ARUP

NatCen
Social Research that works for society

Department for Transport

National evaluation of e-scooter trials

Findings report

December 2022

278971

Ove Arup & Partners Ltd
8 Fitzroy Street
London W1T 4BJ
arup.com

NatCen Social Research
35 Northampton Square
London EC1V 0AX
natcen.ac.uk

Contents

Tables

Figures

Department for Transport

Appendices

Abbreviations

API	Application Programming Interface (a link between two applications)
BCR	Benefit/Cost Ratio
BEIS	Department for Business, Energy and Industrial Strategy
CBA	Cost-Benefit Analysis
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DPTAC	Disabled Persons Transport Advisory Committee
km, kmh	Kilometres, kilometres per hour
mph	Miles per hour
NTS	National Travel Survey
ONS	Office for National Statistics
PACTS	Parliamentary Advisory Council for Transport Safety
TAG	Transport Analysis Guidance (the DfT's appraisal framework)
TfL	Transport for London
WECA	West of England Combined Authority

Executive Summary

The e-scooter trials

The Department for Transport (DfT) is coordinating regulated trials that allow people in certain areas of England to rent an e-scooter. The first trial started in July 2020 and a total of 32 trials across 55 areas have been implemented. By the end of December 2021, 31 trials remained in operation across 50 areas, delivered by a total of 12 e-scooter operators (see Appendix A for the full list of trials and operators).

The trials have the objectives of informing future policy (including legislation), helping gather evidence on their impacts, contributing to the understanding of the effectiveness of COVID-19 policy responses, and learning implementation lessons. Most trials have been extended to the end of November 2022 to allow DfT to continue to gather data beyond the timescales of this evaluation.

This report

This is the findings report of the evaluation of e-scooter rental trials in England. It has been commissioned by the Department for Transport (DfT) and undertaken by Arup and NatCen Social Research. It includes data collected between July 2020 and the end of December 2021. The report does not cover private e-scooter use; however, it is recognised that private use is widespread and that this may affect the perceptions of the trials on behalf of non-users and the recording of safety data. This has been highlighted where relevant.

Data used in this report

This report is based on the following data sources:

Table 1: Data and information analysed in the evaluation

Data type	Trials covered	Details
Operator data (quantitative research)	All 32 trials	• Operator data on trips and their characteristics from July 2020 to the end of December 2021, including: ○ The characteristics (trip length, duration, timing) of 14.5 million e-scooter trips. **This is referred to as "operator data".** ○ 1,779,524 responses to a survey distributed to registered users after each trip (13% response rate). **This is referred to as the "post-ride survey".** ○ 191,092 responses distributed to a survey distributed to all registered users (14% response rate). **This is referred to as the "demographic survey".**

Department for Transport

User survey (quantitative research)	Ten trials[1]	• Online survey of 6,864 users[2], distributed by Dynata on behalf of NatCen, collecting: o 3,193 Wave 1 user survey responses collected between April and September 2021 (6% response rate). o 4,115 Wave 2 user survey responses collected between August and November 2021, including 444 longitudinal responses (from Wave 1 respondents) (5% response rate). • **This is referred to as the "user survey".**
Resident survey (quantitative research)	Ten trials	• Online survey of 3,620 residents[3], distributed by NatCen, collecting: o 1,901 resident survey responses, collected between June 2021 and August 2021. o 1,913 resident survey responses, collected between October and November 2021. • **This is referred to as the "resident survey".**
Qualitative research with users	Five trials[4] (the case study trials)	• Wave 1, April – September 2021, in-depth interviews with 45 users. • Wave 2, September – November 2021, a further 60 interviews with users. • Five focus groups with users were conducted (one per case study area).
Qualitative research with residents	Five trials (the case study trials)	• Wave 1, April – September 2021, in-depth interviews with 58 residents, including 20 participants with a mobility condition, hearing or vision impairment. • Wave 2, September – November 2021, a further 51 interviews with residents (seven resident interviewees had a mobility condition and nine had a hearing or vision impairment). • Five focus groups with residents were conducted (one per case study area).
Qualitative research with local stakeholders	Five trials (the case study trials)	• Qualitative interviews with local stakeholders (the local authority responsible for the trial, the operator delivering the trial and the police) across five case study areas[5] in September – October 2021. In the London case study trial, ten interviews were conducted to account for the more complex stakeholder picture (including different boroughs). In total, 21 interviews were conducted.

[1] The list of trials chosen for surveys are presented in Section 2 of the report.
[2] Note that users are defined as those that have hired rental e-scooters that are part of the e-scooter trials, and residents are defined as those that reside in the trial areas. Residents may also be users.
[3] The response rate for the resident survey could not be estimated as a panel sample was used. 194 longitudinal cases were removed.
[4] The list of trials chosen for case studies are presented in Section 2 of the report.
[5] Note the police was not interviewed in WECA.

Qualitative research with national stakeholders	n/a	• Qualitative interviews with 11 national stakeholders[6] in February and March 2021. • A workshop with 13 national stakeholders[7] in February 2022.
Evidence from secondary data sources	n/a	• Previous studies of rental e-scooter trials, which have (for the most part) taken place overseas. • The National Travel Survey (NTS). • STATS19 data • Office for National Statistics (ONS) data • Wider published research.

Quantitative data was triangulated where possible, and in some cases additional assurance was sought through the qualitative interviews. Further detail on the methodology underpinning this evaluation is available in Section 2 of this report and the separate technical report[8].

E-scooter demand and journeys

At the national level, 14.5 million trips were made since the trials started in July 2020 until the end of December 2021. Some 23,000 e-scooters had been deployed, out of 66,000 that had been approved by the end of December 2021. October 2021 was the month with the highest demand for rental e-scooters, with 1.7 million trips made across all trials. The usage of e-scooters was concentrated among larger trials, with the top five trials by trip volume[9] accounting for just over 60% of rides in December 2021. By the end of 2021, the West of England was the largest trial in terms of demand (trips per day) and London was the largest trial in terms of e-scooter availability.

Over the trial period, an average e-scooter trial trip length was 2.2km and took 14 minutes. E-scooters therefore acted as a mode of transport in-between walking and cycling in terms of average distance, and had a slightly shorter average time duration than both[10].

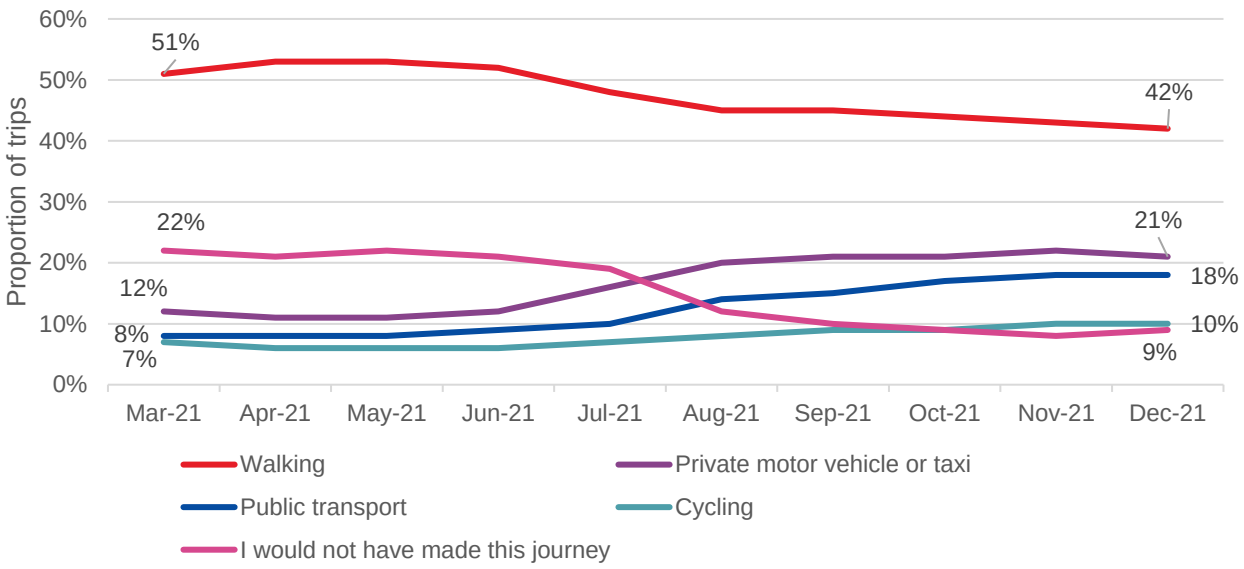
These time savings were a potential factor behind the relatively high mode shift from walking. In December 2021, 42% of users reported that they would have walked if they had not taken an e-scooter on their last trip, 21% of users reported that they would have travelled by private transport (car, van or taxi), 18% would have travelled by public transport (bus, train, tube or tram), ten percent would have cycled, and nine percent would not have made the journey at all (Figure 1).

However, fewer e-scooter journeys were replacing walking trips by the end of the study period: mode shift from walking decreased by seven percentage points from March 2021 to December 2021, while mode shift from private vehicles increased by nine percentage points over the same period (Figure 1). At the same time, the proportion of e-scooter trips

[6] More details available on the National evaluation of e-scooter trials: Technical Report.
[7] The list of stakeholder organisations is presented in the supporting technical report.
[8] National evaluation of e-scooter trials: Technical Report.
[9] West of England, Liverpool, North Northamptonshire, Hampshire and Transport for London were the five largest trials in terms of trips made in December 2021.
[10] Likely explained by the slightly shorter average distance of an e-scooter trip when compared with cycles, and the higher speed of an e-scooter compared with walking.

that were taken to access a specific leisure or work destination increased, and the proportion taken for leisure and enjoyment / no particular purpose fell. This may be due to an increased background volume of work, education, and leisure trips as COVID-19 travel restrictions were lifted, and a transition to more purposeful e-scooter trips as first-timers became regular users.

Figure 1: Mode shift to e-scooters, March to December 2021 (source: post-ride survey)



"Had you not used an e-scooter for this journey, which mode of transport would you have been most likely to use, if any?"

Base: 1,779,524 post-ride responses

Characteristics of e-scooter users

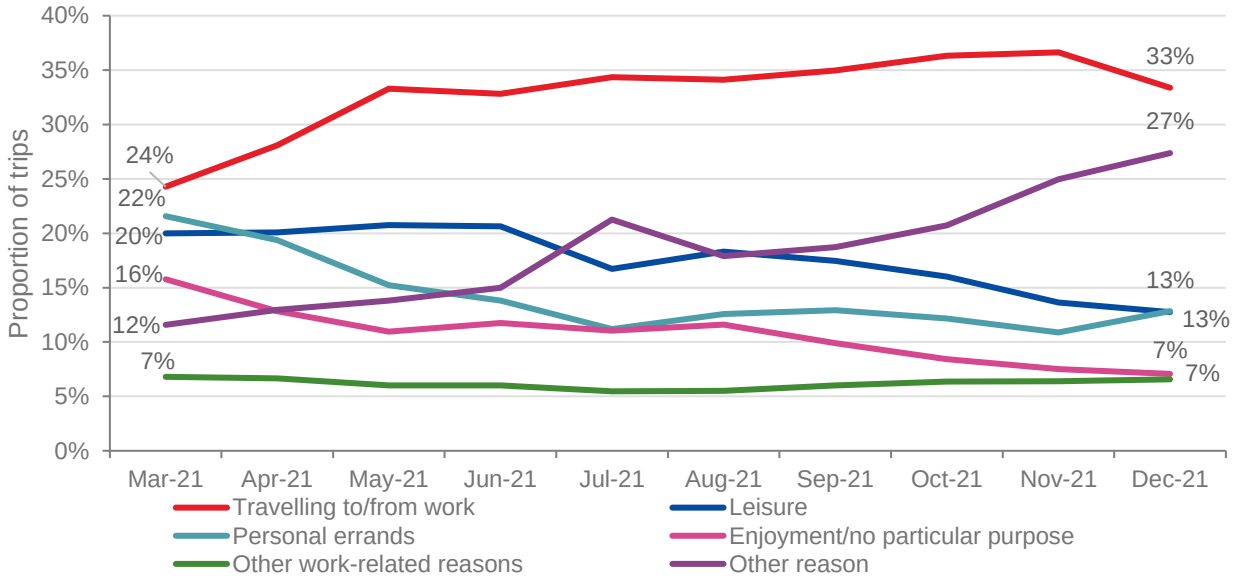
According to the demographic survey, e-scooter users were predominantly male (71%) and under the age of 35 (74%)[11]. There was some indication that the user base became slightly more weighted towards men over time. Amongst those who used e-scooters, men and younger people were also more likely to rent e-scooters frequently. Users from ethnic minority groups, and users on low incomes, were also more likely to be frequent users than their counterparts.

Journey purpose and motivations for using an e-scooter

From March to December 2021, the proportion of trips taken for commuting increased steadily from 24% in March 2021, peaking in October 2021 at 36% before dropping to 33% in December 2021 (Figure 2). Over the same period, the proportion of trips taken for enjoyment / no particular purpose fell from 12% in March 2021 to seven percent in December 2021[12].

[11] This refers to the base of registered users, unweighted by the number of e-scooter trips.
[12] According to findings from the post-ride survey.

Figure 2: Reasons for e-scooter trips (source: post-ride survey)



"What was your main reason for using an e-scooter for this journey?"

Base: 1,779,524 post-ride responses

E-scooters were used mostly outside of the morning peak (90% of journeys took place outside of 7-10am), with 37% of trips taking place between 10am and 4pm, 25% of trips between 4pm and 7pm and 22% of trips made between 7pm and 12am (from the start of the trials up to the end of December 2021[13]).

For users who took part in an in-depth interview, time and cost savings, convenience and enjoyment motivated them to use an e-scooter. In contrast, the novelty factor that initially attracted new users had become less important over time (according to Wave 2 interview findings, compared to Wave 1). A recurring motivation among female participants was that using an e-scooter was seen as safer than walking home at night in the dark.

Safety of e-scooters

According to the user survey, five percent of e-scooter users had experienced a collision[14] in the last 12 months. Less experienced users reported the majority of e-scooter collisions. For the most part, these did not involve other road users (i.e. were single vehicle collisions) with the main contributing factor reported by users being rider error. This suggests that more experience and training, particularly for new users, could help improve rental e-scooter safety.

Limited safety data made estimating a casualty rate and comparing it with other modes challenging. Based on analysis of STATS19 data of rental e-scooters undertaken by DfT, a provisional rate was estimated of 13 casualties[15] per million miles, about three times

[13] According to operator data.
[14] A collision is defined by DfT as an incident where a user collided with another vehicle, or road user, or with an object, or the road (hence it is possible that no other vehicles were involved, in what is known as a "single vehicle collision").
[15] A road casualty is defined in STATS19 as "a person killed or injured in an accident". There were two fatalities associated with the trials at the time of this report, therefore the rental e-scooter casualty rate predominantly reports on casualties resulting in an injury.

higher than the rate for pedal cycles[16]. This may be due to the high proportion of novice riders (as mentioned in the user survey findings above). E-scooters' status as a new mode also means there is more uncertainty around this data, so the estimate should be treated with caution.

According to the user survey, the majority of collisions led to either no injury or minor injuries: 63% led to injuries but 47% of those injuries involved only cuts and bruises. Almost three-quarters (70%) of users who had experienced an injury did not receive any medical attention, although 15% reported having attended Accident and Emergency[17].

Most users felt confident riding e-scooters, and as users became more experienced, their confidence increased. However, riding an e-scooter was generally seen by users as less safe than other modes of transport.

Helmets were provided with all rental e-scooters in Newcastle and York, but not in other trial areas where the user survey was administered. According to the user survey, larger proportions of users in Newcastle (58%) and York (36%) than across the other trial areas (22%), wore a helmet on their most recent journey, suggesting that their provision can significantly increase use.

Wider social impacts of e-scooters

Parking and access were reported as key issues for residents and local stakeholders throughout the evaluation. According to the resident survey, 44% of respondents had experienced a parked e-scooter blocking their access to the pavement, and 45% agreed that parked e-scooters get in the way of pedestrians[18].

E-scooters enabled better access to key services, such as medical appointments and essential shopping, for some people. In the Wave 2 user survey, 13% of users said they used e-scooters to get to or from medical appointments. Among user survey respondents with a disability that affected their mobility, this proportion was 26%.

With over half of trial e-scooter journeys replacing walking and cycling trips, their use may have led to a reduction in physical exercise, and a consequent negative health impact. However, by creating new journeys and encouraging transfer from private vehicles, e-scooters may have also led to some positive impacts including related to mental health; with some users in qualitative interviews reporting increases in independence and freedom.

Environmental impacts

Local stakeholders agreed with the DfT that a key objective for the trials was improving the availability of sustainable transport modes, to support the transition to net zero. In addition, both residents and users highlighted the environmental benefits of e-scooters as a positive feature, although for the latter, it did not play a central role in their decision to use one.

An analysis of the environmental impacts of mode shift from private motor vehicles to rental e-scooters was undertaken for the five case study trial areas[19], based on data up to

[16] Based on 2021 DfT statistics. Casualty rates based on the user survey were not calculated due to the small sample and differences in methodology. See Section 5 for more details on this.
[17] Based on a sample of 196 people experiencing an injury.
[18] Note these findings are likely to conflate private and rental e-scooters.
[19] Essex, Newcastle, London, West Midlands and WECA

December 2021. This showed that the trials in these locations had led to a total reduction of 1.2-1.6 million km of car journeys and 269 to 348 tonnes of CO_{2e}[20]. These only include emissions at the point of use.

When asked about the sustainability of their operations, all operators in the case study areas confirmed they used fully electric vans to collect, redistribute and recharge e-scooters.

Lessons learnt from delivery of the trials

In interviews with local stakeholders, partnership working (between local authorities, operators, the police and other relevant stakeholders, enabling information sharing to inform decision making), establishing clear governance processes, and being responsive and adaptive to dealing with challenges were cited as contributing to successful delivery.

On the other hand, the characteristics of local areas (including road design and governance structures), public perceptions related to a new mode of transport, resource constraints within local authorities, the legal status of private e-scooters and the COVID-19 pandemic presented challenges.

The need for adjustments over time, which took place across case study areas, suggests that degrees of flexibility may be most suitable when it comes to regulations of rental e-scooter trials, and rental e-scooter delivery models. The case study research suggested that local context plays a key role and e-scooter trials require active management to prevent and to deal with incidents effectively.

1. Introduction

1.1 Background

In July 2020, the Department for Transport (DfT) made regulations allowing trials of rental e-scooters to take place. There is no specific provision for e-scooters in the Road Traffic Act 1988, which means that outside of the trials, they are currently subject to the same laws regarding licensing, registration, insurance and certification as other motor vehicles, effectively rendering their use, away from private land, illegal. The trials have the objectives of:

- Informing future e-scooter policy through the Future of Mobility Regulatory Review[21].
- Providing easy access to safe transport options during the COVID-19 pandemic.
- Improving and increasing alternatives to private cars while protecting walking and cycling journeys.
- Providing a safe mode of public transport.
- Enhancing transport options for deprived communities or areas of social exclusion.
- Increasing the availability of low-carbon transport options.
- Increasing user confidence.

DfT commissioned Arup and NatCen to conduct a national evaluation of the e-scooter trials (see Section 2 for detail on the design of the evaluation). Arup is an independent employee-owned firm of evaluation experts and other technical specialists, working across transport, energy, water, and every aspect of today's built environment. NatCen is Britain's largest independent social research agency.

1.2 The e-scooter trials

In total, 32 trials across 55 areas were live at some point between July 2020 and December 2021. The last trial to commence was in London, in June 2021. Thirty-one trials across 50 trial areas remained live at the end of December 2021.

In January 2022, local authorities were given the opportunity to further extend trials to the end of November 2022, to allow DfT to continue to gather data, to further inform potential legislative changes. See Appendix A for the full list of trials, start dates, and operators.

Trials are regulated according to a list of requirements defined by DfT[22] and provided in Appendix B. The trials studied for the evaluation differed in their scale and characteristics, which enabled data collection across a wide range of indicators, including:

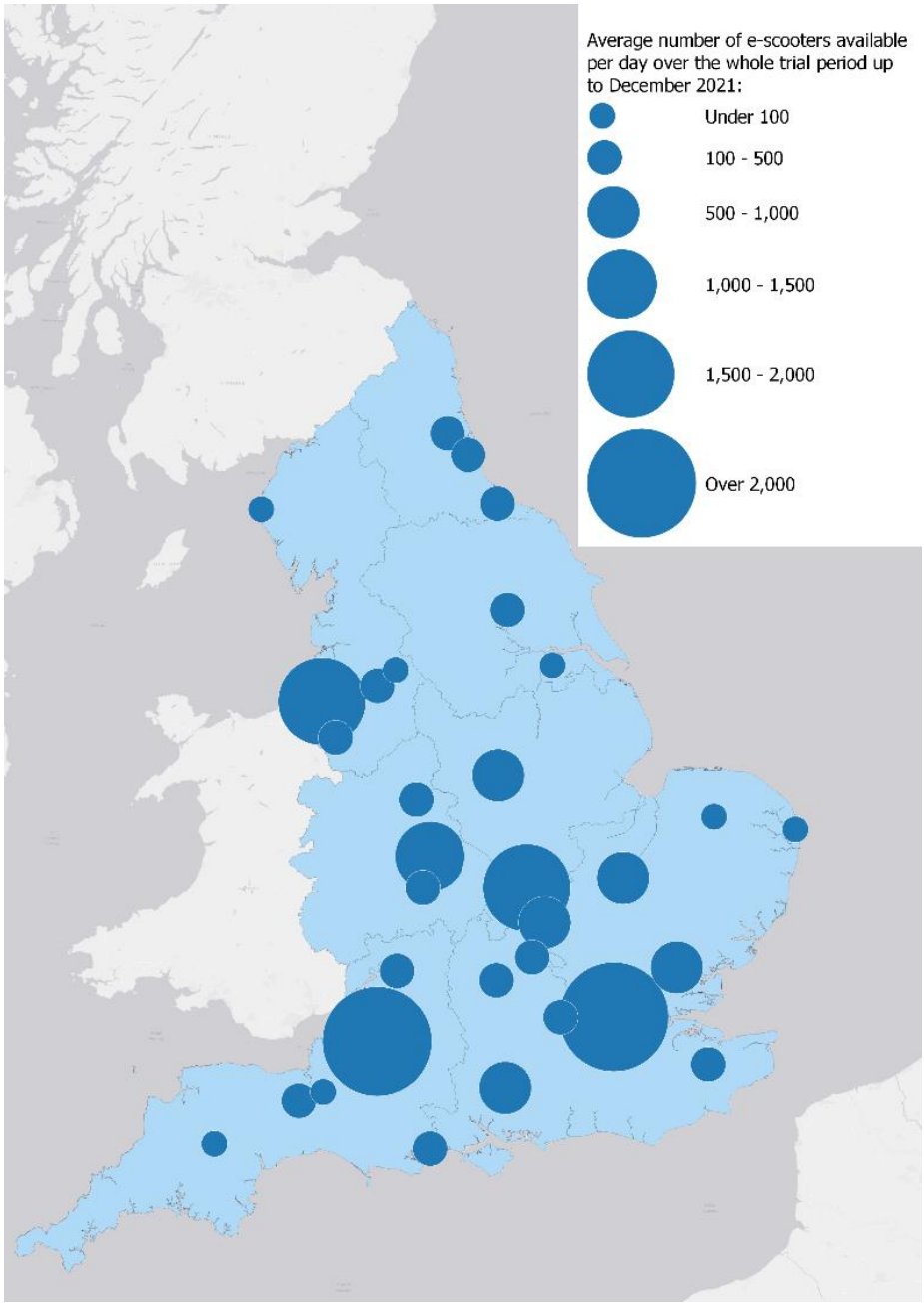
- **Average number of e-scooter vehicles available each day**[23]. On 31 December 2021, this ranged from 14 in Rochdale to 3,538 in London[24].
- **Setting**. This was urban, rural or mixed. An example of an urban trial area was the West of England Combined Authority (WECA) trial, which included Bristol, while an example

[21] DfT (2020), Future of transport regulatory review
[22] DfT (2020), Legalising rental e-scooter trials
[23] Note the number of approved e-scooters is different to the average number of e-scooters actually deployed and available in each trial. The number of approved e-scooters in each trial ranged from 80 in Copeland to 19,800 in London.
[24] North Devon had an even lower number of e-scooters available, but this trial was based around a single educational establishment, with e-scooters not available to the public.

of a rural trial is South Somerset which included smaller settlements such as Chard and Crewkerne.

- **Size of the area of operation**. Many smaller trials operated a relatively small number of e-scooters in a geofenced area focused on a town centre, or place of education, sometimes excluding wider residential locations. Larger trials tended to include a greater number of e-scooters, spread over more substantial parts of the area.
- **Start date**. The variation in start dates meant that the overall number of e-scooters, and demand for e-scooters increased gradually over 2020 and 2021. As such, some trials had been operating for a longer period at the time of writing of this report, and were therefore more established.
- **Type of e-scooter parking**. The different types of parking included mandatory marked and virtual (indicated on app) parking bays, free-floating parking (whereby e-scooters can be parked anywhere on the pavement in the zones that allow this), and incentivised models (whereby users are incentivised to park in bays, often through offering discounts on rides). Some trials operated different models of parking in different zones.
- **Rental model**. Whilst almost all trials offered on-street rental, normally by the hour, some trials also offered a long-term subscription that enabled a user to keep an e-scooter at home, with a helmet and a charger, meaning that they effectively owned the scooter for a period of time.
- **Other characteristics**. This included the level of online training via operator apps, speed limits, and provision of helmets, the latter of which were supplied for each ride in the Newcastle, Sunderland, Slough and York trials.

Figure 3: Location of rental e-scooter trials (source: operator data)



1.3 Objectives of the trials

A key objective of the e-scooter trials was to inform the future regulation and governance of e-scooters and other micromobility modes through the DfT's Future of Mobility Regulatory Review[25]. The evidence obtained in this evaluation is expected to contribute to the decision on whether e-scooters, and potentially other micromobility vehicles, will become a legal part of the national transport system, and, if so, this evidence may also contribute to the rules around their technical specification, and how they can be used. The full list of trial objectives[26] is:

[25] DfT (2020), Future of transport regulatory review
[26] These were provided to Arup and NatCen by DfT at the start of the commission.

- To inform future e-scooter policy through the Future of Mobility Regulatory Review.
- To provide easy access to safe transport options during the COVID-19 pandemic.
- To improve and increase alternatives to private cars while protecting walking and cycling journeys.
- To provide a safe mode of public transport.
- To enhance transport options for deprived communities or areas of social exclusion.
- To increase the availability of low-carbon transport options.
- To increase user confidence.

1.4 This report

This is the findings report for the national evaluation of e-scooter trials. It includes the results from the evaluation, based on data collected between July 2020 and the end of December 2021. It is supported by a separate technical report[27].

The next section provides detail on the data and evidence base gathered to inform the findings presented in this report.

[27] National Evaluation of E-scooter Trials – Technical Report

2. Approach to the evaluation

2.1 The national evaluation of the e-scooter trials

The objectives of the evaluation are closely linked to DfT's objectives of the trials[28]. These are to:

- Inform decisions on whether and how to legalise e-scooter use in the future.
- Help decide whether to make any changes to policy on future regulation of e-scooters and other micromobility modes, through the DfT's Future of Mobility Regulatory Review.
- Gather evidence on costs and benefits to indicate the extent that the trials meet policy objectives and to inform a full impact assessment.
- Input into any Departmental evaluation of the effectiveness of COVID-19 response policies.
- Help with understanding what local characteristics affect strengths and limitations of trial delivery and infer in which contexts results may be translatable to areas not included in the trial.
- Learn implementation lessons for local areas.

The evaluation is of the rental e-scooter trials only. It does not cover private e-scooter use; however, it is recognised that private use is widespread and that this may affect the perceptions of the trials on behalf of non-users and the recording of safety data. This has been highlighted where relevant.

2.2 Overview of the evaluation

This findings report of the national evaluation of e-scooter trials seeks to tackle a set of research themes and questions. It includes analysis at a national level, often drawing out key differences between trial areas, and between different demographic groups. The evaluation incorporates analysis of data from operators, quantitative data from surveys of users and residents (primary research), qualitative interviews and focus groups with users, residents and both national and local stakeholders, and data from third party sources such as evidence from previous studies on e-scooters, which have often taken place overseas.

A theory of change was developed for the evaluation, providing the theoretical framework for the research. Building on this, a list of research questions was agreed with DfT to define the scope for the evaluation. The key themes of research for the evaluation were:

[28] The evaluation objectives were defined by DfT in the evaluation brief.

Table 2: Key themes of research for the evaluation

Research theme	Key areas of research
Transport	• E-scooter travel demand patterns • Impacts of COVID-19 on e-scooter ridership • Impact of the trials on the transport network • Impact on journey times
Social	• User demographics • User behaviour • User experience • Journey purpose and motivations for using an e-scooter • Barriers to using an e-scooter • Safety and perception of safety
Environmental	• Environmental impacts of e-scooters
Regulation	• Impacts of regulations (e.g. user and vehicle requirements)
Other	• Lessons learned from delivery • Unexpected outcomes

Findings across these themes are discussed in respective chapters of this report. The associated technical report includes more information on the research questions, themes and theory of change underpinning the evaluation.

2.3 Approach to data gathering

2.3.1 Data used in this report

This report provides findings based on a three-tiered approach to data gathering and analysis. Operator data, the demographic survey, and the post-ride survey was collected across all 32 trials. The user and resident surveys, undertaken by NatCen, were administered in ten trial areas. Among these ten trial areas, five were selected as case studies in which qualitative interviews and focus groups with users, residents and local stakeholders were conducted by NatCen and Arup (Table 3). More information on data sources is provided in a separate technical report.

Table 3: The ten trial areas selected for the user survey and resident survey, and the five areas selected as case studies

Trial area	Operator	Region	Selected for case study?
Essex	Spin	South East	Yes
Newcastle	Neuron	North East	Yes
West Midlands	Voi	West Midlands	Yes
WECA	Voi	South West	Yes
London	Tier, Lime and Dott	South East	Yes
Cambridge and Peterborough	Voi	East of England	
Liverpool City Region	Voi	North West	
Milton Keynes	Spin	South East	
Northamptonshire	Voi	Midlands	
York	Tier	Yorkshire and the Humber	

The evaluation has involved collecting and analysing the following data:

Table 4: Data collected and analysed as part of the evaluation

Data type	Trials covered	Details
Operator data (quantitative research)	All 32 trials	• Operator data on trips and their characteristics from July 2020 to the end of December 2021, including: ○ The characteristics (trip length, duration, timing) of 14.5 million e-scooter trips. **This is referred to as "operator data".** ○ 1,779,524 responses to a survey distributed to registered users after each trip (13% response rate). **This is referred to as the "post-ride survey".** ○ 191,092 responses distributed to a survey distributed to all registered users (14% response rate). **This is referred to as the "demographic survey".**
User survey (quantitative research)	Ten trials[29]	• Online survey of 6,864 users[30], distributed by Dynata on behalf of NatCen, collecting: ○ 3,193 Wave 1 user survey responses collected between April and September 2021 (6% response rate).

[29] The list of trials chosen for surveys are presented in Section 2 of the report.
[30] Note that users are defined as those that have hired rental e-scooters that are part of the e-scooter trials, and residents are defined as those that reside in the trial areas. Residents may also be users.

		○ 4,115 Wave 2 user survey responses collected between August and November 2021, including 444 longitudinal responses (from Wave 1 respondents) (5% response rate). • **This is referred to as the "user survey".**
Resident survey (quantitative research)	Ten trials	• Online survey of 3,620 residents[31], distributed by NatCen, collecting: ○ 1,901 resident survey responses, collected between June 2021 and August 2021. ○ 1,913 resident survey responses, collected between October and November 2021. • **This is referred to as the "resident survey".**
Qualitative research with users	Five trials[32] (the case study trials)	• Wave 1, April – September 2021, in-depth interviews with 45 users. • Wave 2, September – November 2021, a further 60 interviews with users. • Five focus groups with users were conducted (one per case study area).
Qualitative research with residents	Five trials (the case study trials)	• Wave 1, April – September 2021, in-depth interviews with 58 residents, including 20 participants with a mobility condition, hearing or vision impairment. • Wave 2, September – November 2021, a further 51 interviews with residents (seven resident interviewees had a mobility condition and nine had a hearing or vision impairment). • Five focus groups with residents were conducted (one per case study area).
Qualitative research with local stakeholders	Five trials (the case study trials)	• Qualitative interviews with local stakeholders (the local authority responsible for the trial, the operator delivering the trial and the police) across five case study areas[33] in September – October 2021. In the London case study trial, ten interviews were conducted to account for the more complex stakeholder picture (including different boroughs). In total, 21 interviews were conducted.
Qualitative research with national stakeholders	n/a	• Qualitative interviews with 11 national stakeholders in February and March 2021[34]. • A workshop with 13 national stakeholders[35] in February 2022.

[31] The response rate for the resident survey could not be estimated as a panel sample was used. 194 longitudinal cases were removed.
[32] The list of trials chosen for case studies are presented in Section 2 of the report.
[33] Note the police was not interviewed in WECA.
[34] More information is available in the supporting technical report.
[35] The list of stakeholder organisations is presented in the supporting technical report.

Evidence from secondary data sources	n/a	• Previous studies of rental e-scooter trials, which have (for the most part) taken place overseas. • The National Travel Survey (NTS). • STATS19 data • Office for National Statistics (ONS) data • Wider published research.

A more detailed overview of the data sources included in this report is presented in the supporting technical report. Note that both the "demographic survey" and "post-ride survey" that form part of the operator monitoring data were short surveys distributed to all registered users. These were therefore complemented by longer surveys administered by NatCen to a sample of users and residents (referred to as the "user survey" and "resident survey" throughout this document) as well as interviews to gather more in-depth insights on the experiences of users and residents.

2.3.2 Choices of data sources

Some data was available from multiple sources (for example, user demographic data was available from the demographic survey distributed by operators, and from the user survey administered by NatCen, journey time savings were available from the user survey administered by NatCen and from Google Directions API, and safety data was from a number of sources). Quantitative data has been triangulated where possible, and in some cases additional assurance has been sought through the qualitative findings.

The Wave 1 and Wave 2 user and resident surveys were largely identical, with some questions changing from one wave to another to obtain additional information on topics of interest[36]. Therefore, a comparison between each wave was not possible where questions altered between waves. For this reason, sometimes only Wave 1 or Wave 2 findings are reported, and these cases are indicated as such.

2.3.3 Important note on data limitations

Extensive validation checks were undertaken on the data provided by operators. However, some small inconsistencies and gaps remained in the data at the time of analysis[37]. About three percent of user trip and associated user data was missing from the sample analysed (measured by comparing user trip counts to vehicle trip counts). This was because some user data sharing agreements were signed in March 2021, after some trials had started. Some data is therefore presented from March 2021 onwards (such as the post-ride survey findings). In addition, issues with the post-ride survey were identified with two operators, in which pre-filled answers had been provided up to June 2021. This data was removed from the sample[38]. These issues are not considered to affect the findings of this report.

[36] For example, the Wave 2 user survey included additional questions on collisions and safety.
[37] This includes: (1) Inconsistent vehicle status log submissions by one operator affecting approximately 10,000 trips. (2) Different response rates between areas for the demographic and post-ride surveys, meaning that certain larger trials have greater representation than smaller ones. These factors are not considered to have an impact on the overall data findings provided in this report.
[38] Their data is included from July 2021.

The response rate for the user survey was low (six percent at Wave 1 and five percent at Wave 2). Lower response rates are often associated with higher levels of bias, meaning that the sample of responding e-scooter users may have been systematically different from the sample of non-responding e-scooter users. However, because no data was available on the composition of the population of e-scooter users, it was not possible to assess the extent of any bias.

In the user survey, response rates were different between areas, and this, together with the underlying population size, meant that certain larger trials had greater representation than smaller ones in these surveys. The dataset was unweighted as the composition of the total target population was unknown[39].

For the resident survey, inhabitants of each trial area were sampled using an online non-probability panel. Therefore, as with any survey which does not follow a random probability sampling methodology, the degree of confidence that the views and experiences of the residents surveyed represented the views and experiences of the trial area population as a whole cannot be quantified.

Questions were included in the resident survey asking respondents to distinguish between rental and private e-scooters, and efforts were made to establish a level of understanding among respondents on the differences between both. However, it is acknowledged that some people may not have been able to make this distinction, and so their responses relating specifically to private and rental e-scooters, and their perceptions, could conflate both types. This has been highlighted accordingly.

[39] Weighting is a statistical technique that can be used to make the composition of the achieved sample more closely resemble the composition of the population of interest on a given set of factors. For example, if the age breakdown of the population of interest (in this case, rental e-scooter users) were known, then the sample of rental e-scooter users who completed the survey could be weighted to match this profile. However, the composition of the population of rental e-scooter users is not known, so no weights could be applied.

3. Transport: journeys made by e-scooters

3.1 Key insights

- 14.5 million rental e-scooter trips were made up to the end of December 2021 since the start of the trials. October 2021 was the busiest month, with 1.7 million trips made (broadly equivalent to 55,000 trips per day).
- By December 2021, an average of 23,000 rental e-scooters were available per day across England, a figure which had levelled during autumn 2021.
- The number of registered users increased steadily since the start of the trials, reaching 1.4 million in December 2021. Of these, a large number tried e-scooters and did not become regular users.
- E-scooters were mostly used outside of the morning peak (90% of journeys took place outside of 7-10am).
- E-scooters were mostly used for short journeys; the average distance travelled was 2.2km and the average duration was 14 minutes.
- E-scooter users were most likely to have walked if an e-scooter had not been available for their journey. The proportion of journeys shifting from walking slightly decreased over time, while mode shift from private modes slightly increased over time.

3.2 Trends in take-up and use

3.2.1 Demand for rental e-scooters over time

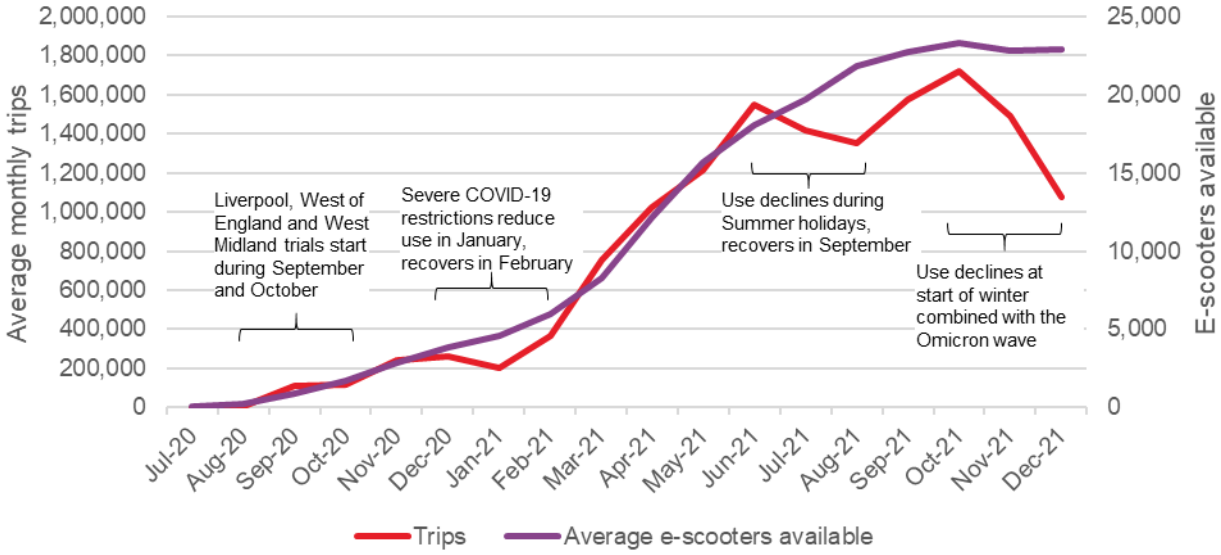
Since the start of the trials in July 2020 to the end of December 2021, 14.5 million e-scooter rental trips were made.

After a fall in trip rates coincident with the early 2021 severe COVID-19 restrictions, there was a period of growth during the first half of 2021 as more trials commenced, others were extended, the weather improved, and travel restrictions were lifted[40]. The number of trips then declined over summer 2021, while many educational institutions and workers were on holiday. Demand then picked up again in autumn 2021, before dropping again as winter began, the COVID-19 Omicron wave started, and the Christmas holidays commenced. October 2021 was the busiest month overall, with 1.7 million trips made (broadly equivalent to 55,000 trips per day) (Figure 4).

E-scooter availability increased steadily each month from the start of the trials in July 2020 to August 2021. From that point onwards, e-scooter availability remained relatively stable.

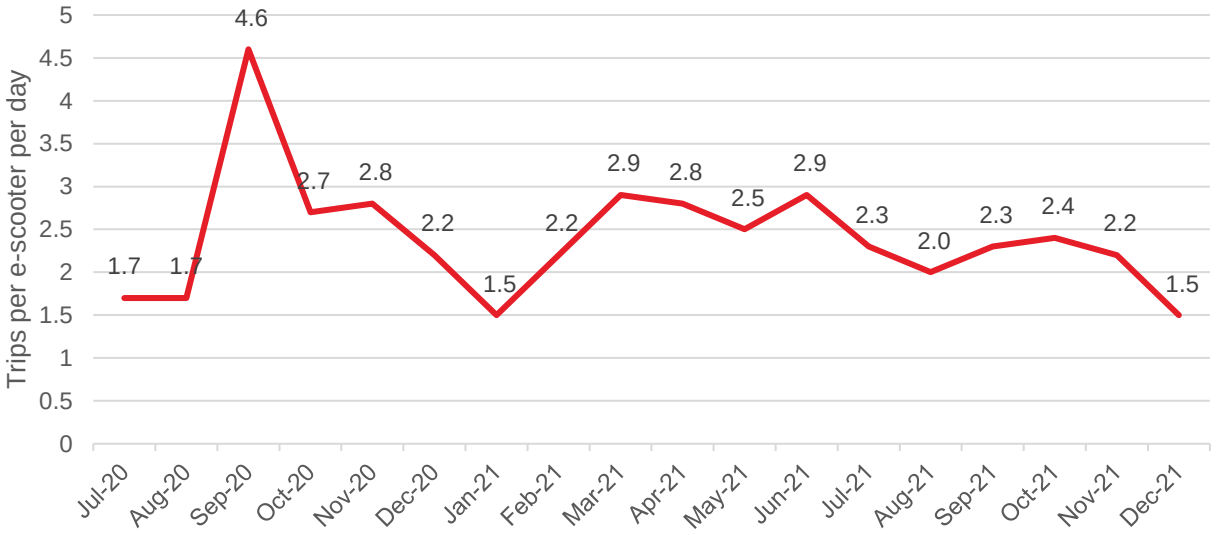
[40] Note some trials started during periods of severe COVID-19 restrictions, particularly during winter 2020/21, when only essential journeys were allowed. Trial launches during these periods had to be low key and were not widely advertised.

Figure 4: E-scooter trips and availability of e-scooters over time across all trial areas (source: operator data)



The decline in demand and increase in supply over summer 2021 meant that utilisation reduced to 2.0 trips per e-scooter per day in August 2021 (Figure 5). With a stable supply of e-scooters at the start of winter but a sharp decrease in trips, utilisation had further reduced to 1.5 trips per e-scooter per day in December 2021, making it the lowest month for utilisation since January 2021 (also at 1.5), when demand fell, coinciding with severe COVID-19 restrictions.

Figure 5: E-scooter utilisation measured as average number of trips per e-scooter (source: operator data)



At a national level, around 23,000 e-scooters had been deployed out of 66,000 approved by the end of December 2021. For instance, in the WECA trial, the largest trial so far, 35% (3,017 out of 8,700) of approved e-scooters were deployed on average during the month of December 2021. As such, there may be scope for trials to grow further, pending future customer demand.

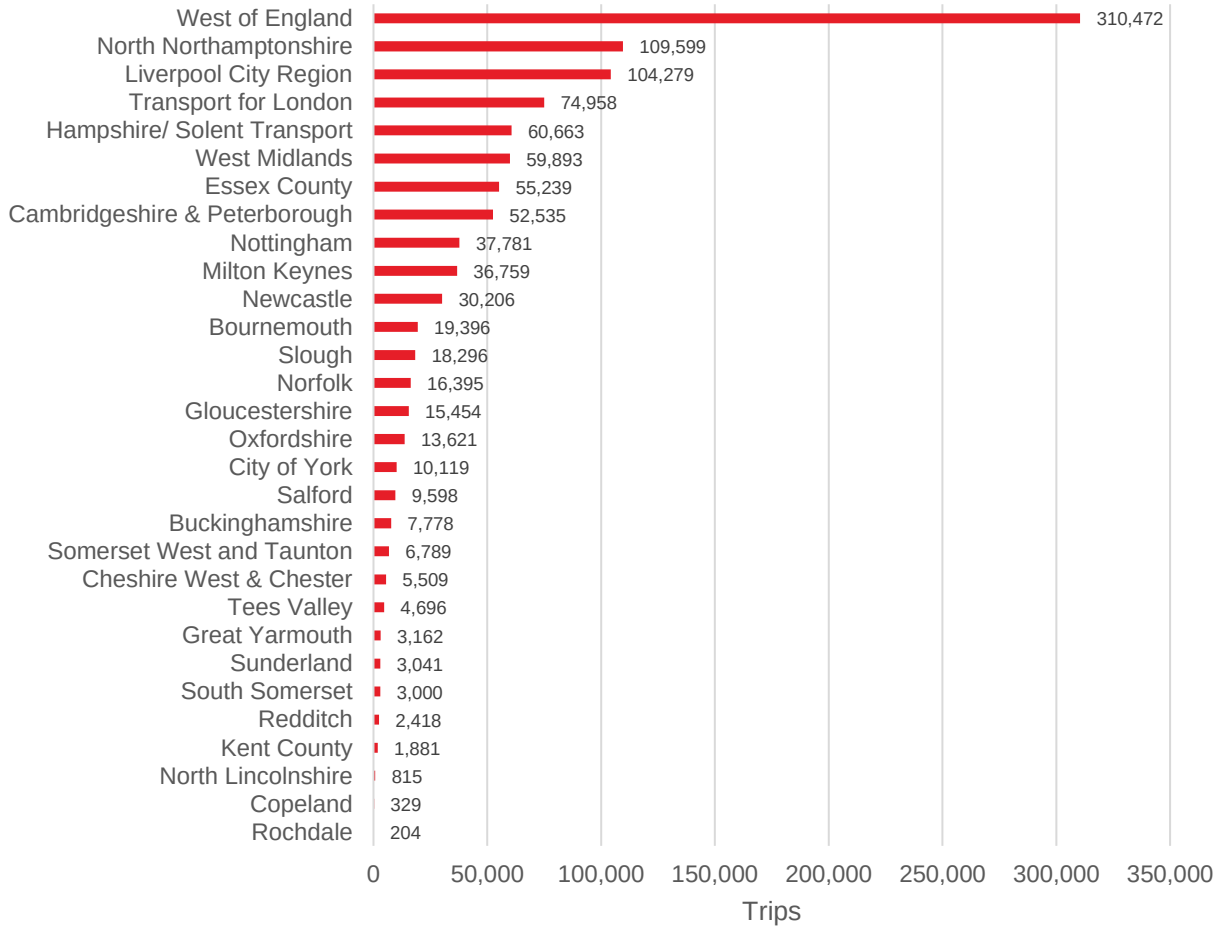
Department for Transport

3.2.2 E-scooter demand across trials

The largest trial by demand for the month of December 2021 was WECA, with over 310,000 trips made. Around 461,000 trips were made during October 2021 (at its highest demand). This was almost three times the number of trips made in the second-placed trial, North Northamptonshire. Local stakeholders in WECA suggested that this was because the scheme remained broadly consistent throughout, demand was allowed to build, and loyalty was established. It was further suggested by stakeholders that the expansion of the trial zone in Bristol to cover a large area of approximately 100 square kilometres[41], allowing longer trips to be made, was a further driver of demand.

The second largest trial by demand in December 2021[42] was the North Northamptonshire trial with just under 110,000 trips during the month, followed by the Liverpool trial with just over 104,000 trips.

Figure 6: Total trips in December 2021 by trial (source: operator data)[43]



In December 2021, the five trials that attracted the highest number of monthly trips provided between around 1,800 and 3,000 available e-scooters per day on average,

[41] This compares with an area of 36 square kilometres in Birmingham, for example.
[42] Data for December 2021, rather than the busiest month of October 2021, is presented here as it reflects the latest month for trials which have continued to grow and change in size over time.
[43] North Devon is excluded from this dataset as the number of trips was very small during this month. Trials that had finished prior to December 2021 are also excluded.

according to operator data. These five trials provided over half (57%) of the supply of e-scooters across all trials and generated 61% of all trips in December 2021.

Table 5: E-scooter availability and demand across the five largest trials by number of trips in December 2021 (source: operator data)**.** Percentages may not add up to 100% due to rounding

Trial area	Operator	E-scooters available in December 2021 (daily average)	Proportion of available e-scooters out of total available e-scooters across all trials	Trips in December 2021	Proportion of trips out of total trips across all trials (December 2021)*
WECA	Voi	3,017	13%	310,472	29%
North Northamptonshire	Voi	2,764	12%	109,599	10%
Liverpool	Voi	1,962	9%	104,279	10%
Transport for London	Lime, Tier, Dott	3,520	15%	74,958	7%
Hampshire	Voi	1,790	8%	60,663	6%
Top 5 (i.e. the five rows above)	**N/A**	**13,054**	**57%**	**659,971**	**61%**
All trials	**N/A**	**22,936**	**100%**	**1,074,892**	**100%**

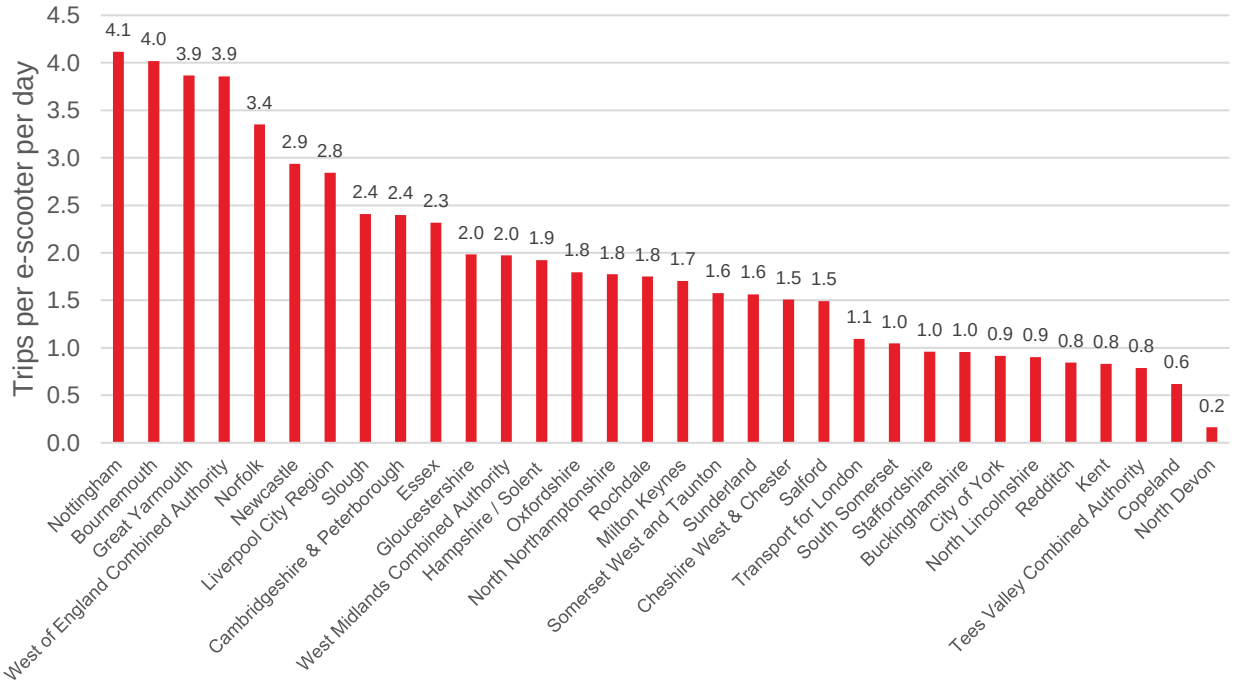
Amongst all the trials, the number of trips in London, Norfolk and Oxfordshire grew the most over the last seven months in 2021, showing a trip compound monthly growth rate (CMGR[44]) of 3.6%, 2.6% and 2.5% respectively. The Liverpool, West Midlands and Nottingham trials experienced the largest decline in monthly trips over the same period, with a CMGR of -6.5%, -6.1% and -6.1% respectively. Most trials show a CMGR between -5 and +2%, with the more mature trials growing more slowly.

There were large differences in e-scooter utilisation across the trials. In general, the trials in larger urban areas, such as WECA, Nottingham, Liverpool and West Midlands, showed a higher utilisation with at least two trips per e-scooter per day, while smaller and more rural trials showed a lower utilisation, with the lowest utilisation found in Copeland, Tees Valley and Redditch[45] (Figure 7). However, utilisation in the trial in London was relatively low (with 1.1 trips per e-scooter per day on average), which may be partly as a result of the low density of parking, as identified by local stakeholders (see case illustration on the next page for more information).

[44] The CMGR is a standard measure to calculate average rate of growth. It is calculated here over a 7-month period. The formula used was: (number of trips in December 2021 / Number of trips in June 2021)$^{1/7}$ – 1

[45] North Devon is a special case focusing on long-term rentals at a single college, and therefore is not included here as a comparison.

Figure 7: E-scooter utilisation by trial area (source: operator data), averaged over the lifetime of each trial



Case illustration

Parking density challenge in London

Following extensive stakeholder engagement, the London trial specified the use of designated and lined parking bays. The physical markings, in addition to technology provided by the operators, meant customers were only able to successfully end a ride if they were in a parking bay. Vehicles left outside of a bay were considered abandoned and the user continued to be charged. Transport for London (TfL) felt that fixed and lined bays had the advantage of providing some certainty to customers on vehicle availability, and were most appropriate to assist in making the trial work for all.

However, TfL and the operators mentioned some limitations of this approach including higher costs, resource intensive processes and lengthy delivery timeframes. This was felt by TfL to have a knock-on effect on available parking density in some boroughs. TfL believed that parking density was key to increasing utilisation as it encouraged regular use, more functional trips and had additional benefits, such as improving parking compliance. An operator mentioned the opportunity to better sign and identify parking bays as well as to link them with attractors and transport hubs, noting that this was critical in creating an integrated network.

"We get a lot of feedback that says there isn't parking in the area that I want to go to, and that is one of our big constraints at the moment, the level of parking density that we have."
(London, TfL)

"To compare to Paris, which I often do, Paris has about two and a half thousand parking locations across the city typically, 100 maximum, 200 metres apart. Within an area of about 80 square kilometres, we're operating in a whole area of about 200 square kilometres, and we've got 380 parking bays."
(London, Operator 1)

3.3 Impacts of COVID-19

At Wave 1 of the user survey, more than half (58%) of users said that the COVID-19 pandemic had made them more likely to rent an e-scooter[46]. This was particularly true among those aged 25-44 (62%, compared to 56% of those aged 16-24 and 50% of those aged 45+). The Wave 2 qualitative interviews indicated that concerns about COVID-19 infection risk on public transport remained an important motivation for e-scooter use, as restrictions were lifted.

> *"The trains were really bad prior to COVID anyway, for being overloaded and crammed in with people. Since COVID, I don't think [taking a train] would be an option for me."*
> *(E-scooter user, West Midlands, Male, 35-54, Wave 2 Longitudinal)*

However, for some people the pandemic was a reason to avoid e-scooters. At Wave 2 of the user survey, 29% of residents in trial areas reported feeling wary of using shared e-scooters due to COVID-19[47]. Perhaps counter-intuitively (compared with the Wave 1 survey findings above), younger people were more likely to feel this way than older people: 38% of those aged 18-44 said this, compared to 21% of those aged 44+. Older people were more likely than younger people to say they neither agreed nor disagreed that they felt wary about using shared e-scooters due to COVID-19: 37% of those aged 44+, compared to 27% of those aged 18-44. These findings suggest that for older people – who used e-scooters at lower rates – factors other than COVID-19 were more important in their decision not to use e-scooters (see Section 4 for more details on barriers to use of e-scooters).

The qualitative research suggests that the easing of COVID-19 restrictions over the spring and summer of 2021, and the lessening of concerns about infection risk, affected e-scooter use in different ways. Individuals who were less worried about infection risk on public transport, and who perceived e-scooters as being comparatively more costly, described plans to return to their pre-pandemic transport choices. Other interview participants reported renting an e-scooter less often due to feeling increasingly unsafe as roads got busier.

> *"If it's not competitive with the bus, then I think now that COVID is kind of dying out, I'm probably more likely to take a bus."*
> *(E-scooter user, Newcastle, Male, 35-54, Wave 2)*

> *"Recently I've been using more public transport, the bus and less scooters, but that's probably because I feel more vulnerable now that the traffic has gone back to crazy days."*
> *(E-scooter user, Focus Group, West Midlands, Wave 2)*

3.4 Number of users, frequency and timing of use

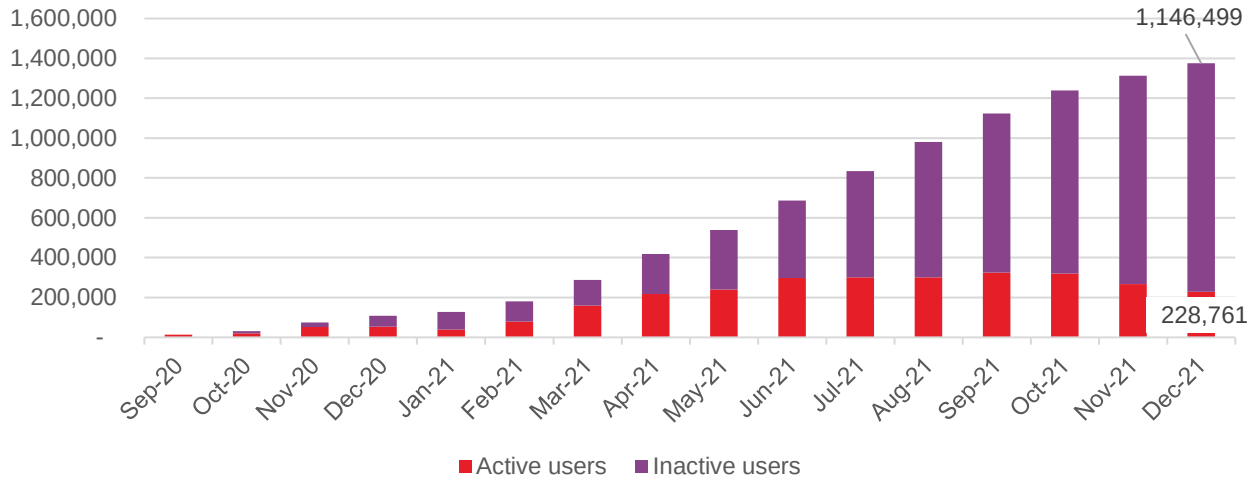
3.4.1 Registered users

From the start of the trials, the number of registered e-scooter users increased to 1.4 million in December 2021. The number of active users – defined as those that made a trip in the last month – also increased, albeit at a smaller rate, peaking at 326,000 users in September 2021 before decreasing to 229,000 users in December 2021. The ratio of

[46] This question was only asked at Wave 1.
[47] This question was only asked at Wave 2.

active to inactive users[48] decreased over time, suggesting that there was a large number of people trying-out e-scooters who did not convert to regular use.

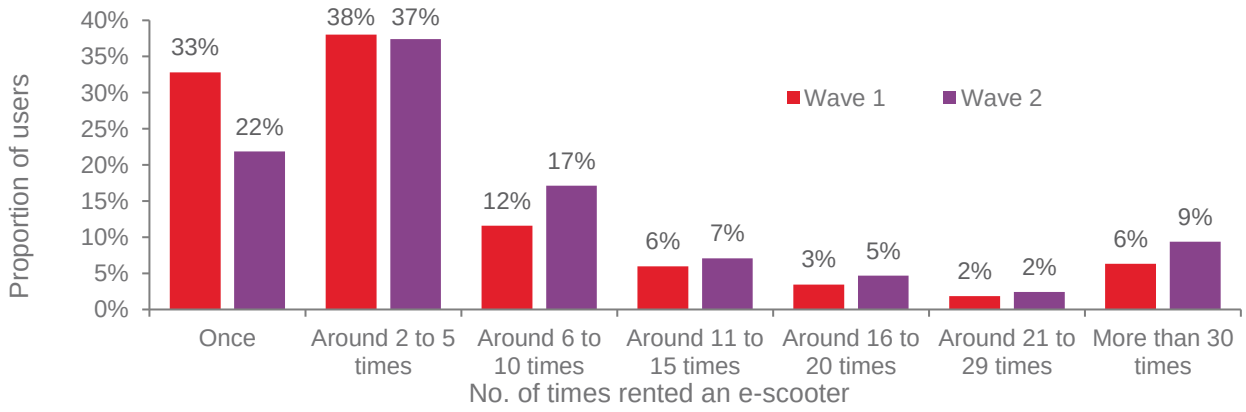
Figure 8: Active and inactive users registered since the start of the trials (source: operator data)



3.4.2 Frequency of e-scooter use

The total number of times users reported renting an e-scooter increased slightly between Waves 1 and 2 of the user survey. At Wave 1, a third (33%) of users reported they had rented an e-scooter only once, and this fell to just over a fifth (22%) at Wave 2 (Figure 9). Almost one in ten (nine percent) users reported renting an e-scooter more than 30 times at Wave 2, an increase from six percent at Wave 1.

Figure 9: Total number of times users had rented e-scooters, by wave (source: user survey, waves 1 and 2)



"How many times in total have you rented an e-scooter in England?"

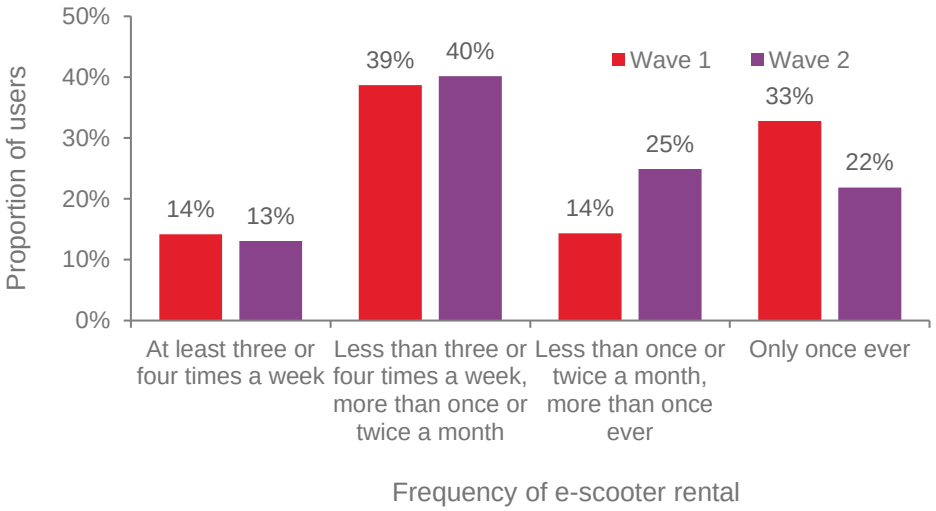
Base: *All users of rental e-scooters in trial schemes, Wave 1 (2598), Wave 2 (3671).*

At Wave 1 around one in eight (14%) users reported renting e-scooters regularly, defined as at least three or four times a week, and this was broadly consistent in Wave 2 (13%) (Figure 10). As would be expected, the proportion of first-time users fell between Wave 1

[48] Active users were those with at least one trip in the last month, while inactive users were those that had not travelled at all over the last month. An active user can become a non-active one from one month to another and *vice versa.*

and Wave 2, and the proportion of relatively infrequent users (those who rented multiple times but did so less than once or twice a month) increased. This suggests that some first-time users were converting to relatively infrequent use, as the trials went on.

Figure 10: Frequency of e-scooter use, by wave (source: user survey, waves 1 and 2)



"How many times in total have you rented an e-scooter in England?"
"How frequently do you rent an e-scooter?"

Base: *All users of rental e-scooters in trial schemes, Wave 1 (2598), Wave 2 (3671).*

Among infrequent users who took part in an interview, some reported renting an e-scooter once to try it out, or a few times in certain circumstances such as during a trip away. Occasional users tended to report renting an e-scooter at least once a month for a range of purposes which included leisure, meeting friends, shopping trips, appointments and getting to the train station when commuting into the workplace. Frequent users (those using more than once a week) commonly reported using a rental e-scooter for commuting, the school run, and trips to the gym, among other things.

Changes in frequency of use over time were evident among Wave 2 interview participants and were reportedly driven by the following factors:

- **Weather conditions:** Some participants reported a reduction in use during autumn, due to exposure to cold temperatures and concerns about icy road conditions and poor visibility. For others an e-scooter became an increasingly useful way of getting home quickly in bad weather, compared to walking.
- **Affordability:** The end of introductory discounts and changes in personal finances were reported as making the schemes less affordable for some.
- **Restriction of access:** Some interview participants said they used e-scooters less often due to restrictions on access such as curfews, that were implemented in some areas to tackle anti-social behaviour.
- **Availability:** Some users interviewed reported renting e-scooters more often, saying they became easier to find due to increases in fleet sizes and parking zones.
- **Confidence:** As they became more confident, some users reported renting an e-scooter more often, and for longer periods of time. The opposite was also reported; negative experiences, such as having a collision that resulted in an injury reduced or prevented further use among others. This is discussed further in Section 5.
- **Return to the office / working from home:** A spell of working from home following a period of being in the workplace (due to changes in COVID-19 restrictions) reduced the frequency of use for participants who used e-scooters for commuting purposes.

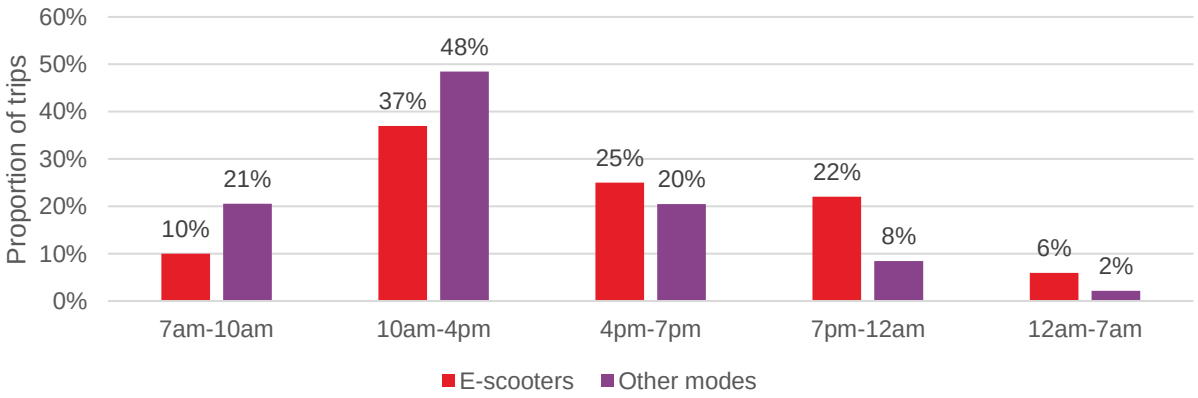
- **Personal circumstances:** Including those who moved out of trial areas and had limited opportunities to rent an e-scooter at their new address.

Experiencing the multiple benefits of e-scooters, such as convenience and speed, was reported as a key factor in the decision to use them on a more regular basis, for some. On the other hand, a decline in the novelty factor led some users to rent e-scooters less often. The qualitative findings indicated that novelty was rarely the sole factor driving changes in use; it was often combined with perceptions of cost, as well as safety and levels of exercise compared with walking or cycling.

3.4.3 Timing of e-scooter use

E-scooters were used mostly outside of the morning peak. Some 37% of trips took place between 10am and 4pm, 25% between 4pm and 7pm, and 22% between 7pm and 12am, since the start of the trials up to the end of December 2021. Only 10% of trips took place between 7am and 10am, and six percent took place between midnight and 7am. In comparison with other modes based on data from the National Travel Survey (2020), rental e-scooters were used more often between 10am to 4pm, and 7pm to midnight, perhaps reflective of the preferences of the younger demographic of riders (see Section 4).

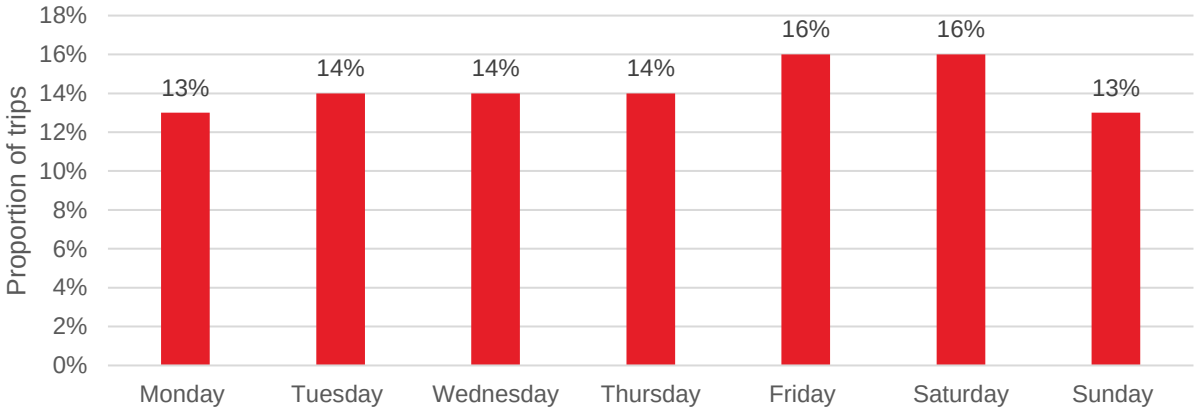
Figure 11: E-scooter trips by time of day across all trial areas, compared with other modes across England (source: operator data used for e-scooters and NTS 2020 used for other modes[49])



According to operator data, Fridays and Saturdays were the most popular day for making an e-scooter trip. There was not a big difference in usage across different days of the week.

[49] National Travel Survey (NTS 2020). When people travel. NTS0501: Trips in progress by time of day and day of week, index: England. Other modes included trips made by walking, cycling, driving a car or a caravan, being a passenger in a caravan, riding a motorcycle, being in other private transport, taking the bus in London or other local buses, non-local buses, London underground, surface rail, taxi/minicab or other public transport. Due to changes in the methodology of NTS data collection, changes in travel behaviour and a reduction of data collected during 2020, as a result of the coronavirus (COVID-19) pandemic, care should be taken when interpreting this data and comparing to other years, due to the small sample sizes. There are two caveats to consider when comparing operator data for e-scooters with NTS findings. First, as a new mode, e-scooters will likely have been used far fewer times in total than the other modes asked about via the NTS. Secondly, the NTS sampling method (i.e. self-reported survey) is different from data captured by e-scooters operators.

Figure 12: Proportion of trips by day of the week since the start of the trials (source: operator data)



Users rode a rental e-scooter on average once every seven days (this includes all users, not just active users), with frequency remaining relatively stable over time. In some trials, frequency of use was much higher, for example with one trip every four days recorded in Slough and North Northamptonshire.

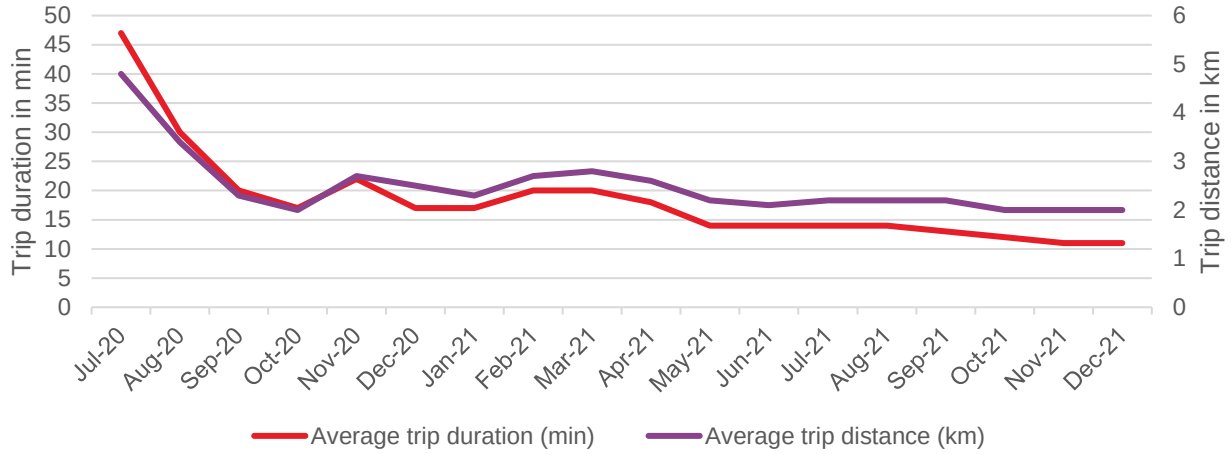
3.5 Trip distance and duration

According to operator data up to the end of December 2021, the average journey distance travelled by a rental e-scooter user was 2.2km and lasted for 14 minutes, implying an average speed of 5.8 miles per hour (mph) (or 9.4kmh). Rental e-scooters were mostly used for short journeys: 61% of rental e-scooter trips were less than 2km long, and 78% of trips were less than 15 minutes long.

After July and August 2020, when only a small number of e-scooters were available[50], trip distance and duration reduced significantly to autumn 2020 period, before stabilising at around 2.5km and 20 minutes. From April 2021 it fell more gradually, to around 2km and 11 minutes in December 2021. This is perhaps a reflection of a decrease in first time trips, which may be longer in duration and more meandering. The average trip length of rental e-scooters was ultimately limited by the size of the trial areas, and so the average length of a rental e-scooter trip may increase if trial areas were to increase in size in the future.

[50] 179 on an average per day at the end of August 2020 across all trial areas.

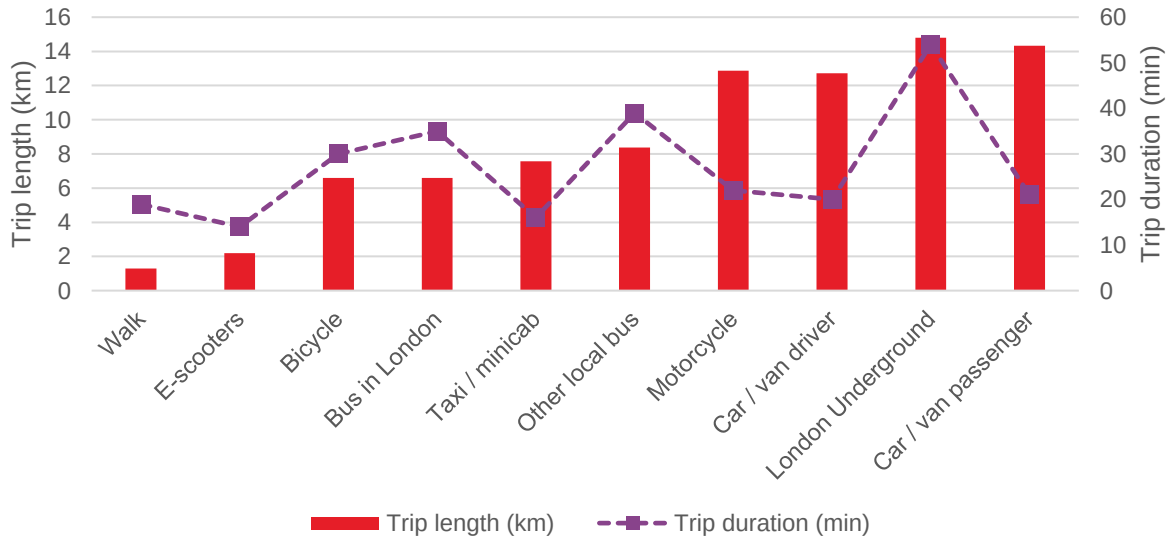
Figure 13: Average trip duration and distance across all trial areas (source: operator data)



Over the trial period, there was an increase in implied average speeds from four mph in July 2020 (6.4kmh), to seven mph (11kmh) in December 2021, which may be linked to increases in user confidence.

Based on a comparison with data from NTS (2020), trial e-scooters fell in-between walking and cycling in terms of average journey distance, with a slightly shorter average duration than both walking and cycling journeys. The shorter duration compared to cycling is perhaps not surprising, as the average distance of a bicycle journey is triple that of trial e-scooters. The average duration of e-scooter trips was shorter than walking trips, but longer in average distance, given users can travel faster on an e-scooter.

Figure 14: Average e-scooter trip length (km) and trip duration (min) across all trial areas up to December 2021 compared to other modes in England (source: NTS 2020 Table NTS0303 and e-scooter operator data)

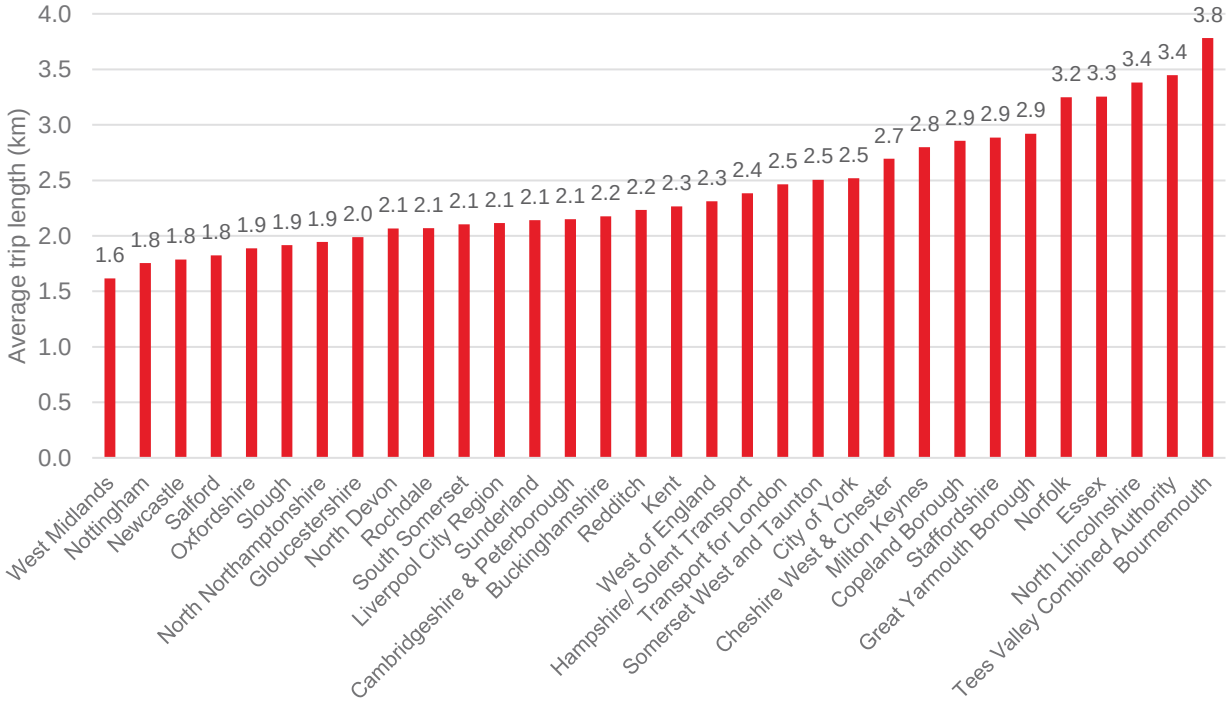


There was variation in the average distance and duration of trips depending on the trial area (Figure 15). The average trip distance varied from 1.6km in WECA to 3.8km in Bournemouth, and the average trip duration varied from nine minutes in Slough to 35 minutes in Bournemouth. The average trip distance and duration in London was slightly above the total trials average (of 2.2km and 14 minutes), at 2.5km and 19 mins, perhaps

reflecting a large trial area. London also showed an implied lower average speed, perhaps due to traffic congestion and other factors[51].

Broadly speaking, the larger trials (by area) tended to have longer than average trip lengths, although there was not a strong correlation[52]. There were outliers such as Bournemouth and Norfolk, which had some of the smallest areas of operation but the longest trip distance.

Figure 15: Average trip distance travelled across all trial areas up to the end of December 2021 (source: operator data)



3.6 Long term rental of e-scooters

3.6.1 Long-term lease

Long-term lease of e-scooters was offered in some e-scooter trials, which enabled users to keep an e-scooter, helmet and charger at home for a monthly subscription fee. As such, the behaviour of long-term renters provides a useful proxy for private e-scooter use. Operators in two areas, WECA and Essex, provided data on long-term use of e-scooters[53]. This service grew in popularity over the course of the trial, particularly in WECA, where it more than doubled from June to December 2021, going from just under

[51] There were a number of "go-slow zones" across London's area of operation where speed was capped at eight mph to improve safety, enforced through geofencing technology. More information is available on the TfL website. The London trial also started later than others, in June 2021, and evidence from other trials is that average speeds can increase over time, potentially alongside user confidence.
[52] A scatter plot showing average distance travel per trial and size of trial area was produced but the correlation between the two variables was not found to be strong enough to warrant being displayed in this report.
[53] Other areas (including North Devon, Nottingham, Derby, York) also offered this option but did not separate out data on long-term use for the purposes of this study. Derby and Nottingham had plans to separate their trial data for long- and short-term rentals from 8 November 2021.

600 to just over 1,250 users. Over the same period, the Essex long-term user base grew but was much lower overall, increasing from 26 to 36 users[54].

Insights from interviews with local stakeholders across case study areas also showed that the success of the long-term rental schemes differed. They appeared to have worked particularly well in the WECA trial, where the long-term rental operating zone encompassed a large area of the region, thus supporting the use of e-scooters for longer journeys. In contrast, in Essex, where the scheme was limited to two specific areas, long-term rental uptake was low. This indicates that the scale of operation may be an important consideration when implementing the long-term rental model.

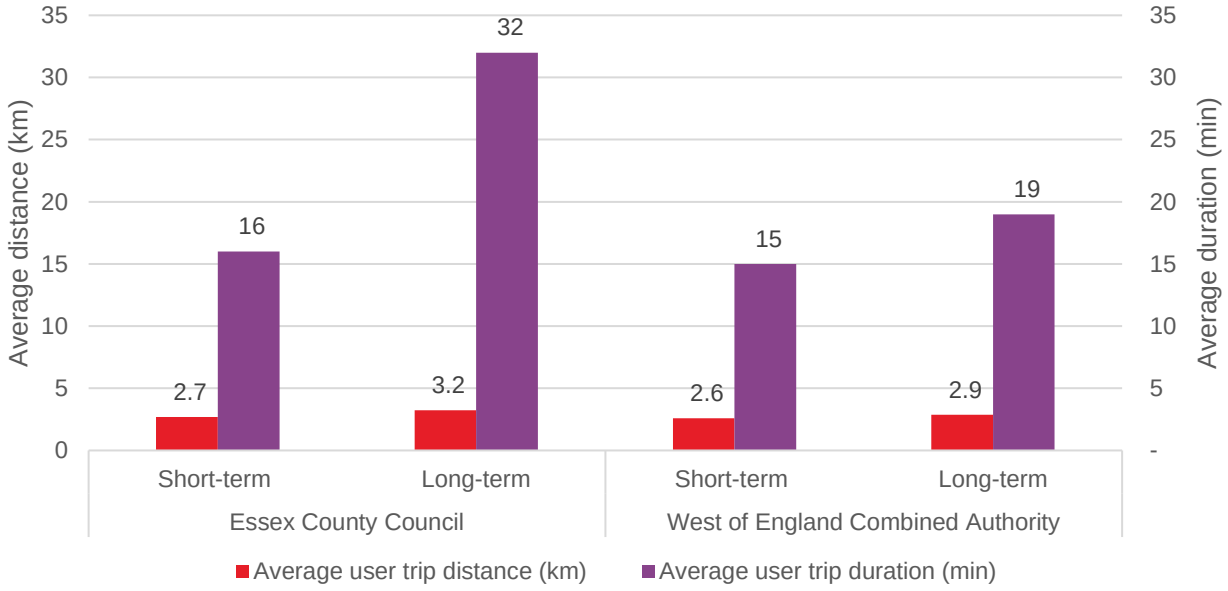
Long-term renters rode e-scooters more frequently than short-term renters[55]. Over the period up to December 2021, long-term renters in Essex had made on average 55 e-scooter trips in total compared to 14 trips for a short-term renter. In WECA, the average figures were 98 trips and 14 trips in total for long-term and short-term renters respectively. This suggests that more widespread availability of long-term rental could encourage more frequent use.

Long-term renters tended to travel further, and for longer periods of time. Analysis of operator data shows an average of 2.7 km for short-term rental trips compared to 3.2 km for long-term rental trips in Essex, and 2.6 km for short-term rental trips compared to 2.9km for long-term rental trips in WECA (Figure 16).

Trips made by long-term renters in Essex were double the duration of trips made by short-term renters on average (32 mins versus 16 mins). In WECA, trips were 25% longer in duration for long-term renters on average (19 mins for long-term renters versus 15 mins for short-term renters). This difference in trip duration may be explained by the stronger financial incentives on short-term renters to end their trip early, as they are charged based on the length and duration of the trip, as well as the longer average distance of long-term user trips.

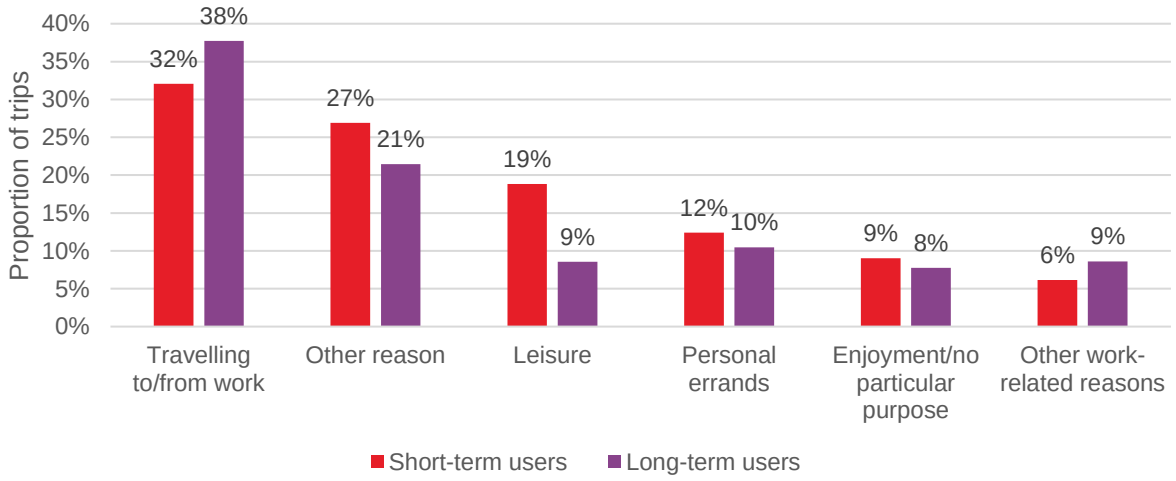
[54] Because of the low take-up, Essex was looking to cancel this service at the time of writing of this report.
[55] Comparisons between long- and short-term renters should be treated with caution as there was a significant difference in the base sizes of each group (particularly in Essex).

Figure 16: Average trip distance and duration for short-term versus long-term rental in Essex and WECA (source: operator data)



A higher proportion of long-term users than short term users (38% against 32%) used e-scooters for commuting to and from work, as well as for other work-related reasons (9% against 6% respectively).

Figure 17: Trip purpose by short- and long-term users in all case studies areas (source: post-ride survey)



"What was your main reason for using an e-scooter for this journey?"

Base size: 191,092 responses (incl. 3,436 from long-term user trips)

Only eight percent of users had rented a long-term hire subscription e-scooter, according to the Wave 2 of the user survey. Of those who had used a long-term rental, 84% said they would use one again. Of those who had not used a long-term rental, 26% said they would definitely consider using one, and 47% would possibly consider it. There was very little demographic variation in whether users had used a long-term rental, or in attitudes towards long-term rentals.

In qualitative interviews, current and previous users of the long-term rental subscription noted the cost effectiveness and convenience of not having to pay each time they used

one. Having long-term access to a rental e-scooter brought some of the benefits of private ownership, such as the certainty that it was always available when needed.

> *"If I was using it for work, I needed to know it's going to be there, it's going to be available. Okay, in my case, I've got these other options, but once you've got in your mind you're going to use that particular vehicle, it's great that it was in my garage"*
> *(E-scooter user, WECA, Female, 55+, Wave 2)*

Overall, the patterns suggest that long-term users are more likely to travel more frequently, for longer and for commuting purposes. Private ownership may therefore encourage more regular use and more use for work-related purposes.

3.6.2 Daily, weekly and monthly passes

For on-street rentals, daily, weekly and monthly subscription services were also offered by operators. These differed slightly between operators, but generally the benefits included an initial waived fee and a certain number of rides included per day, week or month. These passes did not allow users to store the e-scooters at home, as in the case of long-term rental schemes.

The qualitative research with users explored perceptions of rental options. "Pay as you go" was perceived to be well suited to spontaneous use and occasional, short journeys. It was also viewed as a good option where a monthly lump sum was unaffordable, although the disadvantages of paying per minute were noted (the price of a ride could add up very quickly). Pay as you go also offered riders an opportunity to try the e-scooter before deciding whether to subscribe on a daily, weekly or monthly basis.

Negative experiences of daily, weekly or monthly passes revolved around daily limits on use imposed by operators[56]. Users' reasons for choosing not to use one of these passes in the first place, or moving back to "pay as you go", included cost and the perception that they either did not use it enough generally, or during specific months, when the weather was too poor to warrant a subscription.

> *"The pay monthly is a good deal but … I think because it's about £38, it's not something that I could justify because the scooter would always be an additional mode of transport"*
> *(E-scooter user, Newcastle, Male, 16-34, Wave 1)*

3.7 Impacts on the transport network

3.7.1 Mode shift to e-scooters

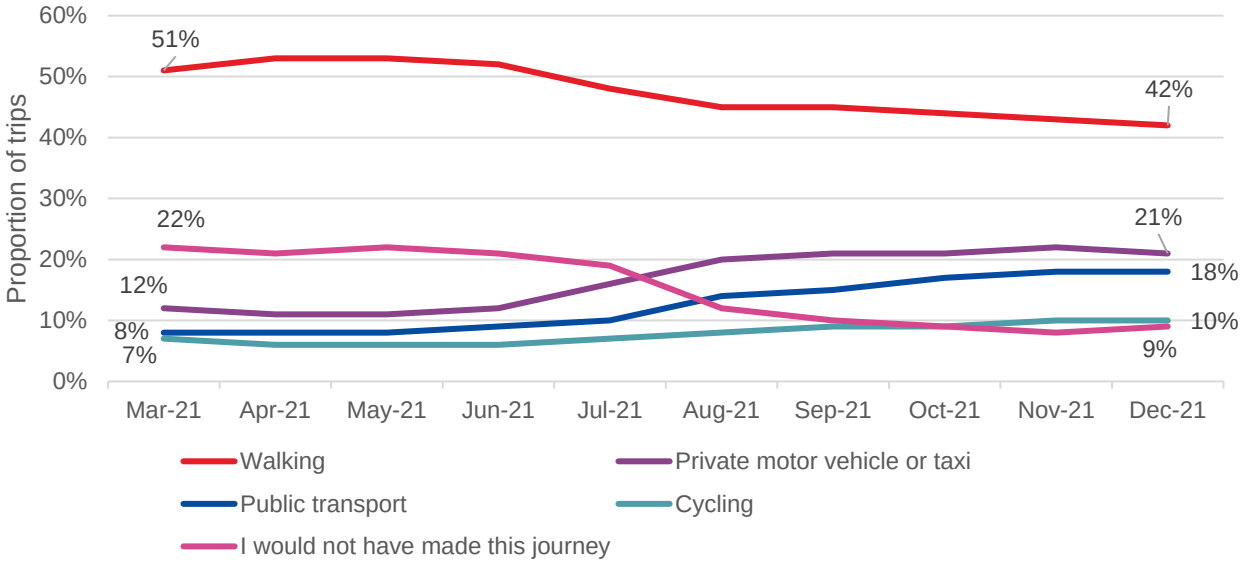
The mode of transport that would be used in the absence of an e-scooter is a key research area for the evaluation. Mode shift can impact on congestion, the environment and personal health.

According to the post-ride survey, most journeys taken by a rental e-scooter would still have been taken in the absence of an e-scooter (87% of trips between March and December 2021)[57]. As shown in Figure 18, e-scooter users were most likely to have walked if an e-scooter had not been available (42% of trips in December 2021), followed

[56] Some of the operators that offered daily, weekly and monthly subscriptions imposed a limit on the number of rides per day and/or a limit on the duration of each ride. A typical example was that riders could take up to 10 rides a day, but not more than 200 minutes in total per day, and after the first 45 minutes of each ride, the standard price per minute was applied.
[57] The user survey showed a broadly similar picture in term of overall mode shift.

by using a private motor vehicle (including motorbikes and cars) or taxis (21%), or taking public transport (18%).

Figure 18: Mode shift to e-scooters, March to December 2021 (source: post-ride survey)



"Had you not used an e-scooter for this journey, which mode of transport would you have been most likely to use, if any?"

Bases: 1,779,524 post-ride responses

Figure 18 shows that from March to December 2021, the proportion of journeys that would not have been made in the absence of e-scooters fell from 22% in to nine percent. At the same time, the extent of mode shift away from walking fell (from 51% to 42%), and the extent of mode shift away from private motor vehicles or taxis, and public transport rose (from 12% to 21%, and eight percent to 18% respectively). Figure 18 also shows that from June to September 2021 there were changes to the extent and type of mode shift occurring, but this became broadly stable between September and December 2021.

These changes may be the result of users becoming more familiar and experienced with e-scooters over time, with fewer rides taken for fun or to see what e-scooters are like, and a replacement with more purposeful commuting or leisure destination-based rides that would have previously been taken by other modes. This is consistent with findings from the user survey. According to Wave 2 of the user survey, frequent users (who rented e-scooters at least three or four times a week), were more likely to have travelled by bus or car/van in the absence of e-scooters, whereas one-time users were more likely to have travelled by foot, or to have not made the journey at all. Of those users who said that they would not have made their most recent journey in the absence of e-scooters, 63% said the journey was just for a ride or for fun.

It is also possible that these changes were somewhat related to the COVID-19 pandemic. A large proportion (58%) of users at Wave 1 felt that the pandemic had made them more likely to use e-scooters, and qualitative interviews confirmed that some were concerned about taking public transport. This concern about travelling by public transport may in part explain why respondents were more likely to say that, in the absence of an e-scooter, they

would have walked or cycled[58], or that they would not have made the journey at all. As the concern about travelling on public transport lessened, due to restrictions being lifted and vaccination rates increasing, public transport may have become a more common alternative to e-scooters.

Using an e-scooter instead of walking was widely reported by participants who took part in interviews or focus groups, since it was viewed as quicker and less tiring, particularly for those with mobility issues. In addition, a recurring view among female participants was that using an e-scooter was safer than walking home at night in the dark, although it was sometimes seen to be less safe than taking a taxi home.

> *"It's definitely safer than walking for a girl. You get there quicker and people know where you are… once [my friend] didn't want to pay for a taxi, so she just scooted. She was by herself and she said it was so much better than walking, because it would have taken her ages to walk and it was pitch black."*
> *(E-scooter user, Essex, Female, 16-34, Wave 1)*

> *"I do feel safer riding speedily through a park on an e-scooter than walking, especially when it's very dark"*
> *(E-scooter user, Essex, Female, 55+, Wave 2)*

Interview participants who owned bicycles and would have otherwise cycled saw e-scooters as a useful alternative when their bike was broken, and they liked that they did not have to worry about leaving their bike unattended for long periods. Interview participants who had rented bicycles sometimes reported preferring e-scooters, particularly where these were seen as cheaper to rent, more fun to ride and requiring less effort than peddling.

Interviewees who used an e-scooter instead of public transport said this was because e-scooters offered a quicker or more direct route, a less crowded form of travel and a higher level of control over their journey.

> *"I live three miles away from work, so particularly in London, that's a 40-minute bus or it's a 20-minute tube, with a ten-minute walk on the other end, or it's a 15-minute scooter from pretty much outside my house to pretty much outside my office."*
> *(E-scooter user, Focus Group, London, Wave 2)*

E-scooters were viewed as particularly useful when participants had faced public transport cancellations, delays or had narrowly missed a bus or train, highlighting the importance of availability of e-scooters at public transport hubs. Users interviewed in London also mentioned e-scooters were a good way to see the sights of the city.

Where e-scooters replaced car trips, this was often reported as for the first or last mile of journeys in conjunction with other modes, such as going to the train station. E-scooters were felt to be limited in their ability to replace cars especially for trips that required transportation of luggage, longer journeys, or for travelling from residential areas in and out of town centres. This was due to the perception that there was a lack of appropriate infrastructure, such as cycle lanes, safety concerns due to fast roads and junctions, and

[58] According to the DfT statistics on transport use during the COVID-19 pandemic, travel by private mode was substantially lower during periods of severe COVID-19 related restrictions compared to a normal equivalent day or week. See DfT (December 2021), Domestic transport use by mode: Great Britain, since 1 March 2020

also because of some riding restrictions which limited e-scooter use outside of central areas.

In addition, whilst e-scooters were felt to be most useful for facilitating travel around towns and cities due to their hop on/off nature, there was a view among users that they did not necessarily replace cars in doing so, since a large proportion of urban travel consisted of walking and therefore e-scooters were more likely to replace walking trips. However, there was evidence that trial e-scooters were providing drivers with an alternative for short trips, especially where they were readily available.

> *"If I'm going to my local Tesco at night, now the evenings are getting darker earlier, I'll take my car, but if there's a scooter outside, I may be inclined to jump on that"*
> *(E-scooter user, Focus Group, West Midlands, Wave 2)*

Among national stakeholders who took part in interviews, a recurring view was that e-scooters presented an opportunity to reduce car traffic and to improve the conditions for active travel. However, concerns were raised around the potential for mode shift away from walking and cycling, and the negative health and environmental implications of this.

> *"We see micro mobility as an important part of the future transport mix, particularly for the first/ last mile of a journey. Reducing car traffic in urban areas will make these areas more appealing for other forms of active travel, such as walking and cycling"*
> *(National stakeholder)*

Findings from the post-ride survey and previous studies of rental e-scooter trials showed that mode shift from other modes of transport to e-scooters in England broadly aligned with other, overseas trials and pilot programmes. Studies of e-scooter trials in Los Angeles, Portland and Auckland showed that mode shift in those locations was primarily from walking, and transfer from cycling was relatively minimal. These comparisons should be taken with caution due to different research methods and variation in national / regional contexts, the duration of each trial, and the nature of scale of the trials (32 trials across England, versus city scale trial / pilot programmes elsewhere).

Table 6: Selection of international evidence on mode shift from e-scooters (sources: various)

	England (December 2021) (post-ride survey)	Los Angeles (2019 – 2020)[59]	Portland (July – Nov 2020)[60]	Auckland (July – Nov 2020)[61]
From walking	44%	48%	37%	53%
From car (as a driver)	21% (includes car as a passenger and taxi)	12%	19%	21%
From taxi / app-based minicab services		21%	15%	N/D
From public transport (bus, train)	17%	8%	N/D	7%

[59] LADOT (2020). Year One Snapshot: A review of the 2019-2020 Dockless Vehicle Pilot Program. Final Draft. July 2020
[60] Portland Bureau of Transportation (2018). 2018 E-scooter Finding Report
[61] Kantar (2019) Public response to rental e-scooters in Auckland. Cited in Auckland Council. 2019. Rental e-scooter trial 2.0: results, evaluation and recommendations

From cycling (personal or shared bike)	9%	6%	5%	6%

3.7.2 Journeys that would not have happened without an e-scooter

As shown in Section 3.7.1, e-scooters were generating some new journeys: nine percent of trips in December 2021 would not have been made if the user had not used a rental e-scooter, according to the post-ride survey. Most of these journeys (63%) were taken just for a ride or for fun, and one in four (23%) were taken for leisure purposes (to visit friends or family, to go shopping, or to get to or from a leisure activity). This suggests that the new journeys generated by rental e-scooters were more likely to be unlinked to a specific destination, spontaneous or informal activities.

3.7.3 Impact on journey times

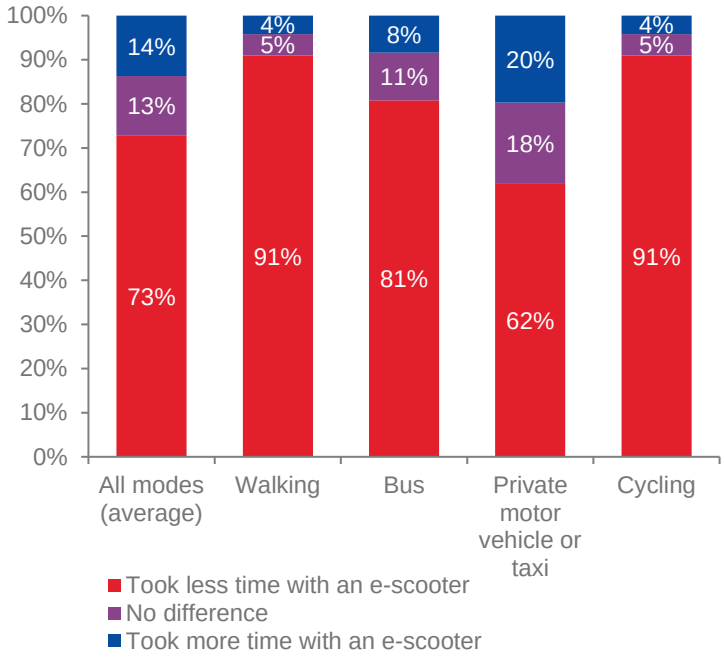
For the most part, e-scooters reduced journey times for those who used them. Almost three-quarters (72%) of users said their last e-scooter journey took less time with an e-scooter compared to the alternative mode they would have used, and on average these users estimated that their journey was 17 minutes shorter. Only 14% of users thought that their last e-scooter journey had taken more time than the alternative mode they would have used, and on average these users estimated that their journey was 19 minutes longer.

When considering the mode that e-scooter users would have used had an e-scooter not been available, e-scooters were generally deemed quicker than all other modes.[62] Figure 19 shows that 90% of users who would have walked in the absence of an e-scooter felt that their journey was quicker with an e-scooter, according to the user survey (wave 2). Eighty percent of those who would have taken a bus, and 62% of those who would have taken a private motor vehicle (including cars, vans, motorcycles and mopeds) or a taxi said the same.[63]

[63] Due to the very low number of users who would have used a train, London underground or tram in the absence of an e-scooter, we cannot determine whether e-scooters were deemed faster or slower than each of these modes on average.

[63] Due to the very low number of users who would have used a train, London underground or tram in the absence of an e-scooter, we cannot determine whether e-scooters were deemed faster or slower than each of these modes on average.

Figure 19: Journey time for e-scooter trips compared to other modes (source: user survey, wave 2)



"Thinking about your last rented e-scooter journey, did using an e-scooter make your journey take more or less time than it would have without an e-scooter?"

Bases: All adults who used a rental e-scooter in UK trials, and in the absence of e-scooters would have walked (1,488), taken a bus (416), taken a private motor vehicle (car, van motorcycle or moped) or taxi (1,233), or cycled (376). All modes (3,788). Not all modes shown.

Just over half (55%) of users reported they would have taken a different route had they not used an e-scooter, according to the user survey. Of those who would have taken a different route, 42% said that this would have been longer, whilst 24% felt it would have been shorter, suggesting that e-scooters gave some people access to routes they would have been unable to otherwise take, perhaps reflecting restrictions on motor vehicles, or fixed public transport routes.

The qualitative interviews provided some insight into why some e-scooter journey times may have been longer than alternative modes. For example, users reported longer journey times on an e-scooter when they experienced difficulties accessing and unlocking the e-**scooters and when geofencing restrictions meant that they were required to walk some of** the way or take a less direct alternative route.

3.7.3.1 Journey time counterfactual analysis

Two approaches were used to assess the counterfactual analysis and estimate journey time savings and changes in distance travelled in five case study trials. The first was based on the journey times and distances reported by e-scooter riders in the user survey, and the second based on a counterfactual analysis undertaken using Google Directions API set out in a separate technical report. Using two different approaches enabled us to provide a more robust picture of impacts. More information on these approaches is provided in the technical report.

Average journey times by rental e-scooter were compared with journey times by the alternative modes users would have taken, up to the end of December 2021[64]. Table 7 shows the total hours saved for people switching to rental e-scooter from an alternative mode.

E-scooter trials in the five case study areas can be seen to have saved between roughly 330,000 and 690,000 hours in journey times for the period up to the end of December 2021. The total self-reported journey time savings are approximately twice as large as the journey time savings using Google Directions API. This is because users self-reported much larger time savings for most modes[65], particularly in West Midlands, Essex and WECA, in contrast to London where the self-reported savings are similar to those assessed through Goggle Directions API. The total journey time savings for the West Midlands are significantly higher than the other areas because it was a bigger trial with significantly more trips.

Table 7: Total hours saved as a result of the five case study e-scooter trials, to end-December 2021 (Source: operator data, user survey, Google Directions API, Arup analysis)

Location	Using Google Directions	Using user survey results
West Midlands	30,000	132,000
WECA	188,000	386,000
Newcastle	41,000	54,000
Essex	23,000	70,000
London	49,000	48,000
Total of above	**330,000**	**691,000**

3.7.4 Impacts on congestion

Over one-fifth (21%) of e-scooter users would have otherwise taken a private motor vehicle (including taxi), according to the post-ride survey. This suggests that e-scooters could have led to positive impacts on congestion by both replacing larger motorised vehicles on the road, and removing trips from the main carriageway in cases where e-scooters were used on cycle lanes. The analysis for the five case study areas showed a total reduction of 1.2-1.6 million km of car journeys up to December 2021. Please see technical report for more details on this calculation.

Nevertheless, the 42% of journeys that would otherwise have been walked, and the nine percent of additional journeys that would not have been made if e-scooters had not been available (in December 2021, according to the post-ride survey) may have had a slight negative impact on congestion.

3.7.5 Integration with other modes of transport

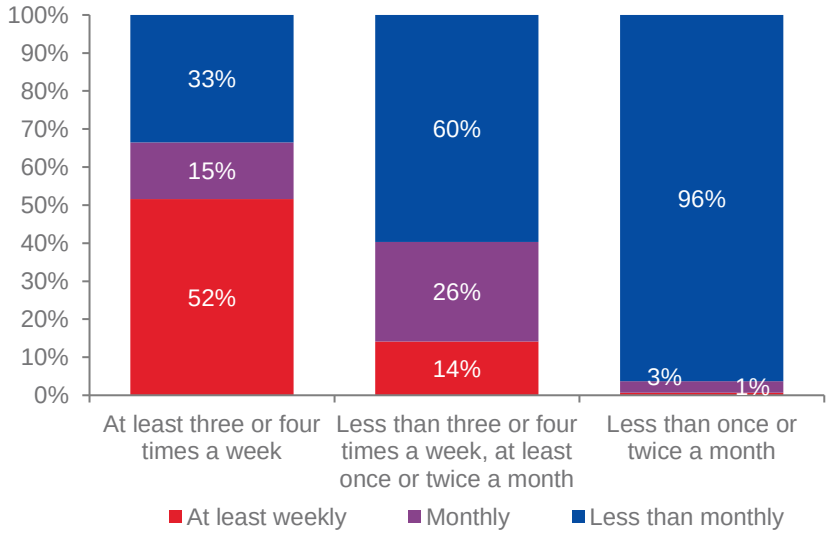
Evidence on the extent to which e-scooters are used to travel to or from other transport modes is mixed. Only the Wave 1 user survey asked respondents whether they used e-

[64] The number of trips using each alternative mode was estimated using mode splits from the user survey. The benefit was then valued by applying values of travel time savings from TAG, accounting for journey purpose splits which were also derived from the user survey. For e-scooter journeys that were newly generated trips, the average time saving across all other modes was used, with the “rule of half” applied.

[65] Note that this varied significantly by trial, with self-reported time saving benefits almost 4.5 times higher in the West Midlands but approximately the same for the London trial. This depends on the local context and the types of journeys that people made. Users are also likely to overestimate the times savings in the survey.

scooters to travel to or from another mode. Half of users reported never having used e-scooters to travel to or from another mode, and very few did so regularly: only 14% did so at least once a week. However, this figure is likely biased downwards by the high proportion of one-time or very infrequent users at Wave 1, who were much less likely to have used e-scooters to travel to or from another mode. As shown in Figure 20, of those who rented an e-scooter at least three or four times a week, 52% used an e-scooter to travel to or from another mode at least weekly. This suggests that while there was only a minority of *users* regularly using e-scooters to travel to or from other modes, a larger proportion of *journeys* overall were to or from other modes.

Figure 20: Use of e-scooter to travel to or from other modes, by frequency of e-scooter use (source: user survey, wave 1)



"How often do you use a rented e-scooter to travel to or from other modes of transport e.g. to get to the bus or train station?"

Bases: all users of rental e-scooters in trial schemes who rent an e-scooter at least once or twice a week (448), less than that but at least once or twice a month (1,272), or less than that (463).

In the Wave 1 user survey, respondents were asked what mode they used to get to or from the e-scooter on their most recent journey. A large majority said they travelled by foot to get to the e-scooter (78%) and to get from their e-scooter drop-off to their destination (71%). It is worth noting that, in most cases, users will have to travel a short distance by foot between other modes and at an e-scooter pick-up or drop-off (e.g. walking from a train platform to the e-scooter point outside the rail station). This may have influenced how respondents answered this question.

Interviewees who used an e-scooter alongside other modes of transport primarily reported doing so to commute. In these cases, they reported either using a rental e-scooter to travel to a rail station, or travelled by car to pick an e-scooter up and then rode to work. If used alongside public transport, availability of e-scooters at transport hubs was highlighted as a key enabler.

> *"I get off at [local] Station, and literally right outside is the Spin, the parking bay, and there's always some scooters always there, just present, so you know that it's like really reliable, just to have a scooter there. So, it's something that you don't really think about, and you just get on and go straightaway wherever you need to."*
> *(E-scooter user, Focus Group, Essex, Wave 2)*

More broadly, the qualitative research identified reasons why use of e-scooters alongside other modes of transport may be limited. Firstly, users did not perceive a need to rent an e-scooter to reach another mode where the distance was relatively short. Secondly, unconnected ticketing systems, such as separate day passes for buses and e-scooters,

were reported to inhibit switching between public transport and e-scooters. This suggests that ticket integration may increase use.

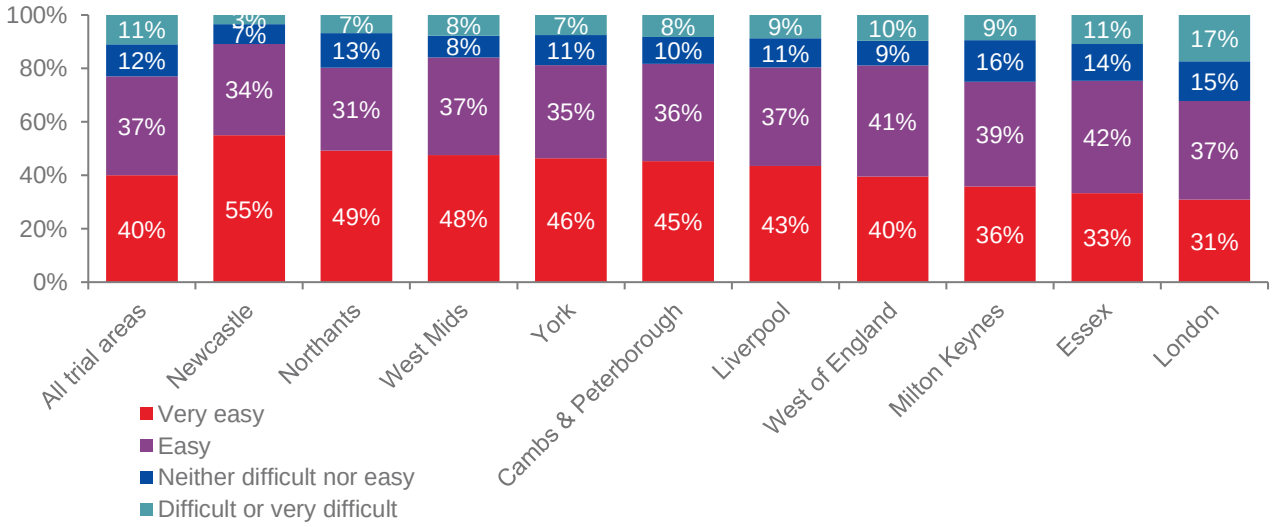
Local stakeholders discussed how they were aiming to further enhance integration with modes of public transport by engaging and collaborating with other transport operators. For example, by locating parking areas near bus and train stations, partnering with companies to raise awareness of e-scooters, having joint marketing and introducing integrated travel tickets.

At the time of the research, some areas had successfully introduced these measures (particularly with parking areas), some were in progress, whilst other stakeholders' attempts to introduce them had been unsuccessful. Barriers to their implementation included cost implications for e-scooter operators, e-scooter operators having other priorities, other transport operators not wishing to collaborate due to perceived negative impacts that e-scooters could have on their services (e.g. obstructive parking) and measures being outside of the local authority's control. E-scooters not being allowed on buses by some bus operators was also believed by local stakeholders to hinder the extent to which e-scooters could be integrated with other forms of transport. More information on integration with local transport is presented in Section 9.

3.7.6 Ease of finding rental e-scooters

The overwhelming majority of users found it easy (37%) or very easy (40%) to find an e-scooter when they last wanted one, according to Wave 2 of the user survey. Only 11% found it difficult or very difficult. However, there was some variation between trial areas. In Newcastle, 55% of users found it very easy to find an e-scooter the last time they wanted one, compared to 31% in London (Figure 21).

Figure 21: Ease of finding an e-scooter, by trial area (source: user survey, wave 2)



"How easy or difficult was it to locate a rental e-scooter when you last wanted to use one?"

Bases: all users of rental e-scooters in trial schemes in all trial areas (4,114), Milton Keynes (148), Essex (324), London (1,024) Northants (264), Liverpool (322), West of England (629), York (347), Cambs & Peterborough (532), West Midlands (322), and Newcastle (202).

The qualitative research identified a range of factors affecting ease of access, including proximity to pick up location, the presence of parking zones, reliability and accuracy of the app (in terms of showing e-scooter locations), technical issues and battery charge.

Technical issues with e-scooters not being located where the app had identified them were perceived by some to have worsened over time, and participants suggested that increases in e-scooter use and the possibility of people keeping e-scooters in their private residences as possible causes.

4. E-scooter riders: who uses e-scooters and why

4.1 Key insights

- E-scooter users were predominantly male (71%) and under the age of 35 (74%). There was some indication that the user base became slightly more weighted towards men over time.
- Amongst those who used rental e-scooters, men and younger people were also more likely to rent e-scooters frequently. Users from ethnic minority groups, and users on low incomes, were also more likely to be frequent users than their counterparts.
- Over time, the proportion of trips taken for commuting increased while the proportion taken for fun or for no particular purpose reduced. Among users who took part in an in-depth interview, time and cost savings, convenience and enjoyment motivated them to continue using an e-scooter, while the novelty factor had become less important.
- One in ten residents reported having rented an e-scooter in their local trial area. Of those who had not rented an e-scooter, nearly two thirds expressed a lack of motivation or interest (63%) while 46% cited safety concerns as a reason for not doing so. The interviews with residents revealed that this lack of motivation was driven by a perception of e-scooters as being for younger people or unsuitable for those with health conditions.
- A third of residents who had not yet rented an e-scooter said they would be interested in renting one in future (34%). However, amongst residents who had used an e-scooter, a strong preference was expressed to own one in future (69%), rather than to rent one (31%).
- Views around cost, issues with availability, and parking and riding restrictions prevented some users from renting an e-scooter more regularly.

4.2 User demographics

This section presents findings on the demographic profile of e-scooter users, drawing from both the demographic survey and the user survey, and compares this to the wider adult population in England[66]. While findings from the two surveys were broadly in line with each other, the analysis presented relies on the demographic survey wherever possible due to the larger sample size. Where looking at change over time, or at how different demographic groups answered other questions, the analysis relies on the user survey data (Waves 1 and 2).[67]

4.2.1 Age and gender

E-scooters users were predominantly male and under the age of 35.[68] In the demographic survey, 71% of users identified as male, compared to 49% of the adult population of

[66] ONS Mid-Year Population Estimates. (2021)
[67] This is because the user survey collected more information about users, including information about patterns of e-scooter use. It was necessary to use the user survey data to look at changes over time in this section because comparisons are drawn between frequent and infrequent users over time. The demographic survey did not collect information about frequency of use so does not allow comparisons between these two groups. Where the analysis looks at change over time without comparing frequent and infrequent users, user survey data was used for consistency.
[68] This refers to the base of registered users, unweighted by the number of e-scooter trips.

England[69]. The user survey suggests that the gender profile of users has become increasingly weighted towards men over time: 64% of respondents to the Wave 1 survey identified as male, which increased to 70% in the Wave 2 survey.

Three quarters (74%) of users in the demographic survey were aged 16 to 34 while just 2% were over 55, comparative figures in the adult English population were 30% and 38% respectively. The user survey suggests that the age profile of users has become slightly less weighted towards younger people over time, but the age profile nonetheless remains significantly skewed: 68% of respondents to the Wave 1 survey were aged 16 to 34, which fell to 57% of respondents in the Wave 2 survey.

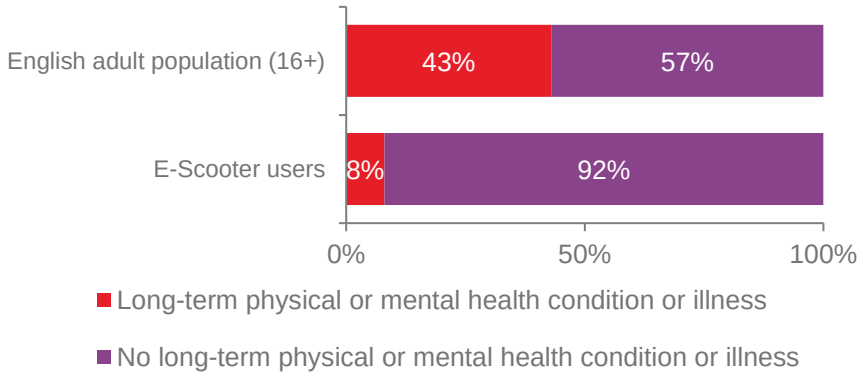
4.2.2 Ethnicity

According to the demographic survey, 17% of e-scooter users were from an ethnic minority group. This is broadly similar to the English adult population, 12% of whom were from an ethnic minority group[70]. The user survey suggests that the profile of e-scooter users became slightly less ethnically diverse over time: in the Wave 1 of the user survey, 19% of respondents reported being from an ethnic minority group, which fell to 14% of respondents in Wave 2.

4.2.3 Physical and mental health conditions

According to the demographic survey, only eight percent of e-scooter users had a physical or mental health condition lasting 12 months or more. This is much lower than the English adult population, 43% of whom have a long-term physical or mental health condition (Figure 22)[71]. There was no indication from the user survey that the proportion of e-scooter users with a long-term condition or illness has changed over time.

Figure 22: Physical and mental health conditions of e-scooter users (sources: 2019 Health Survey for England[72] & demographic survey)



"Do you have any physical or mental health conditions or illnesses lasting or expected to last 12 months or more?"

Figures for English adult population (16+) are from the 2019 Health Survey for England, and figures for e-scooter users are from the user demographic survey.

Bases: users of rental e-scooters in trial schemes (194,737).

[69] ONS Mid-Year Population Estimates. (2021)

[70] ONS Mid-Year Population Estimates, (2021)

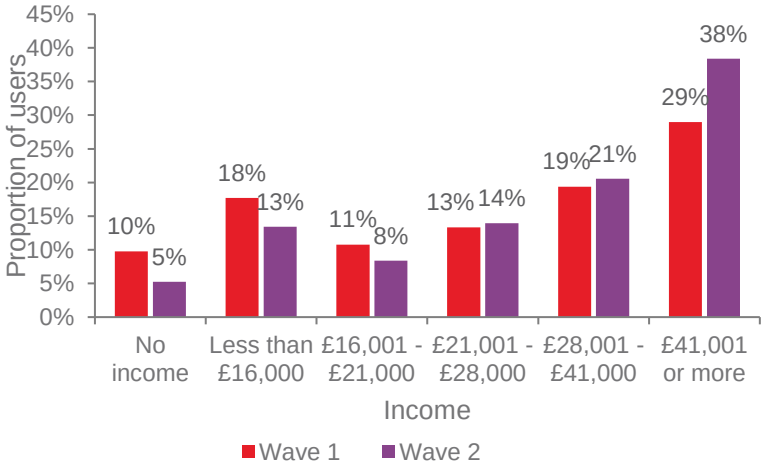
[71] Health Survey for England, (2019)

[72] Health Survey for England, (2019)

4.2.4 Income

As shown in Figure 23, the income profile of e-scooter users shifted slightly over time, away from those with no or low income, towards those with higher incomes. This is based on user survey data, as the post-ride survey did not ask about income.

Figure 23: Income of e-scooter users, by wave (source: user survey)



"Before tax and National Insurance payments, what is your total annual personal income? Include income from pay and earnings, pensions, benefits, investments and other sources like rent."

Base: A*ll users of rental e-scooters in trial schemes, excluding London, Wave 1 (2,207), Wave 2 (3,172).*

4.2.5 Profile of more frequent users

According to the user survey, some demographic groups were more likely to report being *regular* users of rental e-scooters than others, with regular use defined as renting an e-scooter at least three or four times a week. As discussed above, e-scooter users were predominantly male and under the age of 35. Male users and younger users were also more likely to report using e-scooters regularly.

- 20% of male users were regular users compared to 15% of female users. Overall, 77% of regular users were men.
- 20% of users aged 16 to 34 were regular users, compared to just 11% of users aged 55 or over. Overall, 64% of regular users were aged 16 to 34 in Wave 2, a decrease from 74% in Wave 1.
- Users from ethnic minority groups were more likely to report being regular users of e-scooters (27% of users from an ethnic minority background were regular users, compared to 17% of white users).
- Users on low incomes were more likely to report being regular users. Twenty-six percent of those with an income of less than £21,000 per year reported being regular users, compared to 15% of those earning over £41,000 per year.

4.3 Journey purpose

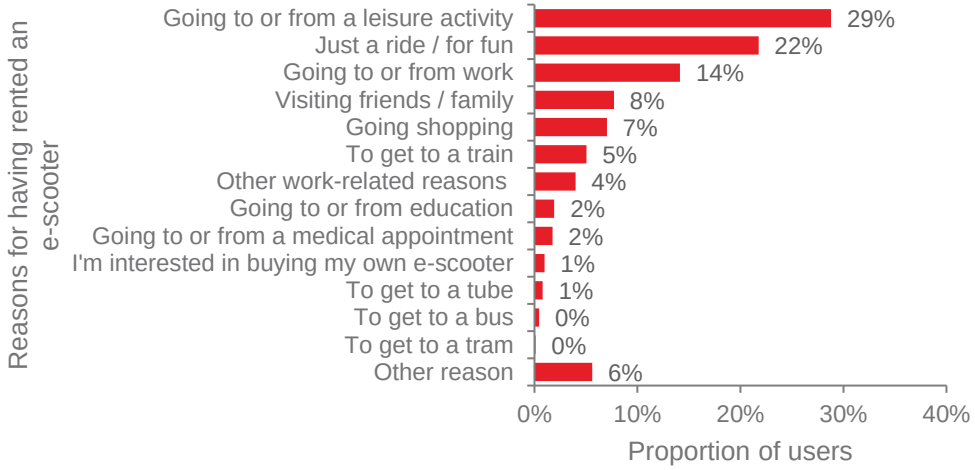
Reasons for using e-scooters differed according to frequency of use. Regular users were much more likely to use them to commute, whereas those who had used them only once or a small number of times were more likely to report using them for fun or to try them out. Overall, the evidence from the post-ride survey indicates more *trips* in December 2021

were made for commuting than for fun: 33% of trips were commutes, whereas just 7% were for enjoyment or for no particular purpose (Figure 26 below).

There is also evidence that an increasing proportion of rental e-scooter trips were being taken for commuting over time. This suggests that, as time went on, e-scooters were seen less as a novelty experience and instead were playing a more functional role in transport networks. However, evidence from the residents' survey suggests that those who did not use e-scooters still perceived that e-scooters were mostly used for fun.

Figure 24 shows the reasons for users' most recent rental e-scooter journey. This includes infrequent and one-time users alongside more frequent users, and so is unweighted according to the number of trips made. The most common answer on behalf of users was to get to or from a leisure activity (29%). More users said they took the journey just for a ride or for fun (22%) than said they were travelling to or from work (14%).

Figure 24: Reasons for most recent rental e-scooter journey (source: user survey, wave 2)[73]



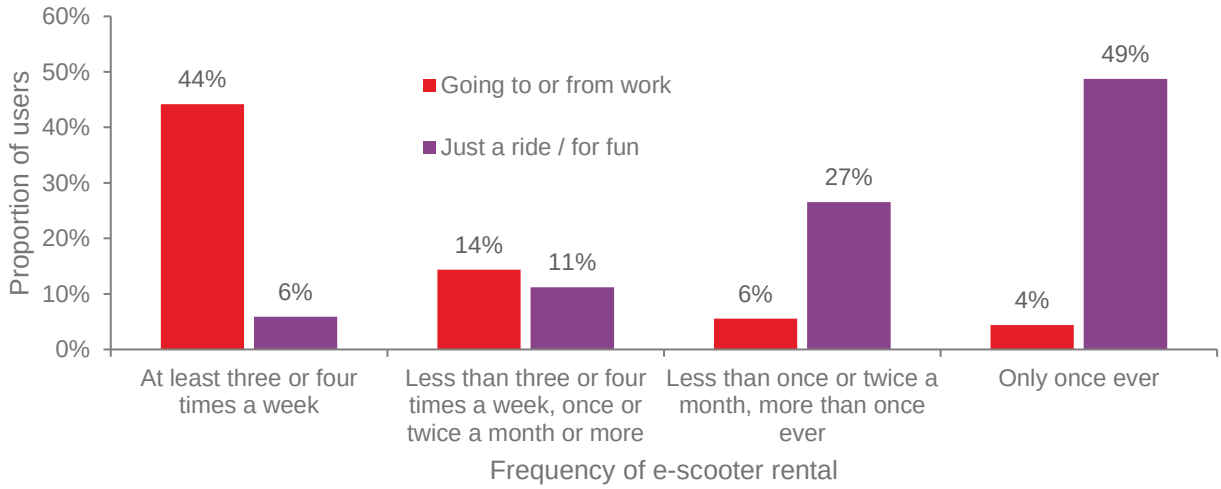
"What was the main reason for your most recent journey on a rented e-scooter?"

Base: A*ll users of rental e-scooters in trial schemes (4113)*.

However, because this includes infrequent and one-time users alongside more frequent users, it likely gives a misleading picture of what most e-scooter trips are for. Figure 25 shows the proportion of users whose most recent rental e-scooter journey was for commuting or just for fun, broken down by how often users rented e-scooters. Almost half (49%) of one-time users said that their journey was just for fun, compared to just six percent of those who rented e-scooters at least three or four times a week. Conversely, among those who rented e-scooters at least three or four times a week, almost half (44%) said their last journey was a commute, compared to just four percent of one-time users.

[73] The wording used for this question changed slightly from Wave 1 to Wave 2 and therefore only Wave 2 is shown on the chart.

Figure 25: Reasons for most recent e-scooter rental, by frequency of e-scooter rental (source: user survey, wave 2)



"What was the main reason for your most recent journey on a rented e-scooter?"
"How frequently do you use an e-scooter?"

Base: A*ll users of rental e-scooters in trial schemes, excluding London, at least three or four times a week (561), less than three or four times a week, more than once or twice a month (1,704), less than once or twice a month, more than once ever (1,009), only once ever (839).*

The interviews and focus groups with users corroborated these findings. More frequent users reported renting an e-scooter to travel to regular commitments, such as exercise classes, work and school pick-ups. In Wave 1 interviews, this included essential workers who had taken advantage of the discounts offered by some e-scooter operators during COVID-19 restrictions. In contrast, less frequent users reported renting an e-scooter for fun or to try it out, to attend one-off social events and for commuting purposes in certain circumstances, such as when trains had been cancelled.

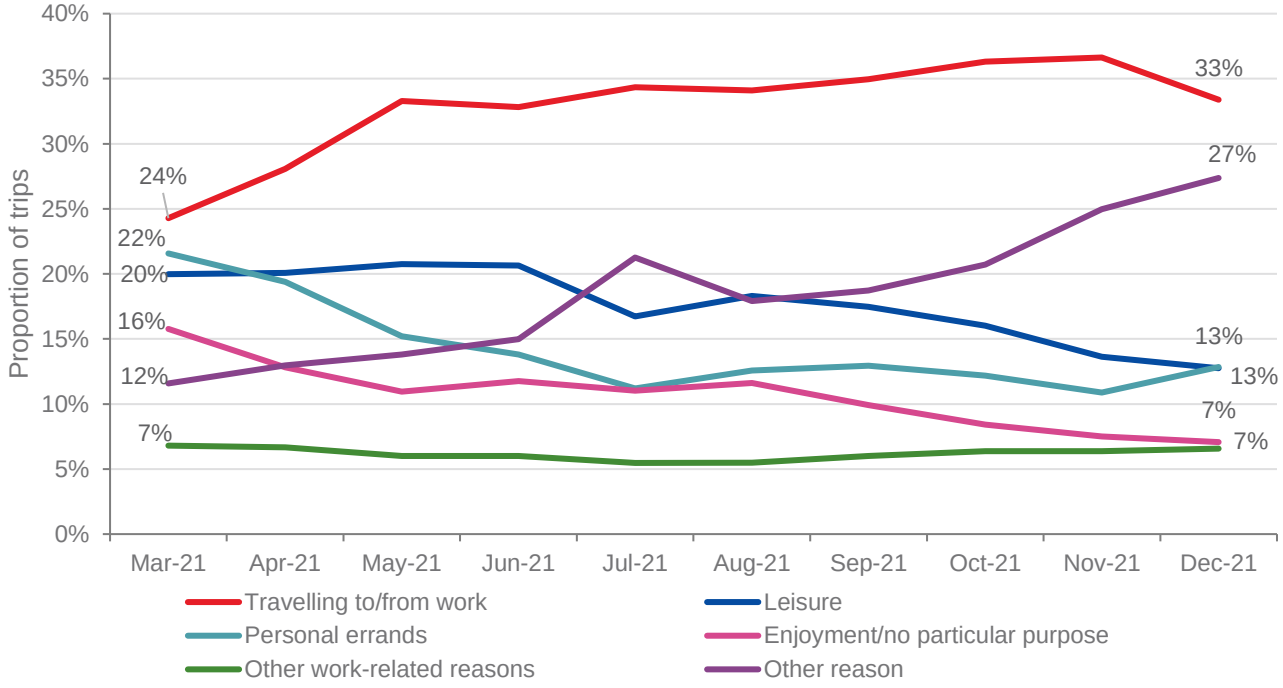
When users were asked about their main reasons for renting an e-scooter *generally,* just under a third (30%) cited commuting or other work-related reasons, according to the user survey. This proportion was slightly higher in London (35%).

This picture was confirmed by the post-ride survey results. The post-ride survey collected information on a *per trip* basis, rather than *per user* basis, and showed that since the start of the trials, on average, 31% of trips were commutes, compared to just 14% of trips that were made for enjoyment or for no particular purpose. The post-ride survey also showed that the proportion of commuting trips rose over time, whilst the proportion of journeys that were made for enjoyment or no particular reason fell (Figure 26). Among interview participants, where changes in use were reported, this was in part driven by the easing of COVID-19 restrictions, which were reported to have prompted the use of e-scooters for fun in the absence of other leisure activities.

The post ride survey also recorded an increase in the proportion of users answering “Other” to the question about journey purpose. This could reflect an increase in trips taken to visit friends and family or to go shopping; options not explicitly listed on the post-ride survey but which the user survey suggests are common. There is evidence to suggest that the number of people renting e-scooters for commuting could continue to increase: 31% of

resident survey respondents agreed or strongly agreed with the statement, “I’m interested in trying e-scooters to commute”.

Figure 26: Reasons for e-scooter trips (source: post-ride survey)



"What was your main reason for using an e-scooter for this journey?"

Bases: all rental e-scooter journeys in trial areas, March (16,686), April (53,071), May (63,382), June (84,597), July (239,121), August (282,727), September (324,766), October (310,205), November (230,621), December (174,233).

Despite the increase in trips for commuting and other purposes, the perception amongst residents that e-scooters were used mostly for fun was widespread and may pose a barrier to public acceptance of e-scooters. When resident survey respondents were asked at Wave 2 what they believed e-scooters were mostly used for, only one in six thought they were mostly used for travelling to work or education. Among residents who took part in interviews, witnessing inappropriate riding was a key factor influencing the view that e-scooters were primarily used for fun. They did not consider e-scooters as a serious alternative mode of transport and expected them to become less popular over time. Increasing public acceptance of e-scooter rentals may therefore require overcoming the disconnect between how rental e-scooters are most commonly used, and how e-scooter use is viewed by residents.

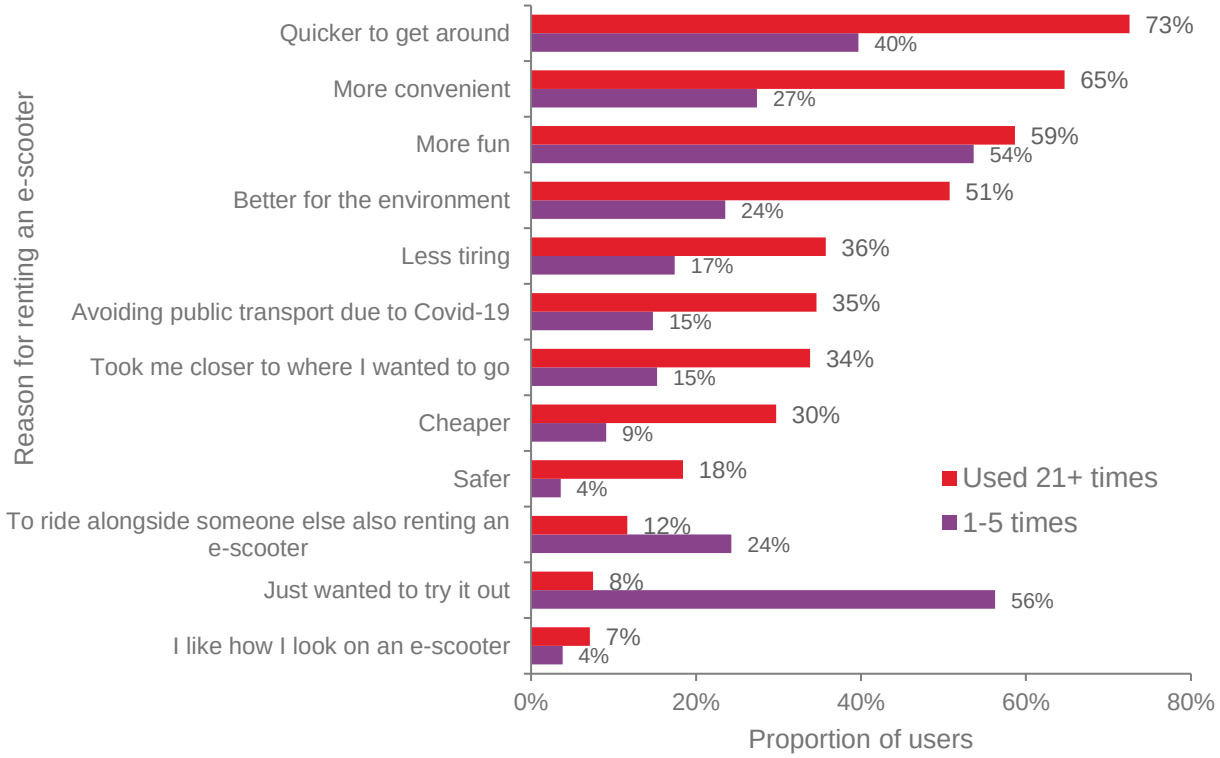
4.4 Motivations for using an e-scooter

4.4.1 Motivations among users

Although a large number of e-scooter users said that the enjoyability of e-scooters was a factor in their decision to rent one, more frequent users cited a range of additional reasons: they found e-scooters quicker than other modes, more convenient, good for the environment, less tiring, and less likely to expose them to COVID-19, amongst other reasons.

Again, there was evidence of a difference between one-time users and more frequent users in terms of motivations for use. In the Wave 1 user survey, participants were asked why they chose to rent an e-scooter, the last time they did so[74]. Although the most common answers were that e-scooters are more fun (55%), or because users just wanted to try an e-scooter out (43%), these results were somewhat skewed by the large number of one-time or infrequent users. As shown in Figure 27, 56% of those who had used an e-scooter five or fewer times said that they rented an e-scooter just to try it out. By comparison, 73% of those who had used an e-scooter more than 20 times said that they used one because it was quicker to get around, and 65% said it was more convenient.

Figure 27 Motivations for renting an e-scooter, by no. of times users have rented an e-scooter (source: user survey, wave 1)



"Why did you choose to rent an e-scooter, last time you rented one?"

Bases: All adults who used a rental e-scooter in UK trials one to five times (2227), more than 20 times (266).

Across both waves of the qualitative research users said they were first motivated to rent an e-scooter for a number of reasons. This included: curiosity or the novelty factor; recommendations from family and friends; a promotional offer from a provider; the convenience of being able to park it close to their home; having prior experience of e-scooters; and wanting to trial e-scooters as an alternative mode of transport, either in the short term; or to inform a future purchase of a private e-scooter.

Reasons why participants said they continued using e-scooters included convenience, time and cost savings and enjoyment, with the novelty factor diminishing over time.

[74] This question was not asked at Wave 2.

"My motivation would be time-saving, convenience, not having to get on a busy bus full of people and not having to wait for the bus…for reasonably shortish journeys, under two miles or something, so time-saving"
(User, London, Female, 35-54, Wave 2)

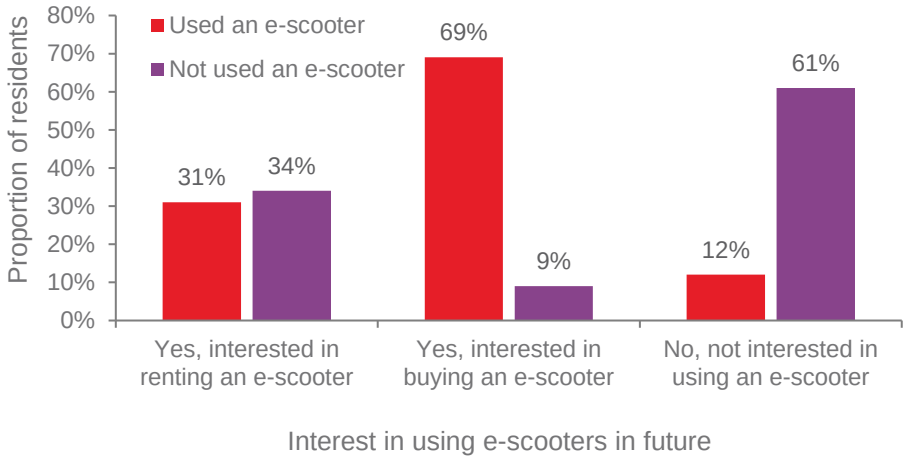
E-scooters being a greener way to travel was also viewed as important, particularly among interviewees with strong environmental values. A further motivation for continuing to use rental e-scooters was that it offered a form of shared transport which did not require ownership and the individual responsibility that came with this, such as storage and maintenance.

Users who had come to rely on renting e-scooters highlighted the importance of continuity of the service beyond the trials. This was also echoed by local stakeholders, whose concern was that a pause or end of the service would reverse any progress they had made in encouraging modal shift away from cars.

4.4.2 Motivations and views of future use among residents

There was some indication from the resident survey findings that a sizeable number of residents who had not yet tried a rental e-scooter would be interested in renting one in the future (Figure 28). However, amongst residents who *had* used an e-scooter before, the preference was to own an e-scooter in the future, rather than to rent one (69% of users said they were interested in buying one compared to 31% who were interested in renting one again), implying some dissatisfaction with the rental scheme (barriers to using the rental scheme are discussed in the next section)[75].

Figure 28: Interest in future e-scooter use amongst residents, by whether residents have used an e-scooter before (source: residents survey, wave 2)



"Would you be interested in using an e-scooter in the future?"

NB. Respondents could say they were interested in both renting and owning e-scooters, so figures do not sum to 100%.

Bases: all adult trial area residents, who did not own an e-scooter, and had used an e-scooter before (502), or had not used an e-scooter before (2,573).

In the qualitative interviews with residents, participants with no intention or desire to use a rental e-scooter held generally negative attitudes towards e-scooters, feeling they were a nuisance. In contrast, those who said that they planned to use one in the future expressed similar motivations to those mentioned by users; they were curious, saw them as fun,

[75] The wording used for this question changed slightly from Wave 1 to Wave 2 and therefore only Wave 2 is shown on the graph.

convenient, had seen others use them (e.g. parents on a school run), and in some cases had used them before whilst on holiday.

In interviews, residents who expressed a preference for buying an e-scooter in the future rather than using a rental scheme cited three main reasons: access, cost-effectiveness and hygiene. Reasons relating to access centred on the ability to find an e-scooter quickly enough, particularly among those residents who lived on the outer edge of local rental scheme boundaries and who felt rental e-scooters were hard to come by. Private e-scooters were considered to be more cost-effective if used regularly. Finally, during the Wave 1 interviews, private e-scooters were considered a more hygienic option than rental e-scooters in the context of the higher profile of the COVID-19 pandemic.

> *"The hygiene and the availability [are issues with rental e-scooters]…because you have to be at work on a certain time, so you couldn't just hang around and hope that there is a scooter available or close to you. I think if I've got to walk to […] get to the nearest scooter location, […] it defeats the point of getting to work quicker on it. Yes, I think I would rather own one than […] rent one"*
>
> *(Resident, Newcastle, Female, 35-54, Wave 1)*

4.5 Barriers to e-scooter use

Among a sizable proportion of resident survey respondents, there were barriers to renting e-scooters arising from perceptions of safety, cost, and convenience. Women and older people were disproportionately more likely to be concerned about safety than their counterparts, whilst younger people were more likely to cite cost as a barrier than older people. According to the resident survey, only one in ten (10%) of residents had rented an e-scooter. Figure 29 shows the reasons that the remaining 90% of residents gave for not having rented an e-scooter.

Figure 29: Reasons for not having tried an e-scooter amongst residents (source: residents survey)

"Why haven't you rented an e-scooter?"
Bases: all adult trial area residents who have not rented an e-scooter (3,011).

Motivation and interest. Most residents who reported not having rented an e-scooter said they had no need for one or felt it was not for them (63%). Older people who had not rented an e-scooter were more likely to feel this way: 71% of those aged 55+, compared to 57% of those aged 18-34 reported this. Across both waves of the qualitative research with residents, the impression that e-scooters were targeted at younger people remained an important barrier to uptake among older people.

> *"I'd feel like a right numpty on one of those. I would, I'd feel really, really silly. I'm trying to think of my mum or my dad or any of my - I just can't see people being on them. I feel like it's, they're more of an attraction to younger people"*
> *(Resident, West Midlands, Female, 35-54, Wave 2)*

Safety and training. Almost half (46%) of residents who reported not having rented an e-scooter said this was because they felt e-scooters were unsafe or were a nuisance. Amongst residents who *were* interested in renting an e-scooter but who had not done so, 35% cited safety as a reason for this. Female residents were no less likely than men to be interested in renting e-scooters, but were more concerned about safety: 28% of women compared to 22% of men cited safety as reason for not renting an e-scooter. The resident survey also showed that older people who were interested in renting an e-scooter, but had not done so, were more likely than younger people to say that this was due to safety concerns. In addition, amongst users who had rented an e-scooter at the Wave 1 survey but had not rented one again by the time of the Wave 2 survey, 21% said this was related to safety concerns.

A key safety concern reported by users in qualitative interviews was the requirement to ride on (sometimes poorly surfaced) roads alongside larger vehicles. Some users who had directly experienced this were put off using e-scooters again, or said that they would use them more regularly if certain improvements were made such as adding more segregated cycle lanes and fixing potholes.

> *"It didn't appeal to me and I did not enjoy it the whole journey. My friends commented how tense I looked. It just didn't seem safe to me, being so close to cars, no helmet"*
> *(E-scooter user, WECA, Female, 16-34, Wave 2)*

A perceived lack of training or experience was a barrier to using a rental e-scooter for 16% of residents who had not rented an e-scooter. This was also raised by some residents participating in qualitative research, including those who had no car-driving experience and were not aware of the rules of the road.

> *"I've never had a driving lesson, I don't feel comfortable then driving a motorised vehicle in any sense on a road. I don't know the highway law - do you know what I mean? I've had no lessons, so it's not for me."*
> *(Resident, WECA, Female, 16-34, Wave 2)*

More details on safety are provided in Section 5.

Cost. Cost of rental was also a central factor for both users and residents. At Wave 1 of the user survey, all users were asked what, if anything, would stop them renting an e-scooter in future, and 58% cited cost. However, at Wave 2, of those users who had not rented an e-scooter again since the Wave 1 survey, only 25% cited cost as a reason for this. Amongst residents who had not rented an e-scooter, 11% said this was because the felt it was too expensive. This view was more common amongst younger residents than older residents:16% of those aged 18-34 who had not rented an e-scooter said this was because of the cost, compared to seven percent of those 55+. Amongst users who cited cost as a barrier to further or more frequent use in the qualitative research, it was also noted that rental e-scooters were more expensive than other modes, and that this was off-putting for some. Together, these results suggest that although cost is a factor in most users' decisions to rent or not rent e-scooters, only a minority of people are actively put off renting e-scooters due to the cost.

Accessibility. The qualitative research with users and residents identified accessibility as a barrier to e-scooter use for some. Among residents who had not used an e-scooter before, they were seen to be inaccessible for participants whose balance was affected by mobility-related conditions.

Functionality and ease of use. The registration process (downloading the app, adding payment details) had also stopped some residents from trying an e-scooter where they perceived it to be too much effort, or they were unable to complete a transaction.

In addition to the themes examined above, participants in the qualitative research also identified several barriers relating to the rental scheme and its integration with the wider transport system. These barriers were reported to have stopped users from continuing to rent an e-scooter, or reduced how frequently they used them. Easy access to e-scooters (such as being able to pick one up close to home and having enough scooters in designated areas) was important, and thus where availability was lacking this deterred use. Riding and parking restrictions, such as restrictions on where e-scooters could be ridden, also limited the types of journeys that users could make and deterred use among

those who were unable to use an e-scooter to reach a particular destination, such as a hospital, or to take a desired route. More exceptionally, errors with monthly subscriptions which, when not resolved by the operator, resulted in some users returning to use an alternative mode of transport.

The user interviews in Wave 2 demonstrated how these factors evolved during the trial period. Whilst some felt that infrastructure and availability had improved, others noted increased restrictions or reduced availability of e-scooters. These experiences may have reflected changes made by operators and local authorities in response to user behaviour and feedback. Examples of how trials changed over time include the implementation of curfews (such as in Newcastle), scaling up of operating zones to the agreed fleet size (WECA) and introduction of parking racks (West Midlands).

4.6 User experience

A clear majority of users (84%) rated their most recent journey good or very good in Wave 1 of the user survey[76]. One-time users were less likely to rate their journey as good or very good compared to those who had rented an e-scooter more than 20 times (73% versus 95%). A small minority (nine percent) of one-time users said their journey was very bad, and 18% of one-time users said they felt unsafe on their last journey (Wave 1). This supports the findings in Section 4.5 showing that some users were put off renting e-scooters by a variety of factors including safety concerns.

Despite concerns about cost of rental (in section 4.5), nearly two-thirds of e-scooter users agreed that their last rented e-scooter journey was good value for money (63%)[77]. Perceptions of value for money differed depending on what activity e-scooters were used for. E-scooter users were most likely to agree that their most recent journey was good value for money if they used it for visiting friends or family, to get to a leisure activity, or to commute.

Interviews and focus groups with users suggest that user experience was influenced by parking and riding rules, vehicle design and the quality of road surfaces. These findings suggest that some of the measures introduced to tackle issues such as anti-social riding or obstructive parking had some negative effects on the user experience. They also indicate that vehicle design adjustments, including smoothening transitions in and out of geofenced areas and adding indicators, could enhance the user experience alongside improvements to road quality.

- **Riding rules.** “No ride zones”[78] were valued for raising riders’ awareness of where not to ride and for enforcing restrictions without police involvement. However, some users reported feeling vulnerable when their e-scooter suddenly slowed or stopped when on the road alongside other vehicles, after entering a no ride zone. User interviewees in London felt this was compounded by some geofencing errors, where e-scooters stopped even though riders were not in no ride zones. Stakeholders in London explained that highly built up areas can limit GPS accuracy, sometimes caused the system to stop the ride incorrectly.

[76] Respondents to the Wave 2 survey were not asked to rate their most recent journey in this way.
[77] Respondents to the Wave 2 survey were not asked to rate the value for money of their most recent journey.
[78] These are designated no-go areas, such as parks, where e-scooters cannot be ridden. The rental e-scooters are designed to come to a safe stop in these areas.

- **Parking rules:** Experiences of parking varied across trial areas, reflecting different parking models. In areas such as Essex, where free-floating parking was available outside town centres, users valued the flexibility and convenience of being able to park their e-scooter anywhere within a given zone. On the other hand, mandatory parking zones were reported to make parking difficult on some occasions. Some users interviewed in London and WECA reported challenges in finding parking close to users' end destinations, or at all, due to the limited number of designated parking areas which could sometimes be full.

  "I tried to park once and I went to one spot and it was full, I went to another spot and it was full, so then I'm having to get my phone out and try and locate another spot I can go to. Then if you don't know the area that well, which I don't, you have to navigate to try and find where the other spot is, and that can be slightly inconvenient."
  (E-scooter user, WECA, Female, 35-54, Wave 2)

  "[docking bays are] not ubiquitous enough yet that I feel I could just hop on one and drop it off somewhere nearby."
  (E-scooter user, London, Male, 35-54, Wave 2, Longitudinal)

- **Vehicle design**. While e-scooters were praised by users for being simple to operate, sturdy and easy to use on cycle lanes, some negative experiences were reported. For instance, users said the absence of indicators from rental models in some areas (such as Newcastle and Essex[79]) was a safety concern because they had to take their hands off the handlebars to signal. Local authority representatives in one case study area also considered this to be an area for improvement. Although rental models in London had indicators, users said they sometimes did not work on rough patches of the road. Some London users also reported not being confident about the e-scooter battery life, and that this could impede use for longer journeys. Issues with acceleration and power when travelling uphill were also commonly reported among users across the trial areas who took part in interviews. Some users felt it was difficult to build up speed to keep up with traffic, while others felt that the e-scooter accelerated too easily and was hard to control.
- **Quality of road surfaces.** Another issue that affected the riding experience, according to user interviewees, was the quality of road surfaces. Across both waves of the research, users expressed concerns about potholes and uneven surfaces in the gutter area of the road and close to the kerb where they tended to ride to avoid holding up traffic.

[79] Some operators added indicators to newer e-scooter models.

5. Safety: perceptions, collisions, training and anti-social behaviour

5.1 Key insights

- As e-scooters are a new mode, data on safety was limited which made estimating casualty rates and making comparisons with other modes more challenging.
- Five percent of e-scooter users reported experiencing a collision[80] in the last 12 months, according to the user survey. Less experienced rental e-scooter users were more likely to be involved in a collision than experienced users.
- Linked to this, user error was the most commonly reported reason for a collision and single-vehicle collisions were also the most common type reported (i.e. a collision involving just the e-scooter and rider, and no other vehicles or pedestrians). This may underscore the significance of training and increased rider experience relative to improving safety.
- An indicative comparison of a provisional casualty rate for rental e-scooters against pedal cycles using STATS19 data from 2021 suggested that casualties were about three times more frequent on rental e-scooter trips than pedal cycle trips. The higher frequency of collisions for rental e-scooters may be linked to the status of e-scooters as a new mode, meaning that there was a higher number of novice users (linked to the user survey findings above). Their status as a new mode also means there is more uncertainty around this data, so the estimate should be treated with caution.
- The majority of collisions led to either no injury or minor injuries: 63% of e-scooter collisions led to injuries but, out of those injuries, 47% involved only relatively minor injuries (cuts and bruises).
- The type of medical attention received was broadly comparable to pedal cycles, according to comparison with NTS data, though with a slightly higher proportion of e-scooter users reported being treated in Accident and Emergency (A&E).
- Wider evidence indicated that, in serious e-scooter collisions, upper limb (arm and hand) injuries were more common than lower limb (leg and foot) injuries. It will be important to monitor this as evidence continues to develop.
- While the majority of users reported feeling safe on e-scooters, user survey respondents were slightly more likely to report feeling safe on a pedal cycle than an e-scooter. Road users were also more likely to report feeling safer around pedal cycles or e-bikes than e-scooters.
- When asked what could help improve safety, users and residents most commonly cited factors relating to road infrastructure, such as having a dedicated lane (such as a cycle lane). Other suggested improvements by residents included encouraging helmet use,

[80] The surveys used the term “accident” to align with the terminology used in the National Travel Survey and the Road Traffic Act. STATS19 data also used the term “accident”. We have used the term “collision” throughout this report as it is a more neutral description and does not imply that the incident could not have been prevented. Except for this, we view the terms as meaning the same: both refer to an incident where a road user collided with another vehicle, or road user, or with an object, or the road (hence it is possible that no other vehicles were involved, in what was defined as a “single vehicle collision”).

and introducing technical improvements (such as lights, license plates, high-vis clothing, and bells) to increase e-scooter visibility.

5.2 Note on e-scooter safety evidence

The following chapter sets out provisional findings on rental e-scooter safety based on research conducted as part of this evaluation and wider sources where appropriate (such as STATS19, NTS, external publications – including hospital studies).

As e-scooters are an emerging mode, safety data was limited, and it is expected to develop more over time. As such, there may be more uncertainty around estimates here than there is in more established modes covered by STATS19.

Owing to the emerging nature of e-scooter safety data, it was challenging to robustly draw comparisons with other modes, where data is much more established. However, where appropriate, some illustrative comparisons have been provided to give a preliminary understanding of the current picture.

The limitations around robust comparisons relate both to differences in the data gathering methods of e-scooters versus other modes, and wider methodological implications of calculating a comparable casualty rate for e-scooters as an emerging mode, compared to more established modes (discussed in further detail in Section 5.3.2). Therefore, the following findings should be treated with caution.

5.3 Safety of rental e-scooters

5.3.1 Collisions

5.3.1.1 Frequency of collisions

Across the trial areas included in the user survey, five percent of respondents said that they had experienced a collision in the last 12 months (313 cases)[81]. Less experienced users reported experiencing the majority of e-scooter collisions: 72% of users who experienced a collision on their most recent trip had used an e-scooter fewer than five times.

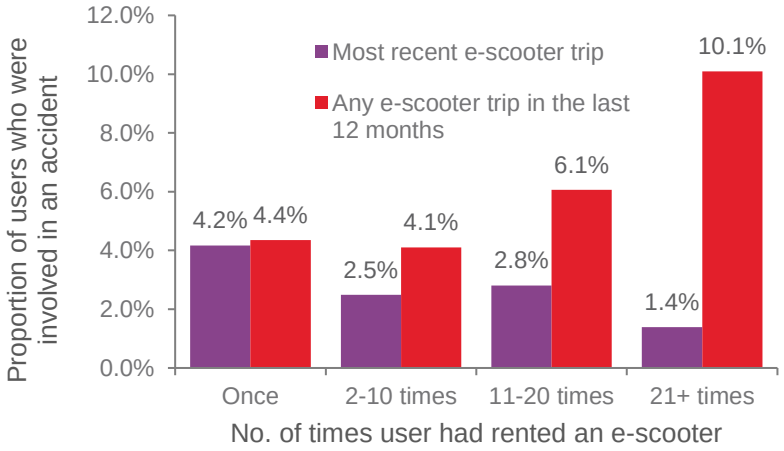
Between Wave 1 and Wave 2, the proportion of e-scooter users who reported experiencing a collision in the last 12 months increased from four percent to six percent. Over half (57% - 179 cases) of those who reported experiencing a collision had one on their most recent trip: this fell from 69% at Wave 1 to 50% at Wave 2. This is unsurprising, given the trend over time of the user base shifting towards more experienced riders.

Figure 30 shows that first-time renters were roughly three times more likely to report having a collision on their most recent trip, when compared to experienced users who had rented an e-scooter more than 20 times. Of those who had only used an e-scooter once, 4.2% reported a collision on their most recent trip, compared to 1.4% of those who had rented an e-scooter more than 20 times. Overall, 38% of those who reported experiencing

[81] Due to ethical considerations, operators were asked to remove from the sample of users to be surveyed any user known to have died or suffered serious injury requiring hospitalisation while using an e-scooter. In total, 11 users were removed from three operators out of a sample of over 50,000 users contacted to fill in the survey. Given that the number of cases removed from the sample for this reason was very low, estimates provided in this report relating to the risk of e-scooter accidents are considered to be unaffected.

a collision on their most recent trip were first-time users, and 72% had rented an e-scooter less than five times. This highlights the role of experience and training in improving users' safety and confidence.

Figure 30: Proportion of users who reported experiencing a collision, on any trip and on their most recent trip (source: user survey, waves 1 and 2 combined)



"In the last 12 months, have you been in any type of accident when renting an e-scooter, no matter how minor?"
"Were you involved in any type of accident when you last rented an e-scooter, no matter how minor?"

Base: all adults who used a rental e-scooter in UK trial areas, once (1,653), 2-10 times (3,289), 11-20 times (676), 21+ times (644).

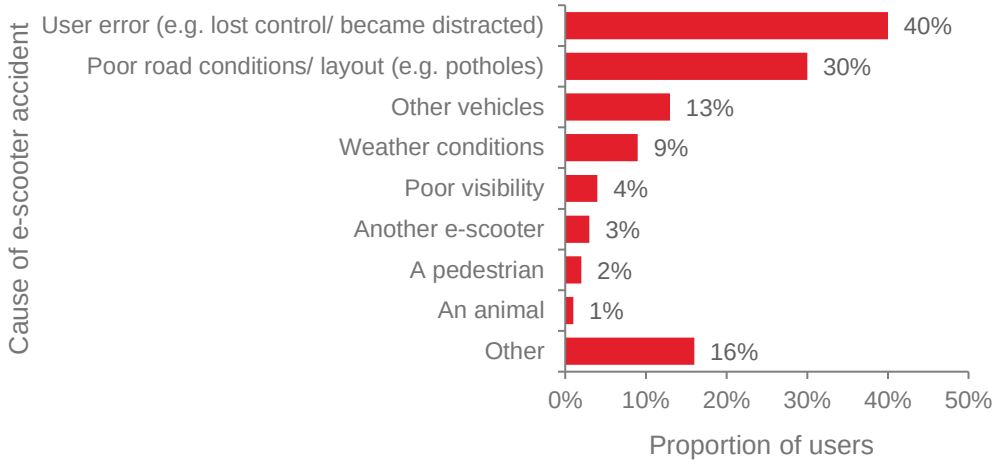
Women were more likely to report having experienced a collision than men: six percent of women said that they had a collision on their most recent trip, compared to one percent of men. Although women had, on average, rented e-scooters fewer times than men, this difference in experience levels does not fully account for the difference in likelihood to report a collision.

5.3.1.2 Types of collisions

Typically, e-scooter collisions reported in the user survey did not involve other road users. Eighty-two percent of those who reported being involved in a collision in the last 12 months said that no other vehicles or pedestrians were involved, and only nine percent said a car was involved.

Most e-scooter collisions were perceived to be either the result of user error (40%) or features of the road such as the layout or the quality of the road surface (30%), according to users (Figure 31).

Figure 31: Causes of e-scooter collisions as reported by users (source: user survey, wave 2)



"What was the cause of the accident, if known?"

Base: All users of rental e-scooters in trial schemes who experienced an accident (234).

Resident survey respondents who reported that they had been in a collision involving an e-scooter were also asked what they thought contributed to it. The results showed a similar picture to the user survey findings: in 35% of cases the cause was perceived to be dangerous or reckless e-scooter riding, in 34% of cases the cause was perceived to be weather conditions, and in 32% of cases the condition of the street was identified as a cause, whilst other road users were perceived to be a cause in 22% of cases.[82]

Some users who reported experiencing a collision (16%) selected "other" when asked what had contributed to it (Figure 31). These respondents described the causes in their own words[83], and a range of themes emerged:

- Issues with the design or state of rental e-scooters, which included brakes not working, being unable to turn off the accelerator, power failures, and unsuitable phone holders leading to phones falling out.
- The way geofenced e-scooters behaved: both sudden loss and sudden returns of power.
- Finding e-scooters unstable or falling after using an arm to indicate when turning.
- Slippery road surfaces in the rain, including drain covers.

E-scooter users who took part in interviews and focus groups considered user error and external circumstances to be common causes of collisions. Users mentioned **errors** such as misjudging the area being ridden, including the sharpness of a turn or the height of a curb. Misuse was also mentioned and encompassed speeding, riding while intoxicated, not paying attention to surroundings, and riding too close to other road or pavement users. Irresponsible riding, such as doing tricks or "messing around", were also mentioned.

> *"I was just driving with two friends behind me and I was trying to do silly tricks on it, and then I fell, and then I had a few scratches … and a few bruises."*
> *(E-scooter user, West Midlands, Male, 16-34, Wave 2)*

[82] These results were based on the small survey base of 157 residents who had been in a collision.
[83] Note that the causes of the collisions are reported as perceived by users and no collision investigation was undertaken.

Examples of collisions related to **external circumstances** included hitting a stone or sliding over wet leaves. Users expressed concern that collisions may increase in the colder months as riding surfaces become more slippery.

Collisions with road users who were unaware of passing e-scooters were also reported, for example when car doors were opened.

Residents also cited user behaviour and external circumstances as perceived causes of collisions and near misses. They reported experiencing near misses with e-scooters on the roads, such as having to swerve to avoid e-scooters undertaking, close-passing or riding along the inside of the lane. This was perceived to be exacerbated by external circumstances such as a lack of visibility of users, especially at night or when residents were driving a large vehicle.

Among blind and partially sighted residents, experiences of collisions or near misses were thought to have been caused by users' lack of spatial awareness, lack of attention and misuse.

"I didn't hear it, I didn't see it, it came from behind us. It made me jump … they came really close. It made my hair fly about in the wind because they were going fast"
(Resident, Essex, female, 16-34, blind/partially sighted, Wave 1)

5.3.2 Estimated casualty rates

A casualty is defined as any person killed or injured in a collision[84]. This may include other road and pavement users involved in e-scooter collisions, in addition to e-scooter users. There were two fatalities associated with the trial schemes at the time of this report, therefore the rental e-scooter casualty rate predominantly reports on casualties resulting in an injury.

The Department for Transport collects road casualty data through the STATS19 reporting system[85] and has published official statistics on e-scooter casualties[86]. This data has been used here to estimate a rental e-scooter casualty rate covering six trial areas (where the police distinguished between trial and private e-scooters in their reporting – listed below). This estimate has then been compared against the STATS19 casualty rate for bicycles for 2021 (also referred to as pedal cycles) [84].

The comparison with pedal cycles is indicative as the differences in the data collection methods, differences in the geography of the data sources and differences in context between the modes mean that the results are not directly comparable. For example, e-scooters are a new mode and hence even those who use them frequently will be far less experienced in travelling on that mode compared to other established modes. Therefore, these findings should be taken with caution.

The key characteristics of this STATS19 data source in relation to e-scooters used in this evaluation are summarised below:

---

[84] DfT (2021), Reported road casualties in Great Britain: notes, definitions, symbols and conventions
[85] The STATS19 database is a collection of all road traffic accidents that resulted in a personal injury and were reported to the police within 30 days of the accident.
[86] DfT (2021), Reported road casualties Great Britain: e-Scooter factsheet 2021 - GOV.UK (www.gov.uk) Note: calculations were based on unpublished underlying data which is related to the published data.

- Includes all e-scooter casualties reported by the police in 2021 supplied to DfT by police forces as part of annual STATS19 returns.
- Includes data from six large trial areas – Liverpool (Merseyside Police), WECA (Avon and Somerset Police), North Northamptonshire (Northamptonshire Police), Nottingham (Nottingham Police), Hampshire (Hampshire Constabulary) and Dorset (Dorset Police), where police have coded trial and private e-scooters in sufficient numbers.
- For Merseyside, Nottingham and Northamptonshire, all casualties are identified as trial or private scooter users (and all but one in Dorset)
- For WECA, Dorset and Hampshire there are some records where scooter type is unknown - these have been apportioned pro-rata to the known records
- E-scooter reporting in STATS19 relies on the police capturing that the collision involved an e-scooter in the "open text box" as there is currently no "e-scooter" category in the selection modes (so they are included in "other vehicles").
- Covers deaths and injuries of all severities.

The calculation of a casualty rate based on user survey data was discarded for a number of reasons:

- The sample from the user survey was relatively small in comparison to the total number of rental e-scooter users and therefore results were sensitive to small changes. The number of trips captured in the user survey represented a small sample (trips made by a small proportion of users out of total trial users). As a result, in the user survey just one collision reported would lead to a high rate. Therefore, the sensitivity of the results could make comparisons with casualty rates for other modes misleading.
- The STATS19 data only included collisions which were reported to the police. Therefore, it was likely that this did not cover all casualties on the roads, such as those resulting in minor injuries or single vehicle collisions[87]. In contrast, the user survey included all self-reported e-scooter collisions, including minor incidents and single vehicle collisions. The differences in coverage could have made comparisons between these sources misleading. While the user survey collision data could be filtered by severity of injury to improve comparability, the small base size would have made the results highly sensitive (see bullet point above). It is also likely that single vehicle collisions are underreported even in the case of severe injuries in STATS19.
- The base of e-scooter users includes a high proportion of new and less experienced riders. As shown in section 5.3.1.2, these users were more likely to self-report a collision.

The provisional casualty rate estimated for rental e-scooters based on STATS19 analysis of casualty data in six trial areas was approximately 13 casualties per million miles. More details on how this rate was estimated can be found in the separate technical report. When compared to the casualty rate for pedal cycles from STATS19 (2021[88]), the provisional casualty rate estimate for rental e-scooters is about three times higher.

[87] Hospital, survey and insurance compensation claims data all indicate a higher number of casualties than those reported in police accident data. This relates to casualties of all road user types. See section on "Strengths and weaknesses" in DfT (2021), Reported road casualties 2020.
[88] DfT Reported road casualties Great Britain, annual report: 2021 - GOV.UK (www.gov.uk)

Table 8: Casualty rates - rental e-scooters and pedal cycles (source: STATS19, DfT)

Mode	Rental e-scooters (provisional estimate based on STATS19)	Pedal cycles (DfT, 2021)
Casualty rate (casualties per million miles)	13	3.9

E-scooters' status as a relatively new mode at the time of this analysis may have contributed to the higher casualty rate estimates; particularly as new users were more likely to experience a collision, according to analysis of the user survey data.

Based on data collected at Liverpool hospitals for both rental e-scooters and cyclists, a study from Liverpool University Hospital[89] concluded that the rates of musculoskeletal injuries caused by rental e-scooter collisions were comparable to rates of injuries sustained on bicycle collisions. This indicates that the difference in casualty rates compared to bicycles might not be as large as suggested by the STATS19 comparison above, or it could reflect undercounting in the estimate of pedal cycle traffic for small areas which could be less robust due to the estimation methodology used. The rate generated through the Liverpool study is not directly comparable with rates calculated for other modes via STATS19 owing to methodological differences in the data collection[90].

5.3.2.1 Other studies

The Parliamentary Advisory Council for Transport Safety (PACTS)[91] 2022 study collected and analysed data on private e-scooter use based on media reports, collision reports from the police and insurance claims, though the data collected did identify some casualties involving trial scooters. The study found that:

- About 750,000 private e-scooters may be in use in the UK.
- There have been 15 deaths to date involving private e-scooters.
- There were a large number of single vehicle collisions involving private e-scooters.
- Instabilities caused by an e-scooter's design pose a risk to riders.
- The use of private e-scooters has led to serious injuries and risks harming efforts by rental operators and local authorities trying to provide a safe, low-carbon mobility option.

It was difficult to generalise these findings to rental e-scooters, as private e-scooters are much more prevalent[92] and are built to a wide range of different design specifications, often to lower standards in comparison to rental e-scooters.

[89] Bodansky et al (2022), Legalisation of e-scooters in the UK: the injury rate and pattern is similar to those of bicycles in an inner city metropolitan area. Public Health, Volume 206, P.15-19

[90] For example, this study was based on all injuries by patients at a major trauma centre covering the whole of the Liverpool rideshare trial site presenting with e-scooter and bicycle musculoskeletal injuries, therefore excludes other types of casualties.

[91] PACTS (2022), The safety of private e-scooters in the UK – Final Report.

[92] This is indicated by comparing the number of rental e-scooters available across trial areas and the estimated number of private e-scooters owned across the country based on data from the DfT Technology tracker. DfT (2021), Transport and transport technology: public attitudes tracker

High-level collision and casualty rates have been reported in a number of papers or public evaluations oversees[93], although only a limited number of robust studies specifically on e-scooter collision or casualty rates have been carried out. Whilst it is challenging to draw comparisons on a consistent basis with different metrics and definitions used across different studies, these can still often provide helpful context.

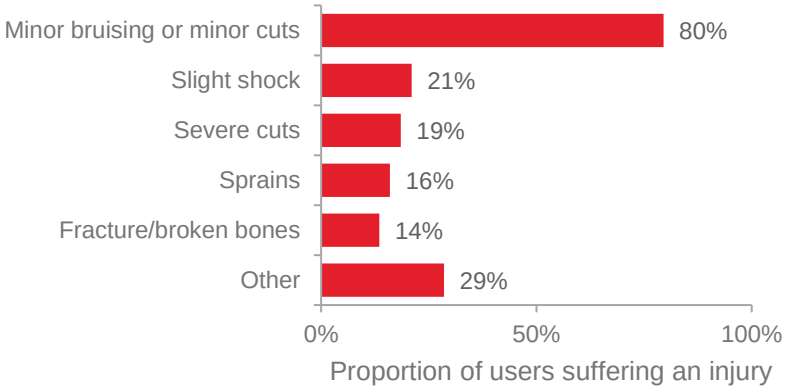
5.3.3 Injuries

Three hundred and thirteen user survey respondents (five percent) reported experiencing at least one collision in the last 12 months (a total of 374 collisions), of whom 196 reported experiencing at least one injury (a total of 226 injuries). According to the user survey, most e-scooter collisions led to injuries (63%) for the riders, although these were typically minor injuries.

Because only a small number of e-scooter collisions reported by users involved other vehicles or pedestrians (see Section 5.3.1.2), there were very few reported cases in which anyone other than the e-scooter user was injured.

As shown in Figure 32, most injuries were relatively minor: 80% of users who were injured said that they sustained minor bruising or minor cuts, and for 47% of users this was the *only* injury they sustained. "Other" (less common) injuries included concussion, whiplash, internal injuries, burns, severe shock and crushing[94]. Seventy percent of users who had experienced an injury did not receive any medical attention, although 15% reported having attended Accident and Emergency (Figure 34).

Figure 32: Severity of injuries experienced by e-scooter users (source: user survey)



"What type of injuries did you have?"

Base: all users of rental e-scooters in trial areas who were injured in an e-scooter accident (200).

Evidence from other UK studies provided insight into the more common types of injury likely to result from an e-scooter collision. For example, the previously mentioned study by

[93] Including, among others:
- City of Atlanta. 2019. Atlanta's e-scooter experience: Georgia Senate Study Committee. October 2019
- City of Adelaide. 2019. E-scooter trial and the challenges of their introduction. IPWEA SA State Conference. 31 May 2019
- Multnomah County Health Department. 2019. Scooter-related injuries in Multnomah County in July – November 2018. Environmental Health Services
- Bekhit M., Le Fevre J. Bergin C. 2020. Regional healthcare costs and burden of injury associated with electric scooters in Auckland. *Injury*. Eb 51(2):271-277

[94] Separate percentages are not reported here due to the low numbers of respondents who reported these types of injuries.

the Liverpool University Hospitals[95], based on both private and rental e-scooters, also showed that e-scooters were more likely to result in upper limb (arm and hand) injuries than lower limb (leg and foot) injuries. This conclusion was supported by a study based on data from orthopaedic injuries associated with private e-scooter collisions, recorded at three hospitals in London between 1 March and 30 November 2020, which also showed a slightly higher proportion of upper limb injuries (56%) compared to lower limb injuries (42%)[96]. Lastly, a service evaluation that examined the impact of e-scooters on Emergency Departments (ED) in Bristol[97] found that head, upper limbs and lower limbs were commonly injured areas, and fractures were diagnosed in 41% of patients.

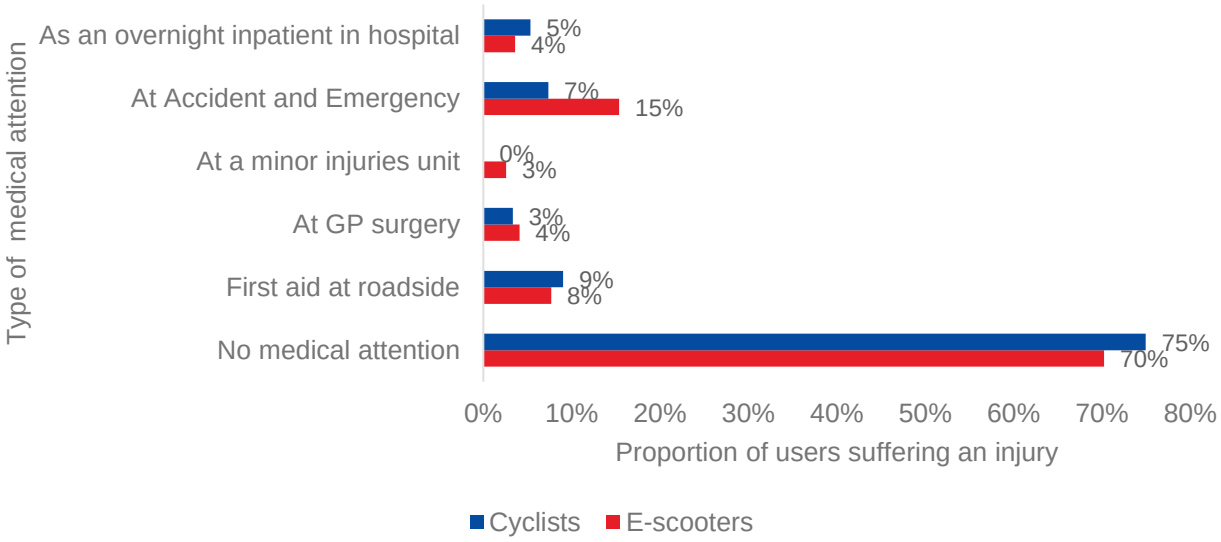
5.3.3.1 Comparison with other modes

The types of injuries reported by e-scooter users in the user survey were broadly similar to the types of injuries reported by cyclists, according to DfT analysis of the NTS (2020). For example, 75% of cycling collisions reported in the NTS resulted in minor bruising or cuts in comparison with 80% of e-scooter collisions reported in the user survey; 24% of cycling collisions and 19% of e-scooter collisions led to severe cuts, and 29% of cycling collisions and 14% of e-scooter collisions led to fractured or broken bones. It is worth noting that both the sample from the NTS for cyclists and the sample of rental e-scooter users reporting an injury in the user survey were small and so these comparisons should be interpreted with caution.

E-scooter collisions were broadly comparable with cycling collisions in terms of the type of medical attention received, according to the user survey and DfT analysis of the NTS (2020), as shown in Figure 33 below.

[95] Bodansky et al (2022), Legalisation of e-scooters in the UK: the injury rate and pattern is similar to those of bicycles in an inner city metropolitan area. Public Health, Volume 206, P.15-19
[96] NJM Dela Cruz, C Morgan, RV Morgan, S Tanna, C Talwar, R Dattani, KM Sarraf, CER Gibbons (2022), Injury patterns of e-scooter-related orthopaedic trauma in central London: a multicentre study. Royal College of Surgeons of England, Annals. Volume 104, Issue 3.
[97] S. Quandil, T. Roberts, T. Dickinson, C. Robinson, M. Watkins, E. Aubrey, E. Dulac, H. Willis, A. Lockyer, M. Lyttle, E. Carlton. (2021). A service evaluation of the impact of e-scooters on emergency departments in Bristol (The SEED Study)

Figure 33: Comparison of proportion of collisions by medical attention received, by mode[98] (Source: user survey and DfT analysis of NTS 2020)



"As a result of your injuries, did you receive any medical attention at any time following the accident?"

Base: Users reporting an accident in their last journey across Waves 1 and 2 (195)

5.3.4 Fatalities

In total, two fatalities related to the e-scooter trials have been recorded at the time of writing this report[99]. Both fatalities occurred in the Northampton e-scooter trial. The first, in October 2020, was recorded by the coroner as an accidental death. The second was in December 2021 and the inquest has yet to take place at the time of writing this report.

5.4 Feelings of safety by users

5.4.1 Knowledge and confidence

According to the user survey, most riders felt confident on e-scooters, and became more confident with experience.

Eighty-eight percent of users reported feeling either confident or very confident riding an e-scooter, in Wave 1 of the user survey[100]. Men were more likely to feel confident than women: 62% felt very confident, compared to 31%. Users' confidence generally increased over time, especially for those who used e-scooters more often. In Wave 2 of the survey, users were asked if their confidence riding an e-scooter changed at all since the first time they rented an e-scooter. The majority (81%) said their confidence had increased greatly or slightly.

[98] Note inpatient in hospital included overnight hospitalisation.
[99] Based on operator reports to the Department for Transport.
[100] This question was not asked at Wave 2.

Similarly, 87% of users agreed they had the knowledge to ride an e-scooter safely. There was no change here between Wave 1 and Wave 2. More experienced users were more likely to agree they had the knowledge to ride safely compared to less experienced users.

These findings were confirmed by the qualitative user interviews. For some, having used an e-scooter elsewhere, such as on holiday abroad, instilled confidence from the outset. Gaining experience and practice over time was also reported to have increased users' confidence and ability to control the e-scooter, to manage speed and to perform manoeuvres.

> *"The more you use it, the easier you find it, and I'm now, when I first started, I found it's difficult to indicate or press the horn, and concentrate on the road, but now it comes naturally."*
> *(E-scooter user, WECA, Female, 35-54, Wave 2)*

Nevertheless, there were instances of confidence being knocked due to negative interactions with other road users, including collisions and near misses, or in certain situations such as wet or icy weather conditions.

5.4.2 Feelings of safety among e-scooter users

5.4.2.1 Feelings of safety riding an e-scooter

The majority (79%) of users felt fairly safe or very safe the last time they used a rental e-scooter, with only 12% feeling fairly or very unsafe. More experienced users felt safer when riding an e-scooter: 89% of users who rented an e-scooter more than 20 times felt very safe or fairly safe, compared to 66% of one-time users. E-scooter users were more likely to feel fairly or very safe if they had not previously reported being involved in a collision, or if they had received training. Just 54% of e-scooter users who reported experiencing a collision in the past felt fairly or very safe during their last trip, compared to 80% of users who did not report experiencing a collision.

User survey findings suggested that those who reported a collision were often put off renting an e-scooter again. Thirty-nine percent of those who reported experiencing a collision on their last ride did not expect to rent one in the future, compared to just six percent of those who did not experience a collision on their last ride.

A range of factors affecting perceptions of e-scooter safety were identified through the qualitative interviews and focus groups with users. These findings indicate that there may be changes to e-scooter design and to road quality and infrastructure that could improve feelings of safety.

Regarding **e-scooter design**, users said the visibility of rental e-scooters – the bright colour and lights – made them feel safer because they felt visible to other traffic and could see where they were going. However, the lights were not felt to be bright enough in poor weather and on unlit roads at night. While audibility appeared to be less of a concern for users than visibility, a louder bell or continuous noise were suggested as more conspicuous ways of avoiding collisions.

Wheel size, suspension and stability also affected perceptions of safety. For example, small wheels were said by users to make the e-scooter feel more likely to topple, and the view that suspension could be improved was widespread. Mirrors were also suggested to enable users to see who was approaching from behind. Participants reported that the large

standing platform and high-quality grip contributed to feelings of safety, as did the controlled speeds and perceived ease of braking. In contrast, some participants reported that the ability to accelerate too quickly and abrupt slowing down or stopping on geofencing boundaries reduced feelings of safety.

Users (as well as residents and stakeholders) agreed that **regulations** such as speed limits and rules against pavement riding were important for protecting the safety of users and residents. However, these regulations were also thought to put riders at risk from other road users who could travel faster, and against whom e-scooter users felt vulnerable. Views of regulations are discussed further in Section 5.6.5.

Experiences of collisions or near misses or hearing about e-scooter collisions in the news tended to decrease feelings of safety among user interview respondents. E-scooter users also described feeling vulnerable due to the behaviour of people driving cars and goods vehicles, who they felt could sometimes drive inconsiderately and pose a risk due to the size and power of their vehicles. Participants who were interviewed at Wave 2 nonetheless reported that interactions had improved as other road users grew more accustomed to sharing space with e-scooters.

Related to the above, users reported improvements in **their own capabilities** which improved feelings of safety. This included: developing their skills in safer riding such as slowing down when turning corners, being more vigilant and cautious and sticking close to the kerb when on the road. Having knowledge and experience of the Highway Code, knowing the local area and chosen route, opting for quieter roads or cycle lanes, and increased familiarisation with the location of no-ride zones, were also reported to increase users' feelings of safety.

Across trial areas, users expressed the view that the **infrastructure and quality of roads** needed to be of a higher standard to ensure safety for e-scooter riders, and that current provision was inadequate. The lack of segregated lanes away from other vehicles was a key reason users gave for feeling unsafe on an e-scooter. Users said they felt safer when in cycle lanes since they provided some separation and tended to be better surfaced than roads with fewer potholes. In contrast, poorly maintained roads, including those with a lack of road markings, made users feel less safe. However, in some cases, cycle lanes decreased feelings of safety where they were crowded and cyclists were perceived to ride "aggressively".

> *"[In] my local area, the cycle lanes that there are very rough road surfaces, so it feels very juddery…so that feels a bit frightening, to be so juddered. There's a lot of competition for cyclists, cycling lanes, so some cyclists are very aggressive the way they cycle."*
> *(E-scooter user, London, Female, 35-54, Wave 2)*

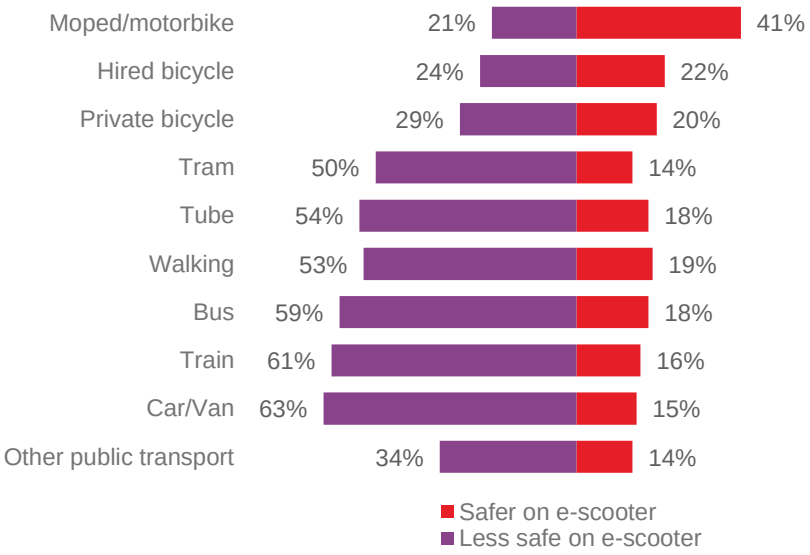
5.4.2.2 Feelings of safety compared with other modes

Although most users reported feeling safe on e-scooters, the majority also considered them less safe than all other modes of transport, with the exception of mopeds and motorcycles (Figure 34).

As shown in Figure 34, e-scooters were generally viewed as slightly less safe than cycling. Among users who took part in the qualitative research, similarities between bicycles and e-scooters in terms of vulnerability and protection were noted, with pros and cons given for each. While e-scooters could be seen as sturdier and easier to manoeuvre around people, some users felt less stable and less in control on an e-scooter in comparison to a bicycle.

This variation in views centred on differences between the two modes in relation to wheel size, control and acceleration, visibility, balance and stability; issues that were also highlighted in the general feedback on e-scooter design above.

Figure 34: User safety on an e-scooter compared to other modes of transport (source: user survey, wave 2)



"Do you feel more or less safe on an e-scooter compared to these other modes of transport? Please think about physical safety rather than safety in relation to Covid-19."

Bases: All users of rental e-scooters in trial areas, moped/motorbike (4081), hired bicycle (4083), private bicycle (4083), tram (4075), tube (4081), walking (4084), bus (4086), train (4085), car/van (4088), other public transport (4065).

5.4.2.3 Dismounting from an e-scooter

According to the Wave 2 survey[101], almost a quarter (23%) of riders had dismounted from an e-scooter during their last journey because they felt unsafe. Less experienced users, women, users who experienced a collision in the last 12 months, users who had not received any training, and users who reported a physical or mental health condition, were more likely to have dismounted their e-scooter for safety reasons during their last trip than their counterparts.

Users were asked what made them feel the need to dismount and could select multiple options. Sixty-nine percent cited other road users, such as avoiding busy traffic, pedestrians, cyclists, or e-scooter users, or because of the behaviour of other road users. Sixty-seven percent cited features of the road, such as needing to cross a large junction, a poor-quality road surface or a hill. Fifty-eight percent cited their own competence or riding, such as lacking confidence, finding it hard to balance, or not wearing a helmet. Less experienced users were much more likely to cite their own competence or riding than more experienced users.

5.5 Feelings of safety by residents

5.5.1 Perceptions of safety among residents

Residents were asked about whether they felt safe around e-scooters when using roads (as a driver or cyclist) and pavements (as a pedestrian). It should be noted that 13% of residents reported they had only ever seen private e-scooters and 18% reported that they

[101] This question was not asked at Wave 1.

were unable to tell the difference between rental and private e-scooters, so the views presented here may conflate perceptions and experiences of both private and rental e-scooters. Across the trial areas, 13% of residents reported that they had witnessed a collision involving an e-scooter.

Resident survey findings indicate that, generally, only a minority of residents felt consistently safe around e-scooters. E-scooters were perceived as more of a safety risk than both bicycles and e-bikes, by pedestrians, drivers, and cyclists. Whilst safety concerns appeared to lessen between Wave 1 and Wave 2 among younger respondents, older respondents continued to report feeling unsafe around e-scooters on both roads and pavements. This indicated that further measures are required to ensure that all road and pavement users can feel comfortable travelling in their area alongside e-scooters (these are explored in Section 5.4.3).

Almost half of resident survey respondents felt that people riding e-scooters were not respectful of pedestrians (40%) and/or rode in a way that was unsafe for other pavement users all or most of the time (43%). Similarly, almost half (48%) of residents reported that people riding e-scooters travelled too fast all or most of the time[102]. These negative experiences increased with age: 64% of residents aged 55+ reported never or rarely feeling safe on the pavement around e-scooters, compared to 22% of residents aged 18-34.

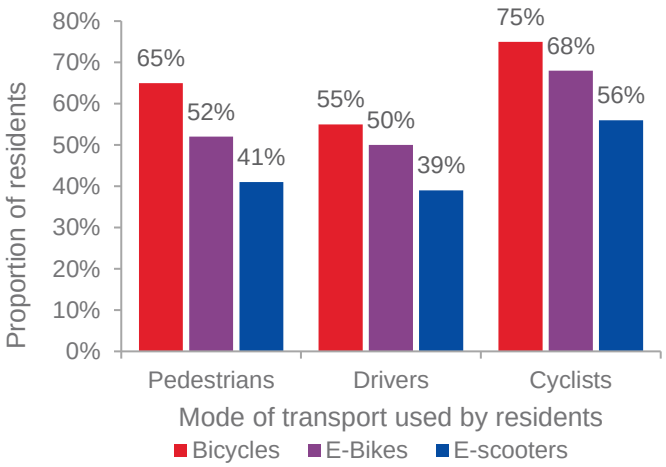
Residents with disabilities and those who used mobility aids were no less likely to report feeling safe around e-scooters than those without. In addition, residents with a disability were more likely to report feeling safer at the time of the Wave 2 resident survey (October and November 2021) than when the trials started, compared to those without a disability (36%, compared to 27% of those without). The in-depth interviews with residents who were blind or partially sighted suggested that the actions of operators in response to complaints and concerns may have contributed to improved feelings of safety over time (and is discussed further in Section 5.5.3).

5.5.2 Other road and pavement users

Within the resident survey, those who identified themselves as pedestrians, drivers and cyclists were asked how safe they felt when using that mode of transport around e-scooters, bicycles and e-bikes (Figure 35). All three resident groups felt safest around bicycles and least safe around e-scooters. Older people were less likely to feel safe around e-scooters than younger people.

[102] There was little change in attitudes between Wave 1 and Wave 2

Figure 35: Whether felt very or fairly safe around bicycles, e-bikes and e-scooters, by mode of transport (residents survey)



"When you are walking / driving a car / riding a bike around your local area, how safe or unsafe do you generally feel with e-scooters around?

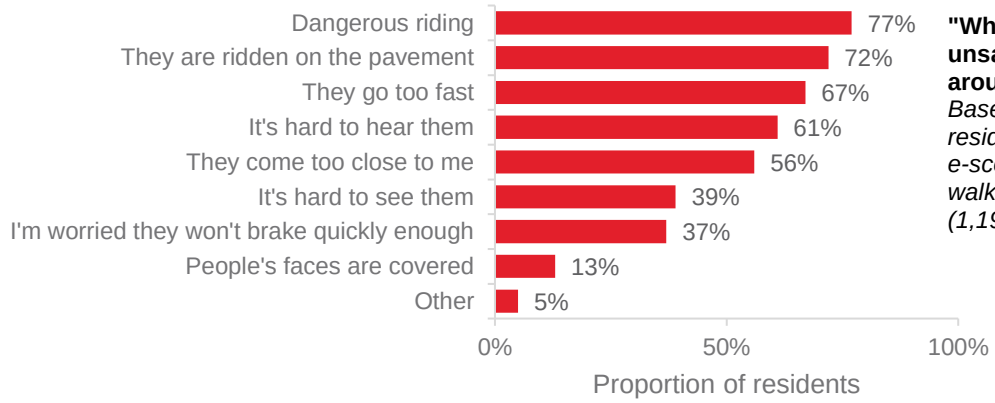
*Base: **Pedestrians**: All adult trial area residents who said they walked in the last 12 months (2,291); **Drivers**: All adult trial area residents who said they drove a car in the last 12 months (1,896); **Cyclists**: All adult trial area residents who said they rode a bike in the last 12 months (984).*

5.5.3 Factors affecting feelings of safety around e-scooters

Residents who reported feeling unsafe around e-scooters were asked what made them feel unsafe and what would make them feel safer. The most commonly cited reasons for feeling unsafe were aspects of dangerous riding, including ignoring traffic lights (77%), riding on pavements (72%), and speed (67%) (Figure 36).

Concerns around audibility and visibility, as well as safety measures like helmet use, were secondary to concerns around user behaviour, but still widely shared by residents who participated in the survey. Road users who took part in the qualitative research, including those driving large and heavy vehicles, expressed concern about the visibility of rental e-scooters, particularly in the dark, despite the bright colours and lights. For pedestrians with hearing and/or sight loss, e-scooters being quiet affected feelings of safety because they could not hear them approaching. These findings indicate a desire for more thorough implementation of e-scooter rules and regulations, as well as consideration of what additional safety and visibility measures could be introduced.

Figure 36: What makes residents feel unsafe when walking, driving or cycling with e-scooters around (resident survey)



5.6 Factors affecting safety

5.6.1 Use of helmets

Wearing a helmet was uncommon, with less than one in four (22%) e-scooter users reporting they wore a helmet the last time they rented an e-scooter. When asked how often, if at all, they wore a helmet, most users (70%) said rarely or never, whereas only 23% said usually or always. In Wave 2, 16% of users reported using their own helmet or one borrowed from friends or family, and six percent reported using a helmet provided by the e-scooter rental company[103].

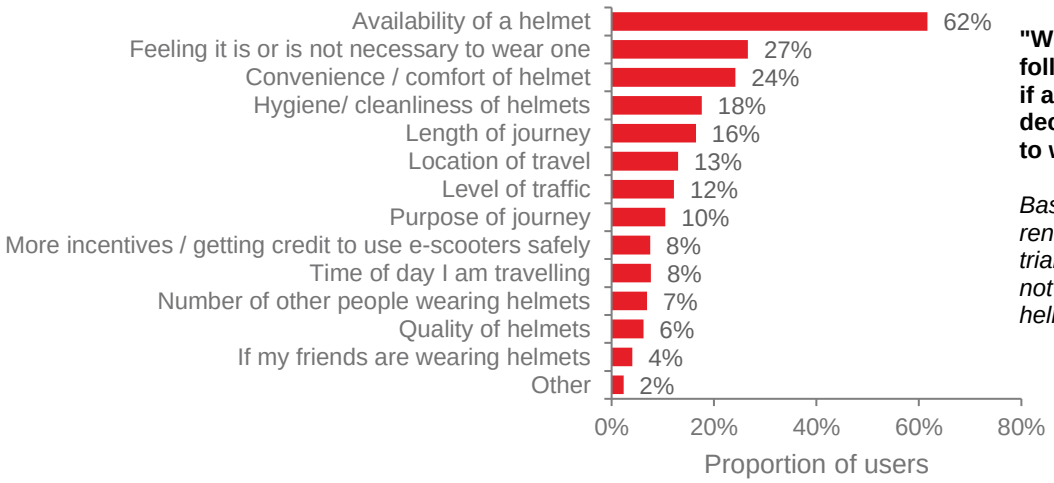
Helmets were provided with all rental e-scooters in Newcastle and York, but not in any other trial areas where the user survey was undertaken[104]. Elsewhere, users were only able to use a helmet if they had their own helmet with them. A larger number of users in Newcastle (58%) and York (36%) wore a helmet on their most recent journey compared to other areas, suggesting that provision of a helmet with the vehicle can significantly increase use. While in Newcastle helmets were provided by being attached to the vehicle in a way that is visible to the user, in York helmets were provided in a box attached to the vehicle. The method of provision of the helmet may partly explain the difference in the number wearing them across the two cities.

Users were asked about the reasons that affected their decision to wear a helmet (Figure 37). Besides the availability of helmets (62%), other reasons included feeling it is or it is not necessary to wear one (27%) and convenience or comfort (24%).

Interview participants in Newcastle said that they used a helmet simply because it was provided and, for some, its presence gave them the impression that this was a rule. Some respondents who were also cyclists said that they wore a helmet on e-scooters since they had one anyway, though if the e-scooter journey was unplanned they would not necessarily have a helmet with them.

[103] This question was asked differently at Wave 1, so only Wave 2 is reported.
[104] Helmets were also provided in Sunderland and Slough, but these areas were not surveyed as part of the evaluation.

Figure 37: What reasons affect users' decision whether to wear a helmet (source: user survey, wave 2)



The user interviews and focus groups revealed that, in addition to helmet availability, social norms and the perception that no one else wore a helmet were important influences on helmet use. This was especially the case where participants had rented an e-scooter alongside friends and felt "peer pressure" to fit in. Whilst feelings of vulnerability led some to wear a helmet, others reported feeling safe and did not think it was necessary, since they had not experienced any collisions or near misses and felt the speed limits were sufficient to keep them safe.

There were examples in the Wave 2 qualitative research of helmet use changing over time, with some users adopting them whilst others abandoning them. Reasons why participants had started wearing a helmet included feeling unsafe on the roads and receiving an (incorrect) warning from the police that helmets were mandatory. Conversely, users who wore helmets less often over time had become more experienced and confident e-scooter riders and did not feel the need for a helmet.

> *"I sometimes use a helmet, I sometimes don't. I think certainly, when you're more new to the scooter game, I think it's more beneficial and possibly, the benefits decrease slightly as you become more used to it."*
>
> *(E-scooter user, WECA, Male, 16-34, Wave 2)*

Where users were considering wearing a helmet in the future, this was commonly linked to having experienced a collision or to COVID-19 changes, whereby, users expected to be less concerned about hygiene related to the use of shared helmets, and for the roads to become more dangerous as COVID-19 travel restrictions eased.

5.6.2 Views on mandating helmet use

The majority of resident survey respondents (75%) agreed e-scooter users should be required by law to wear a helmet, with only seven percent of residents disagreeing. Residents who had used an e-scooter were less likely to be in favour of mandatory helmet use, compared to those who had not, although a majority of them (65%) still agreed.

However, in the Wave 2 user survey, over half of e-scooter users (56%) reported that mandating helmet use would make them use e-scooters less often.

National and local stakeholders in case study areas considered helmets to be important in protecting against serious injury to the head. National stakeholders did not always have a

clear position regarding whether they should be legally mandated or remain discretionary. Considerations which affected stakeholders' views included the perceived trade-offs between safety and uptake, and the extent to which helmet use was the user's choice and responsibility. It was also noted that there was the potential for confusion given that cyclists are not legally required to wear helmets.

Local stakeholders described a range of steps that operators had taken to encourage helmet use including providing free helmets, financial incentives, and in-app messaging. Despite this, low rates of helmet use remained an ongoing concern for some local stakeholders.

5.6.3 Impact of training

The proportion of e-scooter users who reported having received some form of training increased from 44% at Wave 1 to 63% at Wave 2. In the Wave 2 survey, almost all (92%) users who had received training reported that they received training from the rental operator online, whilst 10% had received training from a friend or family member. Among interviewed participants, users who found the online training useful cited its ease and speed. Training was reported as covering how to use the rental service (e.g. payment, parking), how to ride the e-scooter (e.g. accelerating, braking), and the rules and restrictions around use. Training topics noted as the most useful included: how to activate the e-scooter, how to pay, and information on restrictions around pavement use.

Consistent with the user survey findings, it was rare for qualitative interview participants to have accessed any further training, such as in-person training courses. The main reason for this was that they felt no need because the e-scooter was easy to use.

Only three percent of users who had undertaken training had received it in-person from the rental operator or another organisation. Interview participants who had experienced in-person training described it as useful for learning to disembark safely and for providing a safe space to practice. Participants who had not taken part in any training provided by the operator said they had chosen not to. Instead, they said they had been taught by family or friends or did their own online research, such as seeking online video tutorials.

Of those who had received training of some kind, 92% felt they had the confidence to ride safely, compared to 79% of those who did not receive any training. Nine percent of users felt that more or better training would make them feel safer.

5.6.3.1 Views and suggestions for improvement of training

Users' suggestions for improving e-scooter training related to both the type and format of training and training topics. One such suggestion was for in-person sessions where users could learn how e-scooters work and test them out before going on the road. Users making this suggestion seemed unaware of in-person training that was often offered by operators, indicating a need for greater awareness-raising about this option.

There was appetite for ongoing training among users. For example, a follow-up knowledge test was suggested to prevent people skipping through the in-app training, as well as reminders and refreshers about new features. Residents agreed with users on the need for user training and testing on an ongoing rather than one-off basis, following an exam or proficiency test for road safety.

Coverage of three key training topics was felt by users to be important. First, turning and handling of corners, since this was felt to be a different experience to turning in other vehicles. Second, training on road rules/awareness, especially for those who are less familiar – such as provisional licence holders. Finally, training on where e-scooters can be ridden which was felt to be an area that could benefit from further clarity.

National and local stakeholders also agreed on the importance of offering training to e-scooter users. One national stakeholder reported working with operators to develop an online training programme on e-scooter use. Police representatives expressed the view that that in-app training was not sufficient because it could be too easily skipped through.

In-person training was thought to be effective because it could be personalised and offered a safe area to practice. However, more work was thought to be needed to encourage take up, such as making it mandatory. One operator suggested that operators and local authorities could benefit from guidance on e-scooter training to make it easier to run e-scooter training courses effectively. They thought this could come in the form of an official national standard for e-scooter training, as well as through guidance from groups such as the Bikeability network.

These findings suggest that training had an important role to play in increasing riders' confidence and safety. In spite of some users' and stakeholders' support for strengthening the training offer, the likely negative impact that making training mandatory could have on e-scooter usage was widely acknowledged by stakeholders.

5.6.4 Users' and residents' suggestions for increasing safety

When asked what would make them feel safer when using a rental e-scooter, two thirds of users (67%) said using a dedicated lane[105], and a similar proportion (65%) said better road conditions or fewer potholes. Users were also asked what the *single most important* factor for safety was, and using a dedicated lane was most commonly selected (27%), followed by better road conditions or fewer potholes (18%). Residents who participated in the qualitative research called for improvements to road layouts for e-scooters, with a recurring view being that more cycle lanes or segregated areas for micromobility were needed both for their own and users' safety.

Twenty-eight percent of users said that wearing a helmet or having better-quality helmets would make them feel safer. A widespread view among residents who participated in the qualitative research, including drivers and cyclists, was that helmets should be mandatory for e-scooter users – as well as cyclists – due to the perceived need for extra protection against serious injury from other road vehicles. Road users and pedestrians also expressed concern about the dangers posed by the speed and acceleration of e-scooters for users.

When residents who had felt unsafe around e-scooters were asked what would make them feel safer, a large proportion mentioned factors to do with enforcement of the laws around e-scooters. Two thirds (66%) said better enforcement of e-scooter rules, and 52% said better enforcement of the age limit. Residents who participated in the qualitative research suggested more enforcement by the police, local authorities, and operators in

[105] Note that it was not specified in the survey whether a dedicated lane would be shared with cycles.

the form of penalties for antisocial behaviour (e.g. riding while intoxicated), and checks that users have a licence.

Resident survey respondents also cited technical improvements and safety measures such as lights (56%), increased use of helmets (50%), license plates (50%), high-vis clothes (47%) and bells (41%)[106]. This was also echoed in the qualitative research, where resident interviewees advocated for improving e-scooter visibility, particularly at night, by ensuring that all e-scooters have lights or reflectors on the front and rear, including an indicator and brake lights. This was a particular concern for road users. Residents with sight loss mentioned that the colour of e-scooters should be high contrast with its surroundings for improved visibility (as the majority of rental e-scooters are). To improve audibility, residents thought e-scooters should have a bell or horn to alert other road or pavement users to their presence, or a constant artificial noise similar to those seen in some electric cars[107].

5.6.5 Users' and residents' views on e-scooter regulation

A small minority (four percent) of resident survey respondents felt that e-scooter use should be illegal. This view was more common amongst older residents: only two percent of those aged 18 to 34 held this view, compared to eight percent of those aged 55+. Other views on regulation focused on age requirements, speed limits, and the need for provisional driving licences.

5.6.5.1 Age requirements

Depending on the trial area, the lower age limit for renting an e-scooter was 16 or 18[108]. Respondents to the Wave 2 user survey were told this, and then asked what they thought the lower age limit should be. Over a third (36%) of users thought the age limit should be higher than 18 years old, 24% felt it should be 18 years old, and 22% felt it should be 16 years old. Views were similar amongst residents. Users who took part in interviews did not explicitly express support for an age requirement of above 18 years. However, some users and residents believed age was not as important as having a full driving licence or some form of training. Among those who supported an age limit ranging between 16 and 18, this was due to doubts that younger riders would be capable of riding competently or responsibly.

> *"They're not mature enough to understand the impact that their actions could have on others. You have to be 18 to drink. You have to be 18 to do a lot of things here. I don't see why this should be different."*
>
> *(E-scooter user, WECA, Female, 16-34, Wave 2)*

Among local stakeholders there was widespread support for an age requirement of 18 years or over for e-scooter use. Operators interviewed in the five case study areas explained that they had set this as their age policy across the trial areas that they covered. This was as a safety precaution, especially as younger users were viewed as less likely to understand road regulations, and for some operators it was set as an insurance requirement.

---

[106] Some of these features, such as lights and bells, are already required in the specification of rental e-scooter vehicles, and some of these comments may therefore relate to private use.
[107] At the time of writing, audible alerts were due to be trialled by some operators, for example Tier in London.
[108] The minimum legal age to ride a rental e-scooter specified by DfT is 16, but areas may choose to introduce a higher minimum age.

Both local stakeholders and e-scooter users cited anecdotal evidence of underage riding, which was presumed to have resulted from e-scooters being shared by of-age users or drivers' licences being shared, stolen or faked. Underage riding was thought to be more pronounced in areas with high levels of deprivation and existing issues with crime and antisocial behaviour. However, police in one area noted that the licence verification process had been improved to prevent authentication of shared, stolen, or faked licences.

Whilst it was common for stakeholders from national organisations to agree that a minimum age would be necessary under the trials, one view was that this should be lowered to 14 years old if e-scooters were legalised after the trials, to align with e-bike age limits and to prevent exclusion of younger users. Stakeholders also recognised that an age limit may be difficult to enforce in an environment in which e-scooters were legalised or if a drivers' licence or other form of identification was not required. Overall, findings suggest a consensus among users, residents and stakeholders of a minimum age of 16 to 18, but more research, particularly on the link between age and safety, is required on this.

5.6.5.2 Speed limits

Depending on the trial area, the maximum speed limit for e-scooters during the trials was between 12.5mph and 15.5mph, with lower limits in "go-slow zones"[109]. Wave 2 user survey respondents were told this, and then asked what they thought the limit should be. Almost half (46%) of users thought the speed limit should be 15.5mph, a quarter (25%) thought it should be higher, and a similar proportion (23%) thought it should be lower. Men, younger people, and more experienced users were more likely to think the speed limit should be higher than 15.5mph.

Users interviewed as part of the qualitative research who were content with speed limits of 12.5-15.5mph felt this balanced the ability to travel at pace with the risk of harm to both users and pedestrians. Users who supported a higher speed limit were primarily concerned about the difference in speed between e-scooters and other vehicles and argued that the inability to keep up with other traffic was dangerous.

National and local stakeholders who shared this concern called for broader application of 20mph zones for urban roads to create a safer environment for all, particularly given the perceived lack of suitable infrastructure for micromobility vehicles nationally. Indeed, local stakeholders in case study areas interviewed at Wave 2 described a range of measures taken in relation to controlling the speed of rental e-scooters, including more "go slow zones", lowering the maximum speed e-scooters could ride, and police marshalling.

Among residents who reported feeling unsafe with e-scooters around while walking, cycling or driving, speed was one of the most commonly cited reasons (67%). Over half of residents who reported feeling unsafe (52%) said reducing the maximum speed would make them feel safer. Residents who participated in the qualitative research, particularly those with mobility issues, sight loss or hearing loss, suggested reducing the maximum speed in or near pedestrianised areas – a measure already in operation in some trial areas.

5.6.5.3 Licensing requirements

A full or provisional driving licence is a requirement for trial e-scooter use. User survey respondents were asked whether they held a full or provisional driving licence which was

[109] DfT introduced a 15.5 mph speed limit, but trial areas may choose to impose a lower limit.

valid in Great Britain. A large majority (82%) of users held a full driving licence, and 17% had a provisional licence. Only one percent of users had no licence at all[110]. Among users and residents who participated in the qualitative research, there was widespread support for the requirement for a driving licence, though the importance of a full licence over a provisional one was emphasised because it was felt to guarantee awareness of the Highway Code, which was considered important from a safety perspective.

National and local stakeholders held mixed views about the driving licence requirement. They acknowledged the role of full and provisional driving licences in supporting responsible riding, identifying anti-social and dangerous riders, aiding enforcement, and supporting modal shift from cars. However, they considered the licensing requirement to contradict the Government's aim to ease the burden on public transport during the pandemic, given that those reliant on public transport would be less likely to have a driving licence. The licensing requirements were also thought to block access among younger people; a key target market for e-scooters and a cohort less likely than their predecessors to be opting to learn to drive. Stakeholders argued that excluding this group could make it difficult to fully understand the potential market in the short term and could serve as a barrier to uptake in the longer term.

Again, while these findings indicate a level of support for licensing requirements, they also highlight that they can serve as barriers to usage, particularly among target groups such as users of public transport and younger people.

5.6.5.4 Resident views on e-scooter laws

The proportion of resident survey respondents who thought the laws for e-scooters (both private and rental) were not very clear or not at all clear was high (62%), suggesting that e-scooter regulations could be more widely communicated to the public, especially among people who do not use them. Views on whether or not laws for e-scooters were clear varied significantly by age group, and whether or not residents used e-scooters themselves:

- 85% of residents aged 55 or over thought the laws for e-scooters were not very clear or not at all clear, compared to 40% of residents aged 18 to 34.
- 73% of residents who did not use an e-scooter thought the laws for e-scooters were not very clear or not at all clear, compared to 27% of residents who used an e-scooter.

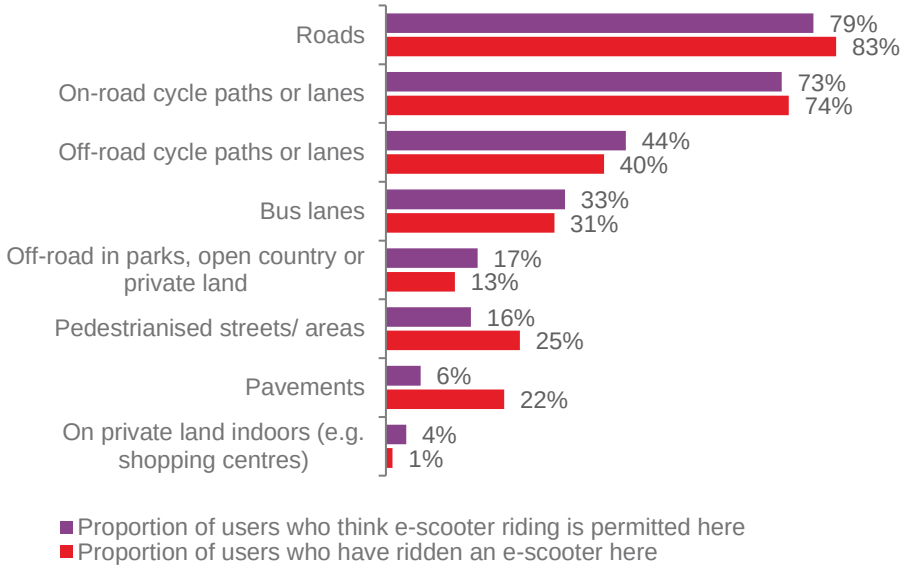
5.7 Improper use and anti-social behaviour

5.7.1 Riding on the pavement

Riding trial e-scooters on the pavement is illegal. In Wave 2 of the user survey, over one in five (22%) e-scooter users reported riding on the pavement (Figure 38)[111]. Despite this, most users (94%) understood that riding on the pavement was not permitted, including among users who admitted to riding on the pavement (80%).

[110] These users could have used e-scooters improperly, have misunderstood the question, or have answered falsely.
[111] This question was asked differently at Wave 1, so only Wave 2 figures are reported. At Wave 1, fewer answer options were presented: "Pedestrianised streets/areas" and "On private land indoors (e.g. shopping centres)" were not presented. At Wave 1, 22% of users reported riding on the pavement.

Figure 38: Where e-scooter users ride, and where they think riding is permitted (source: user survey, wave 2)

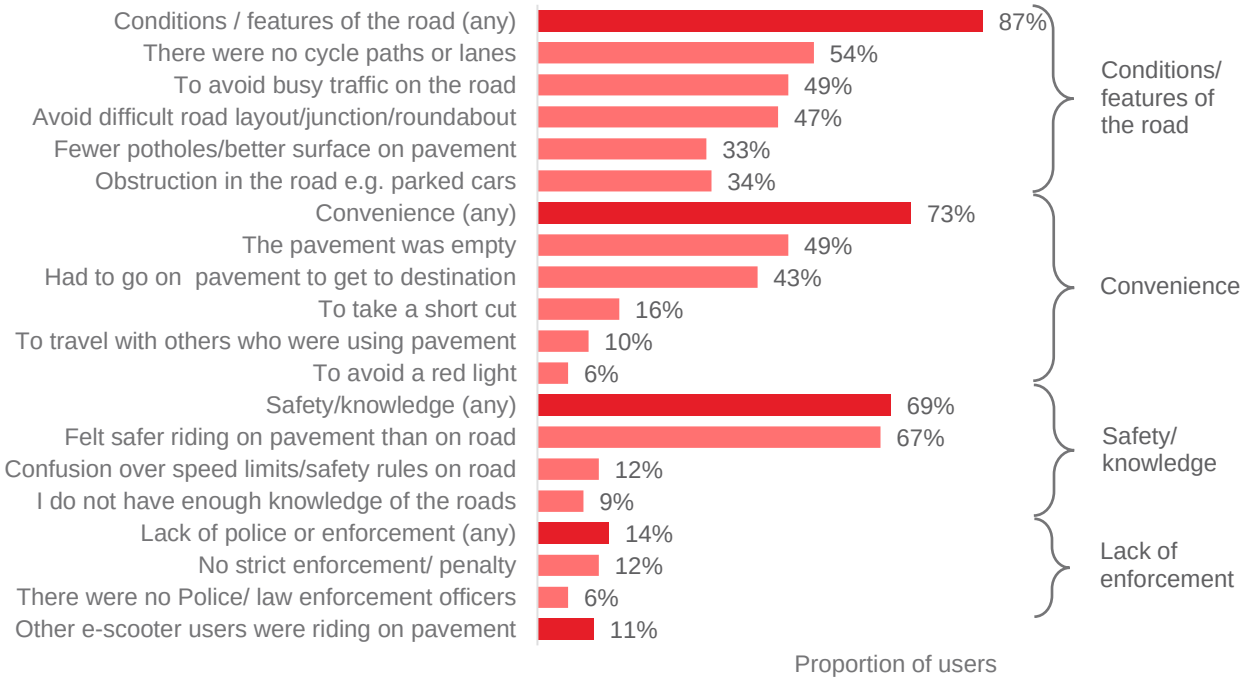


"Which of the following do you ride a rented e-scooter on?"
"Where is it permitted to ride rental e-scooters in your area?"

Bases: all users of rental e-scooters in trial areas: where users ride (4115), where it is permitted (4115).

Figure 39 shows the reasons given by users for riding on the pavement. Most (87%) of those who rode on the pavement reported doing so because of traffic or features of the road. Seventy-three percent of those who rode on the pavement cited reasons related to convenience, and 69% reported riding on the pavement for safety reasons.

Figure 39: Reasons why e-scooter users rode on the pavement (source: user survey, wave 2)



"You mentioned that you have ridden a rental e-scooter on the pavement in the past. Which, if any, of the following are reasons why you have ridden on the pavement?"

Base: All users of rental e-scooters in trial areas who rode on the pavement (891).

Reflecting the survey findings, participants of the qualitative research who had ridden on the pavement reported doing so because they felt unsafe on the roads, or to avoid certain stretches of road that were poorly surfaced or particularly busy. Overall, these participants understood why this was not permitted and described using pavements cautiously; to avoid putting pedestrians at risk. In the Wave 2 qualitative research, some users reported making a conscious effort to stop using pavements due to receiving alerts from operators warning against this. This suggests that greater communication of the rules can act as an effective deterrent against improper use.

While residents who took part in interviews had witnessed rental e-scooter users riding on the pavement, this behaviour was linked more to private e-scooters. Concerns about pavement riding appeared to be particularly pronounced among people with mobility issues and blind or partially sighted participants. These concerns centred on not being able to react quickly enough if there was a risk of a collision.

> *"It's a constant worry. It's another added stress that I don't, even non-disabled people need… It's taking the enjoyment out of going to public spaces because you're forever thinking, oh, am I going to encounter one of them? Is there going to be one left on the pavement? Is one going to whizz past me?"*
> *(Resident, Newcastle, Female, 55+, Wave 1)*

Despite not wanting to share pavements with e-scooters, interviewed residents did not think they were suitable for the roads either and were unsure about the best place for e-scooters to be ridden. In contrast, local stakeholder groups across case study areas believed better shared micromobility and cycling infrastructure to be a key solution to this dilemma.

> *"You almost never see someone riding an e-scooter on the pavement next to a segregated cycle lane, because why would you? Whereas you often see people riding an e-scooter, normally an illegal e-scooter, on the pavement next to a busy road where there is no cycle infrastructure because people feel safer."*
> *(Operator, Case study area, Wave 2)*

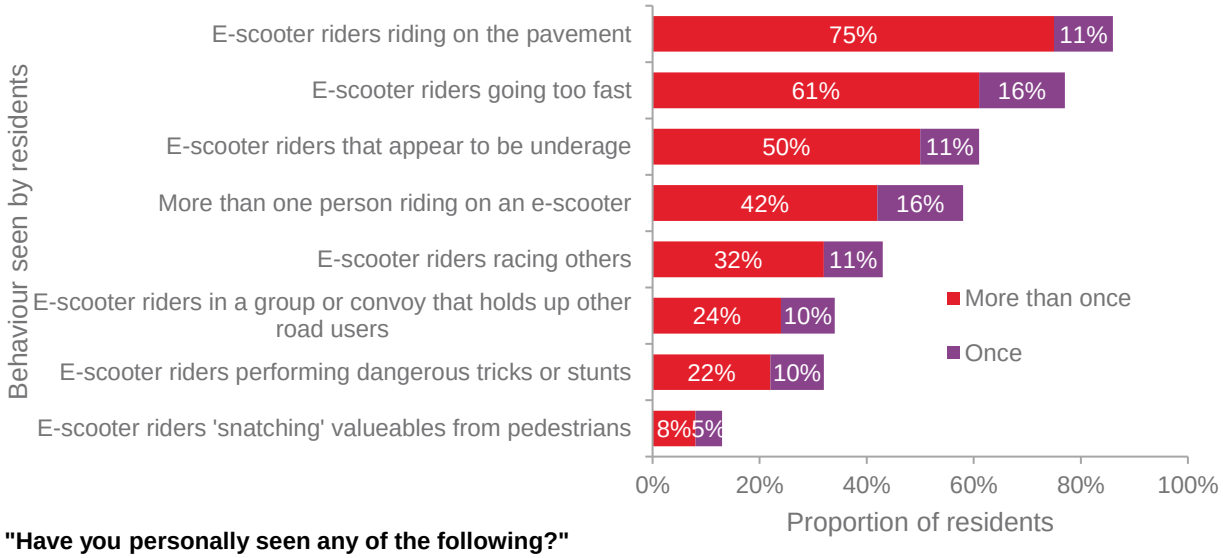
> *"I would say the main focus should be to create more cycling infrastructure, as simply a lot of roads are not deemed safe by the riders to ride on. if they don't feel very safe on the road, they're going to mount the pavement, which obviously isn't what we want."*
> *(Operator, Case study area, Wave 2)*

5.7.2 Anti-social behaviour from e-scooter users

Anti-social behaviour was found to affect safety, and perceptions of safety around e-scooters. Residents reported witnessing a range of anti-social behaviour from e-scooter users. However, it should be noted that 13% of resident survey respondents reported only having seen private e-scooters before and 18% said that they were unable to tell the difference between rental and private e-scooters. Therefore, the views presented here are likely to be affected by perceptions and experiences of private e-scooters, as well as of trial e-scooters.

Figure 40 shows that nearly all residents (93%) reported seeing at least one of the forms of anti-social behaviour listed by either trial or private e-scooters. The most common forms reported were e-scooter users riding on the pavement (86% reported seeing this once or more than once, see Section 5.6.1 for more detail) and riders going too fast (77% reported seeing this once or more than once). There was little change in the percentage of residents who reported these behaviours between Waves 1 and 2.

Figure 40: Anti-social behaviour witnessed by residents (source: residents survey).[112]



"Have you personally seen any of the following?"

Bases: all adult trial area residents who had seen an e-scooter (2,615).

One in three (34%) residents reported personally seeing e-scooter riders in a group or convoy holding up other road users. Among the residents witnessing this, 36% reported them as rental e-scooters, while 27% reported them as private e-scooter users, and 22% reported seeing both rental and private e-scooter users. This perhaps reflects the increased opportunity of coordinating this type of behaviour through access to multiple rental vehicles at once.

Irresponsible riding and antisocial behaviour, such as speeding, drunk riding, and tandem riding, was also reportedly witnessed by residents who took part in interviews. Amongst those who could tell them apart, a distinction was made between rental and private e-scooters. Users of privately-owned e-scooters were considered to be younger or underage, to drive more recklessly and to be less mindful of other road and pavement users. Accordingly, residents were most likely to want improved enforcement of e-scooter regulation.

"You don't tend to hear people saying they've had a near miss with the rental ones… I've seen the private ones whizz past people walking, whizzing past people pushing pushchairs."
(Resident, West Midlands, Male, 55+, Wave 2)

Almost one in eight resident survey respondents (13%) reported seeing e-scooter riders "snatching" valuables from pedestrians once or more than once. In this case, rental and private e-scooter users were as likely as one-another to be reported. Residents in London were almost twice as likely to report seeing this than those in other trial areas: 20% of London resident survey respondents reported witnessing this, compared to 11% elsewhere. Residents who witnessed this were also more likely to be e-scooter users

[112] Respondents were also asked at a separate question where they had seen people riding e-scooters and 79% said they had seen them ridden on the pavement. The variation in the figures between these two questions is likely a consequence of slightly different wording and differences in other answer options that were presented alongside. Both questions indicate that a clear majority of residents have seen e-scooters ridden on the pavement.

themselves (33%, compared to nine percent of residents who had not used an e-scooter). Younger residents were more likely than older age groups to witness this behaviour.

Local stakeholder interviewees in case study areas reported that riding whilst intoxicated was a common cause of collisions and instances of unsafe riding among both rental and private e-scooter users. Operators highlighted the importance of increasing public understanding that e-scooters are motor vehicles and not toys, and for local stakeholders to work together to tackle riding under the influence of alcohol or drugs.

Local stakeholders also cited underage riding to be an issue for both rental and private e-scooter users. Other forms of improper and anti-social riding described by local authority and police that were specific to rental e-scooter usage included jumping red lights, performing “wheelies” and stunts, tandem riding, and using mobile phones or headphones. Local stakeholders suggested that these issues were common among young people, and in deprived areas with existing crime and antisocial behaviour issues. Local authorities and operators described implementing a range of effective strategies to tackle anti-social behaviour including turning areas with known issues into no-ride zones, imposing curfews, and issuing “shock notifications” warning that dangerous riding will result in driving licence points and/or criminal prosecution.

Vandalism was not reported by local stakeholders, users or residents as being a significant issue for rental e-scooters. Stakeholders thought vandalism was limited because technology and riding and parking restrictions (including “no-park zones” and “no-ride zones”) had mitigated against such behaviours. For example, GPS technology enabled local authorities to locate abandoned e-scooters, and “no-park” and “no-ride zones” had improved their control over where e-scooters could be legitimately parked and ridden. Measures had also been taken to prevent vandalism in some case study areas, including removing e-scooters at large public events such as rallies and festivals.

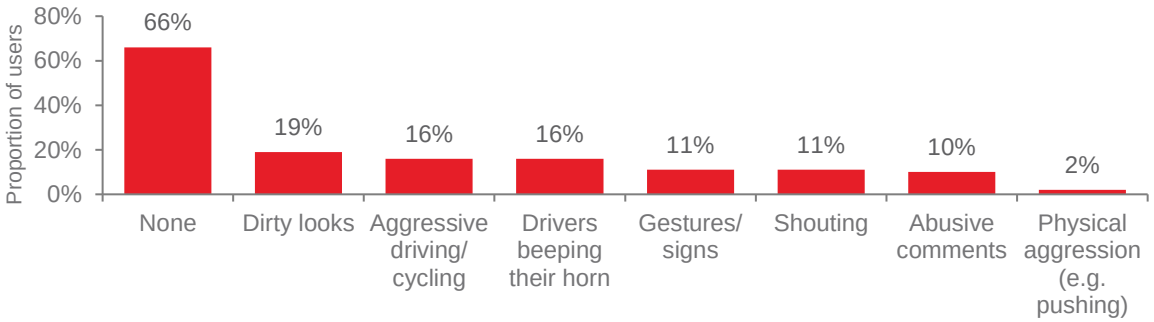
5.7.3 Hostility towards e-scooter users

Wave 2 of the user survey explored whether e-scooter users had experienced any hostility from other road or pavement users, such as aggressive driving, shouting, or physical aggression. The majority of users (66%) said they had never experienced any form of hostility from other road or pavement users (Figure 42).

Users who rode on the pavement were no more likely to report experiencing hostility compared to users that had not ridden on the pavement. Furthermore, users who wore helmets and those who received training of any kind were no more likely to experience hostility from other road or pavement users than their counterparts. This suggests that some road or pavement users may express hostility regardless of the individual behaviours of e-scooter users.

As shown in Figure 41, the most common forms of hostility experienced were dirty looks (19%), aggressive driving or cycling (16%), and drivers beeping their horn (16%). Only two percent of users experienced physical aggression from other road users.

Figure 41: Hostile behaviour experienced by e-scooter users (source: user survey, wave 2)



"Have you ever experienced any form of hostility from other road or pavement users while riding an e-scooter? Please include all types of road user in your answer e.g. pedestrians, cars, vans, HGVs, motorbikes, bicycles etc."

Base: All users of rental e-scooters in trial areas (4,076).

However, experiencing hostility was not a frequent occurrence, even for users that had reported such behaviour. Thirty-seven percent of those who experienced hostility said it happened once or twice, and 38% experienced hostility only rarely.

6. Wider social impacts: public perceptions, accessibility, access to services and health

6.1 Key insights

- Residents were more likely to feel positively about e-scooters than they were about the way e-scooters were used. Around half (51%) saw the introduction of e-scooters in their area as positive, but less than a third (31%) agreed that people riding e-scooters were generally respectful of pedestrians.
- Older residents were more likely to have negative views of e-scooters than younger residents: only 29% of those aged 55+ felt e-scooters were a good addition to their local transport system, compared to 65% of those aged 18 to 34.
- E-scooter parking reportedly caused problems for some residents, including having their pavement access blocked (which was a particular concern for people using buggies or mobility aids).
- Some users reported that e-scooters helped them to access key services – such as medical appointments and essential shopping. In particular, 23% of those with a condition that affected their mobility said that e-scooters made it easier for them to access medical services, compared to nine percent of those with no health conditions.
- As reported in Section 3, rental e-scooters replaced some journeys that would otherwise be undertaken through active travel. This suggests that they may have a net negative impact on physical health. Nevertheless, e-scooters may have a mental health benefit; qualitative findings showed that they gave some users a sense of independence and freedom.

6.2 Awareness of e-scooters

Although most residents had seen e-scooters in their area, there was considerable variation across trial areas in the proportion of residents who were aware of the trials themselves. Across trial areas, 83% of residents had seen a rental or private e-scooter. This increased from 80% at Wave 1 to 86% at Wave 2. Awareness of e-scooter trial schemes also increased from 73% at Wave 1 to 80% at Wave 2. Residents who took part in interviews in Wave 2 reported that an increase in e-scooter use and news reports over recent months contributed to a greater awareness of the trials over time.

Nearly one in five (18%) of residents said they could not tell rental and private e-scooters apart (this did not change between waves). Therefore, it should be noted that attitudes described in this chapter may in some instances reflect experiences of private e-scooter use as well as rental use.

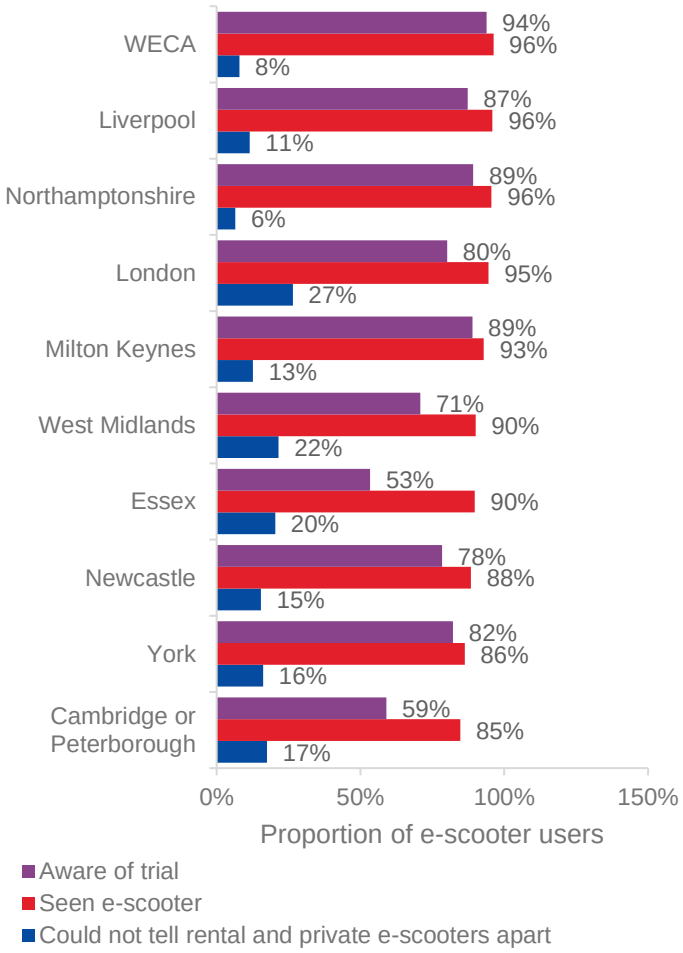
Residents were asked in the Wave 1 survey where they had seen or heard about the schemes. The most common ways residents reported becoming aware of the rental schemes were through seeing e-scooters on the street (51%), TV (32%) and through word of mouth (31%). Only a minority had seen or heard information about the rental schemes via, social media or newspapers, suggesting that use of a range of media could improve awareness of the rental schemes.

Among residents who participated in interviews, those who were more well-informed about the rental schemes had either sought out information through the news, knew people who

had rented an e-scooter or, more exceptionally, had received official communication from local ward councillors.

As seen in Figure 42, awareness of the trials varied across areas, and experience witnessing e-scooters (either private or rental) did not always correspond with high levels of awareness of the trials themselves. Nevertheless, areas with low awareness of trial schemes also had the highest proportion of residents who said they were not able to tell private and rental e-scooters apart.

Figure 42: Awareness of e-scooters, by trial area (source: resident survey)



"Have you seen someone riding an e-scooter in your local area?"

Whether have seen an e-scooter in local area: all adults who have seen an e-scooter (2843). Milton Keynes (212), Essex (326), WECA (185), West Midlands (294) Cambridge and Peterborough (236), Northamptonshire (266), Liverpool (222), York (134), Newcastle (214), London (747)

"Are you aware that an e-scooter rental scheme is taking place in your local area?"

Whether aware of trial: all adults who heard of e-scooters (3,355). Milton Keynes (237), Essex (404), WECA (198), West Midlands (388) Cambridge and Peterborough (275), Northamptonshire (289), Liverpool (261), York (166), Newcastle (267), London (862)

"Were you able to tell whether the e-scooters you have seen were rental e-scooters or whether they were privately owned e-scooters?"
Whether able to tell rental and private e-scooters apart: all adults who have seen an e-scooter in their local area ((3,355). Milton Keynes (197), Essex (292), WECA (178), West Midlands (264) Cambridge and Peterborough (201), Northamptonshire (254), Liverpool (213), York (116), Newcastle (189), London (707)

6.3 Residents' perceptions of e-scooters

Residents' views on e-scooters were somewhat mixed and likely reflect experiences of private e-scooters as well as rentals. While the majority of residents saw the introduction of e-scooters in their area as positive, they were much less likely to feel positively about the behaviour of e-scooter users in practice. There was strong support for increased safety measures, such as mandatory training and helmets. Resident views of safety and regulations, as well as experiences of disruptive e-scooter user behaviour, are discussed further in Section 5.6.

Department for Transport

Around half (51%) of residents saw e-scooters as a positive addition to their local transport system, with similar proportions agreeing that e-scooters were good for the environment (56%), that they were a good alternative to other forms of transport (52%) and that their local area was well-suited to e-scooter use (44%). However, there was an indication that these views had become more negative over time. For example, the proportion that saw e-scooters as a positive addition to their local transport system at the Wave 1 survey was 54% whereas at Wave 2 it was 47%.

Residents were more likely to respond negatively when asked their views about the behaviour of e-scooter users. This is likely to have been informed by experiences of anti-social behaviour (of both private and rental e-scooters) discussed in Section 5.6, including riding on the pavement, speeding, and riding in convoy. Less than a third (31%) agreed that people riding e-scooters were generally respectful of pedestrians. As shown in Figure 43, negative views on e-scooter behaviour and calls for greater regulation were more common amongst older respondents. However, there was support for mandatory helmet wearing across age groups.

Figure 43: Resident views on e-scooters and schemes (1/2) (source: resident survey)

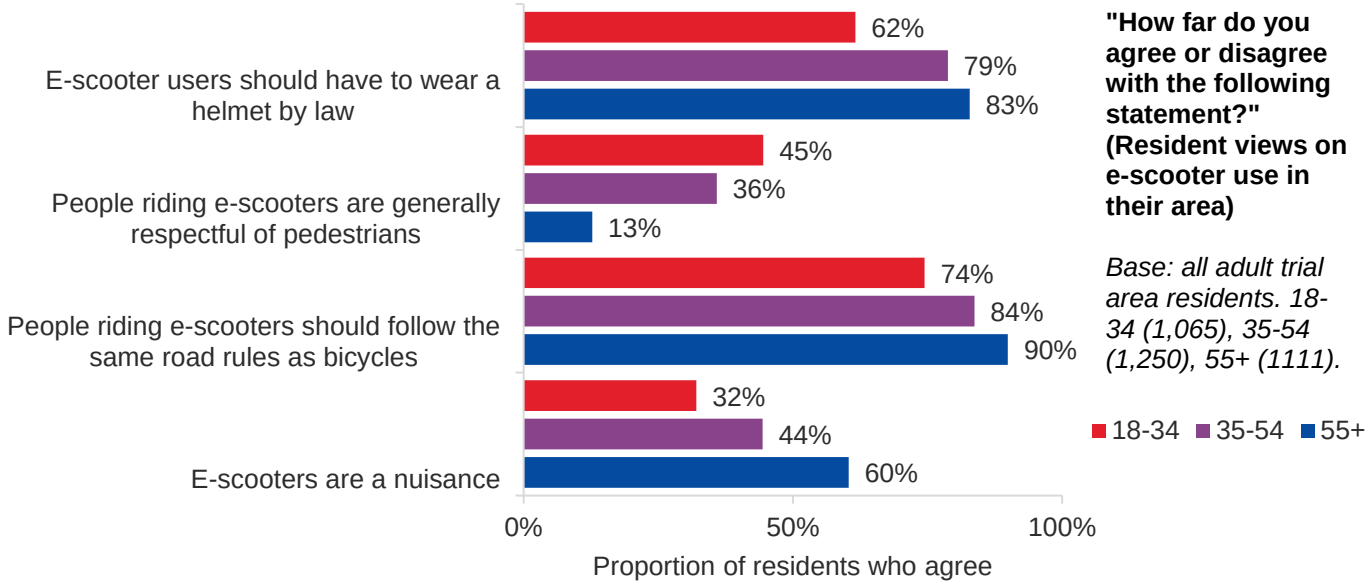
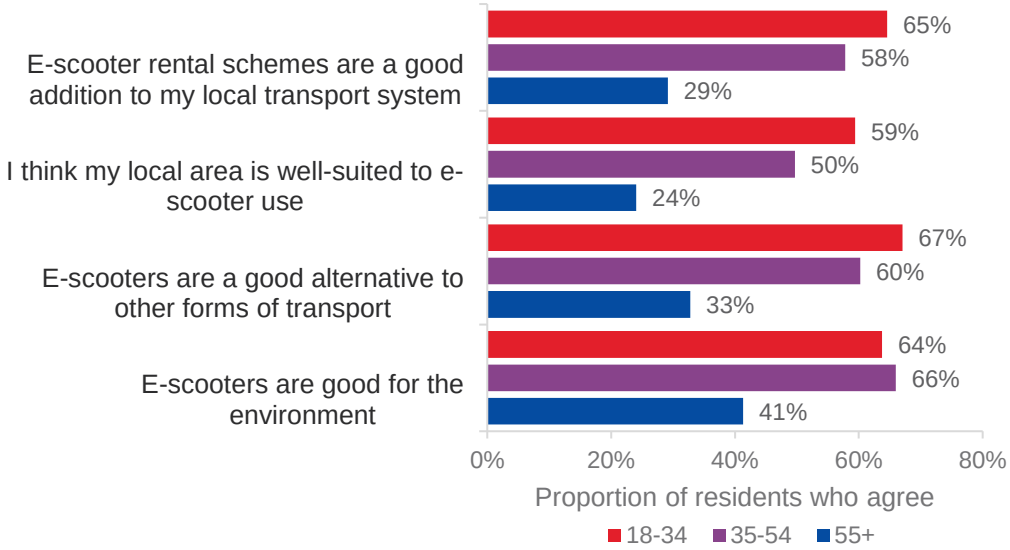


Figure 44 shows that views on the value of e-scooters as a mode of transport were also strongly linked to age. Those aged 18-34 were more likely to agree with positive statements about the value of e-scooters (and to disagree with negative statements).

Figure 44: Resident views on e-scooters and schemes (2/2) (source: resident survey)



"How far do you agree or disagree with the following statement?" (Resident views on e-scooter use in their area)

Base: all adult trial area residents. 18-34 (1,065), 35-54 (1,250), 55+ (1111).

Other than age, no differences in views on e-scooters were found across demographic groups, including between those who had disabilities and those who did not.

Among residents who took part in in-depth interviews, attitudes also appeared to be influenced by age, alongside other factors. Residents with positive or mixed views saw e-scooters as a useful and environmentally friendly form of transport, and were typically open to trying one. They nonetheless had concerns around safety, irresponsible riding behaviour and parking issues (the latter discussed in Section 6.5 below). Residents also viewed e-scooters more favourably if they were used for commuting rather than for "play".

Among interview participants who felt negatively towards e-scooters, the perceived downfalls outweighed the benefits and, for them, trying an e-scooter was out of the question. This group of participants tended to be older, although it included some younger participants who had a mobility condition which required a wheelchair.

National stakeholders who took part in interviews earlier in the trials[113] held the view that public acceptance would increase with acclimatisation and more widespread safe riding practices. However, by Wave 2 of the interviews with residents, some initially more open-minded views had given way to negative perceptions of riding behaviours, safety enforcement and environmental impacts.

> *"Well… when I first heard about them, I thought, brilliant… that is a really, really good concept. I still think the concept is actually really good, but obviously, the more and more of it I've seen how they're used and realised, well, it can't be policed very well, my thoughts of it have dwindled, I must admit."*
> *(Resident, WECA, Male, 35-54, HGV/LGV driver)*

Where residents participating in interviews had become more accepting of e-scooters over time this was in light of their growing concerns about climate change, rather than perceptions of improvements in safety. This suggests that education around the measures

[113] National stakeholder interviews were conducted in January 2021.

put in place to improve e-scooter safety and further improvements around as yet unaddressed safety concerns would go some way to gaining support for the scheme.

> *"I think previously I would have been much more hostile to them. Now I think, okay, well, it may be something that we've got to accept for the reason that we definitely need to get people out of their cars for climate change."*
> *(Resident, West Midlands, Male, 55+)*

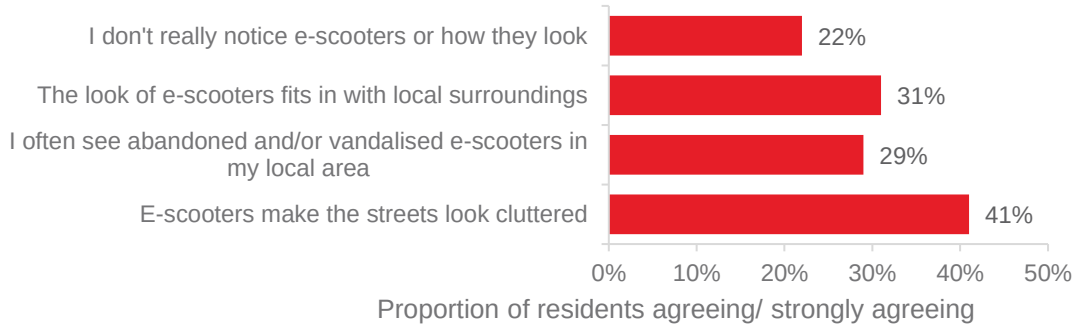
Some blind and partially sighted participants said that although they remained concerned about e-scooters, they felt slightly more positive about the trials following discussions with operators who had made changes to the rental schemes to improve parking (discussed in Section 5).

6.4 Views on how e-scooters look

Views from residents on how e-scooters look tended to be neutral or negative, though the appearance of e-scooters was of less concern among residents than safety and pavement access. Again, older respondents and those who had not used an e-scooter were much more likely to have negative views than their counterparts.

There was also considerable variation by trial area. Views on the appearance of e-scooters were more likely to be positive in Newcastle (where the operator is Neuron), and more likely to be negative in WECA, Liverpool and North Northamptonshire (where the operator is Voi). Voi and Neuron scooters look broadly similar, suggesting that views on appearance may have been more closely linked to how e-scooters were arranged on the street. As such, this suggests that more effort may be required in certain areas to integrate e-scooters into the environment.

Figure 45: Resident views on how e-scooters look (source: resident survey)



6.5 Appropriate parking and accessibility

The trial areas in which users and residents were surveyed included a mix of free-floating, incentivised and mandatory parking in (virtual or painted) parking bays. Across the trials, local authorities were free to choose the parking model implemented.

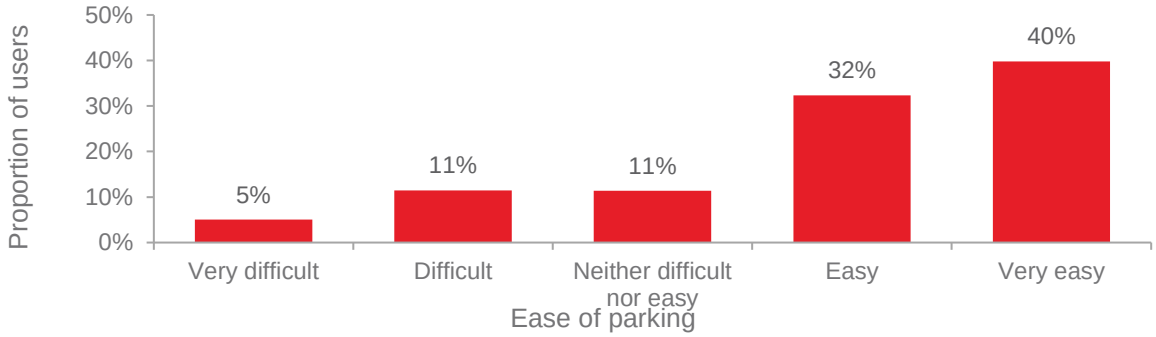
6.5.1 Users' experiences of parking and accessibility

Wave 2 of the survey asked users about parking the last time they rented an e-scooter. Most e-scooter users (86%) reported parking in a designated e-scooter parking area, and for the majority of these users (79%) this meant parking on the pavement.

Users, on the whole, found it easy to park their e-scooter safely in a place that allowed them to get close to their final destination (Figure 46). However, users in London, WECA

and York were more likely to say they found it difficult, with figures of 30%, 19% and 18% respectively, compared to nine percent across the remaining surveyed areas. This is likely due to the fact that in these areas, parking is restricted to bays. Accordingly, those who did not park in a designated parking spot were more likely to say that parking was easy or very easy (83%) than those who did (71%), suggesting that users prefer being able to park anywhere at the end of their journey. See Section 5 for more discussion on experiences of parking from the qualitative research.

Figure 46: Ease of parking e-scooters close to final destination (source: user survey, wave 2)



"How easy or difficult was it to park the e-scooter safely and close to where you wanted to get (the last time when you rented one)?"

Base: all users of rental e-scooters in trial schemes (4113).

6.5.2 Residents' experiences of parking and accessibility

In order to understand the impact of parking practices on the local area, residents were asked about where they had seen parked e-scooters, and how they affected pavement and road accessibility. Overall, e-scooter parking practices were reported across Wave 1 and Wave 2 as causing access problems for residents. Whilst it was widely agreed by residents who took part in interviews that e-scooters should be parked in specific areas, there was a perception that the introduction of docking stations had not been sufficient to eliminate problems, as they were also found to block access for some.

> *"Some of the places that I think where I've seen [e-scooters] put, is no more safer than… where they've been abandoned because I've noticed a lot of them are [parked] on corners. So, if you're coming round the corner, you wouldn't expect to see, expect to have a load of e-scooters lined up."*
> *(Resident, Newcastle, Female, 55+, sight impairment)*

Two thirds of the residents who took part in Wave 2 of the survey (67%) reported seeing e-scooters parked or left around in their area[114]. Among this group, almost half (44%) had experienced an e-scooter blocking their access, an increase from 36% at Wave 1[115]. Similarly, nearly half (45%) agreed that parked e-scooters get in the way of pedestrians. This view was particularly prevalent in Milton Keynes and North Northamptonshire (where free-floating parking was used) compared to other trial areas, and again, amongst older residents.

[114] This question was asked in a different way at Wave 1 so responses are not combined here.
[115] Participants who were able to distinguish between rental and private e-scooters were asked specifically about rental e-scooters. However, those who were not able to distinguish were asked about e-scooters in general.

As found in Wave 1, residents who took part in interviews and focus groups in Wave 2 agreed that when e-scooters were left sporadically on pavements, they had the potential to look untidy. There was general consensus that negative impacts on public space, such as pavements, were lower when e-scooters were parked in a neat and orderly way, unless residents disliked how rental e-scooters looked aesthetically, or felt that designated parking areas took up too much space on public footpaths.

Nevertheless, findings indicate that inappropriate parking was not always down to users' choice. Some riders described having to leave their e-scooter behind midway through their journey due to the battery running out. In addition, some local stakeholders explained that members of the public often mistook correctly parked rental e-scooters as being abandoned or wrongly parked because they were not aware of e-scooter parking regulations, perhaps due to some of the parking areas being virtual rather than painted. This generated complaints from the public to local authorities and operators about parked e-scooters when their riders had in fact been adhering to the rules.

"Any scooter left, albeit parked correctly, in a place they're allowed to leave it is often viewed as abandoned."
(Local Authority, case study area)

6.5.3 Experiences of parking and accessibility among residents with specific needs

Resident survey respondents that used a mobility aid[116] were more likely than other residents to report experiencing an e-scooter on the pavement blocking their access (52%, compared to 38% of other residents). Residents who used prams or buggies were not more likely to experience individual e-scooters blocking their access, but were more likely to report that docking stations (in parking bays) had blocked their access (40%, compared to just 15% of other residents). Residents who used mobility aids, and those who used buggies, were also asked specifically whether e-scooters had made it more difficult to use them. Overall, over half (56%) said that parked e-scooters had made it at least a bit more difficult.

Blind or partially sighted residents who were interviewed described occasions where they were required to go into the road to avoid parked e-scooters and had to rely on passers-by to assist or find an alternative route. Examples where obstructive parking of rental e-scooters created access issues included e-scooters lying on the floor across pavements, driveways or outside homes, in the middle of roads, on disabled ramps, at fire exits, stairs and traffic lights.

"So I've seen them thrown across pavements, laying across driveways. In fact, the other day, I moved one for a young lady to get past with a double buggy."
(Resident, Essex, Female, 55+)

Resident interview participants who were blind or partially sighted reported that it was especially difficult for them to see parked e-scooters or to direct their guide dog around them. This created a serious trip hazard, with some participants reporting almost falling over an e-scooter and suffering the additional impact of having lost track of their route. There was also evidence of obstructive parking leading to the self-exclusion of vulnerable

[116] Including: manual wheelchairs, motorised wheelchairs, mobility scooters, walking frames, walking sticks, and crutches.

groups, whereby blind and partially sighted interviewees described feeling reluctant to make trips into town because of the possibility of encountering an e-scooter.

In line with this, there was general agreement among national stakeholder groups on the challenges of clutter of e-scooters on pavements and roads, especially in densely populated areas, and the need to minimise obstruction to pedestrians. Transport campaign groups highlighted that operators were aware of the issue and were working to find solutions.

Some participants suggested that parking had improved over the trial period. Residents who had noticed improvements felt this was due to additional measures being taken such as the introduction of parking bays and racks; more and larger designated parking areas; the requirement for e-scooter riders to submit a photo of their parking; and increased monitoring and management by operator staff. Residents with health conditions that were involved in individual and charity campaigning believed that many of these improvements were made following their efforts and work with e-scooter operators.

> *"What I've seen more of is, the actual e-scooters' representatives that come around checking these actual scooters and putting them back in their place… It seems like they're doing a bit more in regards to making sure … they're not obstructing people walking down the highway, on the actual pavement and stuff like that."*
> *(Resident, Focus Group, West Midlands)*

Some of the impacts of poor parking were felt to be seasonal. Shorter days in winter months were felt by many to increase the risk from poorly parked e-scooters, as they were less visible.

6.5.3.1 Suggestions for improving parking and accessibility

The majority (73%) of resident survey respondents thought that e-scooters should only be parked in specific designated areas. Perhaps unsurprisingly, those who had used e-scooters in the past were more likely to think e-scooters should be able to be parked anywhere (43%, compared to 12% of residents who had not used one).

Docking stations and designated parking zones were thought to encourage neater and more organised parking among residents who took part in in-depth interviews and focus groups. Interviewees also advocated for parking bays being located on the road rather than on the pavement, such as by replacing a car parking space. Blind and partially sighted interviewees suggested improved access to information on where e-scooter parking areas are located.

Feedback from local stakeholders and residents on free-floating parking led the West Midlands to move to designated parking areas, although the potential trade off with lower usage was noted by stakeholders. Other suggestions by residents for improving parking included introducing more training on parking and fines for those who do not adhere to parking rules.

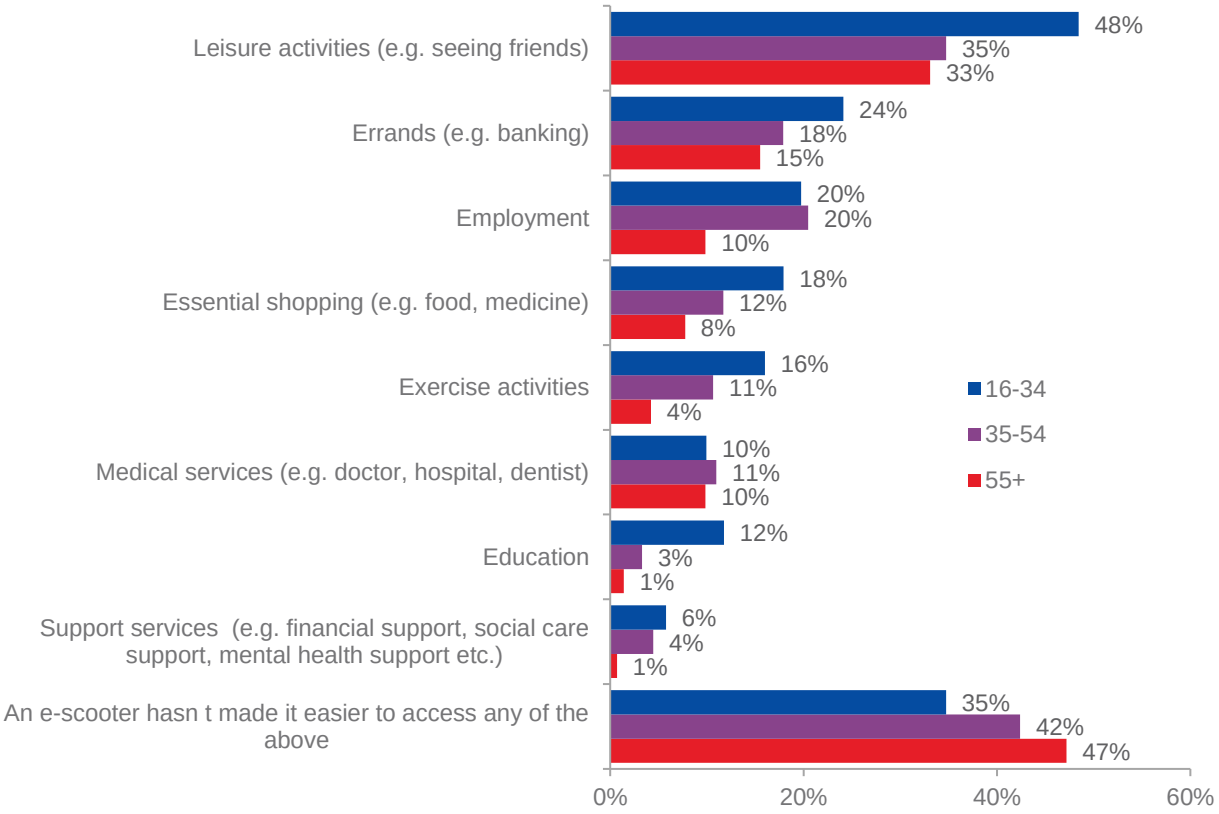
Nevertheless, e-scooter users appreciated the convenience that free-floating parking provided. Some national stakeholders commented that geofencing could be used to ensure parking in this manner was appropriate, through restricting e-scooters in areas where they should not be parked. However, vulnerable group representatives and transport campaign groups questioned the effectiveness of using, and precision provided by, geofencing to regulate parking. National stakeholders highlighted the importance of

working closely with local authorities to identify the most appropriate parking locations, and opportunities to use similar parking infrastructure as used for bikes.

6.6 Access to services for e-scooter users

In Wave 1 of the user survey, participants were asked whether an e-scooter had allowed them to access certain services and activities[117]. Nearly two-thirds (62%) reported that an e-scooter had made it easier to access an activity, service or appointment. Among those who rented e-scooters at least once a month, this proportion was higher (79%). More than one in five (22%) e-scooter users said that e-scooters had made it easier to run errands such as going to the bank, and around one in six (16%) said e-scooters made it easier to access essential shopping. Among frequent users (those who rented e-scooters at least once a month), these proportions were 31% and 24% respectively.

Figure 47: Whether e-scooters have made it easier to access services, by age (source: user survey, wave 1)



"Has renting an e-scooter made it easier for you to access any of the following things?"

Base: All adults who used a rental e-scooter in UK trials, aged 18-34 (2082), 35-54 (967), 55+ (142).

At Wave 1 of the user survey, younger people (as indicated in Figure 47), those from ethnic minorities, and those on lower incomes were more likely than their counterparts to report that e-scooters had made it easier to access almost all activities. This was due in part to those groups being more frequent users on average. However, differences

[117] This question was not asked at Wave 2.

remained between younger and older people, between those of a white ethnicity and those in ethnic minority groups, and those in lower and higher income groups, when looking just at frequent users or infrequent users.

User survey respondents with mental or physical health conditions were no more likely than those without mental or physical health conditions to say that e-scooters helped them access activities. However, they were more likely to report that e-scooters helped them access medical services. This was particularly the case for those with conditions that affected mobility. Over one in five (23%) of those with a condition that affected mobility said that e-scooters made it easier to access medical services, compared to 14% of those with a condition that did not affect mobility, and nine percent of those with no condition. Furthermore, at Wave 2, 13% of users said they used e-scooters to get to or from medical appointments. Among those with a disability that affected their mobility, the proportion was 26%. This suggests e-scooters can have a positive impact on access to services for users with mobility issues, helping to address gaps in the local transport system.

National stakeholders felt that e-scooters could present a mobility opportunity through requiring less physical effort to use than a conventional bike. Despite this possibility for e-scooters to contribute to advances in accessibility, as highlighted in Section 6.5.3, e-scooters can also reduce pedestrian accessibility for some residents.

> *"I'd be interested to see take-up from people with mobility issues. Motorcyclists very often will tell you that they ride a motorcycle as opposed to a pushbike because they have mobility issues. The ability to put in the physical effort of, and exertion of riding a pushbike isn't an option, but sitting on a relatively low-powered moped or scooter is an option, and it's a better option than sitting in a car. We actually promote that as a positive. I think e-scooters should help to fill that gap."*
>
> *(National stakeholder)*

Reflecting the improved access to employment that some e-scooter users reported (Figure 48), local stakeholders in WECA explained that one objective of their trial was to improve access to work by offering e-scooter credits to people travelling to the Job Centre, job interviews or their first weeks of work. Users also shared examples of e-scooters enabling travel to shops and restaurants that were otherwise too far, or enabling them to go out when they were tired or injured.

Residents and users who took part in interviews believed that e-scooters were particularly beneficial for young people and those on a low income who may not have access to a car. Rental e-scooters were also described as an "asset" by some residents, which made the place more attractive and provided visitors with an effective way of discovering the area.

6.7 Impacts on physical and mental health

The net health impacts of the rental e-scooter trials depend on the mode of transport that would have otherwise been used for journeys, had an e-scooter not been available. As discussed in Section 3.7.1, users were most likely to have walked if an e-scooter had not been available for their most recent journey (42% of trips in December 2021, according to the post ride survey) and 9% would have cycled. By comparison, 38% of users would have travelled by taxi, car, bus, train, tube or tram according to the post-ride survey – modes that would require less exertion than e-scooters (assuming a similar walking distance to access and egress). These findings suggest an overall reduction in physical activity, with over half of rental e-scooter trips were replacing active travel. In line with this, some

national stakeholder organisations argued that e-scooters should not be classified as active travel because of the relative lack of level of physical effort required to ride an e-scooter[118].

The views of residents interviewed in Wave 2 on the health benefits of e-scooters were often influenced by comparisons with other modes. Some residents believed that e-scooters had positive impacts as they were a way to get fresh air and be more active, by standing rather than sitting, especially compared to getting a bus or driving a car. Likewise, some users that had rented an e-scooter described positive impacts on their mental health as it provided them with a sense of independence, freedom and refreshment. For example, one user with a disabled son mentioned the impacts that riding an e-scooter had on his mental health and wellbeing.

> *"I just think for this mental health and wellbeing really, just getting out of the house more and in the fresh air, because if he doesn't go out he's just stuck gaming."*
> *(E-scooter user with a son with a disability, Essex, Female, 35-54)*

[118] DfT does not currently classify e-scooters as an active travel mode.

7. Environmental impacts

7.1 Key insights

- Local stakeholders stated that a key objective of the e-scooter trials was moving towards zero carbon travel, which represented an opportunity to provide more sustainable transport options (note this also aligned with DfT's objectives for the trials).
- Both residents and users perceived positive environmental impacts from the use of e-scooters. Environmental impacts were a factor in users' decisions to rent an e-scooter, although they did not appear to be the main motivation.
- A total reduction of 269 to 348 tonnes of CO2e (to December 2021) across the five case study areas was estimated based on a reduction of 1.2 to 1.6 million km travelled by car, due to modal shift from cars to rental e-scooters.
- E-scooter operators interviewed across case study trial areas showed they had implemented initiatives to make their operations sustainable, for example by using fully electric vans to transport e-scooters to areas of high demand and to charging points and using swappable batteries.
- The literature on e-scooters suggests that manufacturing is responsible for a large part of the emissions associated with e-scooters, suggesting this should be an area of focus in the future to improve the sustainability of e-scooters as a mode of transport.

7.2 Environmental impact of the e-scooter trials

An indicative analysis of environmental impacts of five case study trials was undertaken as part of this evaluation. This focused on impacts on greenhouse gases (GHGs) and air quality. In order to feed into this analysis, an estimate of the number of car kilometres saved was calculated using two methods – one based on findings from the user survey and another based on an analysis of Google Directions API data (see technical report for more detail)[119].

In the five case study areas combined, an estimated 1.2 to 1.6 million km of car journeys[120] were saved as a result of modal shift from cars to e-scooters during the trials (from the start of each case study trial[121] to the end of December 2021). This is based on mode shift rates from car to e-scooters ranging from four to ten percent depending on the case study trial area, as reported by users in the post-ride survey. For more information on estimating the counterfactual journeys please refer to the separate technical report.

The emissions from the mode shift from cars were calculated using emission factors for an average vehicle in England (based on the 2021 fleet mix percentages and an average speed of 30mph) taken from the Department for Environment, Food and Rural Affairs (DEFRA) Emissions Factor toolkit[122]. This provided NOx, PM_{10} and $PM_{2.5}$ emission factors

[119] Google Directions API allows users to extract journey times based on google maps given a specific route, mode and time of the day.
[120] This has been estimated based on the total number of e-scooter trips and average length of a trip in each case study area based on operator data until the end of June 2021 and mode shift assumptions from the new user survey. See separate technical report for more details on this calculation: National E-scooter Evaluation: Interim Report – Technical Appendices (Section 3.2.2).
[121] This was different for each case study trial. See Appendix A for the list of when trials started.
[122] DEFRA (2021) Emissions Factors Toolkit

(including brake and tyre wear for PM). Carbon emission factors for kgCO_2e/km were selected for an "average car" based on BEIS emission factors[123]. The g/km emission factors were used to calculate the total emissions saved per study area.

The results of the analysis are presented in Table 9. The table shows the estimated reduction in PM_{10}, $PM_{2.5}$, NO_X and CO_2e for the case study areas resulting from the trials based on the reduction in car km, showing a total reduction of 40-52 kg of PM_{10}, 24-30 kg of $PM_{2.5}$, 317-411 kg of NO_X and 269-348 tonnes of CO_2e. This is a small reduction in emissions in the context of the UK transport sector, which contributed 122 million tonnes of CO2e in 2019, according to BEIS[124], with cars contributing to 68 million tonnes of CO2e.

It was not possible to calculate the decibels of noise saved from the modal shift to e-scooters due to lack of data.

Table 9: Emissions saved due to a reduction in car km in the five case study e-scooter trials

Pollutant		PM_{10}	$PM_{2.5}$	NOx	GHGs
Unit		kg	kg	kg	tCO_2e
West Midlands	Google Directions	6.9	4	55	46.6
	User survey	4.5	3	36	30.7
WECA	Google Directions	33.4	19	265	225.4
	User survey	25.6	15	203	172.3
Newcastle	Google Directions	1.3	1	11	9.0
	User survey	1	1	8	7.1
Essex	Google Directions	5	3	40	33.8
	User survey	6.4	4	50	42.8
London	Google Directions	4.9	3	40	32.9
	User survey	2.5	1	20	16.4
Total	**Total Google Directions**	**52**	**30**	**411**	**347.7**
	Total User survey	**40**	**24**	**317**	**269.3**

Although the results showed a reduction in emissions due to the modal shift from cars, it is important to note that the life cycle emissions from rental e-scooters, additional trips that would not otherwise have been made, and the modal shift from walking and cycling to e-scooter use, are likely to have led to some increase in emissions associated with the e-scooter trips (which are not captured in these findings).

Indeed, this environmental impact was a concern highlighted by local stakeholders. They identified how the potential for e-scooters to encourage shifts away from walking or cycling contradicted their environmental objectives.

"If people were to use e-scooters more than walk, then that wouldn't really fulfil the environment objectives because they're still using electricity, they're still using batteries, there's still the carbon footprint of creating them."
(Local Authority, Case study area)

[123] BEIS (2021) Greenhouse gas reporting: conversion factors 2021:
[124] BEIS (2020), Transport and environment statistics: Autumn 2021

7.3 Life cycle and operational impacts

E-scooters produce no emissions and little noise at the point of use. However, it has been suggested[125] that the environmental impact associated with manufacturing e-scooters, the energy source used for the electricity, the lithium battery, transporting e-scooters for charging and to areas of high demand (especially if using fossil fuelled vehicles), and the impact at end of life can be significant[126]. As such, the environmental impacts associated with the lifecycle and operations of rental e-scooter schemes plays a key role in their overall environmental impact, and that there may be opportunities to improve these impacts through more sustainable operations.

7.3.1 Emissions from charging and servicing

Related to the operational impacts of e-scooters, the charging and servicing strategy for rental e-scooters can be a significant component of their environmental impact. Previous research[127] suggested that 43% of the lifetime carbon impact of rental e-scooters comes from the daily collection and redistribution of e-scooters. Operators recognised this in our interviews and have been introducing different measures to reduce their environmental impact including:

- Deploying 100% electric vans for the collection and redistribution of e-scooters in some trials. Operators in the five case study trial areas reported already introducing this.
- Introducing swappable batteries: in the five case study areas, all operators reported deploying battery-swapping e-scooters for more efficient operation. A previous study[128] found that introducing swappable batteries led to a 51% drop in the operator's operational emissions. These batteries were able to be swapped on the spot, using cargo bikes and e-vans, removing the need for vehicle collection for recharging using e-vans and allowing operators to use e-cargo bikes to swap batteries, thus reducing emissions and preventing traffic congestion. In Essex, the operator reported working with an e-bike delivery company to swap batteries and rebalance e-scooter availability as an alternative to electric vans.
- Using renewable energy to charge e-scooters and electric vans: some operators also mentioned they use renewable energy to power their operations[129].

7.3.2 Emissions from manufacturing of vehicles

It has also been suggested[130] that a further 50% of lifecycle emissions associated with e-scooters comes from the production of the materials and components that go into each vehicle. Most e-scooters use lithium batteries[131], and the production of these has been linked to negative environmental impacts, specifically related to the mining of the lithium

---

[125] Joseph Hollingsworth et al (2019) Are e-scooters polluters? The environmental impacts of shared dockless electric scooters . Environ. Res. Lett. 14 084031
[126] Note this has not been assessed for the trials as it was outside of the scope of this evaluation.
[127] Joseph Hollingsworth et al (2019) Are e-scooters polluters? The environmental impacts of shared dockless electric scooters Environ. Res. Lett. 14 084031
[128] EY (2020), Micromobility: moving cities into a sustainable future, study commissioned by Voi and took place in Paris
[129] For example, Voi references this in their sustainability policy. In addition, in the London trial all operators use 100% renewable energy to power their fleet as referenced on the TfL website.
[130] Joseph Hollingsworth et al (2019), Are e-scooters polluters? The environmental impacts of shared dockless electric scooters. Environ. Res. Lett. 14 084031
[131] Unagi, How to maximize your electric scooter's battery life

raw material[132]. The environmental impacts of manufacturing e-scooters was reflected in local stakeholders' concerns about the durability of e-scooters. They highlighted that if e-scooters get damaged, the implications of manufacturing replacements have the potential to exacerbate their negative environmental impact.

"I'm also concerned about the durability of the trial e-scooters because obviously, a big part of their selling point is their environmental credentials and how it's better for the environment if journeys are done by e-scooter rather than by car. If the e-scooters have a very short life […] we don't know how that would balance out."
(Local Authority, Case study area)

This supports findings from a study[133] that highlighted that the production of the vehicles was the main driver of emissions for the operator. To reverse the trend, some operators promoted on their website having invested in improved e-scooter vehicles and in monitoring battery health to extend their use and repurpose for energy storage. They have also reported having introduced training for local repair teams so that each vehicle and spare part can be used as long as possible[134].

7.4 Public perceptions of the environmental impact

7.4.1 Local stakeholder views

Supporting a "green restart" of local travel was reported as a key objective of the e-scooter trials. During interviews, local stakeholders across the five case study areas discussed the role of e-scooters in moving towards zero carbon travel. Operators considered this an organisational priority, and an important part of efforts to respond to climate change,

"So that's one of our key objectives as a business, to try and make sure we're getting people out of cars and that they're staying out of cars"
(Operator, Case study area)

For local authority representatives in case study areas, the e-scooter trials presented an opportunity to increase the number of available sustainable transport options and were considered in line with their wider transport strategies. Local police forces generally understood and were supportive of this ambition.

7.4.2 Public perception of the environmental impact

Evidence from the residents and user surveys suggests that the environmental impacts of e-scooters were perceived, on the whole, as positive rather than negative, though not overwhelmingly so.

Residents were asked whether they agreed or disagreed that e-scooters were good for the environment. On the whole, a majority (57%) agreed (only 10% disagreed). A relatively high proportion of residents (28%) said they did not agree or disagree, which could indicate a lack of knowledge about the environmental impacts of e-scooters.

A widespread perception among residents who took part in the qualitative research, even among those who felt negatively about e-scooters overall, was that e-scooters were

---

[132] Rennie B Kaunda (2020) Potential environmental impacts of lithium mining, Journal of Energy & Natural Resources Law, 38:3, 237-244
[133] EY (2020), Micromobility: moving cities into a sustainable future, study commissioned by Voi and took place in Paris
[134] Voi. Climate-neutral mobility webpage. Accessed November 26, 2021

environmentally friendly because they do not emit any harmful pollutants at the point of use. Some also assumed that they obtained their energy from renewable sources, rather than fossil fuels[135].

"I do think it's much better for the environment [...and...] much better than getting in a car or contributing to bus journeys [...because...] it's not giving out pollutions, the petrol gases and stuff like the cars do"
(Resident, London, Female, 16-34)

However, some residents questioned the green credentials of e-scooters, presuming that their carbon footprint depended on the electrical source and charging practices. In addition, in Wave 2 interviews some residents felt they had not yet seen some anticipated environmental benefits in practice. This was due to perceptions that the roads were still busy with traffic from polluting vehicles and scepticism about the extent to which e-scooters were replacing cars (mode shift is discussed in more detail in Section 4).

According to user survey findings, environmental considerations did not appear to play a central role in decisions to use e-scooters. At Wave 1, just under one in three (29%) users surveyed said that they were motivated to choose e-scooters over other modes because they were better for the environment[136]. However, only a very small proportion said that they would not rent an e-scooter again because they were bad for the environment (4%). Those who indicated an interest in long-term use were more likely to cite positive environmental impacts as a reason for choosing e-scooters over other modes than those who used them as a one-off.

Despite this, the qualitative interviews with users identified some concerns about the environmental impact of e-scooters during the manufacturing stage, specifically the use of rare metals to produce batteries.

“They're using something which contains some very rare earth metals and chemicals, which will be very difficult to recycle, and a lot of plastics that probably won't last very long. I should think the overall impact on the environment is negative at the moment.”
(E-scooter user, Essex, Male, 55+)

This highlights a degree of public understanding around the need to consider the full lifecycle of emissions (discussed further in the next section) when assessing environmental impact.

[135] It must be noted that these were the views of members of the public and may not be accurate
[136] The five case study trials are: Newcastle, West Midlands, WECA, Essex and London.

8. Lessons from delivery of trials

8.1 Key insights

- Three key challenges with the delivery of the trials were identified:
  - Complex governance structures in some areas presented difficulties for local stakeholders, such as setting up legal arrangements and in decision-making on parking models.
  - Stakeholders found launching trials during the COVID-19 pandemic difficult, with restrictions affecting timelines and limiting public engagement.
  - Overcoming negative societal perceptions of e-scooters and public confusion about private and rental e-scooters was also described as challenging.
- In response to the challenges faced, local stakeholders highlighted the importance of strong partnership working and communication between key stakeholders, tailoring scheme decisions (e.g. parking models and locations, user targeting, riding restrictions) to the local context, making adaptations responsively, and communicating messages about e-scooters in a range of ways with users and the public (e.g. to promote safety and public acceptance).
- There was a widespread view among local stakeholders that more communication on a national level was needed to provide greater clarity on the differences between rental and private e-scooters and on parking rules. Local stakeholders also called for more on-road parking spaces to preserve pavement space for pedestrians, and for segregated lanes (including cycle lanes) for e-scooters to improve safety for users.

8.2 Good practice in implementation of the trials

This section discusses local stakeholders' views of implementing the trials in five case study areas: Essex, Newcastle, West Midlands, WECA and London[137]. The stakeholders interviewed in each area included local authorities, police and e-scooter operators[138].

The evaluation sought to identify good practice in delivering rental schemes in different local contexts. The research with local authority representatives and operators responsible for running and managing the trials in case study areas identified five key lessons:

- **Partnerships** – partnership working between local authorities, operators, police and other relevant stakeholders (such as vulnerable group representatives) was described as important. It enabled the sharing of knowledge and information, which fed into decision making and helped to gain local support for the scheme.
- **Learning and the local context** – stakeholders noted that collecting and using data helped to build up a picture of how schemes were working locally, and in turn, to inform improvements.

[137] The findings from this chapter were drawn from interviews conducted with local stakeholders between October and December 2021. The findings therefore do not reflect any developments that took place after this point

[138] In London, Transport for London was interviewed due to its role in coordinating the three trials. The WECA interviews did not include the police. A full list of stakeholders is presented in the technical report of the evaluation.

- **Establishing governance processes** – stakeholders described a need, as with any new programme, to establish processes for decision making and to set out clear roles and responsibilities.
- **Planning and preparation –** local authorities noted that it was important to understand the target market and the role that e-scooters might play locally before launching a rental scheme, and to have a clear idea of the objectives behind any expansion of operating zones.
- **Being responsive and adaptive** – operators explained that the trials, by nature, required them to be responsive and adaptive to address challenges as and when they arose (see Case illustration 1). Operators in case study areas saw this as a strength of theirs and were praised for their ability to do this by other stakeholders.

Case illustration

Implementing operational changes in response to learning from the trial in Essex

In Essex, the operator, supported by the county council and individual district councils, implemented a range of changes over the course of the trial based on learning from the trial. Firstly, the maximum speed was decreased from 15.5 mph to 12.5 mph, with a lower figure of 10 mph for users on their first ride. Note that a new feature from Jan 2022 of an optional toggle on the customer app to limit speed to 10 mph if desired was also added. Number plates were added to the back of the vehicles to differentiate rental e-scooters from private ones, and to support user, non-user and operator identification. This was introduced as a response to a high volume of complaints about private e-scooters in Essex, where private e-scooter ownership was reportedly high compared with other trial areas. Finally, the locations of dedicated parking and no ride zones were said to be under constant review and were updated/expanded when necessary (for example, in Basildon, some areas were restricted to prevent anti-social behaviour). These decisions were taken by the operator in collaboration with the Local District Councils and *vice versa*, sometimes with involvement from the police.

In addition to these cross-cutting lessons, the research with stakeholders identified specific examples of good practice in relation to uptake, integration, managing impacts on vulnerable road and pavement users, awareness-raising, parking and anti-social behaviour. These are discussed in turn below.

8.2.1 Improving uptake

Operators reported that tailoring the scheme to the needs of local people had helped to attract users. In Newcastle, the operating zone was designed to include hospitals and universities, with free passes offered to key workers during the severe COVID-19 restrictions of the winter of 2021, when the trial started. The operator in Newcastle explained that this enabled them to target desired user groups and to achieve a trial objective around facilitating the transportation of essential workers during the pandemic. This highlights the importance of considering demand among different potential user groups at particular points in time.

Essex and WECA trials offered both short term on-street rental, and long-term subscriptions (where operators provided users with their own individual e-scooter and charger that they were able to store at home). As well as increasing the appeal of e-scooters to a wider group, operators and local authorities saw this as a way of gaining insights on how use of the two rental options differed (see Section 3).

"We're quite interested in looking at the different behaviours of those two aspects and seeing how people might be using the two services differently, because LTR [long term rental] is really a good indicator for what private e-scooter usage would potentially be like in the future"

(Local Authority, Case study area)

8.2.2 Integration with local transport infrastructure

E-scooters were integrated into local transport infrastructure through changes to existing transport infrastructure and land use and journey planning. Across case study areas, the process of integration was achieved through partnership working between local stakeholders, highlighting the importance of effective collaboration.

Changes to infrastructure and land use included adding parking infrastructure and signage. There were also special cases in the West Midlands and Essex where investment into and construction of cycle lanes were underway to separate all forms of micromobility away from vehicle traffic. E-scooter operators also reported working closely with local transport operators on joint integration initiatives such as marketing, parking and journey planning. Across areas, efforts to make e-scooters complementary to other transport modes focused on locating parking zones in or close to public transport hubs such as train and bus stations. This was complemented with close working with local transport operators to carry out joint marketing.

"15% of rides are actually combined with public transport, which we've worked hard to do by working with the transport operators in each of the cities, so forming partnerships with them either for joint marketing or at least for parking adjacent to their premises or on their premises.

(Operator, Case study area)

Work was also being done with digital journey planning companies to integrate e-scooters into their services.

8.2.3 Managing impacts on vulnerable road and pavement users

The local stakeholder interviews demonstrated that close working with local representatives was a key requirement for managing impacts on vulnerable road and pavement users. Partnership working with charities for the blind and partially sighted, road safety organisations, equalities groups and local disability forums were all demonstrated as ways of doing this across the case study areas.

"We considered all road users, pedestrians, all different industry bodies, like the freight industry, but equally, lots of different stakeholder groups, and especially around blind and partially sighted."

(Local stakeholder, Case study area)

The input of these different parties had reportedly informed decisions on the suitability of where e-scooters were parked, with changes made in response. For example, an operator described receiving feedback from disability groups on where to move parking zones to promote street accessibility for blind and partially sighted pedestrians.

8.2.4 Awareness-raising

Stakeholders described using a range of methods, as described below, to spread awareness about e-scooter safety matters.

- Press releases and campaigns on riding safely, promoted through local media networks.

- Mandatory or incentivised online courses offering credits for enrolment.
- In-app messages, marketing and emails on issues such as e-scooter rules, helmets and where to park safely.
- Engagement with community groups to distribute flyers and posters on safe-riding rules.
- Training events to enable riding practice, where free helmets have been given away.
- Films with “local ambassadors” – such as sport personalities and local celebrities - on safe riding, to appeal to target demographics.

These awareness-raising activities were often used in combination and were facilitated by partnership working with other stakeholders, such as local disability groups. This highlights the importance of using multiple and concurrent methods for raising awareness of safe e-scooter use, and collaborating with wider stakeholders to communicate effectively with different target groups.

8.2.5 Parking

Several lessons learned were reported on the implementation of parking systems. The West Midlands for example, shifted from free-floating to designated parking bays[139] mid-trial due to concerns that e-scooters would be left where they should not be. The operator reflected that having visible parking infrastructure in place from the outset would have been a better approach, particularly to avoid confusion around parking rules among users and the public. Similar reasoning was made in favour of mandating designated parking bays by London stakeholders to improve residents’ awareness of where to expect to find parked e-scooters and avoid causing obstructions on pavements.

Consideration of the use and geography of local areas was seen as important when deciding on a parking system. Adopting a hybrid model (a combination of free-floating and designated parking zones, in different areas of town) was viewed to work well in areas such as Essex, which had both residential areas with lower footfall well suited to free-floating parking, and urban centres with limited space where parking needed to be controlled. Communication was thought to be key for improving public acceptability in areas with free-floating parking. The operator in Essex described raising public awareness of how the parking scheme worked through the local council and local media.

Following a process for the approval of parking areas was thought to help with establishing new mandatory parking zones. Enacting an agreed procedure was reported to have clarified roles and responsibilities, thus helping to avoid approval delays (see case illustration 2).

Case illustration

Establishing governance processes in WECA

The trial in WECA adopted mandatory parking zones whereby users were required to park e-scooters in certain areas. These designated parking areas were set up using geofencing technology and were view-able in the operator app. Over the course of the trial, a series of “playbooks” were established setting out procedures and processes that the combined authority, unitary authorities and the operator had to follow

[139] Free-floating parking allowed users to park in different parts of the pavement whereas mandatory parking only allowed users to park in designated parking areas, otherwise they would be fined or would not be able to end the journey.

when new parking zones were proposed, or when existing zones were queried. This sought to establish the tools and processes needed to manage the operations smoothly and in a timely manner.

8.2.6 Tackling anti-social behaviour

Close working between operators and local police forces was considered important in managing rental e-scooter-related anti-social behaviour. This often took the form of automated feedback systems and regular meetings in which evidence of recent incidents or upcoming events were shared. Drawing on this knowledge, a range of strategies for tackling anti-social behaviour were used. One of the main initiatives was the use of geofencing technology for no ride zones. One such example was in Newcastle where usage was restricted geographically in areas notorious for anti-social behaviour and was found to have been effective.

Restrictions on *when* e-scooters could be used also helped to reduce levels of anti-social behaviour, such as riding whilst intoxicated. In WECA, for example, several large events over the summer months, such as concerts and festivals, prompted close working between the combined authority, the operator and the police. E-scooters were disabled after a certain time on event days to avoid the risk of people riding whilst intoxicated. However, this prompted operational challenges, such as how to redistribute large numbers of e-scooters that had been used to travel to the event.

Other strategies included using on-street ambassadors and raising awareness through the media. In Essex, the operator and the police undertook a wide range of initiatives to tackle inappropriate riding on both rental and private e-scooters. Education was a key strategy used by local stakeholders, often in partnership. The operator also reported to us that they prepared and released public reports and ran media campaigns on TV and radio, mainly about pavement riding being illegal.

8.3 Challenges with implementation of the trials

Local stakeholders described a range of challenges that they had experienced in implementing the e-scooter schemes:

- **Local characteristics / geographies** – characteristics of local areas, such as road design, population density and governance structures presented difficulties for implementation such as in making parking decisions.
- **Level of support and public perceptions** – a key reported challenge was overcoming wider societal perceptions of e-scooters and raising support for the trials which had been understandably controversial, as a new and unfamiliar mode of transport.
- **Resourcing / workload** – some local authorities described finding it difficult to manage the day-to-day operational aspect of trial management alongside strategic work including stakeholder management, especially in the context of resource constraints.
- **Legal status of private e-scooters** – stakeholders described challenges relating to the fact that trial e-scooters were introduced whilst privately owned e-scooters remained illegal to use except on private land, most notably due to a lack of awareness and confusion among the public.
- **COVID-19** – stakeholders found launching trials during the pandemic difficult, with restrictions affecting timelines and limiting face to face public engagement.

The local stakeholder interviews provided insight into the challenges faced in relation to set up, expansion, integration, parking and enforcement (outlined below); many of which related to the factors listed above.

8.3.1 Set up and approval

Setting up trials and gaining approval was one of the first hurdles faced by local authorities and operators. Challenges were felt particularly in areas with more complex governance structures, such as Essex where the trial operated in six different local authority districts. The need to set up separate contracts with all six district councils had resource implications for both the local authority, districts and operator, as did the need to go through two layers of governance, with Essex being a two-tier authority.

> *"Getting districts on board meant presenting to cabinet boards, transport boards, scrutiny committees and delivering all member briefings. It was complex and time-consuming but essential."*
>
> *(Local Authority, Case study area)*

Administrative burden and contractual delays in specific areas were reported to have led to a staggered implementation. However, one operator also highlighted the advantages of being able to draw on the knowledge of a wide range of experts locally.

In contrast in the West Midlands and London, also with multiple participating local authorities, the schemes were being coordinated centrally by Transport for West Midlands (TfWM) and Transport for London (TfL) respectively. In the West Midlands, representatives from TfWM felt their central role brought efficiencies and helped remove burden from local authorities, though this was nonetheless resource intensive for TfWM.

Similarly, in London, TfL representatives saw their role in managing the trials, in partnership with London Councils, as key to offering a coordinated and consistent approach across boroughs. However, parking provision, "no-go" and "go-slow zones" were overseen by individual boroughs. This was reported to affect the ability to achieve a consistent and coordinated approach and necessitated greater engagement with the stakeholders involved, with TfL often acting as the intermediary between operators and boroughs.

Experiences of these models suggest that for areas with complex governance structures who wish to introduce e-scooter schemes in future, contractual arrangements, and associated resourcing and timetable implications, are important considerations.

8.3.2 Expansion of operating zones

Operators and combined authorities in some case study areas had encountered political resistance to the expansion of operating zones, which hindered their ability to expand their presence as planned. The most prominent example of this was in the West Midlands. The trials in the West Midlands were operational within three of the seven constituent authorities: Sandwell, Birmingham and Coventry (where the trial was paused, and subsequently re-focussed on Warwick University). Local negative perceptions were seen as key barriers to rolling out the trial further. From the perspective of the combined authority and operator, this was deemed to have weakened the trial.

> *"I think our ability to not deploy it further in the region, and have people slightly more open-minded to this, is probably one of the failings of the whole programme, I would say. We've got close with the other areas, but it's just not had the traction it's needed really to maximise the learning potential."*
>
> *(Local Authority, Case study area)*

These experiences suggest that the strength and breadth of local support should be a key consideration in future decision making to adopt e-scooters by local areas.

8.3.3 Integration with local transport infrastructure

Local stakeholders described facing several challenges in their attempts to integrate e-scooters with local transport. Responsibility and authority for transport planning and integration did not always sit with those managing the trials. Most notably, there had reportedly been limited progress in linking e-scooters with other modes where providers did not permit e-scooters on their services (such as buses in WECA) or did not allow parking bays at rail stations.

Although a few examples of plans and initiatives for integrating payment were given by operators, digital integration (ticketing) had made the least progress across areas. This was thus seen as a priority for the future for stakeholders delivering the trials. Indeed, stakeholders saw the process of integration as a long-term ambition and one that they did not necessarily set out to resolve during the trial period. For areas implementing rental schemes in future, these findings indicate that special efforts may be needed to achieve integration of e-scooters with local transport networks and that establishing partnerships with other transport operators early may be beneficial.

8.3.4 Parking

Parking was viewed as a prominent issue in each case study area and across participating local stakeholders. This was in part due to the design of roads and pavements in local areas. The limited space offered by narrow roads and pavements in areas such as Essex and Newcastle could mean parked e-scooters and designated parking zones caused obstructions. Parking density was raised as an issue in addition to the design of roads and pavements in local areas. Limited parking density across London was reported by local stakeholders to have led to users needing to walk long distances to find a parking bay. Stakeholders cautioned that this risked discouraging e-scooter usage and could have adverse effects on parking compliance because users were more likely to abandon their e-scooters if a bay was not nearby. When attempting to resolve the issue, stakeholders reported further challenges in locating suitable parking spaces that adhered with parking requirements, such as not allowing e-scooters to be parked outside pubs.

The trial areas' choice of parking model also appeared to shape the challenges that local stakeholders faced. Despite the convenience of free-floating parking for users, and the enhanced level of control over parking behaviours of mandated parking, both models were reported to bring challenges and to attract complaints from the public. The trade-offs of either model indicate that parking is a key area of deliberation for future schemes and that consultation and communication with residents and stakeholders on the chosen model and parking locations may be beneficial in garnering public acceptance.

8.3.5 Enforcement

Police representatives shared challenges around enforcement which appeared to differ across trial areas. In one case study area, the police saw the rising number of private e-scooters as their main challenge, rather than the rental scheme which they felt was well managed and had presented few issues.

"The bigger issue that we have is not with the legitimate pilots. It's with people buying independent e-scooters…we find the use of those e-scooters much more challenging because generally people are oblivious to the law."
(Police, Case study area)

However, police in another case study area reported having to deal with issues with rental e-scooters, such as pavement riding or e-scooters being left in the way of vulnerable pedestrians, that they believed should be effectively dealt with by geofencing technology or designated parking zones. In some areas the police also faced enforcement challenges due to difficulties in obtaining rider information from operators and identifying vehicles, especially where they did not have registration plates.

8.4 Suggested improvements

8.4.1 Communications to inform the general public about e-scooters

Across case study areas, local stakeholders highlighted a need for better communication around e-scooter rules as a way of fostering public acceptance. Local stakeholders suggested that more communication using mass media was needed to provide greater clarity on e-scooter rules (such as parking), differences between rental and private scooters, and on safety information. Some suggested that the DfT website needed to be better promoted as a useful and informative resource.

"From a national point of view, I think broadcast would be very helpful. I think we've all seen the 'Drive safe' adverts, but we don't have anything like that for scooters, despite the fact scooters are a brand new mode of transport, which 12 months ago weren't even legal. […] I think to carry weight, it needs to come from DfT or government branches"
(Operator, Case study area)

A recurring view among local stakeholders within the case study areas was that the rules regarding private e-scooter use were not being communicated clearly enough to the public, based on frequent complaints to operators relating to private e-scooters. Retailers were also thought to be responsible for providing customers with legal information at the point of purchase about where and how to ride as well as the need for insurance.

8.4.2 Adaptations to land use and transport infrastructure to accommodate e-scooters

In interviews, local stakeholders were asked for reflections on whether any changes to land use and transport infrastructure would better support the use of e-scooters in the area. The main suggestions made by stakeholders were segregated lanes for e-scooters, more on-road parking and improvements to parking bay signage.

A widespread suggestion across local stakeholder groups and case study areas was to improve the availability of segregated lanes (including cycle lanes) for e-scooters, given the perception that roads were primarily designed around cars. Stakeholders believed this would make e-scooter users safer and in-turn encourage take up. The need for funding to make infrastructure changes was noted, both for creating segregated lanes as well as to enable e-scooter riders to make full use of existing transport infrastructure. For instance, investment was said to be needed for road cleaning and parking enforcement, to enable e-scooter users and cyclists to use cycle lanes which were blocked by debris or parked vehicles.

More on-road parking for e-scooters was a suggestion made by an e-scooter operator. Their view was that pavement-based parking spaces encroached on walking space for pedestrians and were potentially hazardous to vulnerable groups, such as people with visual impairments. Allowing e-scooters to be parked in designated on-road areas, such as in a car parking space, was suggested as a possible solution both to preserving pavement space for pedestrians as well as for allowing more space for e-scooters to be parked tidily together.

One London operator also suggested adding more branding and information about the trials on parking bay signs to improve public awareness of the trials and parking areas without having to download the app:

> *"Let's put a sign up next to it that has the borough's logo on it, has the company's logo on it and explains a bit about the trial. At the moment we just have the markings on the floor and we say, okay, well, you'll have to download an app and find out about the trial."*
>
> *(Operator, Case study area)*

9. Performance against objectives

This section contains the final conclusions and recommendations of the evaluation. The discussion is structured around the key objectives of the trials and the extent to which these have been achieved.

9.1 Performance of the trials against their objectives

9.1.1 To inform future e-scooter policy through the Future of Mobility Regulatory Review

A key objective of the trials was to gather information on their performance that can be used to inform future policy on e-scooters. The national evaluation of the trials has involved gathering a large amount of evidence from users, residents and stakeholders regarding e-scooter travel patterns (including mode shift), the profile of users and the purpose of their e-scooter trips, and the safety, social and environmental impacts of e-scooter use on users and non-users. The evaluation provides feedback on the regulation of e-scooters, including vehicle requirements, speed limits, user requirements, and parking. The focus of the evaluation has been on rental e-scooter use and therefore only partly applys to private e-scooter use.

9.1.2 To improve and increase alternatives to private cars while protecting walking and cycling journeys

The trials have only achieved this objective to some extent, as the shift from both private vehicles and active modes has been high, thus providing a mixed picture. These findings could be partly explained by the fact that the largest trials operated mostly in city centres and urban locations, where travellers are less likely to drive.

However, survey findings also showed that the proportion of users shifting from private motor vehicles to e-scooters had been increasing over time, while mode shift from active modes had been decreasing. This could be because of users making more purposeful journeys (e.g. for commuting) that would have previously been taken by modes other than walking as well as a result of people returning to private and public transport with the easing of travel restrictions (thus resulting in higher mode shift from both private and public transport and less from walking).

As the trials became more mature, there was also evidence to suggest that users were seeing e-scooters less as a novelty and more as a convenient mode of transport that they could use to get to specific destinations, showing trial e-scooters could provide a real alternative to other modes, including cars. However, the perception amongst residents remained that e-scooters were used mostly used for fun.

With most residents who had tried an e-scooter showed a preference for owning one in the future rather than renting one, long-term subscription models of use could be attractive options for encouraging mode shift from private vehicles. This is because long-term users were more likely to use an e-scooter more frequently, showing higher rates of commuting by e-scooter.

9.1.3 To provide easy access to safe transport options during the pandemic

Rental e-scooters appeared to provide improved transport connectivity during the pandemic. Rental e-scooters became a popular mode of transport across trial areas, with approximately 14.5 million trips having been undertaken since the start of the trials up to the end of December 2021. This suggests that e-scooters could have a place in future local transport systems, with some trials being more popular than others.

E-scooters were shown to be a convenient mode of transport and were reported as delivering time savings for users, as shown consistently across the user survey. For some users, e-scooters provided improved access to recreational destinations, and, to a lesser extent, medical services, workplaces and educational services. This demonstrates that e-scooters were able to provide access to different services and destinations during 2021, a period largely affected by the pandemic.

While demand was lower during lockdown periods as the need to travel was reduced and travel restrictions were in place, survey findings also suggest that the COVID-19 pandemic made many users more likely to rent an e-scooter. This was especially the case for those with disabilities, and particularly those with a condition that affected their mobility as shown in the user survey, who may have been particularly sensitive to public transport.

9.1.4 To provide a safe mode of public transport

Gathering reliable safety data was a challenge for the evaluation, recognised by the police and other local stakeholders, who were involved in safety discussions. Findings should therefore be seen as indicative.

Overall, users felt safe on a rental e-scooter but saw them as less safe than other modes of transport, except mopeds and motorcycles. For example, in comparison to bikes, 29% of users reported feeling less safe on an e-scooter while 20% reported feeling safer on an e-scooter, according to the user survey. Users suggested that dedicated cycle or e-scooter lanes, better road conditions and fewer potholes would be most likely to make users feel safer.

Findings from the user survey show that most collisions were experienced by new users[140] and, on the whole, collisions were seen as relating to rider error or poor road conditions, suggesting a need for both better training and infrastructure. An indicative comparison of casualty rates for rental e-scooters against pedal cycles suggested casualties were approximately four times more frequent on rental e-scooter trips compared to cycling[141]. The frequency of collisions may be related to the fact that e-scooters are a new mode and users were less experienced using it.

Resident survey respondents were also more likely to perceive e-scooters as a safety risk than bicycles and e-bikes. Qualitative findings indicated this was as a result of dangerous behaviour and pavement riding. Pavement cluttering and parking remained key issues for the rental schemes, often identified as a safety risk, as confirmed by the resident survey and local stakeholder interviews. Changes to how e-scooters should be parked and better enforcement should be considered to address these issues.

---

[140] First-time renters were roughly 2.5 times more likely to have an accident on their most recent trip, when compared to experienced users who had rented an e-scooter more than 20 times, according to analysis of the user survey.
[141] See Section 5: an estimate rental e-scooter casualty rate was close to four times the rate for pedal cycles according to DfT road safety statistics (2020).

Looking at the delivery of trials, stakeholders and operators worked together to implement different safety measures, to support making rental e-scooters a safe mode of transport. With trials still maturing and attracting new users, e-scooter safety may be expected to improve with time as riders, other road users and pedestrians get used to the new mode.

9.1.5 To enhance transport options for deprived communities or areas of social exclusion

E-scooters might have led to improved accessibility and connectivity for more deprived communities, thus helping achieve this objective. Users on low incomes and from ethnic minority groups were more likely to be frequent users than their counterparts, in addition to men and younger people. Some users also reported that e-scooters had helped them access key services such as medical appointments and essential shopping.

Evidence also indicated barriers to e-scooter use, including a lack of accessibility for those with health conditions, perceptions of e-scooters as for younger people only, difficulties with the registration process and a lack of experience, as reported in interviews with residents. This indicates there is an opportunity for greater diversity among e-scooter users who are predominantly young and male (71% of users were male and 74% were under the age of 35[142]).

E-scooters were also reported to have had a negative impact on some residents, with less than a third of residents agreeing that e-scooter users were respectful of pedestrians, although this view may have been influenced by the behaviour of private e-scooter users. Specific issues were identified with parking, which caused problems for residents by blocking their access on the pavement. Parking was a particular concern for those using buggies and mobility aids and visually impaired residents.

9.1.6 To increase the availability of low-carbon transport options

A reduction of 1.2 to 1.6 million car km across five case study areas was estimated as a result of modal shift from private vehicles to e-scooters, leading to a reduction in emissions (estimated between 269 and 348 tonnes up to the end of December 2021). While this is small in the context of UK emissions, this figure reflects the scale of the five trials analysed.

Users perceived e-scooters to be an environmentally friendly mode of transport and saw this as a motivation to use rental e-scooters. From the local stakeholders' perspective, rental e-scooter schemes were considered to be an opportunity for local authorities to achieve their net zero commitments.

E-scooters can be more carbon friendly at the point of use than some other modes of powered transport. Whilst not as low-carbon, or as healthy as walking or cycling; according to secondary sources they also appear to be one of the most energy efficient forms of motorised modes of transport. Interviews with operators across the case study areas showed that they were conscious of improving the sustainability of operations, for example, by deploying fleets of fully electric vans for charging and distributing e-scooters as well as implementing swappable batteries. This suggests that there is ongoing work by operators to further improve the sustainability of rental e-scooters.

---

[142] Evidence from demographic survey.

9.1.7 To increase user confidence

The majority of users felt confident riding rental e-scooters, with confidence increasing as users became more experienced. Users' confidence generally increased over time, especially for those who used e-scooters more often. In Wave 2 of the survey, users were asked if their confidence riding an e-scooter changed at all since the first time they rented an e-scooter. The majority (81%) said their confidence had increased greatly or slightly. Of those who had received training of some kind, 92% felt they had the confidence to ride safely, compared to 79% of those who did not receive any training, thus suggesting training can help increase user confidence. In this way, the trials can be said to be successful in increasing user confidence where training was completed.

Appendix A List of trials

Below is a list of all e-scooter trials in England. 31 trials across 50 trial areas remained live and those in red had closed at the end of December 2021.

Table 10: Overview of rental e-scooter trials

Trial	Region	Trial Area	Local Authority	Supplier	Trial start date
T01	North East	Hartlepool	Tees Valley Combined Authority	Ginger	July 2020
T01	North East	Middlesbrough	Tees Valley Combined Authority	Ginger	July 2020
T02	South East	Milton Keynes	Milton Keynes Council	Spin	August 2020
T02	South East	Milton Keynes	Milton Keynes Council	Lime	August 2020
T02	South East	Milton Keynes	Milton Keynes Council	Ginger	August 2020
T03	West Midlands	Birmingham	West Midlands Combined Authority	Voi	September 2020
T03	West Midlands	Coventry	West Midlands Combined Authority	Voi	September 2020
T03	West Midlands	Sandwell	West Midlands Combined Authority	Voi	December 2020
T04	East Midlands	Northampton	West Northamptonshire County Council	Voi	September 2020
T04	East Midlands	Kettering	North Northamptonshire County Council	Voi	September 2020
T04	East Midlands	Corby	North Northamptonshire County Council	Voi	November 2020
T04	East Midlands	Wellingborough, Rushden and Higham Ferrers	North Northamptonshire County Council	Voi	November 2020
T05	East of England	Norwich	Norfolk County Council	Beryl	September 2020
T06	West Midlands	Stafford	Staffordshire County Council	Ginger	September 2020
T06	West Midlands	Newcastle-under-Lyme	Staffordshire County Council	Zwings	September 2020
T07	South West	Cheltenham	Gloucestershire County Council	Zwings	September 2020
T07	South West	Gloucester	Gloucestershire County Council	Zwings	September 2020
T08	North West	Liverpool	Liverpool City Region Combined Authority	Voi	October 2020
T09	West Midlands	Redditch	Redditch Borough Council	Bird	October 2020
T10	Yorkshire and the Humber	York	City of York Council	Tier	October 2020

T11	East of England	Cambridge	Cambridgeshire & Peterborough Combined Authority	Voi	October 2020
T12	South East	Slough	Slough Borough Council	Neuron	October 2020
T13	North West	City of Salford	Salford City Council	Lime	October 2020
T14	South West	Yeovil	South Somerset District Council	Zwings	October 2020
T14	South West	Crewkerne	South Somerset District Council	Zwings	March 2021
T14	South West	Chard	South Somerset District Council	Zwings	March 2021
T15	East Midlands	Nottingham and Derby	Nottingham City Council	Wind	October 2020
T16	South West	Bristol	West of England Combined Authority	Voi	October 2020
T16	South West	Bath	West of England Combined Authority	Voi	October 2020
T16	South West	West of England area (Long-term)	West of England Combined Authority	Voi	October 2020
T17	South West	Taunton	Somerset West and Taunton Council	Zipp	October 2020
T17	South West	Minehead	Somerset West and Taunton Council	Zipp	June 2021
T18	South East	Canterbury	Kent County Council	Bird	November 2020
T19	South East	Aylesbury	Buckinghamshire Council	Zipp	March 2021
T19	South East	High Wycombe	Buckinghamshire Council	Zipp	March 2021
T19	South East	Princes Risborough	Buckinghamshire Council	Zipp	May 2021
T20	South East	Portsmouth	Hampshire County Council/ Solent Transport	Voi	March 2021
T20	South East	Southampton	Hampshire County Council/ Solent Transport	Voi	March 2021
T20	South East	Isle of Wight	Hampshire County Council/ Solent Transport	Beryl	November 2020
T21	East of England	Basildon	Essex County Council	Spin	December 2020
T21	East of England	Colchester	Essex County Council	Spin	February 2021
T21	East of England	Chelmsford	Essex County Council	Spin	February 2021
T21	East of England	Clacton-on-Sea	Essex County Council	Spin	February 2021
T21	East of England	Brentwood	Essex County Council	Spin	January 2021
T21	East of England	Braintree	Essex County Council	Spin	January 2021
T22	North West	Whitehaven	Copeland Borough Council	Ginger	November 2020

T23	Yorkshire and the Humber	Scunthorpe	North Lincolnshire Council	Ginger	December 2020
T24	North West	Cheshire West and Chester	Cheshire West & Chester Council	Ginger	December 2020
T25	South West	Bournemouth and Poole	Bournemouth Christchurch and Poole Council	Beryl	January 2021
T26	North East	Newcastle upon Tyne	Newcastle City Council	Neuron	February 2021
T27	East of England	Great Yarmouth	Great Yarmouth Borough Council	Ginger	January 2021
T28	South East	Oxford	Oxfordshire County Council	Voi	February 2021
T29	South West	Barnstaple	North Devon Council	Voi	March 2021
T30	North East	Sunderland	Sunderland City Council	Neuron	March 2021
T31	Greater London	London	Transport for London	Ridedott	June 2021
T31	Greater London	London	Transport for London	Lime	June 2021
T31	Greater London	London	Transport for London	Tier	June 2021
T32	North West	Rochdale	Rochdale Borough Council	Lime	March 2021

Appendix B Trial regulations

All trials need to follow the regulations as determined by DfT, set out in the table below. Trial authorities may impose additional regulations on top of these, such as a lower speed limit, or higher minimum age, which have now been implemented across many areas.

Table 11: Trial regulations (source: DfT[143])

Policy aspect	Details
Vehicle design standards 	• Electric motor with a maximum continuous power rating of 500W. • Maximum mass without rider of 55kg. • Designed to carry no more than one person. • Two wheels, one front and one rear, aligned along the direction of travel. • Fitted with a bell or horn, suitable for giving audible warning. • Fitted with a front and rear position lamp, with reflectors to rear and sides. • Fitted with two independent braking systems. At least one brake must be hand-operated.
Speed limit 	• Maximum speed of 15.5 mph. • Operators may provide variable speed limiters on their e-scooters, to allow for lower speed limits in more built-up areas.
Driving licence requirements 	• Users must have a valid driving licence. This can be: • A provisional or full UK licence with a category Q entitlement[144]. • If overseas - a valid full licence from an EU/EEA country or a valid full licence for small vehicles and entered the UK within the last 12 months.
Helmets and clothing 	• Helmets are recommended, but are not a legal requirement. • Fluorescent or light-coloured clothing is recommended.
Where e-scooters can be used 	• Can be used on the road (but not on motorways) and in cycle lanes. • Cannot be used on the pavement. • Operators and local authorities can impose geographical limits, defining the area of operation for each trial.
Other user rules/guidance	• During trials, e-scooters are classed as motor vehicles and are covered by the same laws and regulations that apply to motor vehicles. • Privately owned e-scooters remain illegal for use on public roads. • Users must be aged 16 or over. • Should only be used within the local area hosting the trial. • Should be used by one person at a time. • Towing prohibited. • Mobile phone use prohibited. • Drink driving, careless and dangerous driving offences apply. • Operators are responsible for motor insurance, and a minimum requirement of third-party cover is required. Providing insurance against vehicle theft/damage and personal insurance is optional.

[143] DfT (2020), Legalising rental e-scooters.

[144] Users can drive 2-wheeled and 3-wheeled vehicles without pedals with: an engine size not more than 50cc if powered by an internal combustion engine or a maximum design speed of no more than 25km/h (15.5mph). This category also includes trial e-scooters. See: Government, Driving licence categories.

Contact:

Matthew Dillon
Director

e: matthew.dillon@arup.com

Adriana Moreno Pelayo
Associate

e: adriana.morenopelayo@arup.com

Ove Arup & Partners Ltd
8 Fitzroy Street London W1T 4BJ
United Kingdom
arup.com