



On Street Taxi and
Minicab Usage Survey

Report
November 2016

Transport for London

Our ref: 22869601
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A On-Street Survey Expansion Process

Executive Summary

Overview

The taxi and minicab on-street survey collected data on the usage of taxis and minicabs amongst London residents and visitors to London. A total sample of 1,512 interviews was obtained and weighted to reflect the population of people in London. The sample included 175 respondents who had made at least one taxi journey in the last 30 days, and 249 who had made at least one minicab journey over the same period.

General use of taxis and minicabs

One in ten respondents use taxis at least once a month and 13% use minicabs at least once a month. The proportions travelling at least once a year are 33% and 50% respectively.

Taxi journeys

Based on respondents' most recent taxi journeys:

- 78% have origins in central/inner London;
- 67% have destinations in central/inner London;
- While most (74%) taxi journeys are made during the day, 18% are made at night (10pm to 6am);
- The most common purpose for the taxi trips is business (37%), with another 14% travelling to or from a place of work;
- Two thirds (68%) of taxi trips are made alone and just 3% with children (the remainder with more than one adult);
- Half of taxis are hailed on-street, 46% picked up at a rank and 2% booked by phone;
- Most (64%) taxi users have to wait between one and five minutes for a taxi with 4% having to wait ten minutes or more;
- The average fare is approximately £14;
- 35% have the cost reimbursed by their employer, and for a further 6% someone else bears the cost;
- Being easy and convenient is the most commonly quoted reason for choosing to travel by taxi with other important reasons being speed and comfort;
- The overall rating of value for money amongst taxi users is 7.1 out of 10, with 22% awarding a score of 9 or 10, and conversely, 13% awarding a score of less than 5.
- Amongst the general population satisfaction ratings are lower with scores of between 5 and 6 for most aspects (including value for money). The exception is personal safety which is rated 7 out of 10.

Minicab journeys

Based on respondents' most recent minicab journeys:

- 60% have origins in central/inner London;
- 49% have destinations in central/inner London, and 4% an airport;
- While most (71%) minicab journeys are made during the day, 19% are made at night (10pm to 6am);

- The most common purpose for minicab trips is travel to or from a leisure destination or tourist attraction, followed by meeting friends or relatives;
- Just under a half (46%) of minicab trips are made alone;
- Half of minicab trips are booked by phone, 21% at a minicab office, and 16% using an app;
- Just under half (46%) of minicab users have to wait between one and five minutes with 43% having to wait more than five minutes;
- The average fare is approximately £15;
- 15% have the cost reimbursed by their employer, and for a further 13% someone else bears the cost;
- Being easy, convenient and quick are the most commonly quoted reason for choosing to travel by minicab, with other important reasons being comfort, value, good when travelling with children or luggage, or travelling late at night;
- The overall rating of value for money amongst minicab users is 7.9 out of 10, with 24% awarding a score of 9 or 10, and conversely, just 2% awarding a score of less than 5.
- Amongst the general population satisfaction ratings are lower with scores of between 5 and 6 for most aspects except value for money which is rated 7 out of 10.

Considered trips

5% of respondents said they had made one or more trips in the last seven days by another mode when they would have preferred to use a taxi.

6% of respondents said they had made one or more trips in the last seven days by another mode when they would have preferred to use a minicab.

Cost and availability were the factors leading to taxis and minicabs not being used, with cost being somewhat more of a factor for taxis.

Bus was the mode most likely to have been used instead of both taxis and minicabs, though for taxis, the Underground was also important, as was walk trips.

Changes in use

Amongst taxi users, 6% had increased their use over the last 12 months while 12% had decreased it (in most cases by “a little”);

Amongst minicab users, 15% had increased their use over the last 12 months and 7% had decreased their use, implying a net increase.

The reasons for changes were primarily due to personal reasons rather than anything connected to taxis or minicabs themselves.

Taxi and minicab booking apps

Amongst the population as a whole, one-quarter were aware of taxi apps and one-third of minicab apps. 13% of taxi users and 21% of minicab users said they use an app for booking travel.

Uber was by far the most commonly used app with 79% of app users said this was the app they used most often. The next most commonly used was Keen, albeit only mentioned by 5% of app users.

1 Introduction

Background

- 1.1 This report presents the results of an on-street survey of London residents and visitors concerning their usage of taxis and minicabs. The survey was undertaken at on-street locations across London. It forms one part of a larger study examining the Taxi and Private Hire markets, and has fed into estimates of the current market size.
- 1.2 The objectives of this on-street passenger survey were:
- Identify the extent to which taxis and minicabs are used by people in London (both Londoners and visitors);
 - For those that are users what the characteristics of their taxi and minicab trips are;
 - Measure levels of user satisfaction;
 - Understand the extent to which people considered using a taxi or minicab but then used another mode;
 - Understand the use of apps for booking taxis and minicabs.

This report

- 1.3 The following chapter, Chapter Two describes the methodology for the survey and presents the profile of survey respondents (which is designed to reflect the population). Chapter Three then identifies general travel patterns of respondents and the extent to which they use different modes, including taxis and minicabs.
- 1.4 Chapter Four and Chapter Five detail the characteristics of respondents' most recent taxi and minicab trips respectively.
- 1.5 Trips for which respondents considered taxis or minicabs are the subject of Chapter Six, and Chapter Seven describes the use of apps.

2 Methodology and profile

Overview

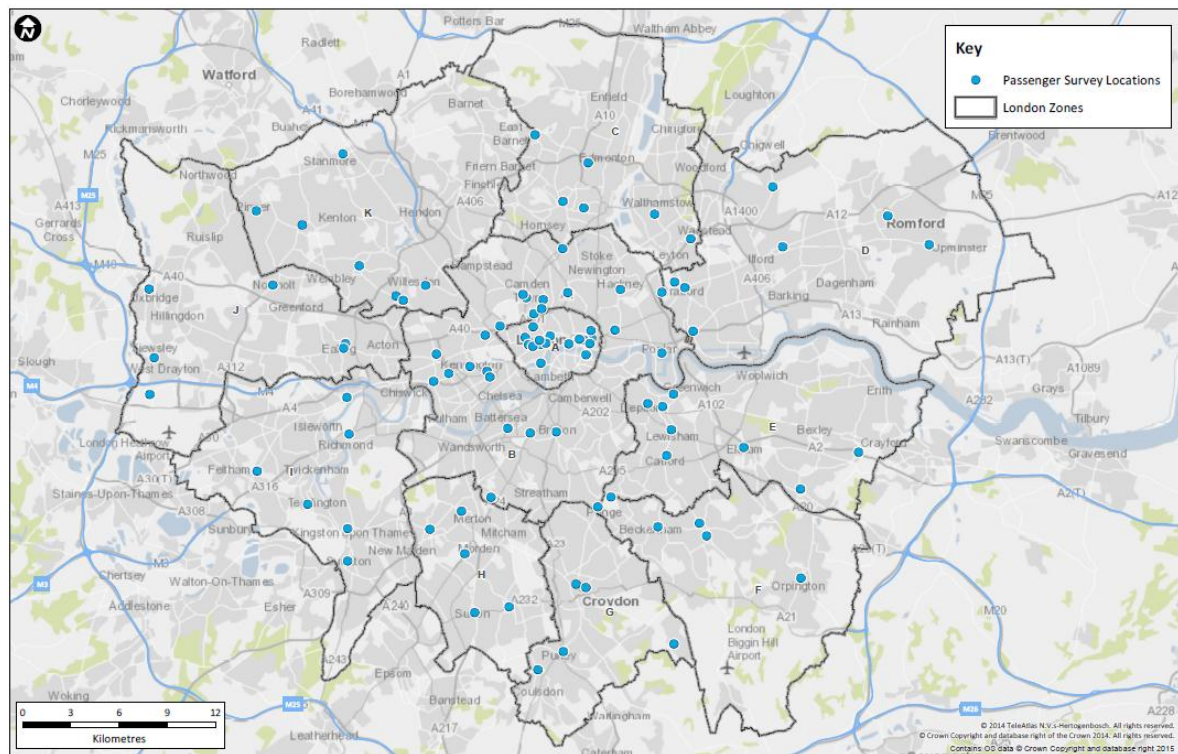
- 2.1 The on-street survey involved face-to-face interviews with a random sample of people at a selection of on-street locations around London. Fieldwork was undertaken during October and November 2015. A total sample of 1,512 respondents was obtained.

Methodology

Sampling and sample size

- 2.2 On-street sampling points were selected to be representative of London as a whole: their locations can be seen in Figure 2.1. To ensure a good geographic representation London was divided into eleven zones (identified as A-K in Figure 2.1) with at least five sampling points selected for each.

Figure 2.1: On-street passenger survey locations



Questionnaire

2.3 As the interview was undertaken face-to-face it was necessarily kept as short as possible (other methods were also tested but proved to be less effective). The finalised questionnaire included information about:

- Use of different modes for travelling in London;
- Details of most recent trip by taxi;
- Details of most recent trip by minicab;
- Satisfaction with taxi and minicab;
- Trips considered for being made by taxi and minicab;
- Use of taxi and minicab booking apps;
- Demographics of the respondent.

Data weighting

2.4 To ensure the results are representative of the whole target population, the survey data has been weighted by:

- Age;
- Gender;
- Borough of residence (segmented into central, inner, and outer);
- Activeness (segmented into high, medium, low);
- Worker/non-worker; and
- Resident/non-resident.

2.5 Full details are provided in the Appendix A.

Profile

2.6 The profile is shown in Figure 2.2 to Figure 2.9. The profile shows the following key points are:

- 94% live in London including 57% in outer London and 38% in inner/central London;
- 65% are aged 25-59;
- 63% are working full or part time;
- 12% have a disability of some kind;
- 18% have an income of over £50k, 12% under £11k;
- 87% have a mobile phone with internet access.

Figure 2.2: Residency

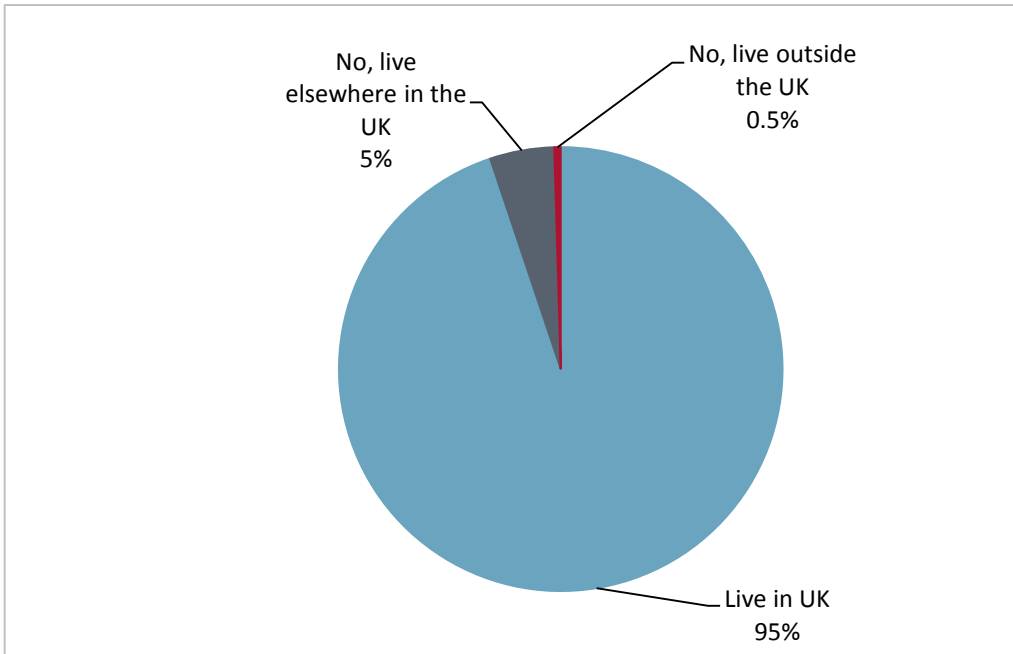


Figure 2.3: Home location within London

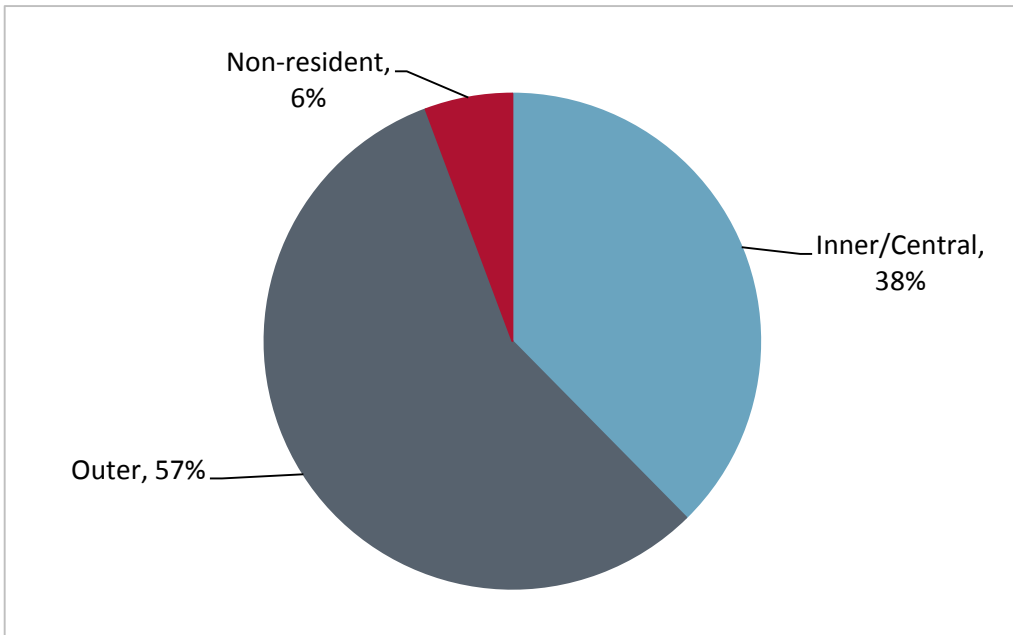


Figure 2.4: Age

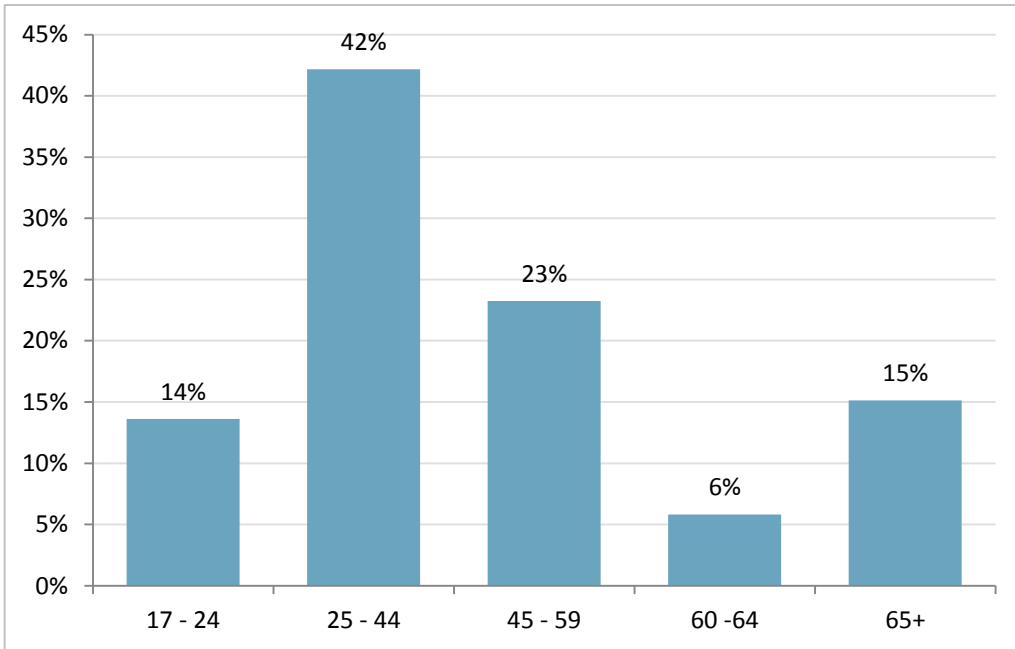


Figure 2.5: Working status

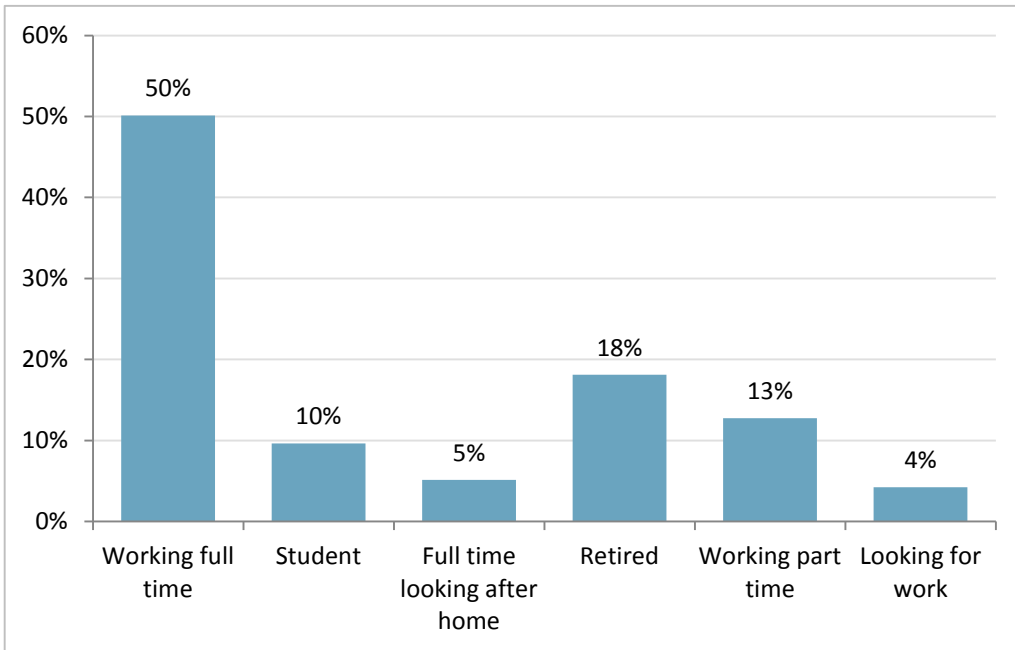


Figure 2.6: Ethnicity

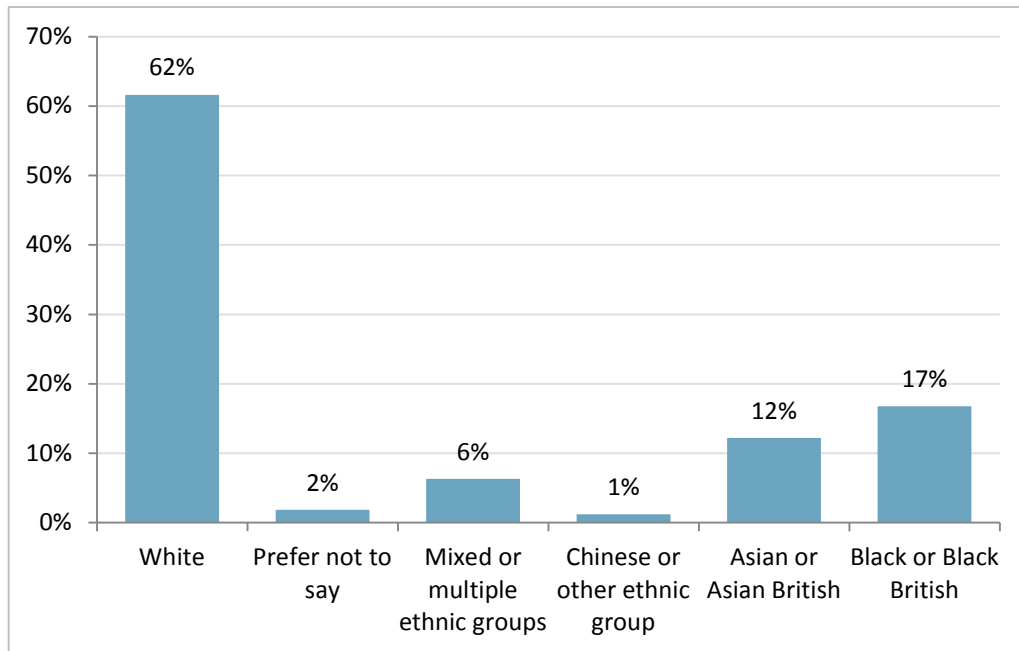


Figure 2.7: Respondents' disability

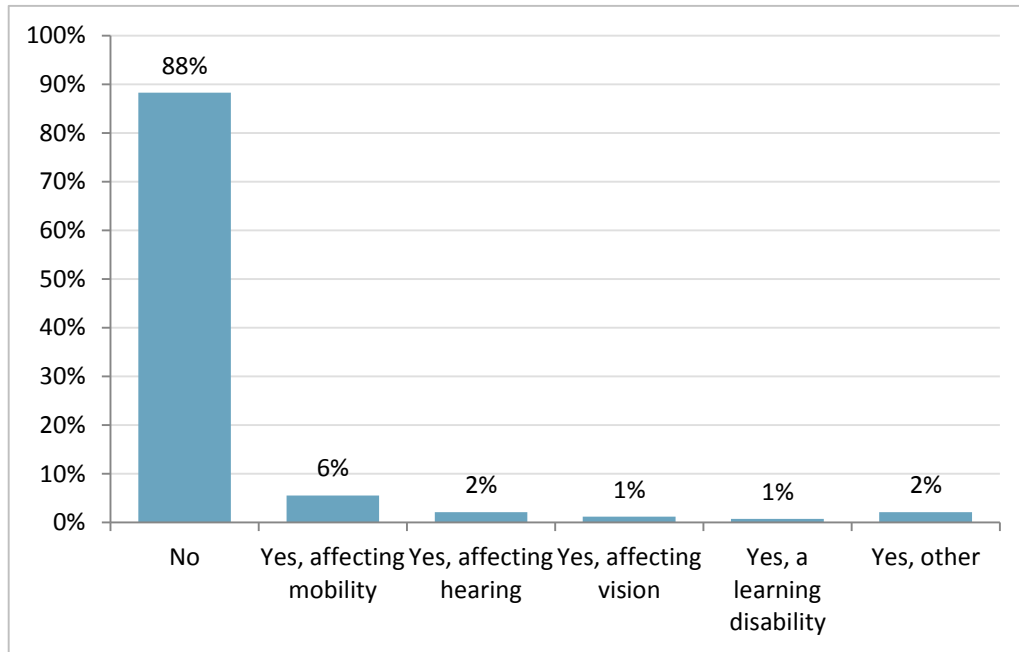


Figure 2.8: Income

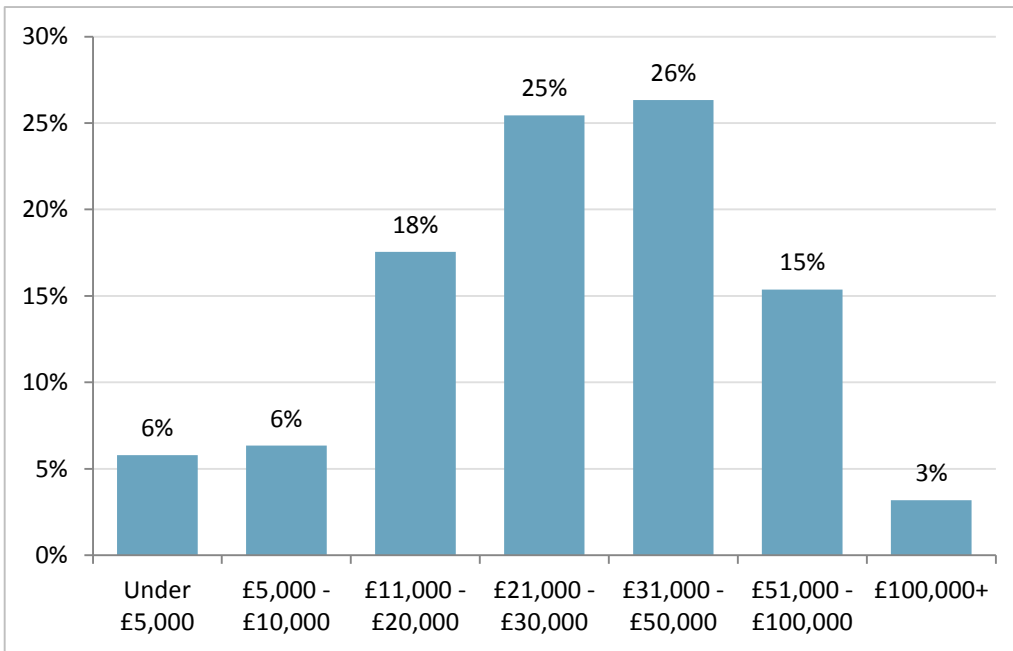
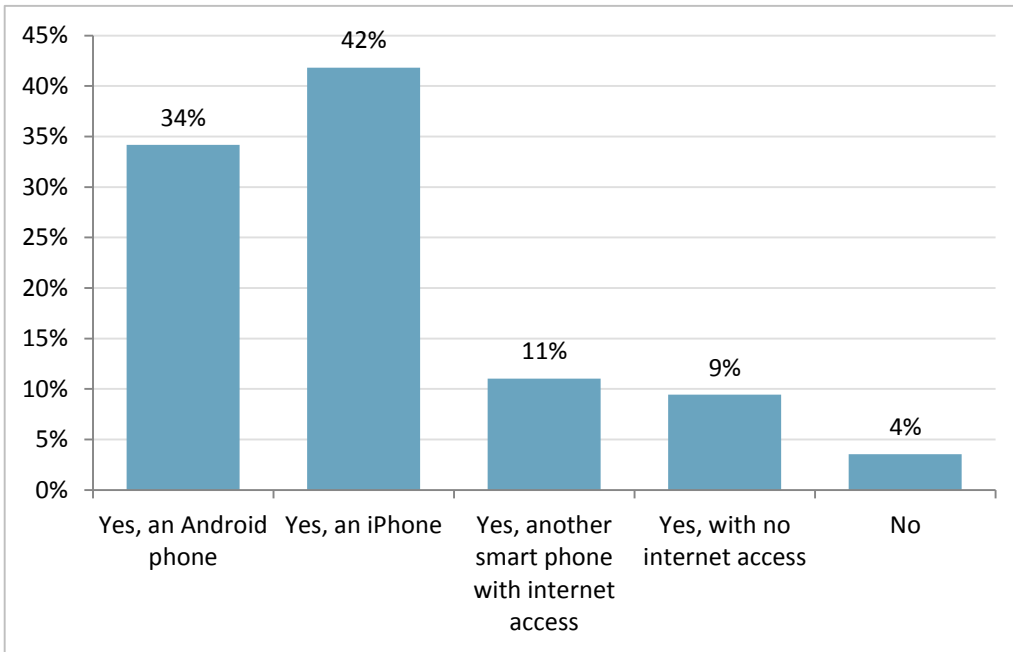


Figure 2.9: Use of a mobile phone



3 General travel

Introduction

3.1 This chapter identifies the extent to which respondents use different means of travel to get around London.

Use of travel modes

3.2 The use of different modes for travelling around London is provided in Table 3.1. This shows that:

- Bus is the mode used by the largest proportion of people: 92% including 65% who use at least once a week;
- 10% use taxi at least once a month;
- 13% use minicabs at least once a month;
- In terms of the overlap between use of taxis and minicabs, while most people (three quarters) who use taxis also use minicabs, only around half of minicab users also use taxis;
- Overall, a fifth do not use either taxis or minicabs.

Table 3.1: Different modes of transport and regularity of use in London

	5 or more days a week	1-4 days a week	At least once a month	Less often	Less than once a year or never	Total
Car (as driver or passenger)	17%	31%	15%	17%	19%	100%
Bus	37%	28%	12%	15%	8%	100%
Train (Overground or National Rail)	17%	26%	26%	21%	11%	100%
Underground / Tube / DLR / Tram	22%	26%	18%	22%	12%	100%
Cycling using own bike	2%	4%	9%	14%	72%	100%
Santander Cycle Hire bike	2%	2%	3%	9%	85%	100%
Taxi / Black cab	0%	3%	7%	24%	67%	100%
Minicab	0%	2%	11%	36%	50%	100%
Walk of at least 10 minutes	39%	24%	11%	8%	18%	100%
Motorcycle / moped / scooter	1%	0%	1%	5%	94%	100%

4 Taxi use

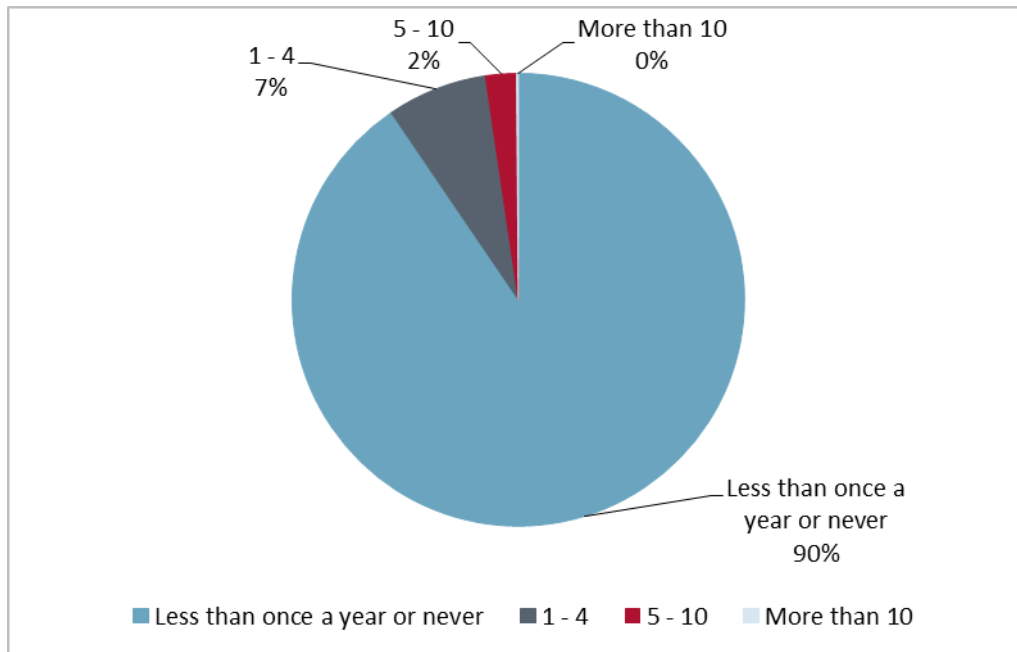
Introduction

4.1 Respondents who used taxis at least once a month were asked further questions about their recent use of taxis and their last journey in particular. This chapter presents the responses to these questions and is based on a sample of 175 taxi users (with the exception of Figure 4.1 which includes all respondents).

Recent use of taxis

4.2 As shown in Figure 4.1 7% of respondents had used a taxi between 1 and 4 times in the last 30 days, while just 2% had made five or more taxi trips.

Figure 4.1: How many taxi trips taken in last 30 days



Most recent trip

For the most recent taxi trip, the origin was in central/inner London for 78% and outer London for 22% (Figure 4.2). Destinations were more likely to be in Outer London (32%) or an airport (2%) – see Figure 4.3.

Figure 4.2: Trip origin

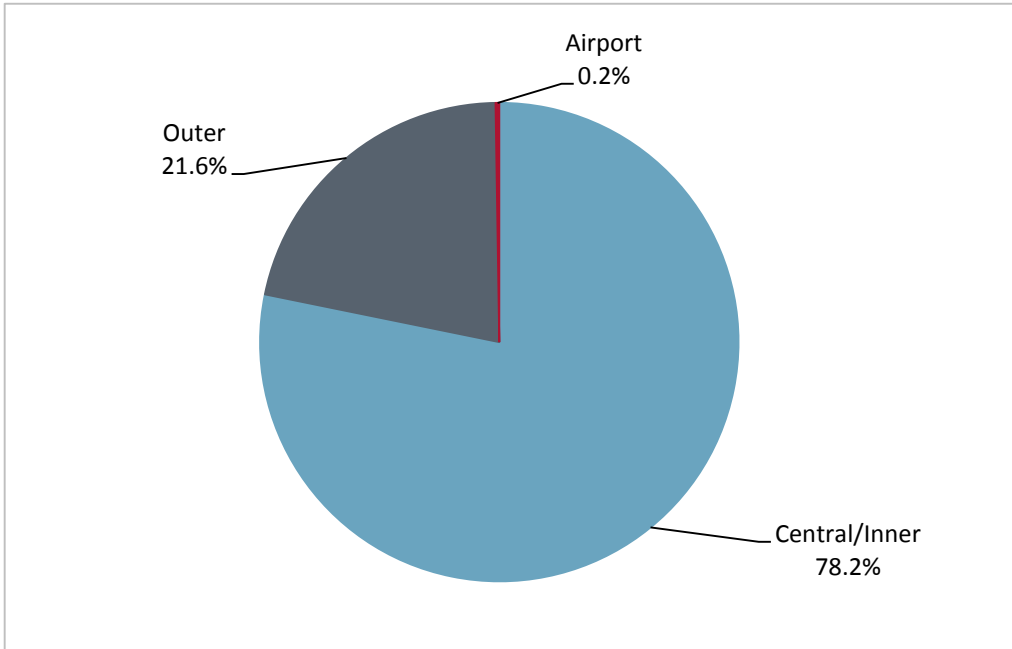
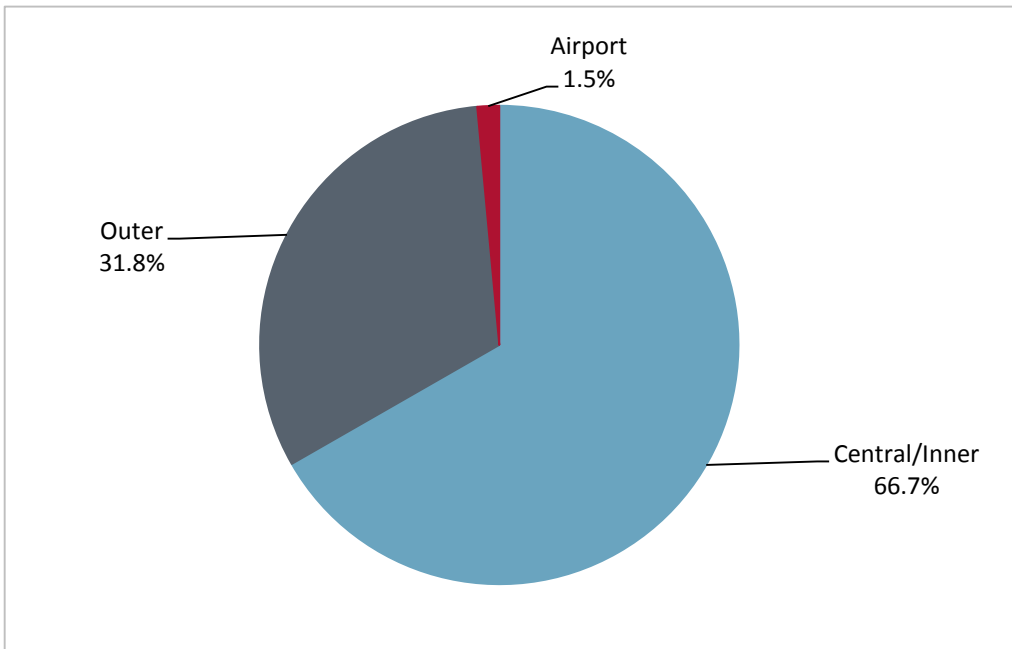


Figure 4.3: Trip destination



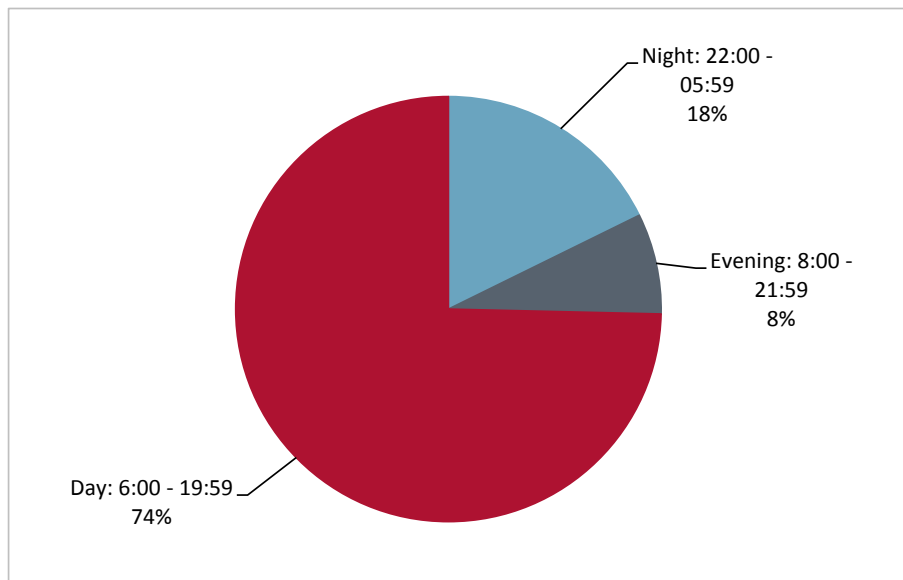
Almost three quarters (64%) of taxi trips are entirely within inner/central London, with 14% inner/central London to outer London and 17% entirely in outer London (see Table 4.1 for the full breakdown).

Table 4.1: Origin-destination matrix for taxi trips

Origin	Destination		
	Central/Inner	Outer	Airport
Central/Inner	64%	14%	0%
Outer	2%	17%	1%
Airport	0%	0%	0%

4.3 The start time of the most recent taxi journeys is shown in Figure 4.4, which shows that nearly a fifth (18%) are between 10pm and 6am.

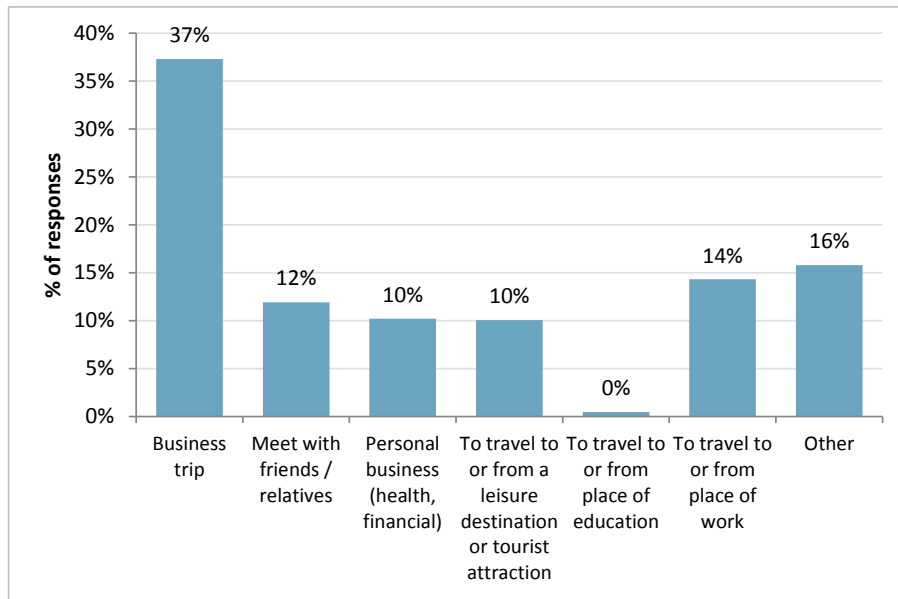
Figure 4.4: Start time of journey



Journey purpose

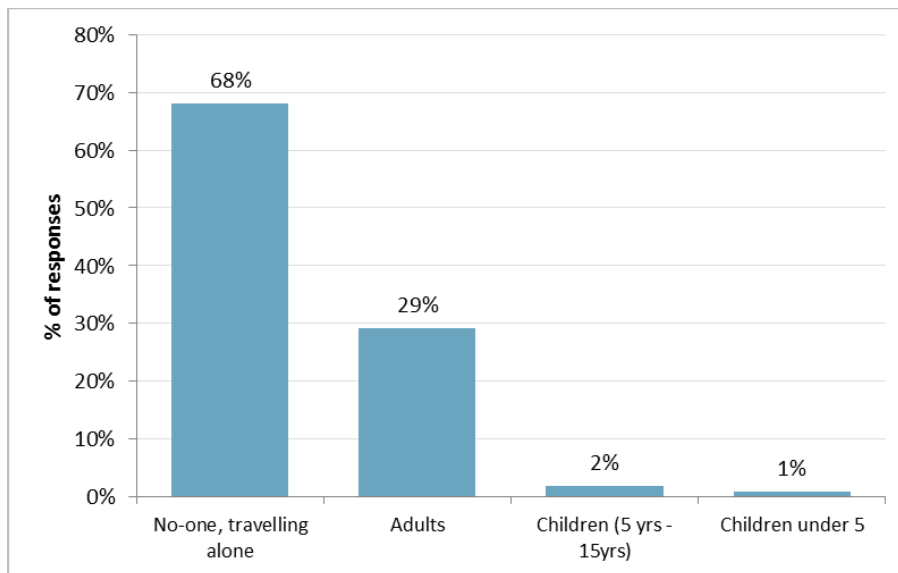
4.4 The most common purpose for the taxi trips was business (37%), with another 14% travelling to or from a place of work (see Figure 4.5).

Figure 4.5: Journey purpose



4.5 Two thirds (68%) of taxi trips were made alone and just 3% with children (Figure 4.6).

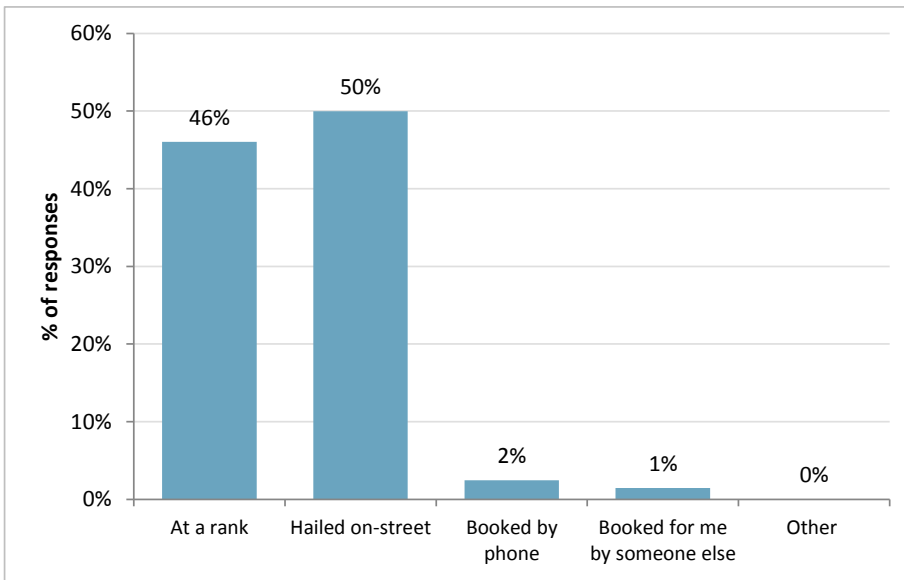
Figure 4.6: Party composition



Taking a taxi

4.6 Half of all taxi trips were hailed on street, with just under a half (46%) of taxis trips from a rank and 2% booked by phone (Figure 4.7).

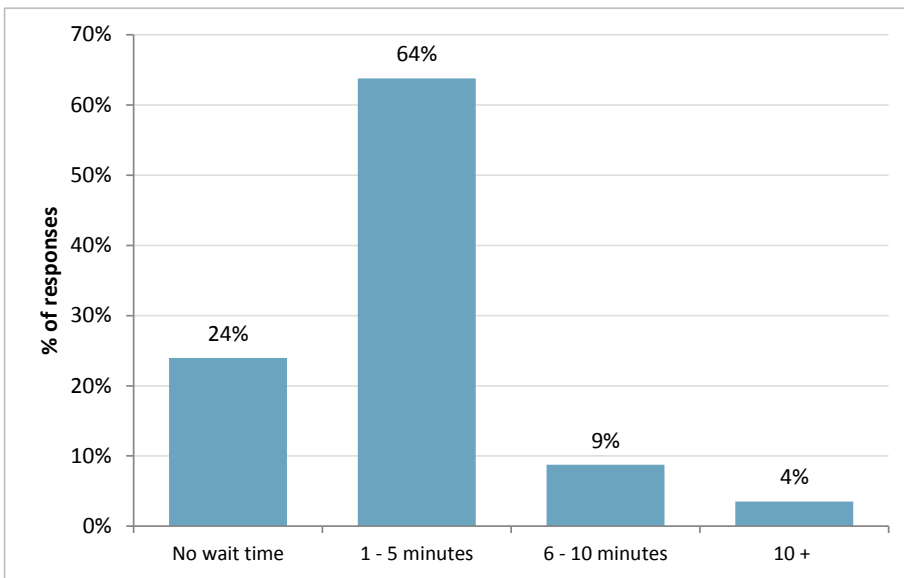
Figure 4.7: How they got a taxi



How long users had to wait

4.7 Most (64%) taxi users had to wait between one and five minutes with 4% having to wait ten minutes or more. The full breakdown is shown in Figure 4.8.

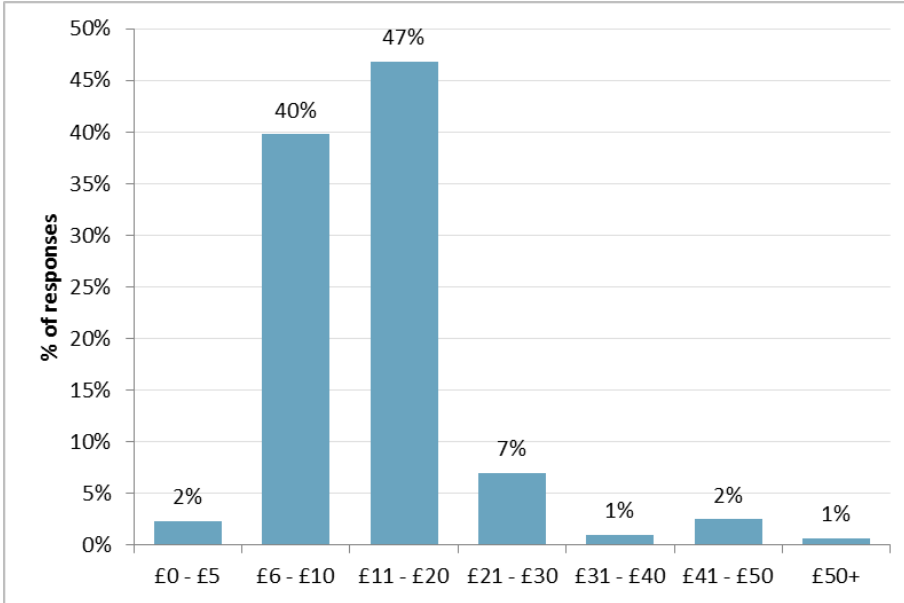
Figure 4.8: Passenger wait time



Paying for the taxi

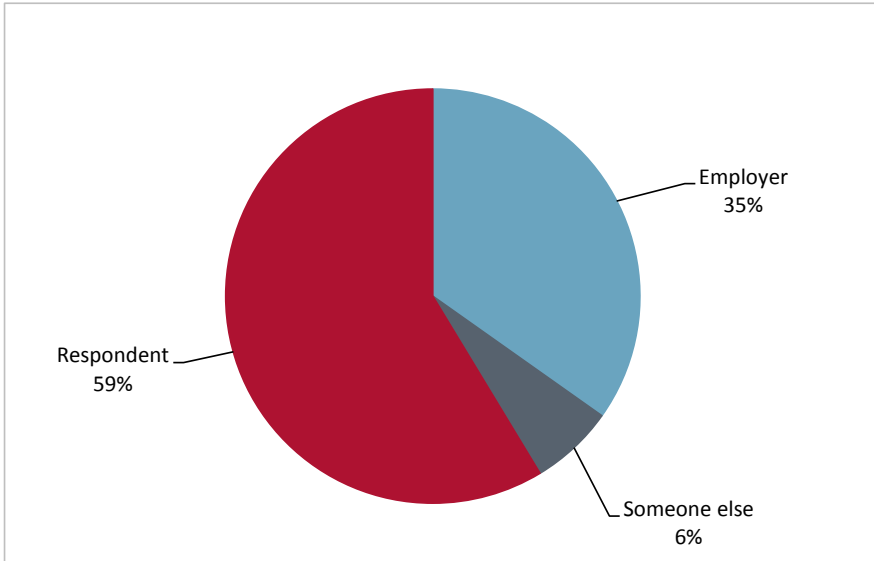
4.8 The distribution of taxi fares (not including tips) is shown in Figure 4.9: most fares (87%) are between £6 and £20 with the average fare being approximately £14.

Figure 4.9: Cost of fare (excluding tips)



4.9 While 59% of passengers bore the cost of the taxi fare themselves, 35% had the cost reimbursed by their employer, as shown in Figure 4.10.

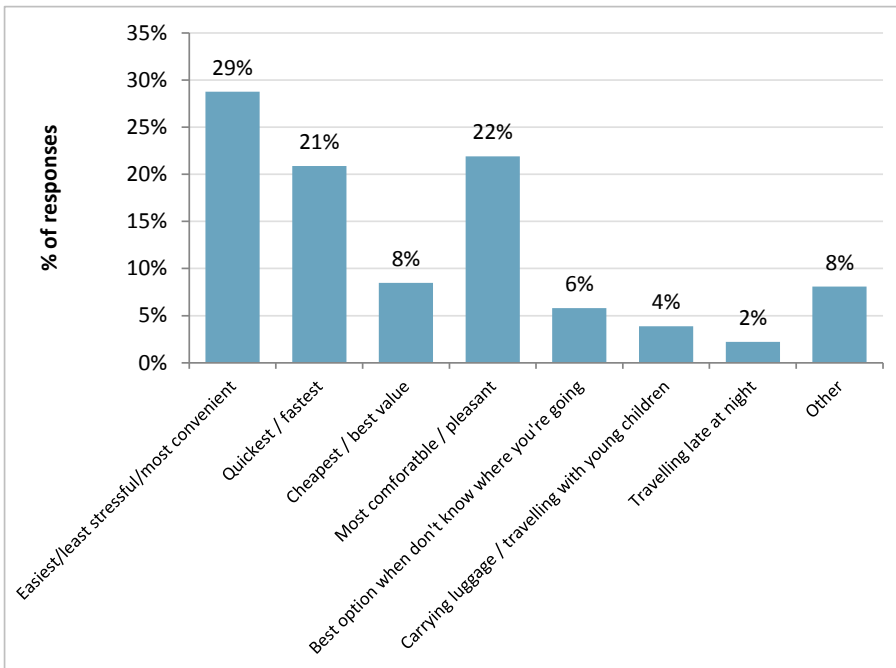
Figure 4.10: Who bore the cost of journey



Choosing a taxi

4.10 Being easy and convenient was the most commonly quoted reason for choosing to travel by taxi with other important reasons being speed and comfort. The full range of responses is provided in Figure 4.11.

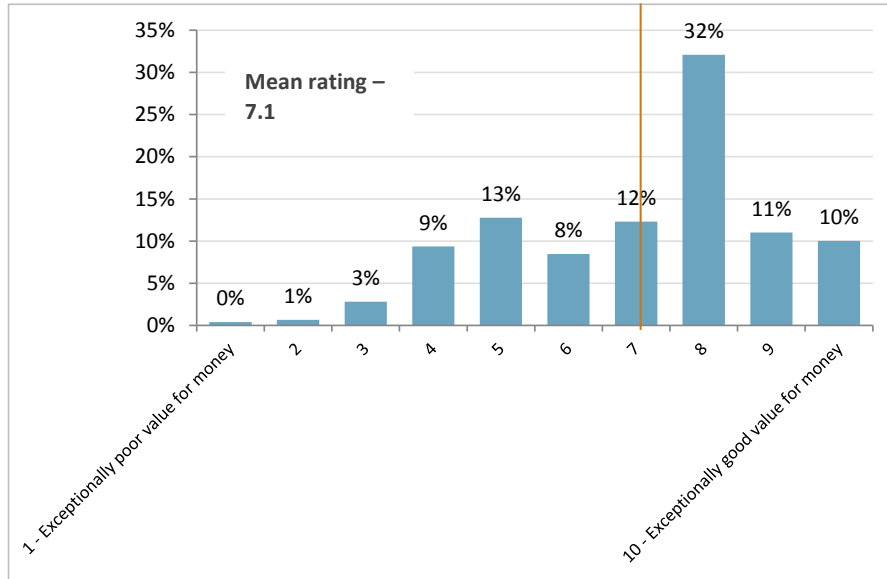
Figure 4.11: Why chose to use taxi



Satisfaction with taxis

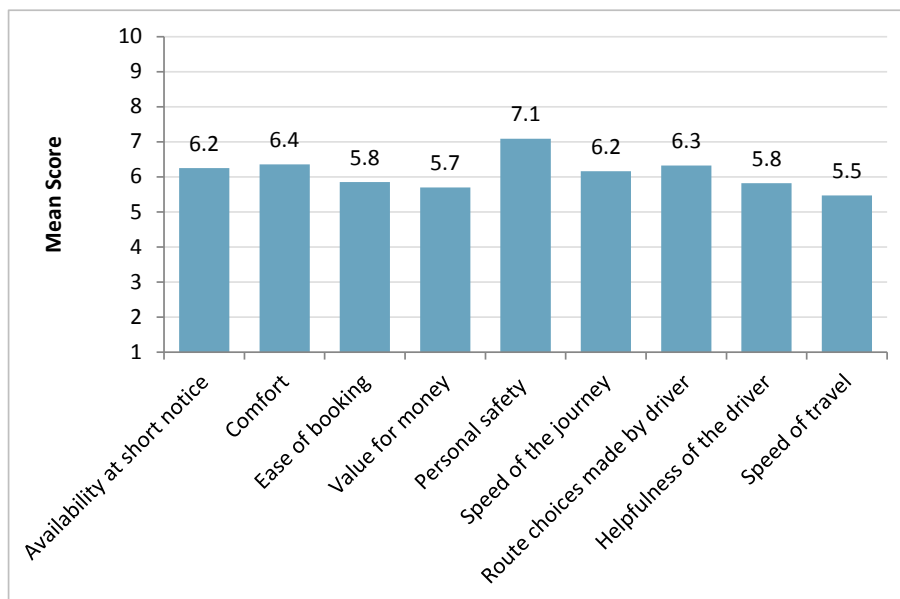
4.11 The overall rating of value for money of taxis was good: the mean rating was 7.1 out of ten with two thirds giving a score of 7 or more. Figure 4.12 shows the full distribution of ratings.

Figure 4.12: Rating of value for money



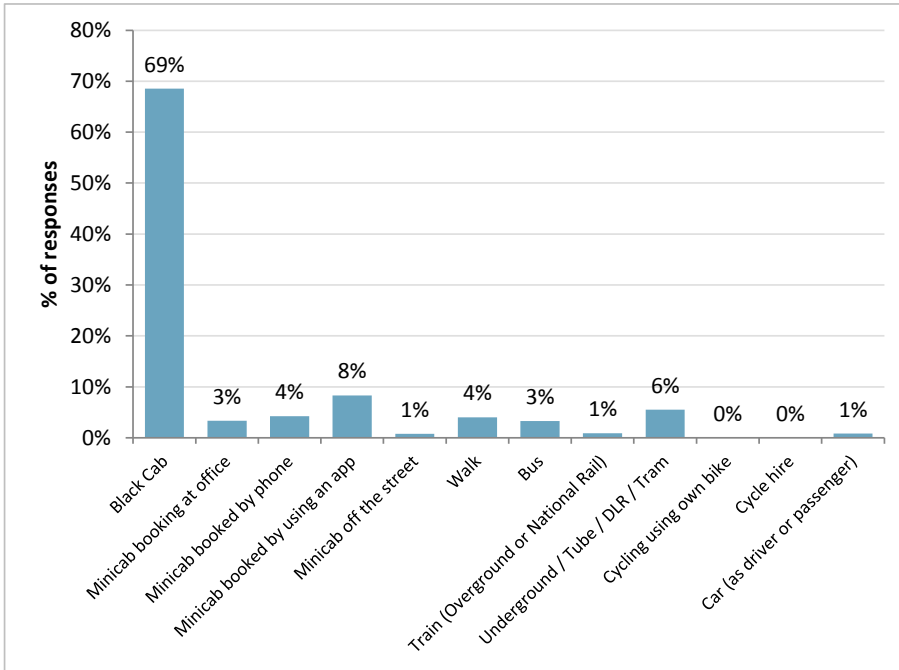
4.12 Satisfaction with individual aspects of taxis amongst the whole sample (that is, both users and non-users) are shown in Figure 4.13. This shows that general perceptions of taxis are mostly in the 'neither good nor poor' range (5-6 out of 10). Personal safety is the exception which was given a rating of over 7 out of 10 which can be regarded as 'good'.

Figure 4.13: Mean satisfaction ratings for taxis



4.13 Taxi users were asked what mode they would use if they were to make same journey again and the overwhelming response was that they would use taxi again. Nevertheless, 8% did say they would use a minicab booked using an app, another 7% a minicab booked at an office or by phone, and 6% said Tube, DLR or tram.

Figure 4.14: Mode used if were to make the same journey again



5 Minicab use

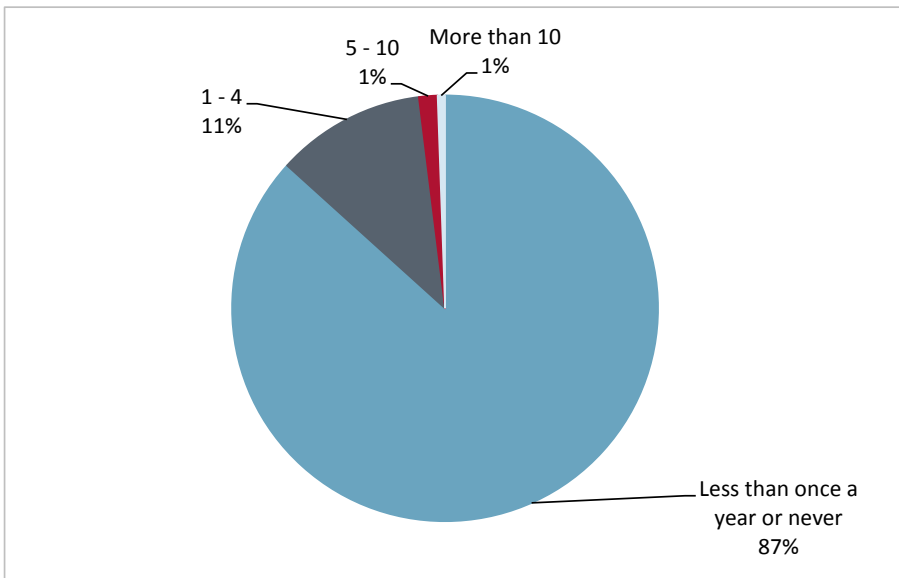
Introduction

5.1 This chapter presents the responses from minicab users regarding their most recent trip (in the last 30 days). Data in this chapter is based on a sample of 249 minicab users (except Figure 5.1 which includes all respondents).

Recent use of minicabs

5.2 As shown in Figure 5.1 11% of respondents had used a minicab between 1 and 4 times in the last 30 days, while just 2% had made five or more minicab trips.

Figure 5.1: Number of minicab trips in last 30 days



Most recent trip

5.3 For the most recent minicab trip, the origin was in central/inner London for 60% and outer London for 36% (Figure 5.2). Destinations were more likely to be in central/inner London (49%) or outer London (47%) with an airport a destination for a minority of trips (4%) – see Figure 5.3.

Figure 5.2: Origin of trip

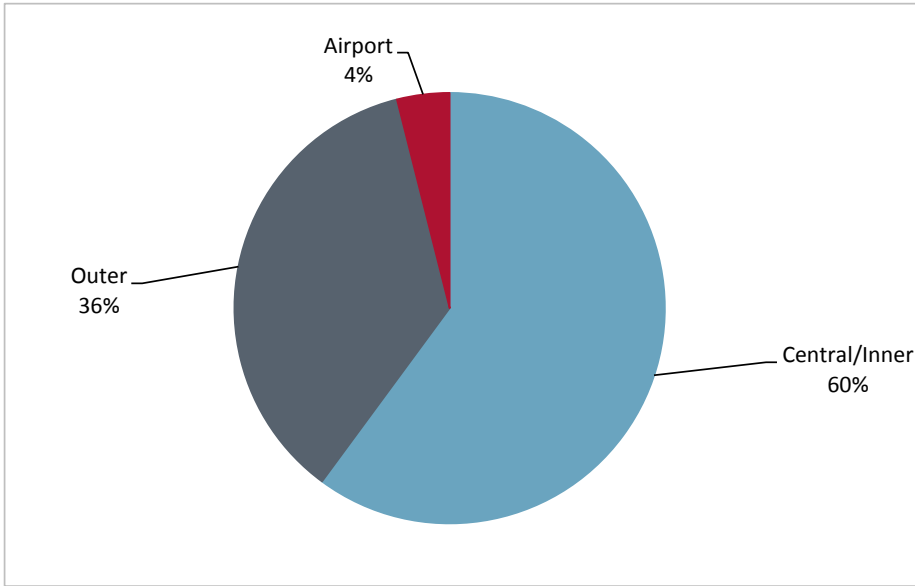
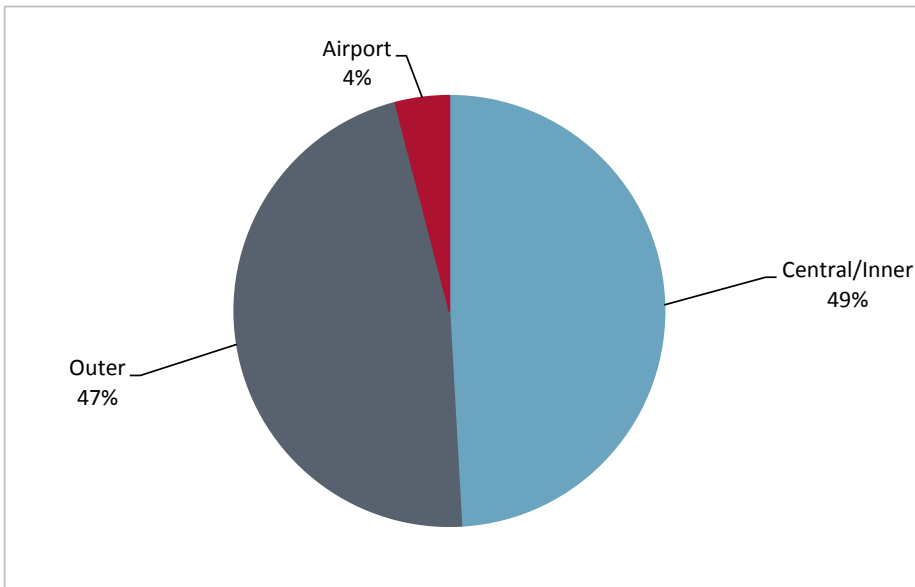


Figure 5.3: Destination of trip



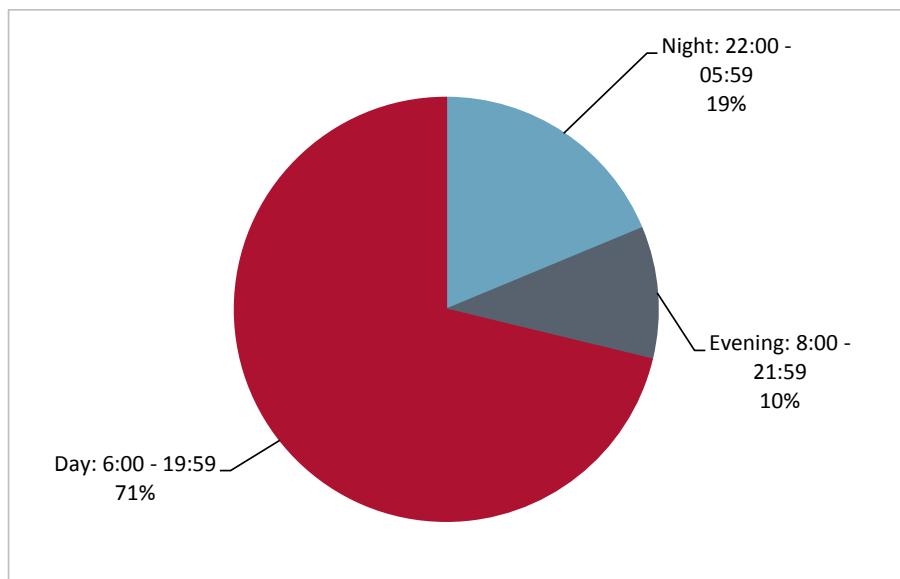
5.4 In terms of origin-destination combinations, these are provided in Table 5.1. This shows that 40% of trips are entirely within inner/central London and 17% are from inner/central London to outer London.

Table 5.1: Origin-destination matrix for minicab trips

Origin	Destination		
	Central/Inner	Outer	Airport
Central/Inner	40%	17%	2%
Outer	7%	25%	2%
Airport	1%	3%	0%

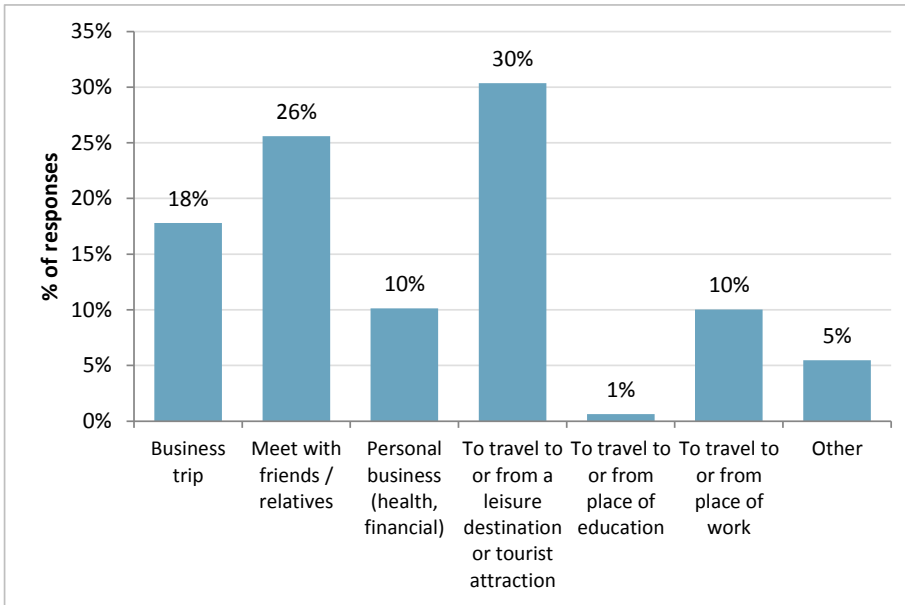
5.5 The start time of the most recent minicab journeys is shown in Figure 5.4, which shows that nearly a fifth (19%) are between 10pm and 6am.

Figure 5.4: Start time



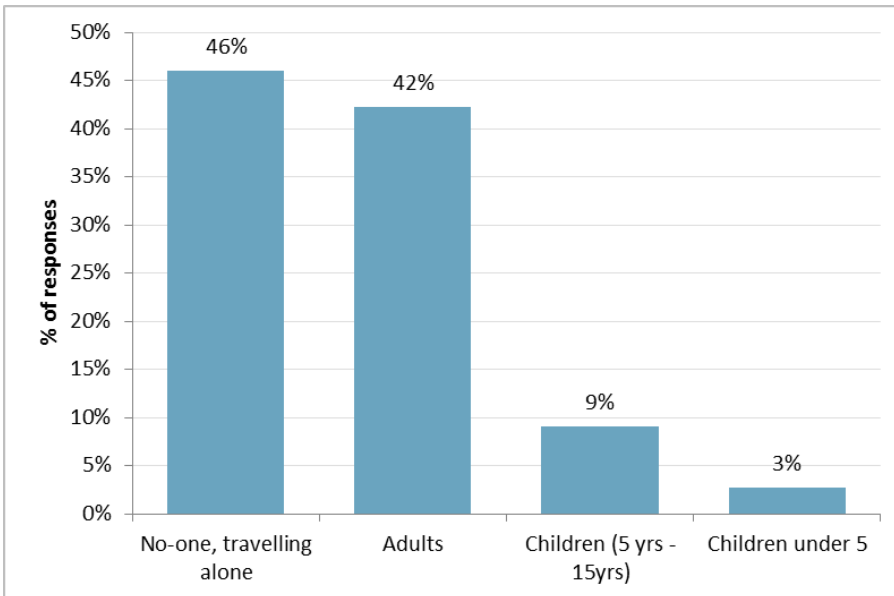
5.6 The most common journey purpose for a minicab trip was to travel to or from a leisure destination or tourist attraction, followed by meeting friends or relatives (see Figure 5.5).

Figure 5.5: Journey purpose



5.7 Just under half (46%) of minicab trips were made alone with 42% with at least one other adult and 12% with children, as shown in Figure 5.6.

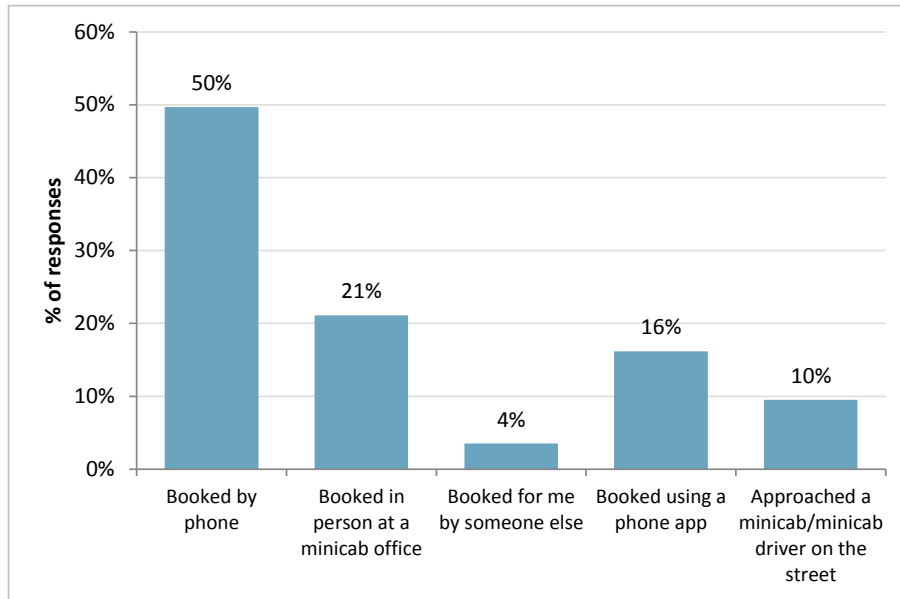
Figure 5.6: Traveling party



Booking a minicab

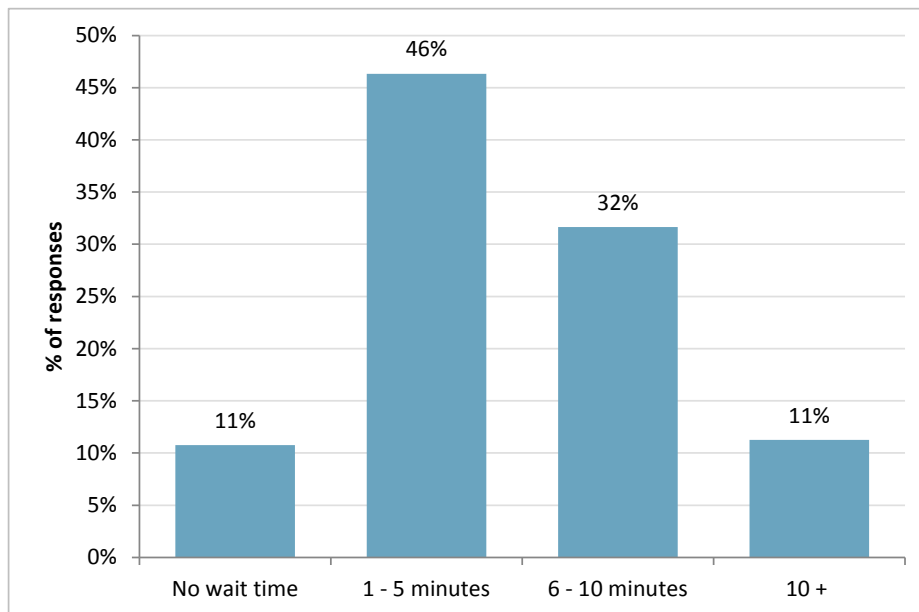
5.8 Half of all minicabs were booked by phone, with 21% booked in person at the minicab office and 16% booked using a phone app. In 10% of trips passengers approached the driver or vehicle directly. Figure 5.7 shows the full range of responses.

Figure 5.7: How minicab was booked



5.9 The length of time minicab users had to wait is shown in Figure 5.8. This shows that 43% had to wait more than five minutes and the remainder five minutes or less.

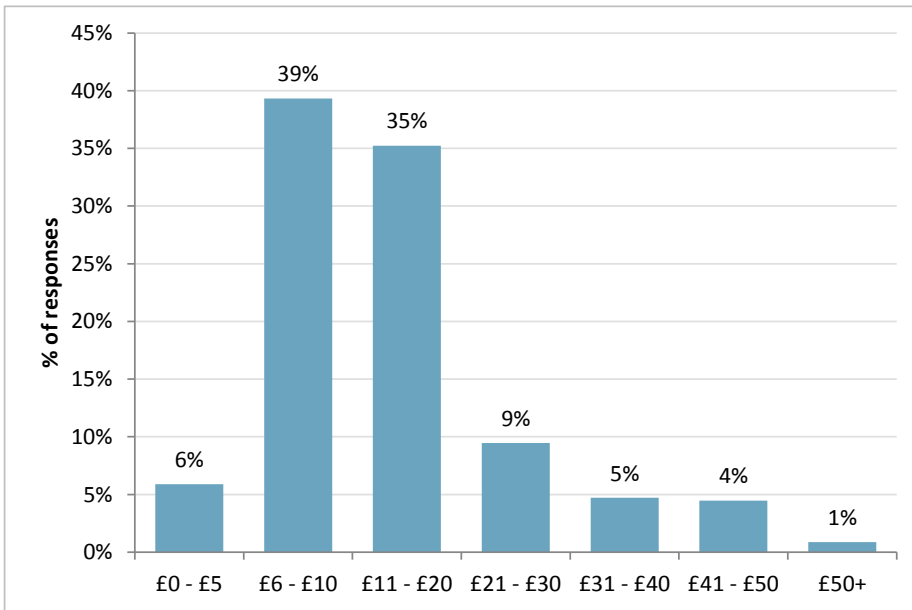
Figure 5.8: Passenger wait time



Paying for the minicab journey

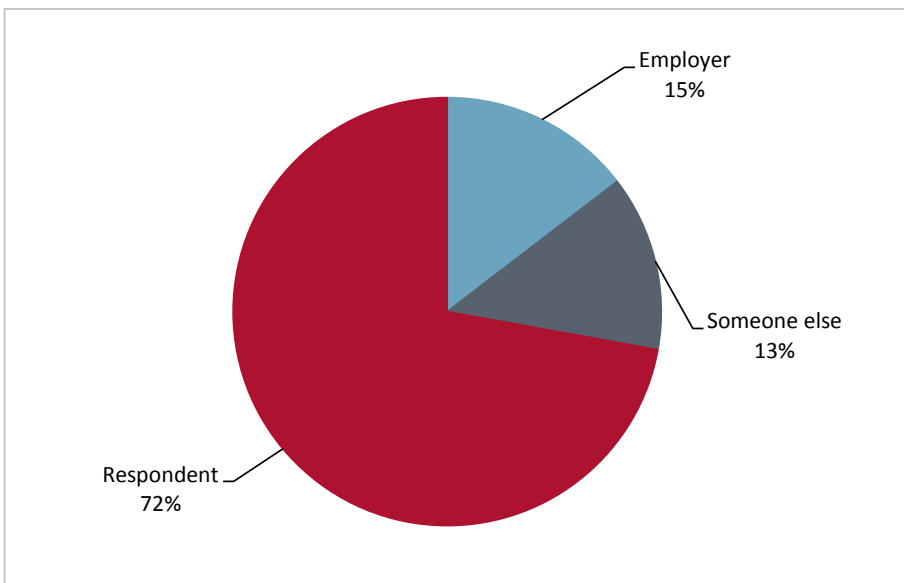
5.10 Most fares for minicab journeys were between £6 and £20, with the average being approximately £15.

Figure 5.9: Cost of fare (excluding tip)



5.11 In almost three-quarters of cases (72%) it was the respondent who bore the cost of the journey, as shown in Figure 5.10.

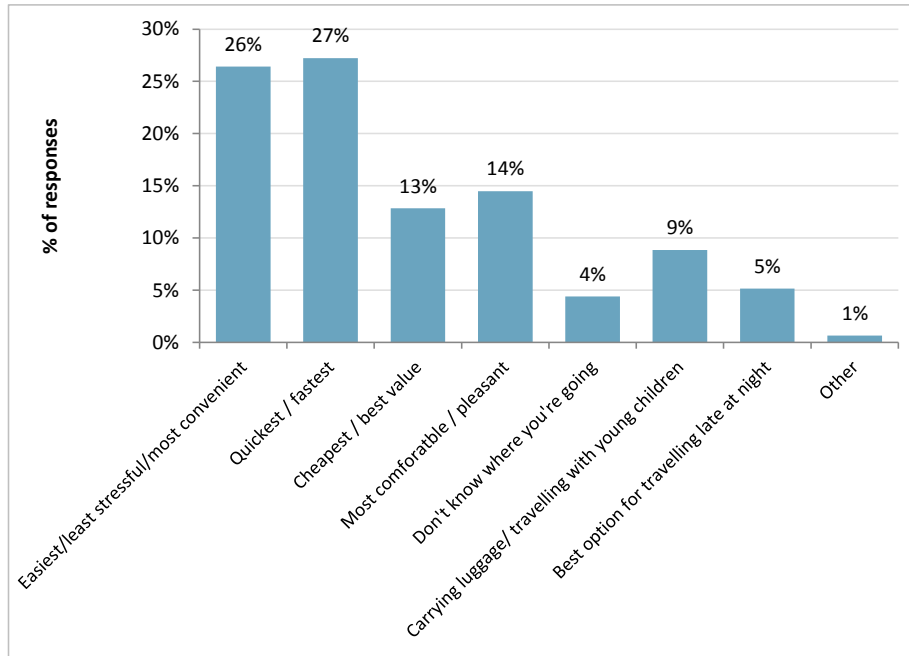
Figure 5.10: Who bore the cost



Choosing minicabs

5.12 Minicabs were generally chosen for convenience, ease and speed, as shown in Figure 5.11.

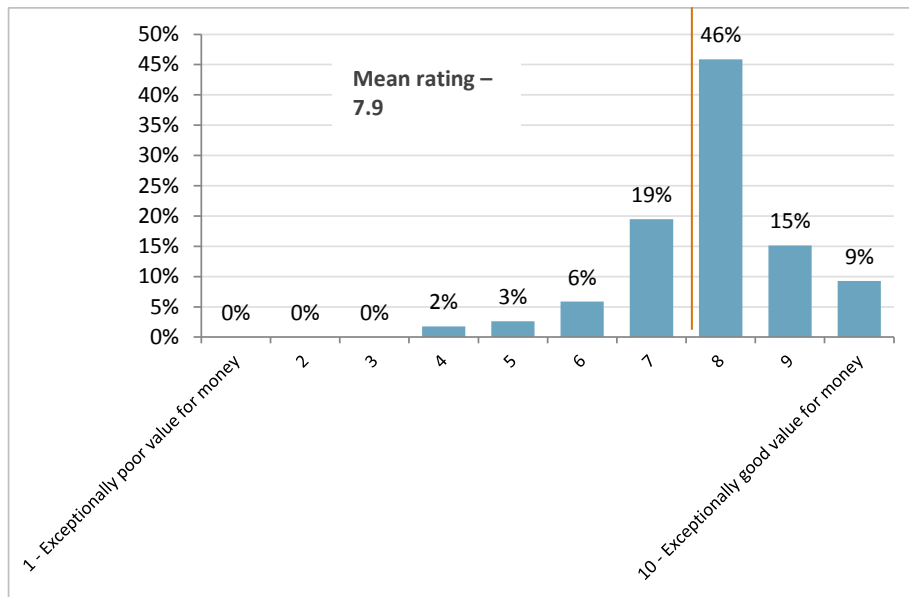
Figure 5.11: Reasons for choosing a minicab



Satisfaction with minicabs

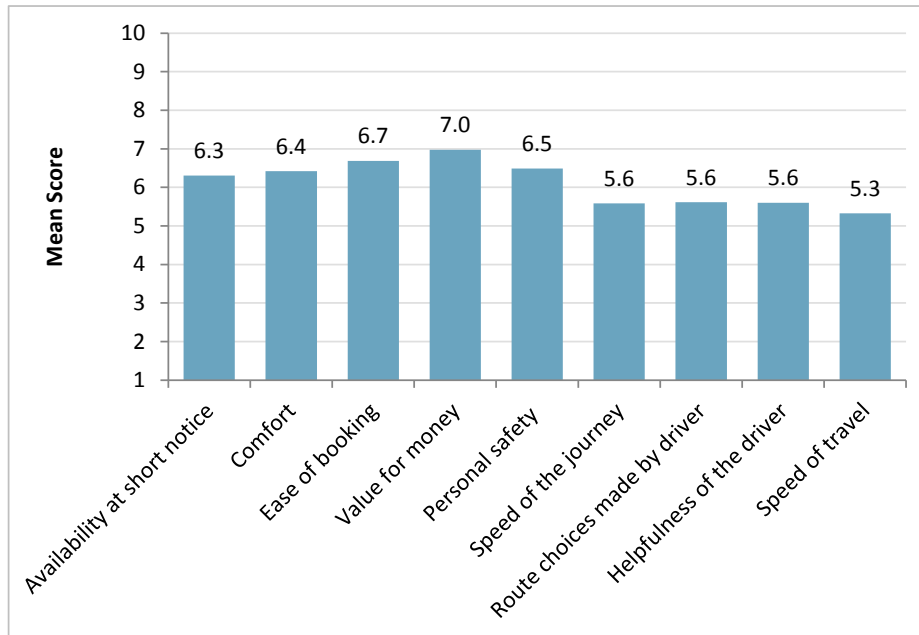
5.13 The average rating of value for money for minicabs was 7.9 out of 10: the distribution of responses is provided in Figure 5.12.

Figure 5.12: Value for money



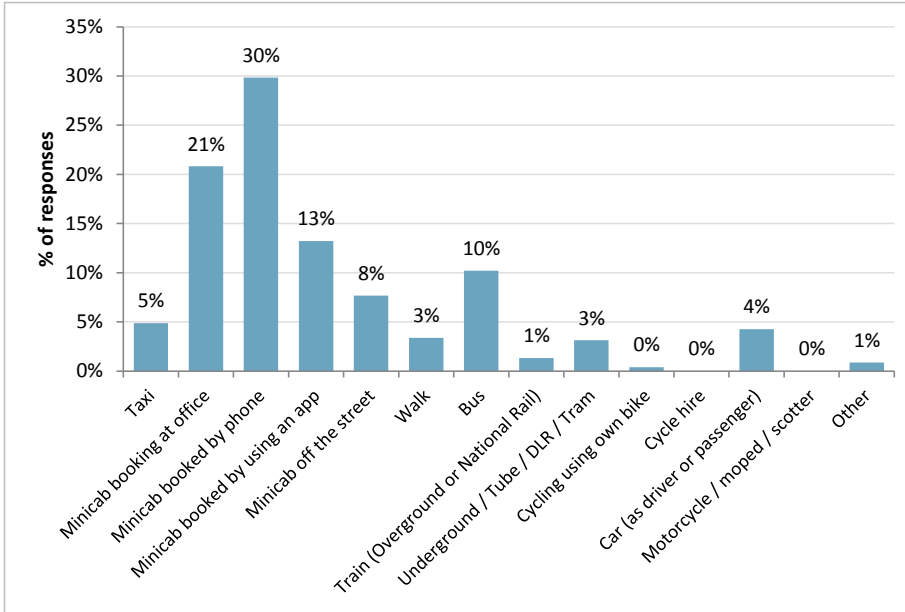
5.14 Satisfaction with individual aspects of minicabs amongst the whole sample (that is, both users and non-users) are shown in Figure 5.13. This shows that the general perceptions of minicabs are mostly in the 'neither good nor poor' range (5-6 out of 10). Value for money is the exception which was given a rating of 7 out of 10 (or more) which can be regarded as 'good'.

Figure 5.13: Mean satisfaction scores



5.15 Minicab users were asked what mode they would use if they were to make same journey again and the overwhelming response was that they would use a minicab again. Nevertheless, 10% did say they would use bus and 5% a taxi (Figure 5.14).

Figure 5.14: Mode used if make same journey again



6 Considered trips

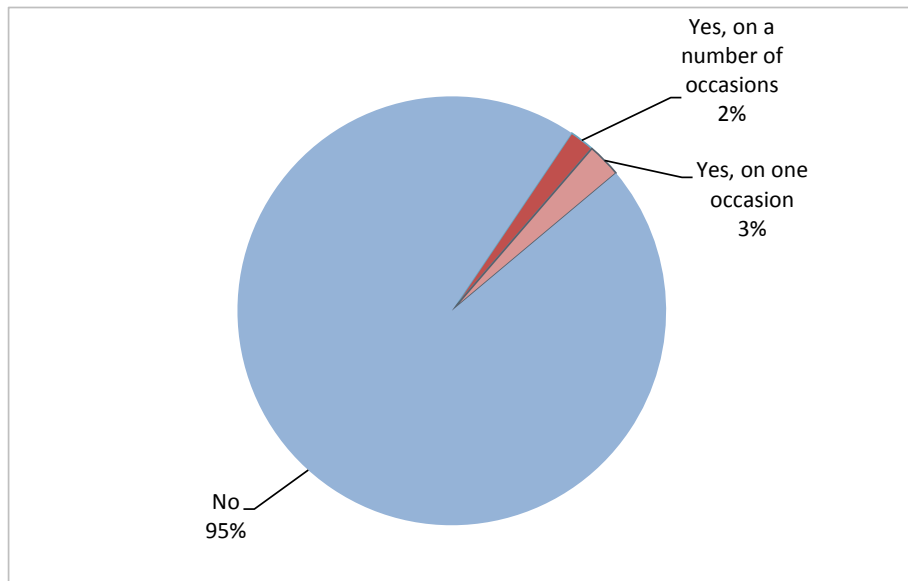
Introduction

6.1 This chapter details analysis of trips that people would have preferred to make by taxi or minicab but were unable to (this can be termed as unmet demand). It should be noted the sample sizes for these 'considered' trips are quite small: 72 for taxi considered trips and 80 for minicab considered trips.

Considered taxi trips

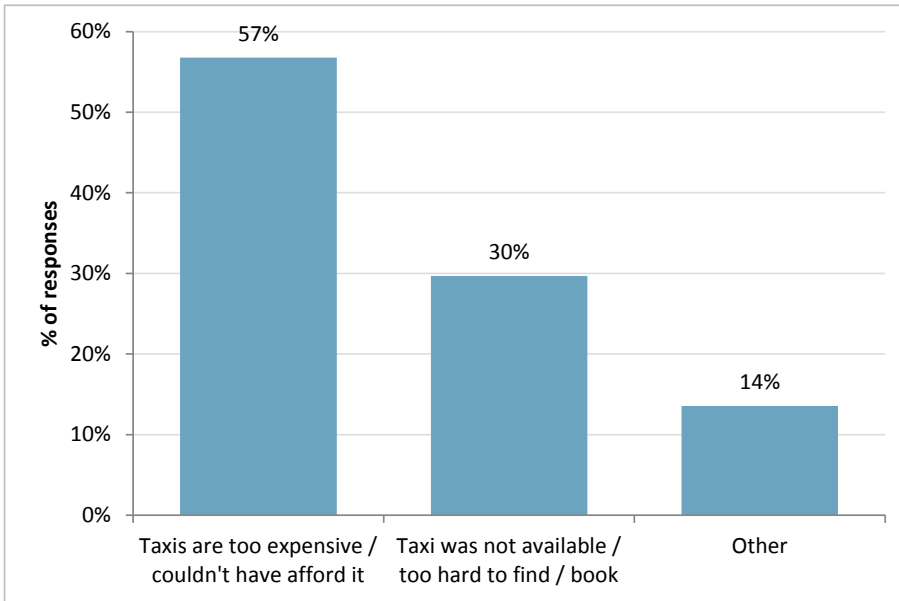
6.2 Some 5% of respondents said they had made one or more trips by another mode in the last seven days when they would have preferred to use a taxi - Figure 6.1

Figure 6.1: Whether made a trip by another mode when would have preferred a taxi



6.3 The reasons for not using a taxi were primarily cost (57%) and lack of availability (30%). Specific reasons noted in 'Other' include levels of traffic and receiving a lift from another person driving.

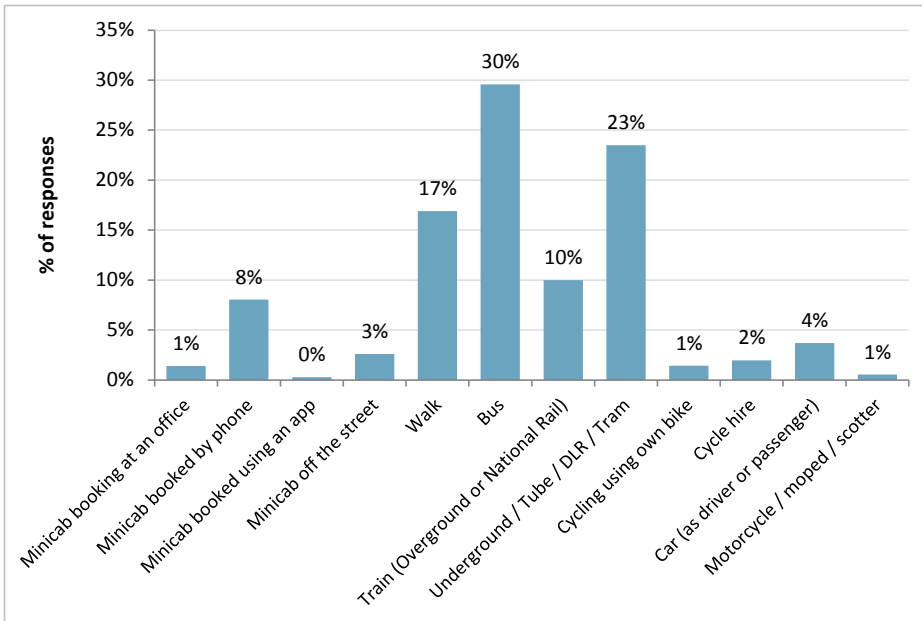
Figure 6.2: Reason for not using a taxi



Profile of taxi considered trips

6.4 The mode most likely to have been used instead of a taxi was bus, followed by Underground, DLR or tram. The full range of responses is provided in Figure 6.3.

Figure 6.3: Means of transport used instead of a taxi



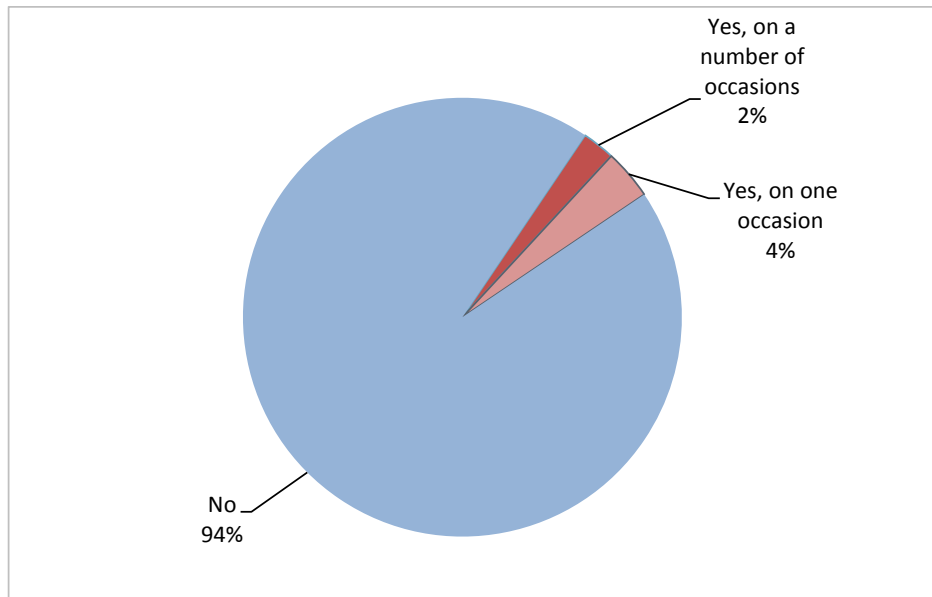
6.5 For trips where a taxi was considered but the trip was ultimately made by another means:

- Most were made during the daytime (72%), but with a significant minority (23%) made at night;
- Two thirds had origins in central/inner London and a third in outer London;
- A slightly lower proportion were destined for central/inner London (62%), with 38% destined for outer London.

Considered minicab trips

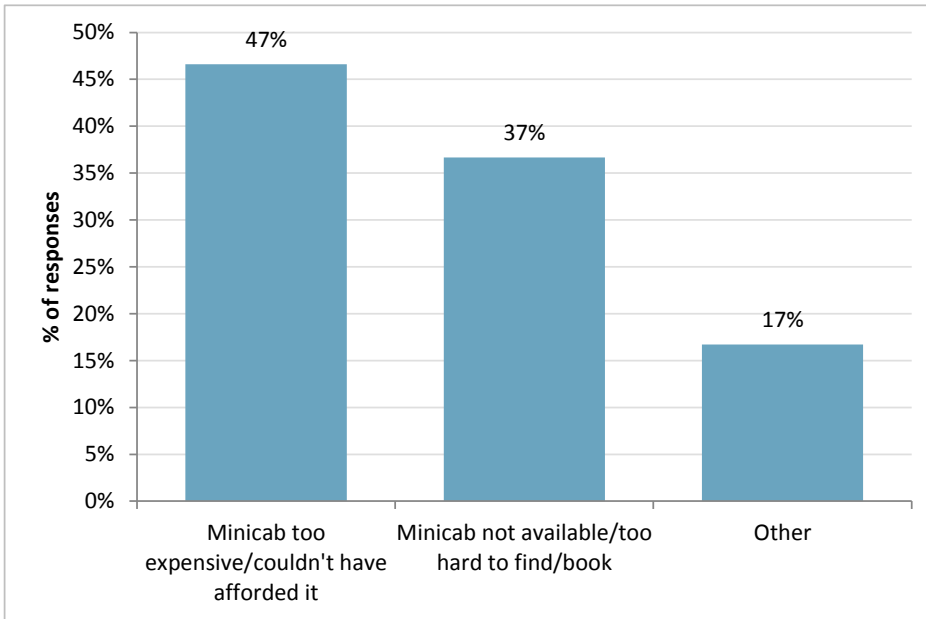
6.6 6% of respondents said they had made one or more trips in the last seven days by another mode when they would have preferred to use a minicab (Figure 6.4).

Figure 6.4: Whether made a trip by another mode when would have preferred to use a minicab



6.7 The reasons for not using a minicab were primarily cost (47%) and lack of availability (37%). Note that cost was somewhat less of a factor for minicabs compared with taxis.

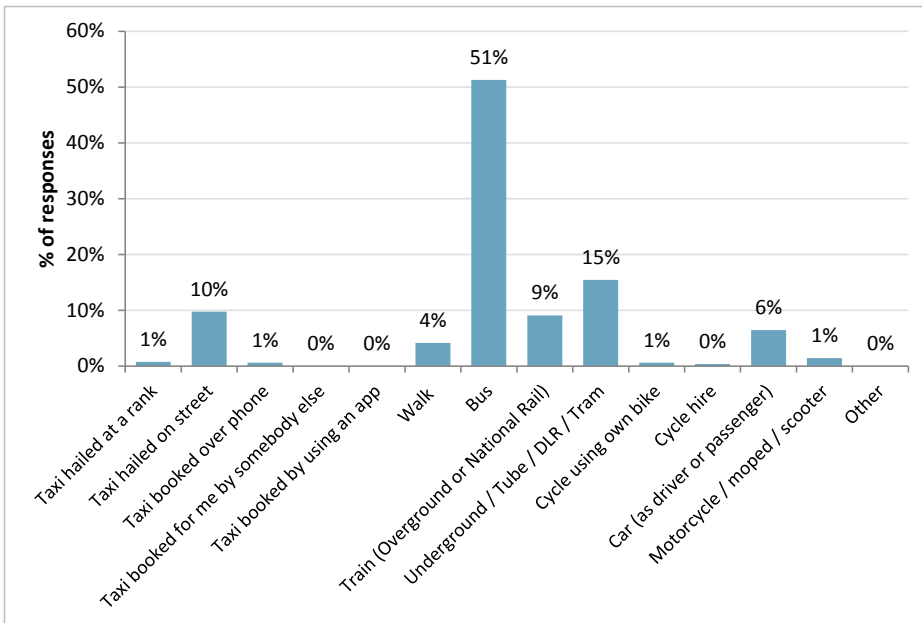
Figure 6.5: Reason for not using a minicab



Profile of minicab considered trips

6.8 The mode most likely to have been used instead of a minicab was bus, for more than half of all responses – the full range of responses is provided in Figure 6.6.

Figure 6.6: Means of transport used instead of a minicab



For trips considered for minicabs but ultimately made by another means:

- Most were made during the daytime (72%), but with a significant minority (23%) made at night;
- Half started in central/inner London and half in outer London;
- Just over half (55%) had a destination in central/inner London.

7 Stated changes in use

Introduction

- 7.1 Respondents were asked about whether they'd changed their use of taxis or minicabs over the last 12 months and the responses are presented in this chapter.

Changes in last 12 months

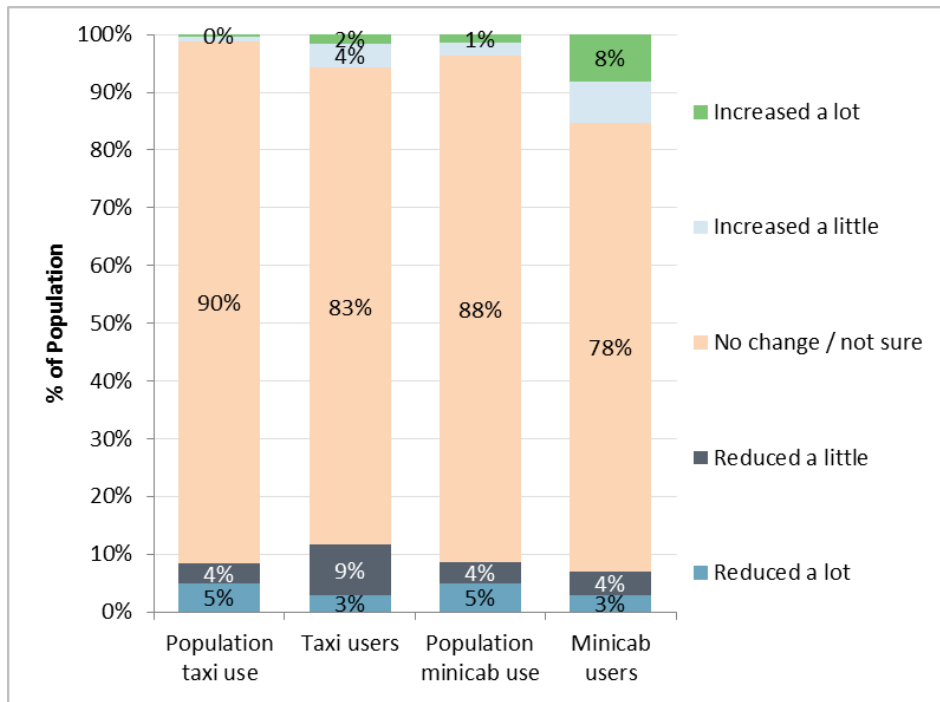
While most people hadn't changed their use of taxis or minicabs in the last 12 months, of those that had, more said they had reduced their use than said they had increased it. In fact, only around 1% said their use of taxis had increased.

7.2 Figure 7.1 shows the details for the sample as a whole, and also just for users of taxis and users of minicabs.

7.3 This comparison highlights that amongst users, the pattern was somewhat different to that of the population as a whole (the majority of whom are non-users):

- Amongst taxi users, while 6% had increased their use, 12% had decreased it (in most cases by “a little”);
- Amongst minicab users, 15% had increased their use and 7% had decreased their use, implying a net increase.

Figure 7.1: Changes in use of taxis and minicabs over last 12 months



7.4

In terms of the reasons for changes in use, these were mostly personal factors rather than anything directly connected to taxis and minicabs and mainly reasons for a reduction in trips, particularly for taxis. However, the use of apps was identified as an influence by a small number of respondents. Figure 7.2 and Figure 7.3 have detail for taxi and minicab responses, note that respondents could specify more than one reason for changes of use.

Figure 7.2: Reason for changing use of taxis

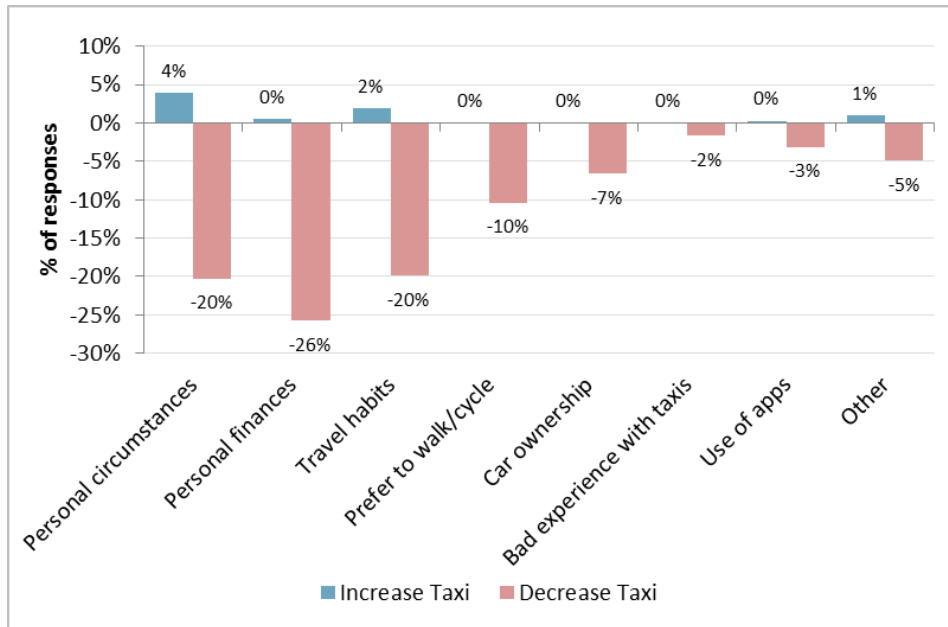
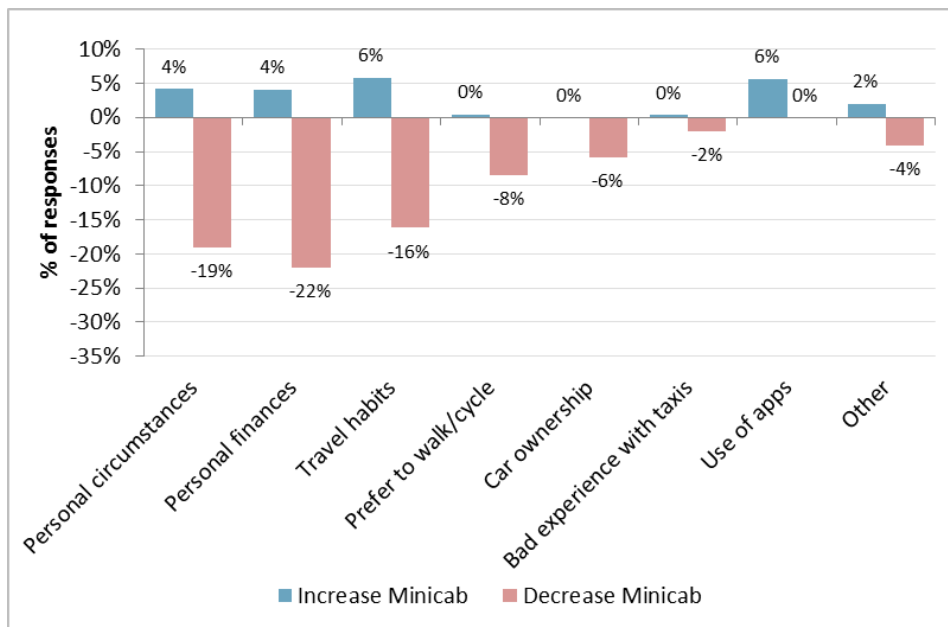


Figure 7.3: Reason for changing use of minicabs



8 Taxi and minicab booking apps

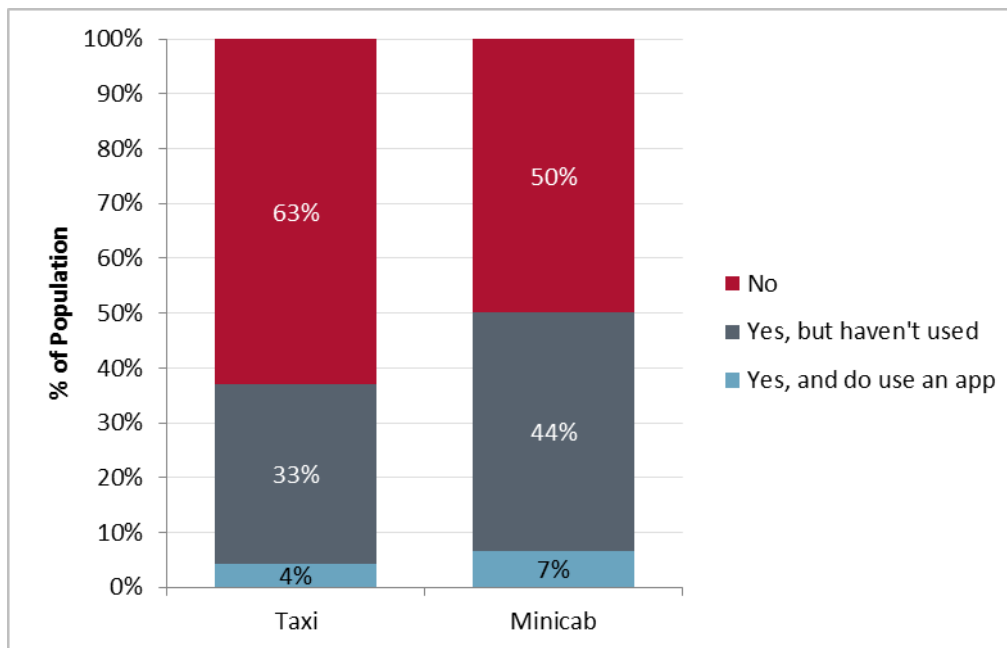
Introduction

8.1 In this chapter we present the results of questions concerning taxi and minicab booking apps. Note that the questions asked only of app users are based on a relatively small sample (155).

Awareness and use of apps

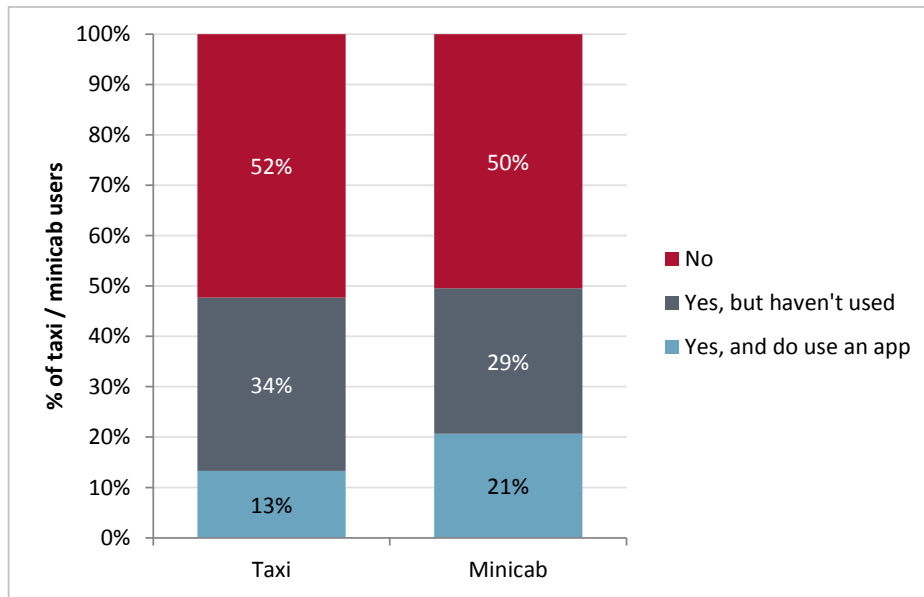
8.2 Overall, a little over one-third were aware of taxi apps and half of minicab apps. Usage of these apps was at 4% and 7% respectively (see Figure 8.1).

Figure 8.1: Awareness and use of apps



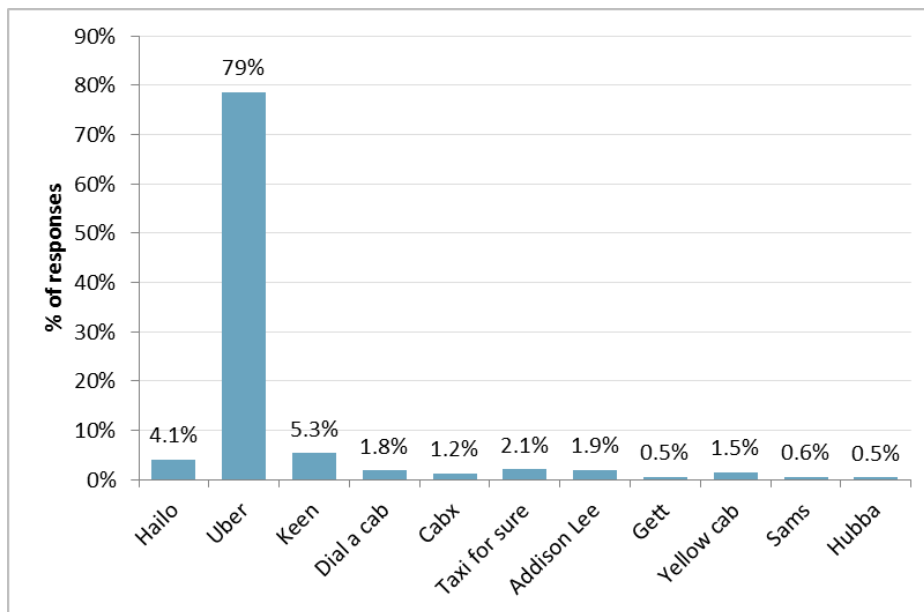
8.3 Awareness and use of apps amongst users of taxis and minicabs is shown in Figure 8.2. Around half of users of both taxis and minicabs are aware of apps, though a higher proportion of minicab users make use of them (21% compared with 13%).

Figure 8.2: Awareness and use of apps amongst taxi and minicab users



8.4 In terms of which apps were used most often, Uber was by far the most widely used and was mentioned by fifteen times as many respondents as the next most often used, Keen (79% used Uber most often compared with 5% for Keen). Hailo was the only other app mentioned by a significant number (4%).

Figure 8.3: Apps used most often



The reasons for using their preferred app are ease and convenience. Of app users, around a quarter had also used an app outside London.

A On-Street Survey Expansion Process

This Appendix details the on-street survey expansion process which was used to gather data regarding the use of taxis and minicabs in London. An expansion, or weighting, process was undertaken to make the sample of respondents as representative of the overall London population as possible. The expansion process is necessary to ensure that all groups of London's population are proportionally represented. This is particularly important in an on-street survey such as this due to the general bias towards picking up more active members of society. In addition to questions about their travel habits, a series of questions were also specifically asked that were used to facilitate the expansion process.

The information used to carry out the expansion process was:

- Residency status
- Borough of residence
- Gender
- Age group (17-24, 25-44, 45-59, 60-64, 65+)
- Activeness (measure of how active they have been over the past 7 days: high/medium/low)
- Employment status (worker/non-worker)
- Interview location (central/inner/outer London)

Each of these factors was used to sequentially categorize respondents and re-weight them back to actual population data (sourced from LTDS 2014).

The process can be broken into a series of steps outlined in the following section:

Step 1: Residents

Residents and non-residents were separated due to two primary reasons. Firstly, due to the lack of availability of meaningful population data to expand the non-residents population, they cannot be processed in the same way as residents. Furthermore, previous studies from 1998 and 2001 have identified significant variances in taxi and minicab usage between residents and non-residents. Weighting of non-resident respondents will be addressed in Steps 9 and 10.

Step 2: Gender, Age-Band, and Activeness

Residents were segmented into one of 30 groups based on age, activeness, and gender (for example, 17-24 highly active male). In order to expand these survey respondents to be representative of the London population, population data of London was sourced from LTDS 2014.

The 30 survey groups were then compared to the LTDS data by dividing the segment population by the segment sample size. This resulted in the determination of the first set of scaling factor.

$$\frac{\text{London Highly Active Male Age 17 – 24 Population \%}}{\text{Survey Highly Active Male Age 17 – 24 \%}} = \text{Scaling Factor}$$

Please note that under 17's were not interviewed, so only the population of London over 16 years of age were considered in this analysis.

Step 3: Workers and Non-Workers

The next step takes into account the split in London population between workers and non-workers. The survey responses were compared to worker/non-worker data obtained from the 2011 Census.

The survey results returned a significantly higher proportion of workers than the true London population, so the survey workers had to be scaled down, and the non-workers scaled up:

$$\frac{\text{London Working Population \%}}{\text{Survey Working \%}} = \text{Scaling Factor}$$

$$\frac{\text{London Non – Working Population \%}}{\text{Survey Non – Working \%}} = \text{Scaling Factor}$$

The above equations determined the second set of scaling factors.

It is important to note that the scaling factors from Step 2 were applied before the calculations for Step 3 were conducted.

Step 4: Location of Interview (Workers Only: Central, Inner, or Outer)

It is important to scale the survey respondents according to where they were interviewed, so as to negate the potential bias towards people who work in the areas where the surveys were conducted.

For workers that were interviewed during weekday working hours, a similar assumption to previous surveys (1998 and 2001 on-street survey) was adopted: namely, that those workers are representative of those London residents who work in the area of interview.

The proportional split of workers who work in central/inner/outer London (further broken down by gender) was obtained from LTDS 2014. Similarly to the process above (in Step 3), these relative percentages were compared to the percentages in the survey respondents and the survey respondents were scaled accordingly so that they match the actual London population.

Table A.1 shows the comparison between survey respondents and actual London data. The weightings were calculated with the following formula:

Table A.1: Percentage breakdown of workers of survey and actual London population

$$\frac{\% \text{ of London residents in a category}}{\% \text{ of Survey Respondents in that category}}$$

STEP 4	Survey (Scaled from Steps 2 & 3)	London	Weighting
Male Central Working	15.0%	18.8%	1.248
Female Central Working	14.9%	14.3%	0.963
Male Inner Working	11.7%	15.1%	1.295
Female Inner Working	14.6%	15.8%	1.079
Male Outer Working	23.1%	16.8%	0.726
Female Outer Working	20.7%	19.2%	0.928
Total	100.0%	100.0%	-

**Note: This Step was only conducted for survey respondents that were workers and were interviewed during standard working hours.*

It is important to note that the scaling factors from Step 2 and Step 3 (in sequential order) were applied before the calculations for Step 4 were conducted.

Step 5: Adjust Data (for Worker/Non-Worker)

Due to the various expansion steps that were undertaken, the overall ratio of workers and non-workers became slightly skewed, so a further expansion factor was applied to return the ratio back to a representative value.

Step 6: Area of Residence

The final factor for scaling residents was their area of residence. Breaking down by borough of residence produced too many small groups, so the decision was made to scale according to whether residents lived in Outer, Inner, or Central Boroughs.

$$\frac{\% \text{ London Residents Living in Zone (Outer, inner, or central)}}{\% \text{ of London Residents Living in Same Zone}} = \text{Scaling Factor}$$

Step 7: Adjust Data (for Total Population)

The process taken in Steps 2 through 6 is all relative scaling of the respondents (not to the total population). Thus, it is necessary to scale the respondents to the total population (data obtained from GLA, 2014 Population Projections for 2015):

$$\frac{\text{London Population Over 16}}{\text{Number of Resident Respondents}} = \frac{6,584,451}{1,391} = 4,733.61$$

This factor was applied to all residents.

Step 8a: Check Data (Age)

Each time the data is scaled according to one factor, it will slightly skew the other factors. Thus, it is important to check at the end of the scaling that each segment of the population has been fairly represented. The table below shows our initial results:

Table A.2:

	Survey (Pre-Weighting)	Survey (Post-Weighting)	London
Gender: Male	54.4%	47.2%	48.0%
Gender: Female	45.6%	52.8%	52.0%
Age: 17-24	12.9%	17.1%	14.6%
Age: 25-44	51.5%	34.2%	43.6%
Age: 45-59	26.6%	17.5%	21.4%
Age: 60-64	5.5%	5.3%	5.4%
Age: 65+	3.6%	25.8%	15.0%
High Activeness	50.1%	40.4%	33.3%
Medium Activeness	16.1%	30.3%	33.3%
Low Activeness	33.8%	29.3%	33.3%
Outer Resident	42.7%	52.0%	52.0%
Inner Resident	26.1%	28.8%	28.8%
Central Resident	20.8%	5.5%	5.5%
Non-Resident	10.4%	13.8%	13.8%

Comparing the two right-hand columns, it can be observed that most of the factors are close to the representative London figures. However, the age distributions are of particular concern, especially the 65+. In our scaled data, the 65+ age group is representing over 25% of the population; far more than the 15% that they actually represent. Since age is one of the biggest factors affecting how people travel, it was decided that the data should be scaled again by age to bring the figures closer to the LTDS 2014 data.

A similar procedure to the previous Steps was conducted to scale the population by age:

$$\frac{\% \text{ of London Population in an Age Group}}{\% \text{ of Scaled Survey Population in an Age Group}} = \text{Age scaling factor}$$

Each respondent was then multiplied by their respective age factor to complete the process.

Step 8b: Check Data (Activeness)

Following the scaling by age, the following activeness was represented:

	Survey (Pre-Weighting)	Survey (Post-Weighting)	London
High Activeness	50.1%	43.0%	33.3%
Medium Activeness	16.1%	33.1%	33.3%
Low Activeness	33.8%	23.9%	33.3%

A significant bias towards the High Activeness category can be observed. An identical process to Step 8a was repeated for activeness to negate this bias:

$$\frac{\% \text{ of London Population in an Activeness Group}}{\% \text{ of Scaled Survey Population in an Activeness Group}} = \text{Activeness scaling factor}$$

The final ratio for residents is seen in the table below:

	Survey (Pre-Weighting)	Survey (Post-Weighting)	London
Gender: Male	54.4%	45.2%	48.0%
Gender: Female	45.6%	54.8%	52.0%
Age: 17-24	12.9%	13.6%	14.6%
Age: 25-44	51.5%	41.7%	43.6%
Age: 45-59	26.6%	21.8%	21.4%
Age: 60-64	5.5%	5.7%	5.4%
Age: 65+	3.6%	17.2%	15.0%
High Activeness	50.1%	33.3%	33.3%
Medium Activeness	16.1%	33.3%	33.3%
Low Activeness	33.8%	33.3%	33.3%
Outer Resident	42.7%	51.8%	52.0%
Inner Resident	26.1%	28.9%	28.8%
Central Resident	20.8%	5.5%	5.5%
Non-Resident	10.4%	13.8%	13.8%

A significant improvement for both Age and Activeness was achieved. A significant narrowing of the gap between the original survey data and the London data can be noticed after the weighting has been applied. As expected, a significant bias occurred towards middle-aged inner/central residents.

Step 9: Scale to Correct Population

Due to the various expansion steps that were undertaken in Steps 2-8, the total population did not match the data from the GLA 2015 Projections. Another expansion factor was applied equally to all respondents to return the total population back to the GLA figure.

$$\frac{\text{Scaled Survey Population}}{\text{London Population Over 16}} = \text{Overall population scaling factor}$$

Step 10: Non-Residents

As specified earlier, Steps 1 through to 9 were exclusively for residents. Non-residents did not have data to scale against, so had to be handled differently.

Non-residents were intercepted amongst the quasi-randomly-selected on-street survey samples. Therefore, in principle, their presence in the survey should be in proportion to their presence in the on-street population in the survey locations. Thus, non-residents intercepted in each survey location were expanded by the same expansion factor that was applied to residents intercepted in the same location (grouped into central, inner, & outer).

Therefore, an average of the expansion factors applied to each survey respondent in each of the three groups (central, inner, & outer) was obtained. Each non-resident respondent was then multiplied by their respective average expansion factor.

Step 11: Total Non-Residents

The results from Step 10 are a relative way of scaling non-residents, and are not yet scaled to be representative of the total amount of non-residents in London at any one time. Information on the number of daily commuters coming in to London each day, domestic tourism numbers, and international tourism numbers were gathered¹²³. The data was used to determine the average amount of visitors in London at any one time.

The expansion factors from Step 10 were then scaled according to the total number of visitors in London at any one time (1,188,838) so that non-residents were adequately represented.

$$\frac{\text{Non-Resident Presence in London}}{\text{Scaled Non-Resident Survey Population}} = \text{Non - resident population scaling factor}$$

¹ TfL, Travel in London, Report 3 & 7

² Visit England: Trips to Different Parts of England in 2015;

³ London and Partners: London welcomes 17.4 million international visitors in another record-breaking year for tourism

Summary

Step 11 gives the final step in the process used to expand the survey sample to the London population.

This process identified the shortfalls in the process of taking a small sample of the population via an on-street survey and attempted to ameliorate them. The process involved scaling survey respondents according to their:

- Age
- Gender
- Borough of residence (segmented into central, inner, and outer)
- Activeness (segmented into high, medium, low)
- Worker/non-worker
- Resident/non-resident

Combining these factors resulted in a range of overall scaling factors which varied from 101,307 to 1,402 (i.e. each person's response represented between 1,402 and 101,307 residents of London). Respondents with higher scaling factors were ones in groups that were poorly represented in the survey (and thus had to be scaled up to reflect their presence in the overall population). Conversely, those with lower scaling factors were the respondents that were overly represented in the survey.

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SDG project/proposal number

22869601

Client contract/project number**Version control/issue number**

Draft
Second Draft
Final

Date

02/02/2016
10/03/2016
03/11/2016



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