In looking at those who said they were willing to pay more, 75% have a negative perception during the pandemic with the remaining 25% having a positive perception.

From a location perspective there was no particular area which was willing to pay more. From an income perspective individuals in the lowest income group were the second most likely, behind those earning the most to be willing to pay more (Figure 31). Those in the £20,001-£50,000 income bracket, which includes individuals on the London average salary, were least likely to want to pay more for public transport.

Figure 31: Willingness to pay more for public transport in London to maintain social distance by income group
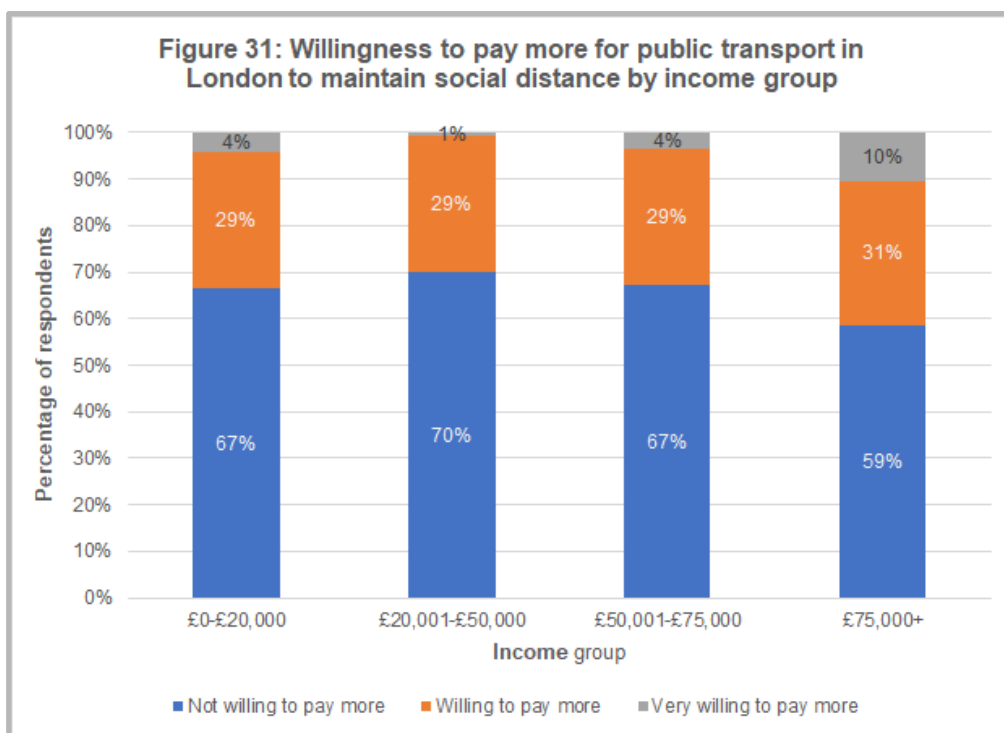
The survey asked what steps TfL or the Government could take to support public transport usage post the Covid-19 pandemic. Given the number of suggestions provided the responses have been analysed and grouped below (Table 6).

Table 6: Ways in which TfL or Government could support public transport usage post Covid-19		
Suggested measure		**% of respondents**
1	Limit numbers/penalties for non-compliance with safety measures	27%
2	Deep cleaning/sanitising	19%
3	More frequent services	14%
4	Increase funding for PT/more frequent services	8%
5	Cheaper fares/more flexible ticketing	6%

6	Don't know	6%
7	Encourage flexible working	4%
8	Communication on current risk level/capacity	4%
9	Continue as normal	2%
10	Discourage PT/PT is not an option until vaccine found	2%
11	Encourage cycling	2%
12	Encourage e-scooters	1%
13	Focus on reliability of services	1%
14	Increase workers' pay	1%
15	Introduce additional safety measures	1%
16	Open up economy to encourage PT use	1%
17	Restrict car use	1%
	Total	**100%**

Further rationalisation of the data and grouping of similar responses together into themes highlights that hygiene standards and enforcement of safety measures (including the wearing of face coverings and limiting numbers of travellers on transport modes) was by far the most frequent response (Figure 32). Whilst this looks ahead to a post-pandemic world, there are clearly still concerns in the population about a new epidemic or pandemic emerging and spreading. It also relates back to the questions on how individuals perceive public transport and the substantial number who still see this in a negative light. It also points to discourse mentioned in Chapter 2 about public transport as a vector for disease (Rodrigue et al, 2020; Budd and Ison, 2020; Harris, 2020a; De Vos, 2020; DfT, 2020c) as well as the health and social impacts from the pandemic outlined in literature (De Vos, 2020; van Bavel, 2020; Brooks et al, 2020).

Figure 32: Ways in which TfL/Government could support public transport usage post Covid-19 pandemic by theme

Legend:
- Increased hygiene, enforcement of safety measures and comms on level of risk
- Increased funding/more frequent and reliable services
- Cheaper fares/more flexible ticketing
- Don't know
- Encourage flexible working
- Encourage active travel
- Continue as normal
- Discourage PT/PT is not an option until vaccine found
- Increase workers pay
- Open up economy to encourage PT use
- Restrict car use

The second theme which emerged from the findings was in relation to increased funding for public transport as a means to provide more frequent and potentially more reliable services. Whilst additional funding would no doubt be welcomed by TfL, the current national economic position and political climate suggests that this may be unlikely and if it were agreed, would come with strings attached. The most recent bailout of TfL by the Government in May 2020 included conditions on considering fare rises from January 2020, temporarily suspending free travel in the morning peak for over 60s and suspending free travel for all under-18s (TfL, 2020b).

Cheaper fares/more flexible ticketing was the third most mentioned suggestion with 6% of respondents. There is a potential link from this suggestion to the 4% of respondents who suggested support for an increased uptake of flexible working. To make this work for many commuters the ticketing system would need to be changed to make it more adaptable to how people want to travel in the future, reflecting that post-pandemic many individuals may work one or more days from home. With flexible working this may also mean individuals starting and finishing work at different times and ticketing could be used to further spread the number of journeys over a greater timeframe to lessen the peak hours and reduce overcrowding.

Perhaps surprisingly from the responses is that active travel did not feature more prominently, with only 3% of respondents suggesting this. Given walking and cycling increased during the lockdown period, the low level of response may indicate respondents expect to largely return to pre-pandemic primary modes, albeit with safety measures in place and potentially different travelling patterns.

The suggestions given will need to be considered to encourage public transport uptake in a post-pandemic world. This is explored further in the next chapter.

5. Conclusion

The Covid-19 pandemic is a public health emergency. It has sent shockwaves through society as a whole, including the transport sector. It's unlikely the sector will return to pre-pandemic norms and there will be longer-term impacts. At the time of writing it's neither possible nor appropriate to return to 'business as usual' with the disease still resulting in large numbers of people falling ill or dying, but the focus does need to turn to how public transport adapts to a 'new normal' and in the longer term how the pandemic could act as a catalyst for more substantial change (Budd and Ison, 2020; Campaign for Better Transport, 2020).

Short-term measures

Firstly the perception of public transport needs to be addressed. Primary research outlined in Chapter 4 clearly shows a substantial concern in using public transport during the pandemic and that this negative perception is unlikely to dissipate and could continue longer-term. It has been fuelled by discourse on public transport as a vector for the disease (Rodrigue et al, 2020; Budd and Ison, 2020; Shen et al, 2020; Fa-Chun et al, 2020; van Doremalen et al, 2020; and Harris, 2020a) and in the Government messaging to avoid public transport which may have been too successful as set out in Chapter 1.

Primary research highlights how stress and anxiety feature in concerns around using public transport, backed up by separate national surveys which indicated that three in ten people, *'don't feel safe using public transport at the moment'* (Transport Focus, 2020b). It is vital that transport authorities like TfL reassure passengers about the efforts they're taking to make the public transport system clean, safe and secure. Consistent and targeted communications on the mitigations taken must be increased to counter the negative perception that exists and which has been allowed to gain ground.

Public transport must adapt to a 'new normal'. There can be no degradation of services. Services must be enhanced from pre-pandemic levels to allow for reduced capacity and social distancing. Such distancing results in capacity levels being much

lower than those from the pre-pandemic era (McKinsey & Company, 2020). The fear, stress and anxiety highlighted in primary research and academic literature (De Vos, 2020; van Bavel, 2020; Brooks et al, 2020) must be tackled through measures which highlight to the public that whilst there is reduced capacity on individual services, the frequency has been increased to allow the system to operate safely and securely. This is critical given that for some sections of society, as set out in Chapter 2, public transport is the only means to get to work or for leisure purposes. To do this investment in transport authorities, like TfL, will be critical to ensure financial stability in a time when revenue from passenger fares and advertisement are lower. Primary research in Chapter 4 highlighted that there is not a willingness to pay more for public transport to keep it safe and secure, so such revenue will need to come centrally from the Government. This will be challenging given national budgets are under severe strain.

The 'new normal' will need to also include measures to enhance active travel. There are health benefits to this and people who walk or cycle also tend to be more satisfied with their journeys (Chatterjee, 2020). Steps to encourage uptake in London during lockdown go part of the way, as do commitments from the Government with the announcement of £2bn to support walking and cycling in the longer term (DfT, 2020b). Regulation to support cycling must be forthcoming to lower speed limits and improve cyclist safety. Investment in permanent segregated cycleways is vital to encourage greater uptake of cycling and ending the postcode lottery of where cycle lanes exist through a comprehensive and joined up network. This will result in increased space being needed for cycling, but also increased pavement widths to encourage walking. Studies of current pavements earlier in 2020 indicated that in London only one third are wide enough to meet social distancing requirements (Nathan, 2020). Increasing walking and cycling have both mental and physical health benefits with analysis already indicating that if every Londoner walked or cycled 20 minutes a day, the saving to the NHS over 25 years in treatment costs would be £1.7bn (Mayor of London, 2017).

Long-term measures

In the long-term communication on the mitigations to keep public transport clean, safe and secure must continue. Primary research indicated the majority will still likely have a negative perception of public transport post-pandemic. Many people will still be fearful of public transport and social contact even when social distancing is removed (De Vos, 2020). However there is the potential for transformational change and a unique opportunity to re-imagine urban mobility. The dramatic change in travel behaviour as a result of the pandemic resulted in more people living and working more locally. It highlights what could be possible in a post-pandemic world with political and public will (Budd and Ison, 2020). Remote working could present an opportunity to reimagine our local neighbourhoods.

The creation of more locally focussed neighbourhoods is being led by the C40 network, made up of forty of the world's city mayors. Amongst its ambitions for a *'Green and Just Recovery'* is the creation of '*15 minute cities*' where urban planning policy supports workplaces, services and amenities all being a short walk or cycle ride away from residents. These neighbourhoods are enhanced by open green spaces and investment in safe, affordable and efficient public transport systems. Such 15-minute cities are being led by Portland and Paris (C40, 2020; Portland Online, 2020 and Bloomberg, 2020b).

Addressing climate change must also be a priority coming out of the pandemic. Transport accounts for 28% of all greenhouse gas emissions and became the largest emitting sector in 2016 (DfT, 2020d). This is led by private motor vehicle use which became the standard mode of transport for 28% of those surveyed, of which 68% of whom previously used public transport. It will be critical to draw pre-pandemic public transport users back and encourage greater uptake. This should be through increased fees for using a car in the city and for parking, both aimed at deterring it's use. Public realm changes in town centres could also substantially reduce car use as a primary mode. Alongside this there should be increased investment in public transport taking account of new travel behaviours and patterns. Services from before the pandemic may no longer be fit for purpose in a post-pandemic world and should be reviewed on a borough by borough basis. Communication on the benefits of

public transport for the environment should be enhanced with investment too in new technologies to fuel buses, trains, trams etc. Clearly this level of investment will be challenging in the short term, but there will be longer-term gains.

With potentially increased remote working, ticketing should also be made more flexible and affordable to support those who have season tickets, but who may no longer commute five days a week. Ticketing could also encourage travel at particular times and help to flatten the rush hour curve. New start-up ventures focussed around e-mobility (mentioned in survey responses) present another option to entice travellers away from the car and especially in the last mile of journeys from transport hubs to home/office/shops. This will require investment in infrastructure or tie-ups with micro mobility companies to provide this. Enforcement must be considered to ensure pavements, parks and rivers are not littered with e-scooters with impacts on the environment and for those with reduced mobility or vision. In addition more on-demand transport services (e.g.: Snap) could operate in London, filling existing gaps in the transport network with minimal public subsidy or support. Such new services are enhanced through mobile apps, linked to TfL, which could fully integrate the mobility offering for Londoners and support the management of crowding levels.

Perceptions of public transport have been impacted as a result of the pandemic as shown through the primary research. There is a risk that without action the negative perception could prevail into a post-pandemic world with it being seen as unhygienic (Tirachini, 2020). However the future does not have to be seen to be bleak. Communication with the public going forward will be vital. The measures outlined above, both short and long-term, go some way to support a green and resilient recovery, encouraging people back to a clean, safe and secure network whilst investing in local neighbourhoods, new technology and services which will benefit London's economy, environment and public health.

Future research

The primary research undertaken as part of this paper provides a snapshot of the position in London during Summer 2020 and provides suggestions of measures that could be taken to encourage the uptake of public transport. Given the fast moving

nature of the pandemic and its effects, future research in this area could look at the impacts on public transport in greater depth, as well as how perceptions may impact on behaviour in different cities and settings. It could also focus on the effect of more remote working on transport and/or the uneven impact changes to public transport had on particular groups in society as described in Chapter 2. Future research could also consider the policy measures in response to this pandemic and the public's view and willingness in accepting them. Research could also look at the lessons learned for the transport sector and how it prepares for the next pandemic.

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Annex A: UK Government poster in Evening Standard article - 28 May 2020

(Source: Evening Standard, 2020b)

Annex B: Online survey

This short survey asks about your travel choice and behaviour within London before and during the Covid-19 pandemic. It also looks ahead to ask how you will likely travel after the pandemic.

There are 15 questions and the survey should take around 10-15 mins to complete. Data gathered will not be attributed to any individual and your name is not required.

Your participation is greatly valued in helping to understand how the Covid-19 pandemic may affect transport in London longer-term.

Section 1: About you

Before answering the questionnaire, please tell me a bit about yourself.

1. **Are you:**
   ● Male
   ● Female
   ● Prefer not to say

2. **What year were you born?**
   ● [enter]

3. **What is the first part of your postcode e.g. SE1, CR0, TN16?**
   ● [enter]

4. **What's your income level?**
   ● Up to £20,000
   ● £20,001-£50,000
   ● £50,001-£75,000
   ● Above £75,001

Section 2: Before the pandemic

This section looks at your behaviour and choices towards transport <u>before the pandemic was declared.</u>

Please answer questions based on your primary mode of travel. This is the mode used most frequently in any given week and could have been to/from work, school, college, university or for another activity.

5. **What was your primary mode of transport before the pandemic was declared?**
   - Walking
   - Cycling
   - Car
   - Motorcycle
   - Train
   - Tram
   - Tube
   - Bus/Coach

6. **Thinking about your feelings towards using public transport before the pandemic, were they positive or negative?**

Range (1=very negative, 2=negative, 3=positive, 4=very positive)			
1	2	3	4

7. **In a sentence, what were the reasons for your previous choice?**

Section 3: During the pandemic

This section looks at your behaviour and choices towards transport <u>during the pandemic.</u>

Once again please answer questions based on your primary mode of travel. This is the mode used most frequently in any given week and could be to/from work, school, college, university or for another activity.

8. **What has been your primary mode of transport during the pandemic?**
   - Walking
   - Cycling
   - Car
   - Motorcycle
   - Train
   - Tram
   - Tube
   - Bus/Coach

9. **What are your feelings towards using public transport at present?**

Range (1=very negative, 2=negative, 3=positive, 4=very positive)			
1	2	3	4

10. **In a sentence, what were the reasons for your choice?**

11. **How willing would you be to paying more for public transport to maintain safe levels of social distance?**

Range (1=not willing to pay more, 2=willing to pay more, 3= very willing to pay more)		
1	2	3

Section 4: After the pandemic

This section <u>looks ahead at life after the pandemic.</u>

12. **Thinking about your feelings towards using public transport after the pandemic, are they positive or negative?**

Range (1=very negative, 2=negative, 3=positive, 4=very positive)			
1	2	3	4

13. **In a sentence, what were the reasons for your choice?**

14. **Thinking longer-term how do you think your usage of public transport in London will change compared to before the pandemic?**

Range (1=will use a lot less, 2=will use a little less, 3=will use same as before pandemic, 4=will use a bit more, 5=will use a lot more)				
1	2	3	4	5

15. **Finally, to what steps could TfL or the Government make to support public transport usage post-pandemic?**

Thank you for taking the time to complete this questionnaire.

RISK ASSESSMENT FORM

FIELD / LOCATION WORK

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form

http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION: BARTLETT SCHOOL OF PLANNING/TRANSPORT AND CITY PLANNING
LOCATION(S): LONDON, ENGLAND
PERSONS COVERED BY THE RISK ASSESSMENT: Nick Milford

BRIEF DESCRIPTION OF FIELDWORK: I will undertake independent primary research using an online survey to ascertain views on transport choice and behaviour before and during COVID-19, as well as seeking views how individuals will likely travel after the pandemic. I will also undertake secondary research using online literature, statistics and passenger transport data to use this in comparing and completing my dissertation.

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.

If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.

Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard
e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low ? No risks are expected given both primary and secondary research is being undertaken online via the internet. This is because of current government guidelines around not going out unless essential for work or exercise and the need to maintain social distance between individuals.

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	work abroad incorporates Foreign Office advice
	participants have been trained and given all necessary information
	only accredited centres are used for rural field work
	participants will wear appropriate clothing and footwear for the specified environment

	trained leaders accompany the trip
	refuge is available
	work in outside organisations is subject to their having satisfactory H&S procedures in place
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EMERGENCIES	**Where emergencies may arise use space below to identify and assess any risks**
e.g. fire, accidents	Examples of risk: loss of property, loss of life

No risks are expected which will result in the need to use external services. All fieldwork is being carried out online. Should any issues arise with participants taking part in the survey, they will seek medical help through health services and in extreme cases where urgent attention is needed contact emergency services.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
	fire fighting equipment is carried on the trip and participants know how to use it
x	contact numbers for emergency services are known to all participants
x	participants have means of contacting emergency services
	participants have been trained and given all necessary information
	a plan for rescue has been formulated, all parties understand the procedure
	the plan for rescue /emergency has a reciprocal element
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   1   May 2010

EQUIPMENT	**Is equipment used?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any** **risks**
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	the departmental written Arrangement for equipment is followed

	participants have been provided with any necessary equipment appropriate for the work
	all equipment has been inspected, before issue, by a competent person
	all users have been advised of correct use
	special equipment is only issued to persons trained in its use by a competent person
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	YES	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. alone or in isolation *lone interviews.*	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

Fieldwork is being undertaken during a time of isolation as a result of Covid-19. There is a risk that an accident whilst working along could take place resulting in the need to seek external help.

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	the departmental written Arrangement for lone/out of hours working for field work is followed
	lone or isolated working is not allowed
	location, route and expected time of return of lone workers is logged daily before work commences
X	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
X	all workers are fully familiar with emergency procedures
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   2   May 2010

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.
e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? Ill health could come about through usual day to day activities creating common illness like colds/flu or more seriously from Covid-19. This risk is more limited during periods of isolation.
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	an appropriate number of trained first-aiders and first aid kits are present on the field trip
	all participants have had the necessary inoculations/ carry appropriate prophylactics
	participants have been advised of the physical demands of the trip and are deemed to be physically suited
	participants have been adequate advice on harmful plants, animals and substances they may encounter
	participants who require medication have advised the leader of this and carry sufficient medication for their needs
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented: Fieldwork is being undertaken from home due to ongoing isolation as a result of Covid-19. This should reduce the risk of illness.

TRANSPORT	Will transport be required	NO	X	Move to next hazard
		YES		Use space below to identify and assess any risks
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training			
	Is the risk high / medium / low? No transport from the fieldwork is expected as this is all being carried out from home. Participants do not need to travel to take part.			
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk			

	only public transport will be used
	the vehicle will be hired from a reputable supplier
	transport must be properly maintained in compliance with relevant national regulations
	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
	drivers have been trained and hold the appropriate licence
	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
	sufficient spare parts carried to meet foreseeable emergencies
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low?		
	Given current restrictions due to Covid-19 social distancing is in force and surveys will be conducted online only. Research is also being undertaken online with no direct access to the public as may be expected through interviewing on the street.		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	all participants are trained in interviewing techniques
	interviews are contracted out to a third party
	advice and support from local groups has been sought
	participants do not wear clothes that might cause offence or attract unwanted attention
	interviews are conducted at neutral locations or where neither party could be at risk
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   3   May 2010

WORKING ON OR NEAR WATER	Will people work on or near water?	NO NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	lone working on or near water will not be allowed
☐	coastguard information is understood; all work takes place outside those times when tides could prove a threat
☐	all participants are competent swimmers
☐	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
☐	boat is operated by a competent person
☐	all boats are equipped with an alternative means of propulsion e.g. oars
☐	participants have received any appropriate inoculations
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	**Do MH activities take place?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any** **risks**
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

☐	the departmental written Arrangement for MH is followed
☐	the supervisor has attended a MH risk assessment course
☐	all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
☐	all persons performing MH tasks are adequately trained
☐	equipment components will be assembled on site
☐	any MH task outside the competence of staff will be done by contractors
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   4   May 2010

SUBSTANCES	**Will participants work with substances**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any** **risks**
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	the departmental written Arrangements for dealing with hazardous substances and waste are followed
	all participants are given information, training and protective equipment for hazardous substances they may encounter
	participants who have allergies have advised the leader of this and carry sufficient medication for their needs
	waste is disposed of in a responsible manner
	suitable containers are provided for hazardous waste
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	**Have you identified any other hazards?**	**NO**	**If 'No' move to next section** **If 'Yes' use space below to identify and assess any** **risks**
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		

CONTROL MEASURES	**Give details of control measures in place to control the identified risks**

Have you identified any risks that are not adequately controlled?	**NO**	**X**	**Move to Declaration**
	YES		**Use space below to identify the risk and what action was taken**

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research?	No

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

DECLARATION	The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

x	I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
X	I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR   Beatriz Mella Lira

FIELDWORK   5   May 2010