

Electric Vehicle Charging Research

Survey with electric vehicle drivers

Research report



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1. Background

The UK Electric Vehicle (EV) Infrastructure Strategy sets out the Government's vision for the rollout of charging infrastructure needed to successfully achieve the 2030/35 phase out of new petrol and diesel cars and vans¹. Understanding consumers' needs is central to the strategy, to identify how to overcome current barriers to EV uptake.

To explore drivers' future charging needs and preferences for public charging provision, the Department for Transport (DfT) commissioned BritainThinks to conduct a three-part research project. The first two phases focused on drivers without access to off-street parking; the third phase of research, focusing on current EV drivers' attitudes, behaviours and experiences, is presented in this report.

- **Phase 1: Large-scale, deliberative research** with 90 UK drivers without access to off-street parking at home, including 61 non-EV (i.e. conventional petrol and diesel) drivers and 29 battery electric vehicle (BEV) drivers.
Fieldwork took place online between 16th June and 21st July 2021.
- **Phase 2: Quantitative survey** of 1,006 UK non-EV drivers without access to off-street parking at home.
Fieldwork took place online between 2nd and 15th September 2021.
- **Phase 3: Quantitative survey** of 848 UK EV drivers (battery electric and plug-in hybrid electric vehicle drivers).
Fieldwork took place online between 7th October and 4th November 2021.

Findings from the deliberative research and quantitative survey with non-EV drivers have been published separately in March 2022².

2. Methodology

All participants in the quantitative survey of **EV drivers** were UK adults aged 18+ whose household had continuous access to either a battery electric or plug-in hybrid electric car, and included respondents with and without access to off-street parking. Currently EV drivers are a difficult segment to target for large-scale research, due to a small incidence in the wider UK population of less than 1%; therefore, a non-probability sampling method was deemed most suitable for this study. To maximise the sample size that could be achieved, participants were primarily sourced from a survey panel of members of the public (505) and this was supplemented with recruitment via EV driver associations and online forums (343) to give a total of 848 respondents.

Existing data indicates that there were 600,000+ ultra-low emission cars in the UK by the end of Q3 2021, of which 52% were battery electric and 45% were plug-in hybrid electric³. The sample achieved in this survey includes 627 respondents with continuous access to a battery electric vehicle (BEV) (74%), 340 to a plug-in hybrid electric (PHEV) (40%), and 119

¹ Taking charge: the electric vehicle infrastructure strategy
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1065576/taking-charge-the-electric-vehicle-infrastructure-strategy.pdf

² Public electric vehicle charging infrastructure: drivers without access to off-street parking
<https://www.gov.uk/government/publications/public-electric-vehicle-charging-infrastructure-drivers-without-access-to-off-street-parking>

³ Data on all licensed and registered vehicles, produced by Department for Transport.

to both types of vehicles (14%), suggesting that BEV drivers are slightly overrepresented in this sample.

About one fifth of the sample reported being in single-car households (18%), 6% reported being in multi-car households with EVs only, while the remaining 76% were multi-car households with both EVs and non-EVs. The vast majority of the sample (70%) started driving an EV in 2019 or more recently. The main car models respondents reported using were Nissan Leaf (12%), Kia Niro (8%), BMW i3 (8%), Tesla model 3 (8%), which are among the top BEV models registered at the end of Q3 2021.

However, limited information is known about the demographic characteristics of battery electric and plug-in hybrid electric vehicle (PHEV) drivers within the UK population, meaning survey data could not be post-weighted. As such it is difficult to estimate sampling variability and identify sampling bias and caution should be taken in making statistical generalisations to the UK/England population from the results.

Key demographics of respondents to this survey have been outlined in Section 6: Demographic Profile.

2. Access to parking

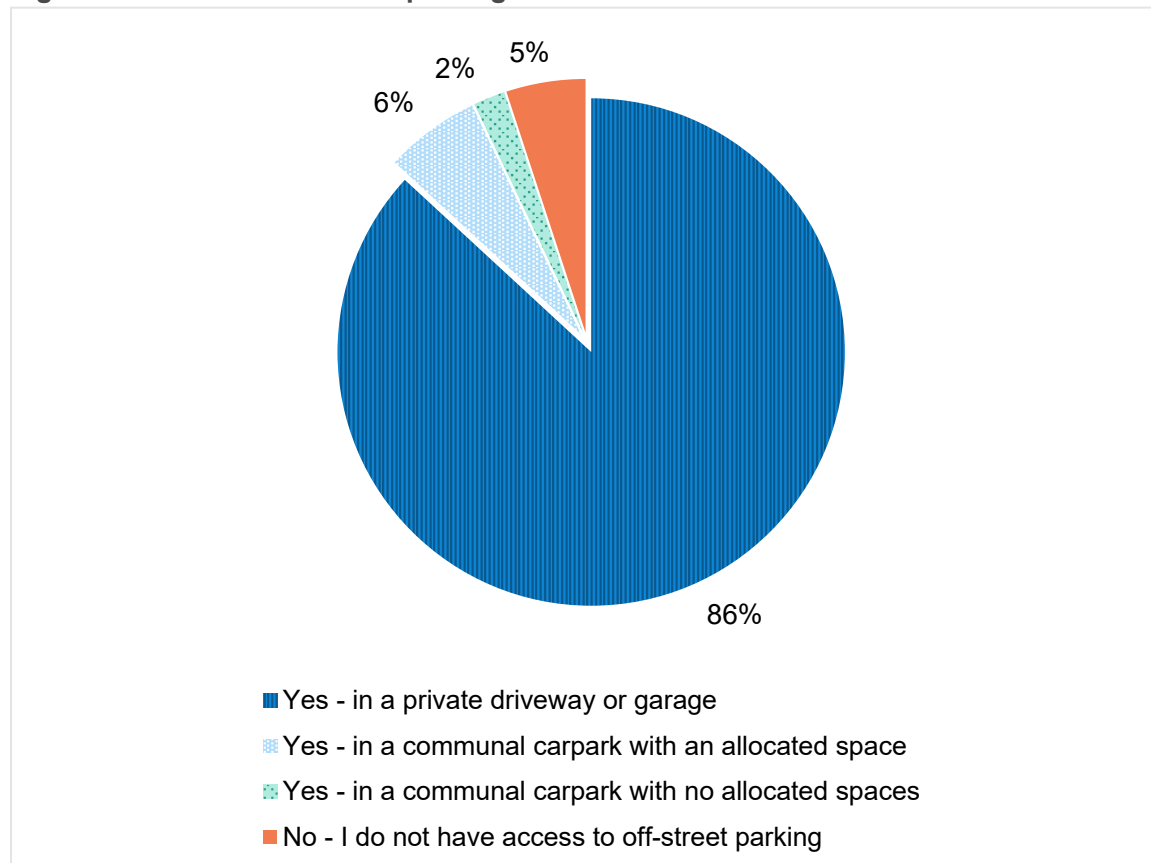
The vast majority (95%) of EV drivers responding to the survey reported having access to off-street parking. For most (86%) this was a private driveway or garage, while a minority reported using a communal car park either with (6%) or without (2%) an allocated parking space (Figure 1).

In contrast, 5% (n=45) of survey respondents reported not having access to off-street parking where they live. Among this group, around two-thirds (n=29) reported being able to park in front of or near their home, usually in an unallocated space (n=25).⁴

Those living in an urban area (11%), who rent their home (13%), and/or were single-car households (10%) were more likely to not have access to off-street parking compared to the total sample (5%).

⁴ Figures based on the sample of EV drivers without off-street parking should be treated with additional caution because of the low base size (n=45)

Figure 1: Access to off-street parking for at least one vehicle at normal home address



Q.5 Do you have access to off-street parking for at least one vehicle at your normal home address? Base: All respondents (n=848)

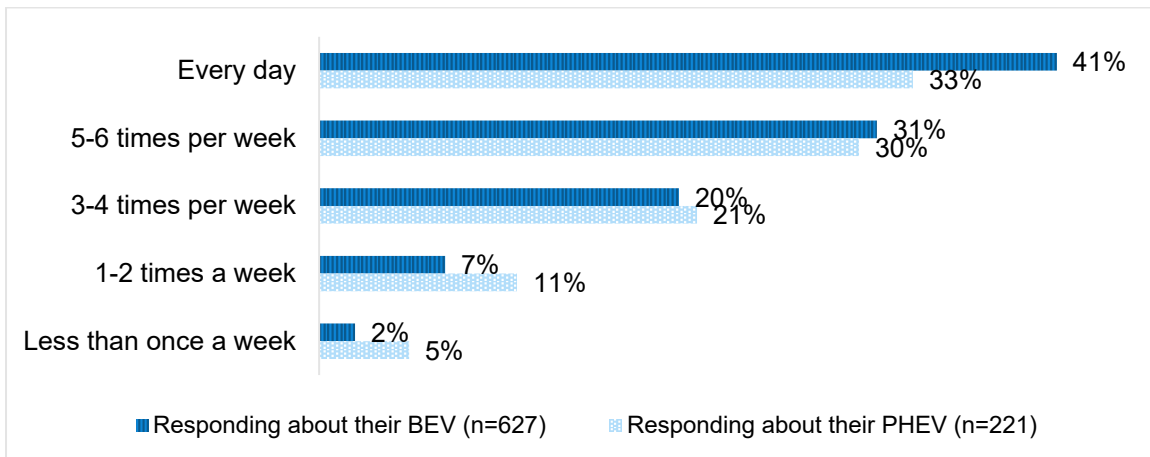
3. Driving behaviours

Almost four in five respondents (79%) reported using their EV as their ‘main vehicle’ (i.e. the vehicle they use most often), while most of the remainder (19%) reported using an internal combustion engine vehicle (ICEV) as their main vehicle despite having access to an EV in their household.

Respondents were asked how frequently they drove their BEV (if they had access to at least one in their household) or PHEV (if they did not have access to any BEVs). Nine in 10 respondents reported driving their EV frequently (3+ times per week), with those responding about their BEV being significantly more likely to drive their EV frequently (3+ times per week) (92%) than those responding about their PHEV (84%) (Figure 2).

Those living in suburban areas were more likely to report driving their EV every day (44%) than those living in urban areas (36%).

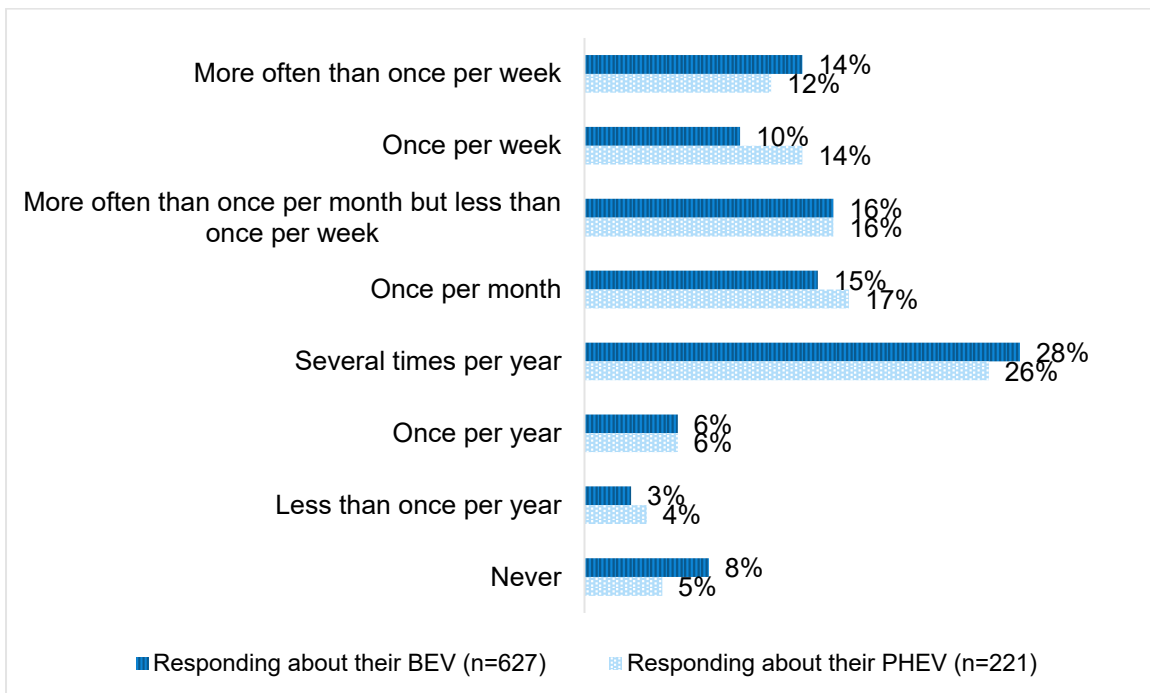
Figure 2: Frequency of driving their BEV or PHEV



Q.8 How frequently do you drive your PHEV or BEV? Base: Respondents responding about their BEV (n=627), respondents responding about their PHEV (n=221)

When asked specifically about their frequency of making longer trips of more than around 130 miles in one day, more than half of respondents reported doing so frequently (at least once a month) (56%) (Figure 3). There were no significant differences in frequency of undertaking these longer trips between those responding about their BEV and those responding about their PHEV.

Figure 3: Frequency of making longer trips of more than around 130 miles in one day

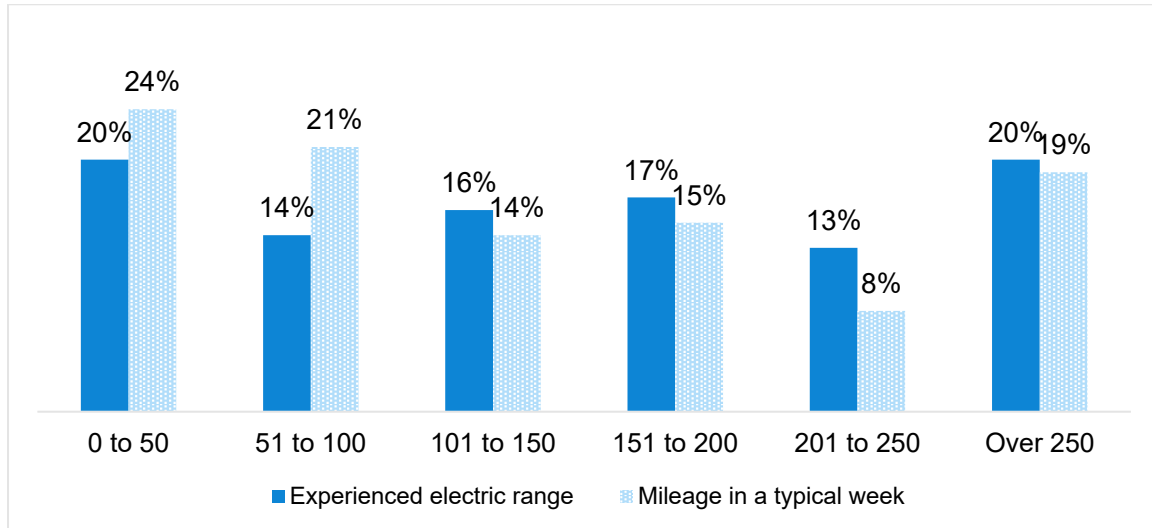


Q.9 How often do you typically make longer trips of more than around 130 miles in one day, using your PHEV or BEV? Base: Respondents responding about their BEV (n=627), respondents responding about their PHEV (n=221)

Survey respondents were asked to indicate their best estimate of their BEV or PHEV's experienced electric range (that is, the typical mileage they get from a full charge) and their mileage in a typical week (including both electric and non-electric mode for PHEVs). When answering this question, respondents were again asked to answer about their BEV if they had access to both a BEV and PHEV.

The median experienced electric range was 153 miles; however, there was a wide variation in the electric range respondents reported experiencing when using their EVs. This could in part have been caused by differing EV models and respondents having difficulties conceptualising the typical mileage they got from a full charge. Despite this, experienced electric range was broadly in line with typical weekly mileage (Figure 4), with the median typical weekly mileage being 129 miles.

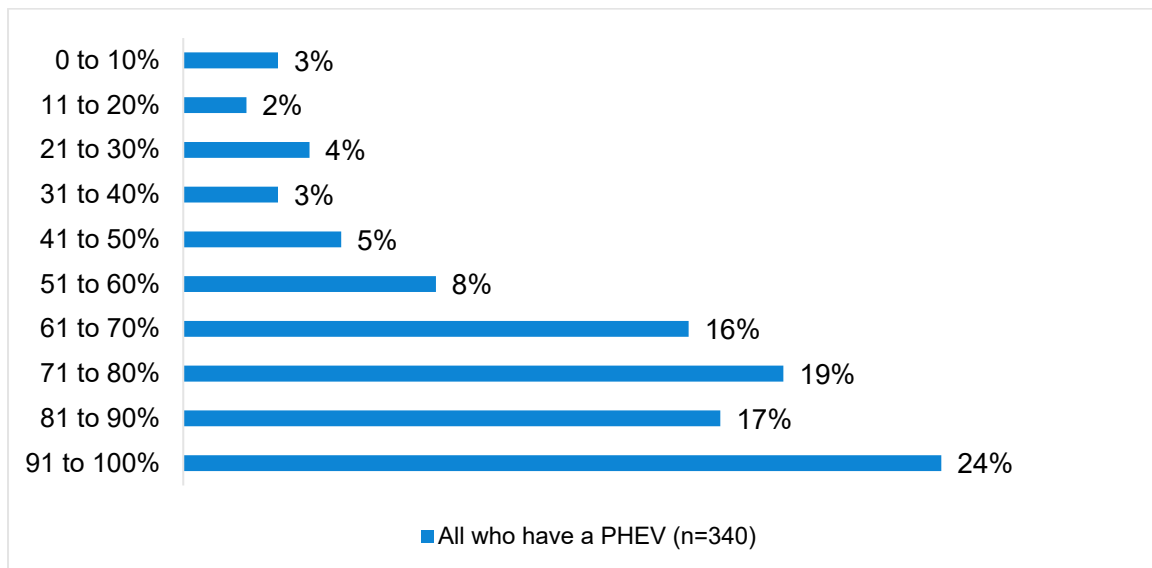
Figure 4: Experienced electric range and mileage in a typical week



Q.10 Please indicate your best estimate of your BEV or PHEV's (A) Experienced electric range: the typical mileage you get from a full charge, even if this is not what was specified by the manufacturer. (B) Mileage in a typical week: for a PHEV, please include the total mileage for both electric and non-electric mode. Base: All respondents (n=848)

When respondents with PHEVs were asked what proportion of their mileage in a typical week was driven on electric mode, 86% reported driving on electric mode for 50% or more of their mileage in a typical week, with 45% doing so for 80% or more of their typical mileage (Figure 5). Those with a smart charger at home were more likely than average to drive on electric mode for 80% or more of their mileage in a typical week (57%). It should be noted that survey respondents were in part sourced from EV forums and dedicated Facebook groups for EV drivers; these respondents may be more likely to use PHEVs in electric mode than the average PHEV user.

Figure 5: Proportion of mileage driven on electric mode in a typical week, amongst PHEV drivers



Q.11 Thinking about your PHEV (or the PHEV you use most often, if you have more than one), what proportion of your mileage in a typical week is driven on electric mode? Base: All who have a PHEV (n=340)

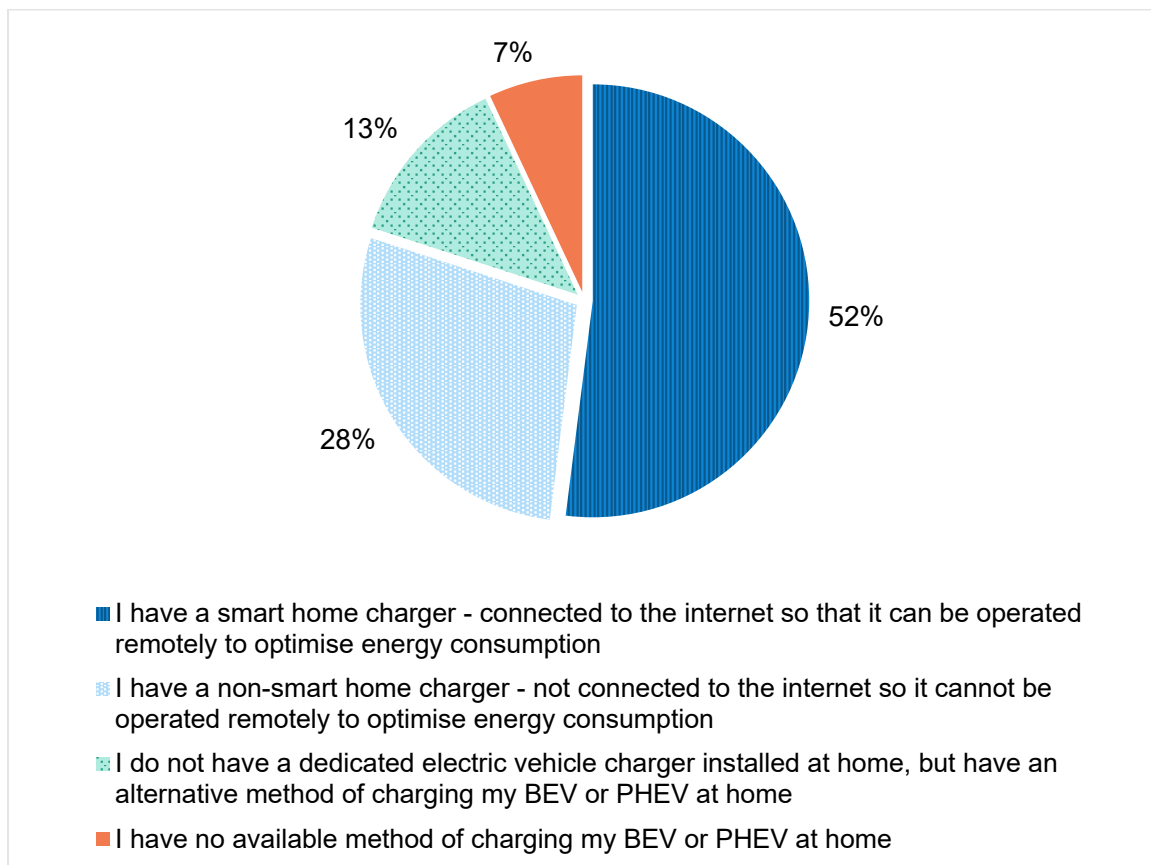
4. Charging behaviours

Almost all respondents (93%) reported having access to home charging. More than half of respondents had a smart home charger⁵ (52%) (Figure 6), with three-quarters of these respondents reporting that they use the smart functionality of these chargers always or most of the time (76%). Only 13% of those with a smart home charger reported using the smart functionality rarely or never (13%).

Older respondents aged 55+ years old were less likely to report having a smart charger installed (44%) than those aged 35-54 years old (57%) or 18-34 years old (59%).

⁵ In this study, a smart home charger was defined as a charger connected to the internet so that it can be operated remotely to optimise energy consumption. Note that there are different levels of smart functionalities, and not all may be captured here.

Figure 6: Access to a charger for BEV or PHEV vehicle at home



Q.12 Which of these statements best describes your access to a charger for your BEV or PHEV at home? Base: All respondents (n=848)

Respondents with the means to charge at home were asked how often they do so during the day and overnight, with respondents asked to answer about their BEV if they had access to both a BEV and PHEV.

Overnight charging was more common than daytime charging, with 90% of respondents with the means to charge at home reporting that they had ‘ever’ charged overnight (i.e., at least once a year, regardless of frequency of doing so), compared to 83% who reported charging during the day (Figure 7).

While 78% of respondents reported charging overnight at home regularly (once a week or more often), only 18% reported doing so every day. This proportion was even smaller for daytime charging at home, with just 9% of respondents reporting that they charge during the day on a daily basis.

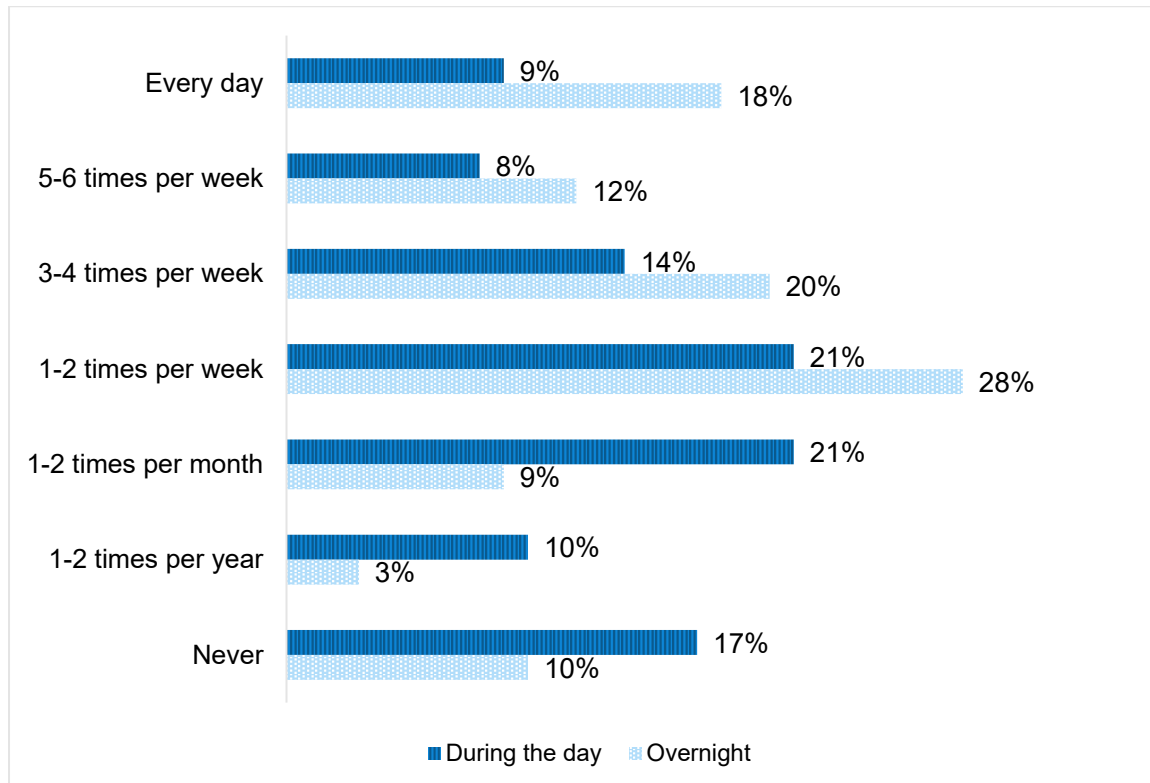
Across both overnight and daytime charging, respondents most commonly reported charging 1-2 times per week (28% for overnight, 21% for daytime charging). Daytime charging was also equally as common 1-2 times per month (21%), indicating that it is an option used by respondents on a more ad hoc basis compared to overnight charging, which is more regular.

There were some key differences in home charging behaviour between groups:

- Those responding about their PHEV were significantly more likely to report charging at home during the day once a week or more often (74%) compared to those responding about their BEV (45%).

- Those with a smart charger at home were significantly more likely to report charging at home overnight, with 96% doing so once a week or more often compared to 69% of those without a smart charger at home.
- Those who purchased their EV second-hand were more likely to charge overnight at home every day (27%) compared to the average across the full sample of respondents (18%).

Figure 7: Frequency of charging PHEV or BEV at home during the day and overnight

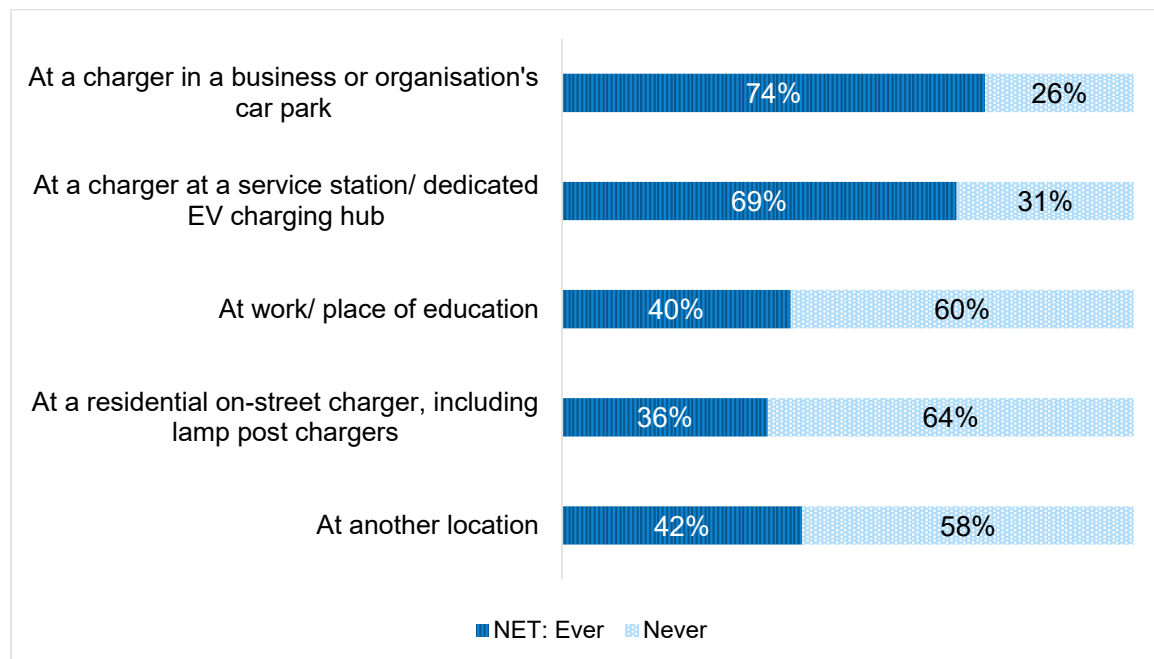


Q.15 How often do you charge your PHEV or BEV at home during the night or the day? Base: All with means to charge at home (n=785)

Respondents were asked about the frequency of using public charge points at a variety of locations, including: at work/place of education, on-street in residential area, in a business or organisation’s car park (e.g. supermarket), at a service station/dedicated EV charging hub, or at another location. Respondents were again asked to answer about their BEV if they had access to both a BEV and PHEV.

The vast majority of respondents reported having ‘ever’ (i.e., at least once, regardless of frequency of doing so) used a public charge point (88%). Three quarters of respondents reported having ‘ever’ charged in a business or organisation’s car park (74%), and more than two-thirds of respondents reported having ‘ever’ charged at a service station or dedicated EV charging hub (69%). For charge points at work/place of education or residential on-street chargers, there was a higher proportion of survey respondents who had never used these charge points (60% and 64% respectively) than who reported having ‘ever’ used them (40% and 36% respectively).

Figure 8: Incidence of charging at public charge points in various locations



Q.16 How often do you charge your PHEV or BEV at the following types of charge points? Base: All respondents (n=848)

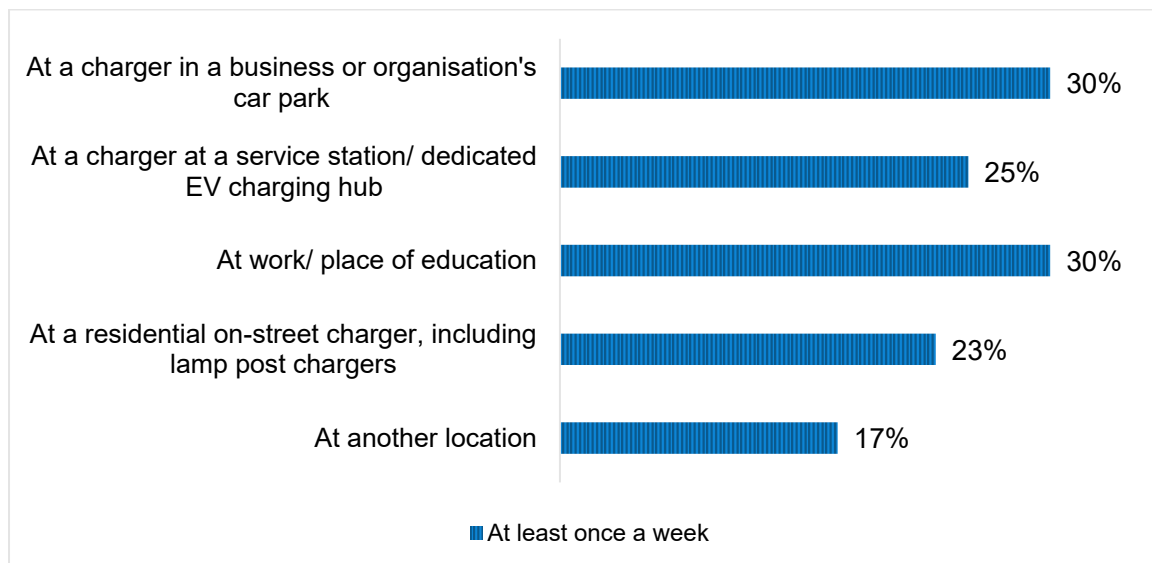
The public charging locations most used on a regular basis were at work/place of education or in a business or organisation's car park, with three in 10 respondents indicating that they charged at each of these locations at least once a week (30% at each location). A quarter of respondents also reported charging at a service station/dedicated EV charging hub at least once a week (25%) (Figure 9).

Respondents with vehicles with a more limited electric driving range reported charging at public chargepoints more often than those with a higher electric driving range, indicating that they take advantage of charging opportunities when they arise. For example, 19% of respondents with a second-hand EV reported charging daily at their work/place of education compared to 12% of the total sample, and similarly 42% of those responding about their PHEV reported charging weekly at their work/place of education compared to just 26% of those responding about their BEV.

While regular use of on-street charge points in residential areas was unsurprisingly higher among those without access to off-street parking at home (38% charging in this location at least once a week), the survey still found that 22% of those with access to off-street parking were charging in this location at least once a week. Those without access to off-street parking were also significantly more likely than average to report charging at business or organisation's car park (51%) at least once a week.

Those aged 18-34 were most likely to use each of the public charging locations asked about in the survey at least once a week compared to those aged 35-54, and both age groups were more likely to charge at public charging locations at least once a week than those aged 55+. Those in rented accommodation were also more likely to charge at each of the locations at least once a week compared to those who owned their home.

Figure 9: Frequency of charging at public charge points in various locations



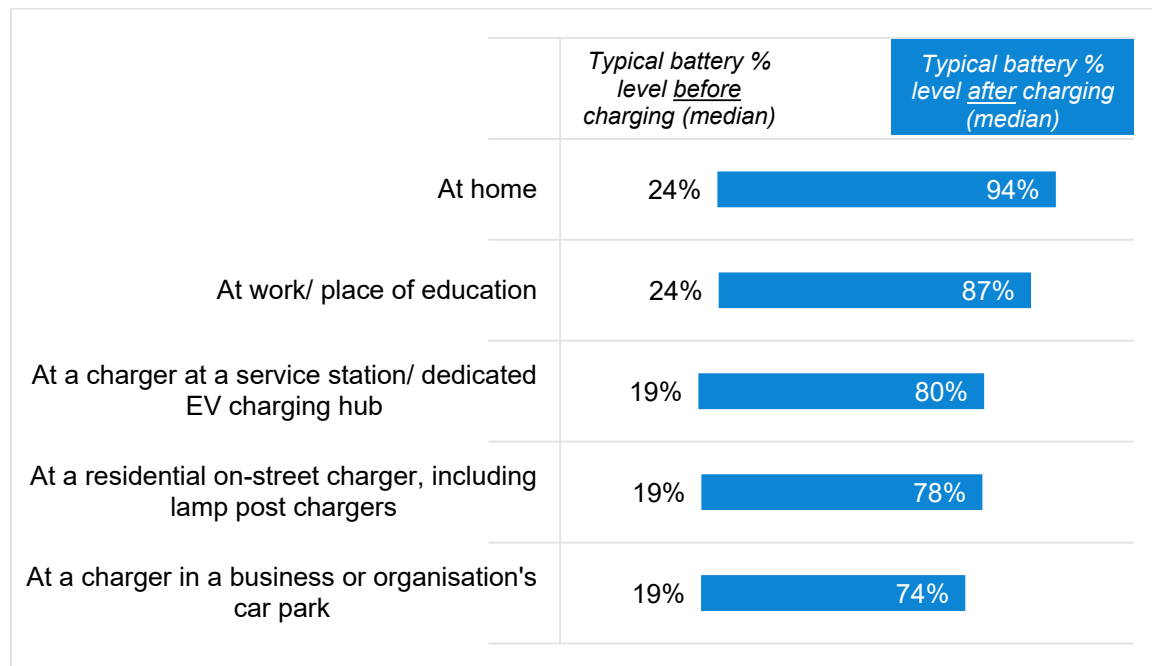
Q.16 How often do you charge your PHEV or BEV at the following types of charge points? Base: All respondents (n=848)

Respondents were asked what their typical battery percentage level is before and after charging in locations they reported 'ever' charging their EV (Q16, Figure 8).

Respondents with the means to charge their EV at home reported their typical battery percentage level before charging at home to be 24% (median score), rising to 94% (median score) after charging.

In contrast, when using the public charging network, the battery percentage level before charging was typically lower than when charging at home (median of 19%), with the battery percentage level after charging also typically lower than when charging at home (medians of 74%-80% at destinations). The exception is when charging at work/place of education, where battery percentage levels before and after charging were typically closer to what was achieved charging at home.

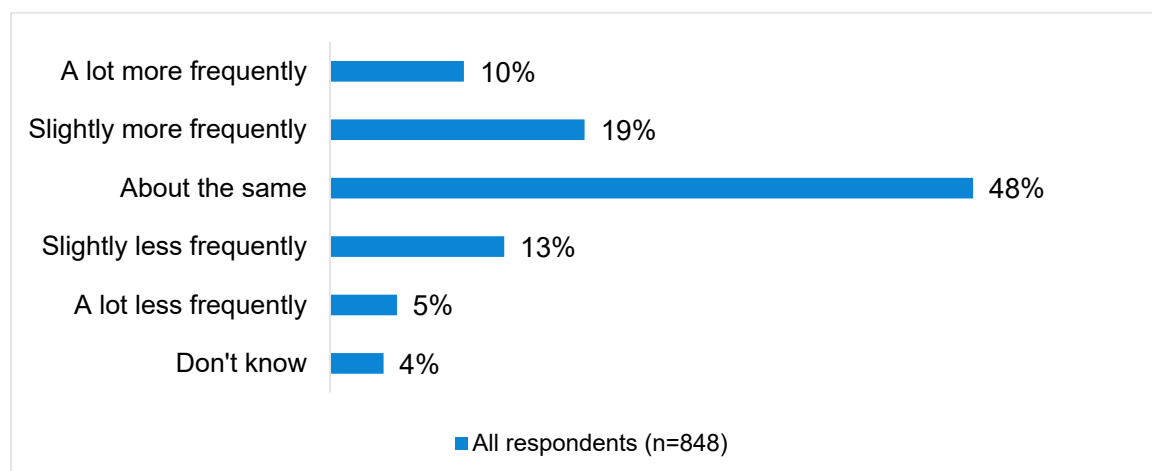
Figure 10: Self-reported typical battery percentage level before and after charging BEV or PHEV at various locations (median scores)



Q.18 When charging your vehicle at each of the following locations, what is the typical battery percentage level before you charge your vehicle? And what is the typical battery percentage level after you charge your vehicle? Base: All respondents (n=848) NB. Median values reported to minimise the impact of outlier responses on the figures reported (vs. mean scores).

When asked about how their expectations of charging frequency prior to purchase aligned with their actual behaviour now, almost half reported charging their EV at about the same frequency as they expected before buying their vehicle (48%), however, three in 10 reported having to charge more frequently than expected (29%) (Figure 11). Respondents who reported driving an ICEV as their main vehicle and/or who do not have access to off-street parking were more likely to report having to charge their EV more frequently than expected, when compared to the total sample.

Figure 11: Frequency of charging compared to expectations prior to purchase



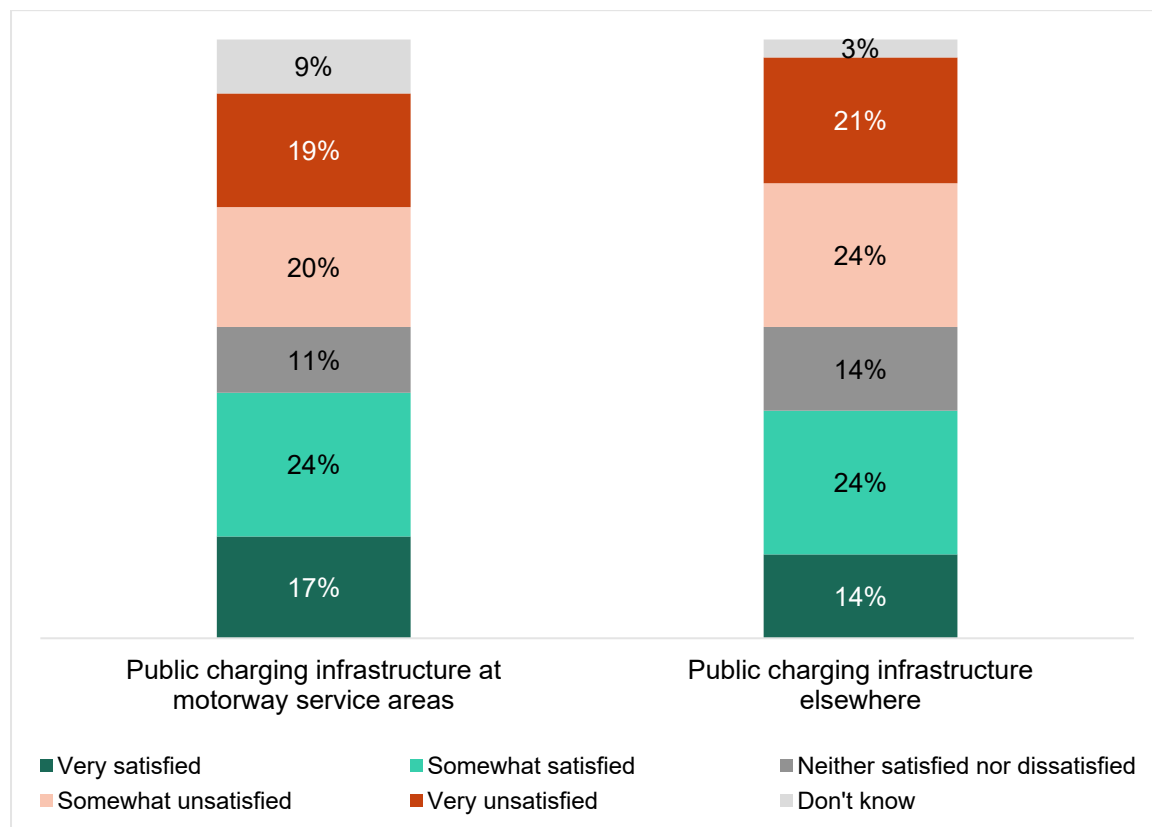
Q.17 Do you charge your PHEV or BEV more or less frequently to what you had expected before buying a PHEV or BEV? Base: All respondents (n=848)

5. Attitudes to public charging infrastructure

The survey asked respondents who reported having ‘ever’ used the public charging network (88% of the sample) how satisfied they were with public charging provision either at motorway service areas or elsewhere on the public network. Responses were mixed for both types of charging infrastructure, indicating that there is a large degree of variation in respondents’ experiences (Figure 12).

As mentioned previously (page 10), respondents aged 55+ were less likely to report using public chargepoints. They were also significantly less likely to be satisfied (very or somewhat satisfied) with charge points at motorway service areas (21%) compared to younger respondents aged 35-54 (49%) or aged 18-34 (66%). Likewise, respondents aged 55+ were also significantly less likely to be satisfied (very or somewhat) with charge points elsewhere on the public network (20%) compared to respondents aged 35-54 (46%) or aged 18-34 (61%).

Figure 12: Satisfaction with public charging infrastructure at motorway service areas and elsewhere



Q.19 How satisfied or unsatisfied are you with the public charging infrastructure at the following locations? Base: All except those who only charge at home (n=745)

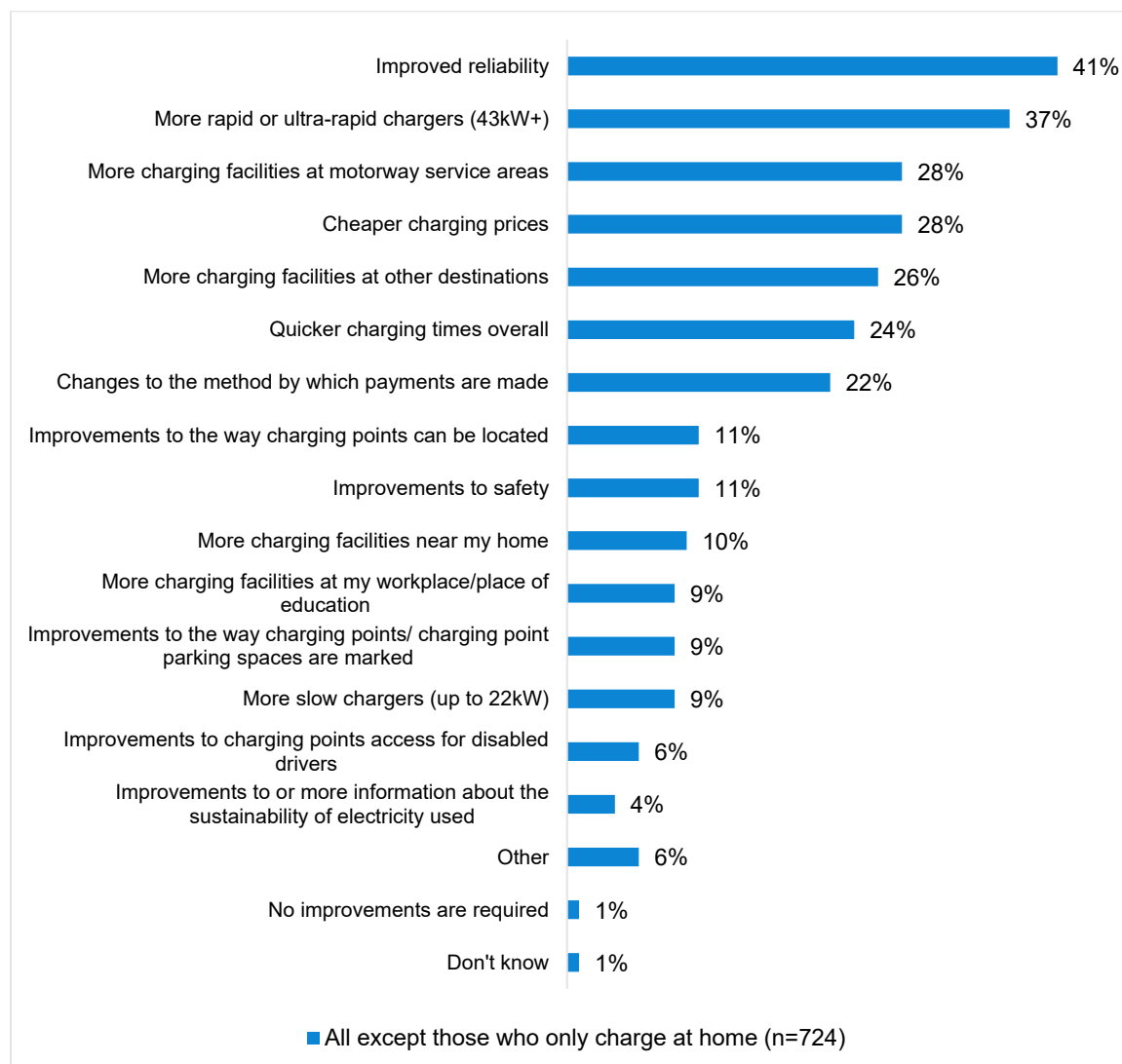
Respondents who reported using the public charging network were also asked to rate how safe they felt when using public charging infrastructure using a scale of 0-10 where 0 meant ‘not at all safe’ and 10 meant ‘extremely safe’. Two thirds of respondents gave a high safety rating of 8-10 out of 10 (66%), however women were significantly less likely to give a high safety rating (55% giving a score of 8-10 out of 10 compared to 70% of men). Respondents giving lower ratings cited a range of reasons: location of chargepoints in isolated or dark

areas, charging at night, insufficient lighting, concerns about leaving the cable exposed whilst charging, and concerns about potential theft of the vehicle.

6. Improvements to public charging infrastructure

Respondents who had ‘ever’ used the public charging network (88% of the sample, Figure 8) were asked to select their top three improvements for the public charging network from a list of options. Almost four in five of these respondents indicated that having more charging facilities/chargers would make an improvement (79%) including 37% who would find additional rapid or ultra-rapid chargers an improvement and 28% who felt that having more charging facilities at motorway service areas would be an improvement. Improved reliability (41%) and cheaper charging prices (28%) also emerged as important improvements across the sample (Figure 13).

Figure 13: Options that would most improve the public charging network



Q.22 Please select up to three options that you feel would most improve the public charging network. Base: All except those who only charge at home (n=724)

When asked specifically about where they would like to see any additional publicly-accessible charge points, most respondents who use the public charging network indicated that they wanted to see additional charge points at all locations (Table 1).

However, the greatest need for additional charge points was reported to be at service stations, destinations such as supermarkets and council car parks, and dedicated EV charging hubs – with nine in 10 respondents indicating more chargers were needed in these locations (92%, 91%, and 90% respectively).

While most wanted more rapid chargers (43kW+) at these locations (81%, 65%, and 78% respectively), two in five wanted to see more chargers up to 22kW at other destinations such as supermarkets and council car parks (40%), and workplaces and places of education (38%) as well.

Statistically significant differences were seen between EV drivers with and without off-street parking with relation to on-street chargepoints in residential areas. The latter were significantly more likely to want additional chargepoints on a street directly outside their home (88% vs 54%) and on a street near their home (88% vs 65%).

Table 1: Types of additional publicly-accessible chargepoint desired

	NET: More chargers	More chargers 43kW+ (rapid)	More chargers up to 22kW (slow/fast)	No additional chargers needed
At service stations	92%	81%	18%	8%
At other destination (e.g., supermarket, public car park)	91%	65%	40%	9%
At a dedicated EV charging hub	90%	78%	22%	10%
At workplace / place of education	68%	36%	38%	32%
On a street near my home	66%	39%	33%	34%
On a street directly outside my home	56%	32%	28%	44%
Somewhere else	64%	50%	25%	36%

Q.23 What kind(s) of additional publicly-accessible chargepoints, if any, would you like to see? Base: All except those who only charge at home (n=724)

6. Demographic profile

Table 2: Demographic profile

	All respondents (n=848)
Gender	
Male	76%
Female	23%
Age	
18-34	21%
35-54	34%
55+	45%
Location	
London	19%
NET: England (incl. London)	85%
Scotland	9%
Wales	4%
Northern Ireland	1%
Rurality	
Urban	35%
Small town/Suburban area	34%
Village/fringe of town	26%
Isolated rural area	5%
Ethnicity	
White	82%
Black/African/Caribbean/Black British	5%
Asian/Asian British	4%
Mixed	3%
Other ethnic groups	1%
Prefer not to answer	5%
Incidence of long-term illness, health condition, disability or impairment that impacts mobility	
NET: Yes	14%
No	80%
Prefer not to answer	6%
Children aged under 18 in household	
NET: Yes, children up to 10 years old	26%
NET: Yes, children up to 18 years old	41%
No children aged 18 or under	58%
Prefer not to answer	1%
Type of building current living in	
Detached house	47%
Semi-detached house	27%
Terraced house	11%

Converted flat (i.e., a house that has been converted into flats)	4%
Maisonette (i.e., a flat across two floors)	3%
Flat in a small block of flats (less than 3 floors)	3%
Flat in a tower block/high-rise complex (3+ floors)	2%
Other	2%
Working status	
NET: Employed	70%
NET: Not working	2%
NET: Retired	25%
Household income	
Up to £7,000	1%
£7,001 to £14,000	2%
£14,001 to £21,000	4%
£21,001 to £28,000	6%
£28,001 to £34,000	8%
£34,001 to £41,000	8%
£41,001 to £48,000	8%
£48,001 to £55,000	7%
£55,001 to £62,000	7%
£62,001 to £69,000	5%
£69,001 to £76,000	6%
£76,001 to £83,000	6%
£83,001 or more	21%
Prefer not to answer	12%
Year first started driving a PHEV or BEV	
2021	18%
2020	34%
2019	18%
2018	9%
2017	7%
2016	5%
2015	3%
2014	1%
2013	1%
2012	1%
2011	<1%
2010	1%
Before 2010	1%

7. Appendix A: Glossary of terms

<i>Electric Vehicle (EV)</i>	A vehicle powered using an electric motor. This includes battery electric vehicles (BEVs) and hydrogen fuel cell vehicles (FCVs). In this document, plug-in hybrid electric vehicles (PHEVs) are also included in this category.
<i>Battery electric vehicle (BEV)</i>	A vehicle that runs on a battery-powered electric motor only. BEVs are recharged by plugging the vehicle into a source of electricity (charging point). When people talk about 'pure electric', 'fully electric', or 'all-electric' vehicles, they are normally talking about BEVs.
<i>Plug-In hybrids (PHEVs)</i>	Has both a battery-powered electric motor and an internal combustion engine (ICE). Can travel medium distances (up to c.40 miles) on just electric power.
<i>Hydrogen Fuel Cell Electric Vehicles (HFCV)</i>	A vehicle that has an electric motor but does not have a battery and does not plug in to charge.
<i>Internal Combustion Engine Vehicle (ICEV)</i>	A vehicle that uses only petrol or diesel to fuel an engine. Currently, most cars in the UK are ICEVs.

8. Appendix B: Questionnaire

Section 1 – Key demographic information

Dummy Q – source of respondent:

1. Panel respondents
2. Open link

1. [ASK ALL | SINGLE CODE] Which of the following describes where you live?

[SCREEN OUT ALL WHO CODE OPTION M]

- a. Scotland
- b. North East
- c. North West
- d. Yorkshire and the Humber
- e. West Midlands
- f. East Midlands
- g. Wales
- h. East of England
- i. London
- j. South East
- k. South West
- l. Northern Ireland
- m. Outside the UK

1B. [ASK ALL | SINGLE CODE] Do you identify as...?

- a. Male
- b. Female
- c. Non-binary
- d. Prefer not say

1C. [ASK ALL | NUMERICAL CODE] Please enter your age in the box below:

- a. [Max 99]

Section 2 – Car ownership and driving habits

2. [ASK ALL | NUMERIC GRID | MULTIPLE RESPONSE] Please indicate in the table below how many cars your household has continuous use of, according to the categories below – as well as whether they are owned, leased or a company car.

[SCREEN OUT ALL WHO CODE 'NONE' FOR BOTH OPTION D AND E]

	Own (bought new)	Own (bought second-hand/used)	Lease	Company car	None [NMUL]
a. Petrol engine	I	II	III	IV	V
b. Diesel engine	I	II	III	IV	V

c. Hybrid vehicle that cannot be plugged in to charge	I	II	III	IV	V
d. Plug-in Hybrid Electric Vehicle (PHEV) (has both a battery-powered electric motor and a petrol/diesel engine that needs to be refuelled)	I	II	III	IV	V
e. Battery Electric Vehicle (BEV) (has a battery-powered electric motor only and must be plugged in to charge)	I	II	III	IV	V
f. Hydrogen Fuel Cell Electric Vehicle (HFCV) (has an electric motor but does not have a battery and does not plug in to charge)	I	II	III	IV	V
g. Other (please specify)	I	II	III	IV	V

2B. [ASK THOSE CODING I-IV FOR OPTION G AT Q2A | OPEN TEXT] You mentioned that your household has access to another type of vehicle that was not listed above. Please tell us what type of vehicle this is.

3A. [ASK THOSE WHO SAY THEY HAVE MORE THAN ONE CAR AT Q2 | SINGLE OPTION GRID] The vehicle I use most often is my...

[ONLY SHOW OPTIONS SELECTED AT Q2A]

- a. Petrol engine
- b. Diesel engine
- c. Hybrid vehicle that cannot be plugged in to charge
- d. Plug-in Hybrid Electric Vehicle (PHEV) (has both a battery-powered electric motor and a petrol/diesel engine that needs to be refuelled)
- e. Battery Electric Vehicle (BEV) (has a battery-powered electric motor only and must be plugged in to charge)
- f. Hydrogen Fuel Cell Electric Vehicle (HFCV) (has an electric motor but does not have a battery and does not plug in to charge)
- g. Another vehicle **[IF 'OTHER' SELECTED AT Q2 | PIPE IN RESPONSE TO Q2B]**

3B. [ASK THOSE WHO SAY THEY HAVE MORE THAN ONE CAR AT Q2 | OPEN TEXT] Why do you use this vehicle most often?

4. [ASK ALL | MULTI CODE] What model is your BEV or PHEV?

If your household has continuous use of more than one Battery Electric Vehicle (BEV) or Plug-in Hybrid Electric Vehicle (PHEV), please select all that apply.

- a. Audi e-tron
- b. BMW 3 Series
- c. BMW 5 Series
- d. BMW i3
- e. Hyundai Ioniq
- f. Jaguar I-Pace
- g. Kia Niro
- h. Land Rover Range Rover
- i. Mercedes Benz A Class
- j. Mercedes Benz C Class
- k. Mini Countryman Cooper S E
- l. Mitsubishi Outlander PHEV
- m. Nissan Leaf
- n. Renault Zoe
- o. Tesla Model 3
- p. Tesla Model S
- q. Tesla Model X
- r. Toyota Prius
- s. Volkswagen e-Golf
- t. Volkswagen Golf GTE
- u. Volvo XC90 Twin Engine
- v. Other (please specify)

5. [ASK ALL | SINGLE OPTION] Do you have access to off-street parking for at least one vehicle at your normal home address?

- a. Yes – in a private driveway or garage
- b. Yes – in a communal carpark with an allocated space
- c. Yes – in a communal carpark with no allocated spaces
- d. No – I do not have access to off-street parking

6. [ASK ONLY THOSE WHO CODE OPTION D FOR QUESTION 5 | SINGLE OPTION] You have told us you do not have access to off-street parking for at least one vehicle at your normal home address.

Which of these options best describes your access to parking for your main vehicle at your normal home address?

- a. In front of or near my home, in an allocated space
- b. In front of or near my home, in an unallocated space
- c. On my street, but not in front of or near my home
- d. On a neighbouring street
- e. In a public council car park
- f. In a private car park
- g. In a friend or family member's private driveway/garage or residential carpark for their building/complex
- h. Other (please specify)

7. [ASK ALL | SINGLE CODE] What year did you first start driving a plug-in hybrid vehicle (PHEV) or battery electric vehicle (BEV)?

- a) 2021
- b) 2020
- c) 2019
- d) 2018
- e) 2017
- f) 2016
- g) 2015
- h) 2014
- i) 2013
- j) 2012
- k) 2011
- l) 2010
- m) Before 2010

8. [ASK ALL | SINGLE CODE]

For the following questions about your driving and charging habits, please think about your battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV).

If you have continuous use of multiple BEVs and/or PHEVs...

- Combination of BEV and PHEV: please think about your BEV
- 2+ BEVs but no PHEVs: please think about the BEV you use most often
- 2+ PHEVs but no BEVs: please think about the PHEV you use most often

How frequently do you drive your PHEV or BEV?

- a. Every day
- b. 5-6 times per week
- c. 3-4 times per week
- d. 1-2 times a week
- e. Less than once a week

9. [ASK ALL | SINGLE CODE] When answering this question, please think about your battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV).

If you have continuous use of multiple BEVs and/or PHEVs...

- Combination of BEV and PHEV: please think about your BEV
- 2+ BEVs but no PHEVs: please think about the BEV you use most often
- 2+ PHEVs but no BEVs: please think about the PHEV you use most often

How often do you typically make longer trips of more than around 130 miles in one day, using your PHEV or BEV?

- a. More often than once per week
- b. Once per week
- c. More often than once per month but less than once per week
- d. Once per month
- e. Several times per year
- f. Once per year
- g. Less than once per year
- h. Never

10. [ASK ALL | NUMERIC GRID] When answering this question, please think about your battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV).

If you have continuous use of multiple BEVs and/or PHEVs...

- Combination of BEV and PHEV: please think about your BEV
- 2+ BEVs but no PHEVs: please think about the BEV you use most often
- 2+ PHEVs but no BEVs: please think about the PHEV you use most often

Please indicate your best estimate of your BEV or PHEV's...

a. Experienced electric range (the typical mileage you get from a full charge, even if this is not what was specified by the manufacturer)	
b. Mileage in a typical week (for a PHEV, please include the total mileage for both electric and non-electric mode)	

11. [ASK THOSE WHO CODE D AT QUESTION 2A | SLIDING SCALE METERED BY PERCENTAGE] Thinking about your PHEV (or the PHEV you use most often, if you have more than one), what proportion of your mileage in a typical week is driven on electric mode?

If you are unsure, please provide your best estimate.

Never drive in electric mode

Always drive in electric mode

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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Section 3 – Charging habits

12. [ASK ALL | SINGLE CODE] Which of these statements best describes your access to a charger for your BEV or PHEV at home?

- I have a **smart home charger** – connected to the internet so that it can be operated remotely to optimise energy consumption
- I have a **non-smart home charger** – not connected to the internet so it cannot be operated remotely to optimise energy consumption
- I do not have a dedicated electric vehicle charger installed at home, but have an alternative method of charging my BEV or PHEV at home (e.g. running an extension cable through my window or letterbox)
- I have no available method of charging my BEV or PHEV at home

13. [ASK THOSE WHO SELECT OPTION A AT Q12 | SINGLE CODE] How often do you use the smart functionality of your home charger?

- Always
- Most of the time
- Sometimes
- Rarely
- Never
- Don't know [FIX TO END]

14. [ASK ONLY THOSE WHO CODE A-C AT QUESTION 12 | SINGLE CODE] Which of the following energy tariffs do you have at home? If you have more than one tariff, or one that covers more than one options below, select all that apply.

Non-specific EV tariff

- a. Variable or fixed rate tariff
- b. Capped rate
- c. Green tariff
- d. Dual fuel (gas + electricity)
- e. Time of use tariff (e.g. Economy 7 or 10)
- f. Other non-specific EV tariff

Specific EV tariff

- g. EV tariff (time of use) – offering off-peak charging periods
- h. Smart EV tariff – with automated control from energy supplier to schedule charging
- i. Vehicle-to-grid tariff – offering rewards for transferring energy from battery back to the grid
- j. Other specific EV tariff (specify)

- k. Don't know

15. [ASK THOSE CODING A-C AT QUESTION 12 | SINGLE RESPONSE GRID] How often do you charge your PHEV or BEV at home during the night or during the day? Please include any charges you make, even if you do not fully charge your vehicle each time.

If you have continuous use of multiple BEVs and/or PHEVs...

- Combination of BEV and PHEV: please think about your BEV
- 2+ BEVs but no PHEVs: please think about the BEV you use most often
- 2+ PHEVs but no BEVs: please think about the PHEV you use most often

- i. Every day
- ii. 5-6 times per week
- iii. 3-4 times per week
- iv. 1-2 times per week
- v. 1-2 times per month
- vi. 1-2 times per year
- vii. Never

- a. Overnight
- b. During the day

16. [ASK ALL | SINGLE RESPONSE GRID] How often do you charge your PHEV or BEV at the following types of chargepoint? Please include any charges you make, even if you do not fully charge your vehicle each time.

If you have continuous use of multiple BEVs and/or PHEVs...

- Combination of BEV and PHEV: please think about your BEV
- 2+ BEVs but no PHEVs: please think about the BEV you use most often

- 2+ PHEVs but no BEVs: please think about the PHEV you use most often
 - i. More than once per day
 - ii. Every day
 - iii. 5-6 times per week
 - iv. 3-4 times per week
 - v. 1-2 times per week
 - vi. 1-2 times per month
 - vii. 1-2 times per year
 - viii. Never
 - a) At work/place of education
 - b) At a residential on-street charger, including lamp post chargers
 - c) At a charger in a business or organisation's car park (e.g. supermarket, pub, hotel)
 - d) At a charger at a service station / dedicated EV charging hub
 - e) Other location (please specify)

16B. [ASK THOSE CODING I-VII FOR OPTION E AT Q16 | OPEN TEXT] You mentioned that you charge your vehicle 1-2 times per week at another location, please can you tell us where this is.

17. [ASK ALL | SINGLE RESPONSE GRID] Do you charge your PHEV or BEV more or less frequently to what you had expected before buying a PHEV or BEV?

- a) A lot more frequently
- b) Slightly more frequently
- c) About the same
- d) Slightly less frequently
- e) A lot less frequently
- f) Don't know

18. [ASK ALL | NUMERIC GRID (%) OR SLIDING SCALE METERED BY PERCENTAGE | RANDOMISE OPTIONS A-F]:

When charging your vehicle at each of the following locations, what is the typical battery percentage level before you charge your vehicle? And what is the typical battery percentage level after you charge your vehicle?

- i. Before I charge my vehicle, the battery is usually at...
 - ii. After I charge my vehicle, the battery is usually at...
 - iii. Unsure [EXCLUSIVE FOR ROW, NOT NUMERIC]
- a. At home [ASK THOSE CODING A-C AT QUESTION 12]
 - b. At work/place of education [ASK ONLY THOSE WHO CODE I-VII FOR OPTION A AT Q16]
 - c. At a residential on-street charger, including lamp post chargers [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B AT Q16]
 - d. At a charger in a business or organisation's car park (e.g. supermarket, pub, hotel) [ASK ONLY THOSE WHO CODE I-VII FOR OPTION C AT Q16]

- e. At a charger at a service station / dedicated EV charging hub **[ASK ONLY THOSE WHO CODE I-VII FOR OPTION D AT Q16]**
- f. Other location **[ASK ONLY THOSE WHO CODE I-VII FOR OPTION E AT Q16; PIPE IN RESPONSE AT Q16]**

Section 4 – Public charging infrastructure

19. [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B, C, D or E AT QUESTION 16 | SINGLE RESPONSE GRID, FLIP SCALE] How satisfied or unsatisfied are you with the public charging infrastructure at the following locations?

- a. Public charging infrastructure at motorway service areas
- b. Public charging infrastructure elsewhere
 - i) Very satisfied
 - ii) Somewhat satisfied
 - iii) Neither satisfied nor unsatisfied
 - iv) Somewhat unsatisfied
 - v) Very unsatisfied
 - vi) Don't know **[FIX TO END]**

20. [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B, C OR D AT QUESTION 16 | METERED SLIDING SCALE] Using a 0-10 scale, where 0 is “not at all safe” and 10 is “extremely safe”, how safe or unsafe do you feel when using the public charging infrastructure?

21. [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B, C OR D AT QUESTION 16 | OPEN TEXT] Why did you give that answer? Please provide details of what makes you feel safe / unsafe when using public chargers, including charging location / time of use.

22. [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B, C OR D AT QUESTION 16 | MULTI CODE, MAXIMUM 3, RANDOMISE ORDER] Please select up to three options that you feel would most improve the publicly charging network.

- a. More charging facilities near my home
- b. More charging facilities at my workplace/place of education
- c. More charging facilities at motorway service areas
- d. More charging facilities at other destinations
- e. More rapid or ultra rapid chargers (43kW+)
- f. More slow chargers (up to 22kW)
- g. Quicker charging times overall
- h. Cheaper charging prices
- i. Changes to the method by which payments are made
- j. Improved reliability
- k. Improvements to or more information about the sustainability of electricity used
- l. Improvements to the way charging points / charging point parking spaces are marked
- m. Improvements to the way charging points can be located
- n. Improvements to charging points access for disabled drivers
- o. Improvements to safety
- p. Other, please specify **[OPEN TEXT BOX, FIX TO END]**
- q. No improvements are required **[NMUL, FIX TO END]**
- r. Don't know **[NMUL, FIX TO END]**

23. [ASK ONLY THOSE WHO CODE I-VII FOR OPTION B, C OR D AT QUESTION 16 | MULTI RESPONSE GRID, RANDOMISE] What kind(s) of additional publicly-accessible chargepoints, if any, would you like to see?

- i. More slow chargers (up to 22kW)
- ii. More rapid chargers (43kW+)
- iii. No additional chargers needed **[EXCLUSIVE, FIX TO END]**
 - a. On a street directly outside my home
 - b. On a street near my home
 - c. At my workplace/place of education
 - d. At other destinations (e.g. supermarket, pub, public car park)
 - e. At service stations
 - f. At a dedicated EV charging hub
 - g. Somewhere else **[FIX TO END]**

23B. [ASK ONLY THOSE WHO CODE I OR II FOR OPTION G AT QUESTION 23 | OPEN TEXT] You mentioned that you would like to see the following types of charger somewhere else, please can you tell us where.

- a. More slow chargers (up to 22kW) **[SHOW ONLY TO THOSE CODING i AT OPTION G AT Q23]**
- b. More rapid chargers (43kW+) **[SHOW ONLY TO THOSE CODING ii AT OPTION G AT Q23]**

24. [ASK ALL | MULTI CODE] Have you ever contacted a consumer advisory service, made a formal complaint or attempted to make one as a result of any issues with the following:

- a. Purchase of my BEV / PHEV
- b. Leasing of my BEV / PHEV
- c. Quality / performance of my BEV / PHEV
- d. BEV / PHEV's manufacturer's warranty
- e. BEV / PHEV's servicing / repairs
- f. Use / access to public chargepoints
- g. Installation of home charger
- h. Installation of workplace charger
- i. Home / public chargepoint functionality
- j. Purchase of a bundled service (e.g. home charger and access to public chargers)
- k. Access to a specific EV tariff
- l. Other (please specify) **[OPEN TEXT, FIX TO END]**
- m. No, I haven't made nor attempted to make a formal complaint **[NMUL, FIX TO END]**
- n. Don't know **[NMUL, FIX TO END]**

25. [ASK ALL EXCEPT THOSE WHO CODE M or N AT Q24 | OPEN TEXT] How was your experience with the complaint process? Please provide details of the organisation you made / attempted to make a complaint to, your issue and expectations, and the final outcome.

Section 5 – Background information/Demographics

Thank you for your answers so far. Please answer some final questions about you to wrap up...

26. [ASK ALL | SINGLE CODE] Which of the following best describes the type of building you currently live in?

- a. Detached house
- b. Semi-detached house
- c. Terraced house
- d. Converted flat (i.e. a house that has been converted into flats)
- e. Maisonette (i.e. a flat across two floors)
- f. Flat in a small block of flats (less than 3 floors)
- g. Flat in a tower block / high-rise complex (3+ floors)
- h. Other (please specify)

27. [ASK ALL | SINGLE CODE] Which of the following best describes the street you live on?

- a. Mostly terraced houses
- b. Mostly detached or semi-detached houses
- c. Mostly flats (including converted, split level and studio flats)
- d. Other, please specify

28. [ASK ALL | SINGLE CODE] To which of the following ethnic groups do you consider you belong?

- a. White
- b. Mixed
- c. Asian / Asian British
- d. Black / African / Caribbean / Black British
- e. Other ethnic group, please specify
- f. Prefer not to answer

29. [ASK ALL | SINGLE CODE] Do you have a long-term illness, health condition, disability or impairment that limits your daily activities and has an impact on your mobility?

This could include physical or mental health conditions.

Please remember that your answers are always treated confidentially.

- a. Yes - mental condition
- b. Yes - physical condition
- c. Yes - disability
- d. Yes - other
- e. No
- f. Prefer not to answer

30. [ASK ALL | NUMERICAL CODE] Including yourself how many people in total live in your household?

- a. Max 99

31. [ASK ALL | SINGLE CODE] Do you have any children aged 18 or under? If so, how old are they?

- a. No children aged 18 or under
- b. Yes - children aged under 5 years old
- c. Yes - children aged 5 to 10 years old
- d. Yes - children aged 11 to 15 years old
- e. Yes - children aged 16 to 18 years old

- f. Prefer not to answer

32. [ASK ALL | NUMERICAL CODE] Please enter the first half of your postcode. Please enter the letters in upper case.

33. ASK ALL | SINGLE CODE] Which of the following best describes where you live?

- a. Urban
- b. Small town/Suburban area
- c. Village/fringe of town
- d. Isolated rural area

34. [ASK ALL | SINGLE CODE] Is the house or flat in which you live...?

- a. Owned outright - without mortgage
- b. Owned with a mortgage or loan
- c. Rented from the council
- d. Rented from a housing association
- e. Rented from someone else
- f. Rent free

35. [ASK ALL | SINGLE CODE] Please indicate which of the following best describes your working status

- a. Currently furloughed / reduced hours / employer imposed temporary leave of absence as a result of the Coronavirus
- b. Working full time - working 30 hours per week or more
- c. Working part-time - working between 8 and 29 hours per week
- d. Self-employed - working 30 hours per week or more
- e. Self-employed - working between 8 and 29 hours per week
- f. Not working but seeking work or temporarily unemployed or sick
- g. Not working and not seeking work
- h. Student
- i. Retired on a state pension only
- j. Retired with a private pension
- k. House person, housewife, househusband, etc.

36. [ASK ALL | SINGLE CODE] Are you required to drive as part of your job?

- a. Very Frequently
- b. Frequently
- c. Occasionally
- d. Rarely
- e. Very Rarely
- f. Never

37. [ASK THOSE CODING A-E AT Q35 | SINGLE CODE] What is the total combined annual salary of your household before tax?

- a. Up to £7,000
- b. £7,001 to £14,000

- c. £14,001 to £21,000
- d. £21,001 to £28,000
- e. £28,001 to £34,000
- f. £34,001 to £41,000
- g. £41,001 to £48,000
- h. £48,001 to £55,000
- i. £55,001 to £62,000
- j. £62,001 to £69,000
- k. £69,001 to £76,000
- l. £76,001 to £83,000
- m. £83,001 or more
- n. Prefer not to answer