

# Powering the UK Gig Economy Safely: Tackling E-Bike Fire Risks for Food Delivery Riders



# Powering the UK Gig Economy Safely: Tackling E-Bike Fire Risks for Food Delivery Riders

**Nicola Christie, Sarah O'Toole and Jose Torero**

Department of Civil, Environmental and Geomatic Engineering  
University College London

**Tatianna Rodrigues**

Electrical Safety First

## About Electrical Safety First

Electrical Safety First is a campaigning charity that aims to reduce deaths and injuries caused by electricity in UK homes. We do this by working closely with Government, the electrical industry, manufacturers, retailers and consumer safety organisations to improve safety regulation and standards. We run media and digital campaigns to share advice and guidance with consumers that will help them to stay safe in their homes.

**This research was funded by Electrical Safety First**



# Contents

|                                                                                                |           |                                                                                  |           |
|------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------|-----------|
| <b>Foreword</b>                                                                                | <b>4</b>  | 5.5 Impact of consumer demand for fast food delivery                             | 34        |
| <b>Executive summary</b>                                                                       | <b>5</b>  | 5.6 Communication barriers and information needs                                 | 35        |
| <b>2. Introduction</b>                                                                         | <b>8</b>  | 5.7 Promising solutions and models                                               | 35        |
| 2.1 Context and Background                                                                     | 8         | 5.8 Infrastructure barriers to safety solutions                                  | 36        |
| <b>3. Methodology</b>                                                                          | <b>12</b> | 5.9 Collaboration and institutional constraints                                  | 36        |
| 3.1 Online survey of delivery workers using e-bikes                                            | 12        | 5.10 International approaches and good practices                                 | 36        |
| 3.2 Interviews with riders                                                                     | 13        |                                                                                  |           |
| 3.3 Interviews with stakeholders                                                               | 14        | <b>6 Stakeholder workshop</b>                                                    | <b>37</b> |
| <b>4. Results</b>                                                                              | <b>15</b> | <b>7 Summary of research findings</b>                                            | <b>38</b> |
| 4.1 Rider survey and interview participants                                                    | 15        | 7.1 Battery fire risk is real, growing, and taken seriously                      | 38        |
| 4.2 Rider survey and interview findings                                                        | 15        | 7.2 Indoor and overnight charging is widespread and often unavoidable            | 38        |
| 4.3 Theme 1: Fire risk is recognised, but unevenly prioritised                                 | 15        | 7.3 Informal and weakly regulated supply chains increase risk                    | 38        |
| 4.4 Theme 2: Charging and storage practices are shaped by housing constraints and work rhythms | 16        | 7.4 Responsibility for fire safety is fragmented and unclear                     | 38        |
| 4.5 Theme 3: Informal supply chains and conversions increase fire risk                         | 18        | 7.5 Education is necessary but not sufficient on its own                         | 39        |
| 4.6 Theme 4: Responsibility for fire safety is unclear and weakly governed                     | 20        | 7.6 Economic pressure is a core driver of unsafe conditions                      | 39        |
| 4.7 Views on support to manage battery safety                                                  | 22        | 7.7 Infrastructure solutions are widely supported                                | 39        |
| 4.8 Riders' views on leasing a bike                                                            | 22        | 7.8 Action must be coordinated and multi-level                                   | 39        |
| 4.9 Riders' views on employment status                                                         | 23        |                                                                                  |           |
| 4.10 Riders' views on what would improve safety                                                | 23        | <b>8 Policy recommendations</b>                                                  | <b>40</b> |
| 4.11 Photo submissions of rider e-bikes: visual evidence of safety risks                       | 24        | <b>9 Using behavioural science to identify voluntary intervention approaches</b> | <b>43</b> |
| <b>5. Views of stakeholders</b>                                                                | <b>31</b> | <b>10 Conclusions</b>                                                            | <b>45</b> |
| 5.1 Precarity, economic pressure and the transfer of safety responsibility                     | 31        | <b>11 Acknowledgements</b>                                                       | <b>46</b> |
| 5.2 Safety risks and public impact                                                             | 33        | <b>12 References</b>                                                             | <b>47</b> |
| 5.3 Regulatory and enforcement gaps                                                            | 34        | <b>13 Glossary of terms</b>                                                      | <b>49</b> |
| 5.4 Data deficiencies and evaluation challenges                                                | 34        | <b>14 Appendix</b>                                                               | <b>51</b> |

# Foreword

**Lesley Rudd, Chief Executive, Electrical Safety First**

At Electrical Safety First, our mission is to reduce deaths and injuries caused by electricity. As lithium-ion batteries become increasingly common in everyday life, powering everything from e-bikes and e-scooters to household devices, understanding and addressing the risks associated with their use has never been more important.

This landmark research, conducted by University College London in partnership with Electrical Safety First, provides vital new evidence on one of the most pressing electrical safety challenges facing modern society: the rising incidence of battery fires involving e-bikes used in the gig economy. The findings offer important insights into the experiences of delivery riders and the factors that influence battery safety in their daily work.

The rapid growth of app-based food delivery has transformed how many people work and how consumers access services. For thousands of delivery riders, e-bikes provide an affordable and flexible means of earning a living. Yet, as this report shows, many riders are doing so while navigating electrical safety risks that are not entirely within their control.

While many riders are aware of the dangers and want to work safely, they are often constrained by economic pressures, housing conditions, limited access to safe charging facilities, and fragmented responsibility for safety.

Importantly, the findings show that unsafe battery practices cannot be explained by individual behaviour alone and are strongly shaped by wider structural factors. It encourages us to move beyond blame and towards practical solutions that recognise the realities of gig economy work. The findings demonstrate that improving electrical safety requires coordinated action from government, regulators, industry, delivery platforms, manufacturers and others across the supply chain. Only by working together can we create the conditions that make safe behaviour both possible and achievable.

We hope this report will serve as a catalyst for evidence-based policymaking and practical interventions that reduce the risk of battery fires and better protect riders, their families, their communities and the wider public. By providing a clearer understanding of the challenges riders face, it offers an important foundation for developing solutions that deliver both safer outcomes and fairer working conditions.

I would like to thank the researchers at University College London, the stakeholders who contributed their expertise, and the delivery riders who generously shared their experiences so openly and honestly. Their insights have been invaluable in helping us understand the electrical safety challenges they face and the support they need to do their jobs safely, with confidence and dignity.

# Executive summary

The rapid growth of app-based food delivery has made e-bikes an effective means for thousands of gig-economy delivery riders across the UK to earn income. At the same time, lithium-ion battery fires involving e-bikes have increased significantly, posing serious risks not only to riders but also to their families, neighbours, emergency responders, and the wider public.

Most delivery riders want to work safely. However, this research found that economic pressures, housing constraints and the realities of gig economy work often make unsafe battery practices the easiest, or only, option. Almost three-quarters (73%) of riders surveyed said they were concerned about battery fires, and one in ten had experienced their battery overheating, an early warning sign of potential failure. Riders also showed strong support for practical solutions, including safe charging facilities, battery inspection services, and platform-delivered safety information, demonstrating that the challenge is not about motivation but about giving riders the opportunity and support to act safely.

## What needs to happen next

The evidence shows that reducing e-bike battery fires requires action that addresses the structural causes of risk, not simply rider behaviour. Based on the findings, this report recommends that the government, regulators and industry consider the following actions:

- **Review employment status for gig economy delivery riders**

The government should review the employment status framework for gig economy delivery riders, including 'worker' status, to determine whether it provides an appropriate basis for clear and enforceable health and safety responsibilities. This should include consideration of how platforms can be required to provide mandatory e-bike battery and fire safety training. The review should not predetermine a change in employment status but establish how consistent and proportionate safety protections can best be delivered across the sector.

- **Introduce mandatory health and safety training**

Require delivery platforms to provide mandatory battery and fire safety training before riders begin work, supported by regular refresher training, multilingual guidance and mandatory in-app recall and safety alerts.

- **Strengthen battery and online marketplace regulation**

Improve the regulation of lithium-ion batteries, chargers, conversion kits, and online marketplaces through stronger product standards, third-party certification, traceability, and recall arrangements.

- **Invest in safe charging infrastructure**  
Expand access to secure communal charging hubs, battery lockers and approved charging facilities so riders are not forced to charge batteries inside homes or shared accommodation.
- **Improve battery disposal and recall systems**  
Establish simple disposal routes for lithium-ion batteries and strengthen recall systems so safety information reaches riders quickly.
- **Improve data collection and evaluation**  
Develop a consistent national approach to collecting data on e-bike battery fires especially related to delivery riders and develop targeted approaches to identify the most effective ways to reduce fire risk.

## About this research

This report presents the findings of the first comprehensive UK study examining the risk of lithium-ion battery fires among food delivery riders. Conducted by University College London (UCL) in partnership with Electrical Safety First (ESF), the research combined:

- An online survey of **637 delivery riders**;
- **20** in-depth interviews with delivery riders;
- **10** interviews with stakeholders from government, regulators, emergency services, industry and civil society;
- A multi-stakeholder workshop;
- Analysis of rider-submitted photographs; and
- Behavioural science analysis using the **COM-B model** to understand the factors driving unsafe battery behaviours and identify the interventions most likely to reduce risk.

## Key findings

The research demonstrates that unsafe battery practices are not primarily the result of poor individual choices or a lack of awareness. Instead, they are shaped by wider structural factors, including insecure working arrangements, economic pressures, limited access to safe charging facilities, poor-quality batteries, housing constraints and fragmented responsibility for safety.

Across the research, five key findings emerged:

- **Riders want to work safely**, but economic pressures and the realities of gig economy work often limit their ability to do so.
- **Indoor and overnight charging is widespread and frequently unavoidable**, increasing the potential consequences of battery failures.
- **Unsafe equipment remains in use, with photo evidence identifying modified e-bikes and batteries subject to safety recalls** (see photos on the following page).
- **Responsibility for battery safety is fragmented**, with risks often falling on individual riders despite being shaped by wider systems and working conditions.
- **Education alone will not solve the problem**. Lasting reductions in battery fire risk require coordinated action across Government, delivery platforms, regulators and industry, supported by safer infrastructure, stronger regulation and clearer accountability.

## Conclusion

E-bike battery fires should not be viewed solely as an electrical safety issue. They are also employment, housing, and public safety issues.

The findings show that many unsafe behaviours are rational responses to the systems within which riders work. Reducing battery fire risk, therefore, requires more than asking riders to make different choices. It requires coordinated action to make safe behaviours easier, more affordable, and more achievable.

By addressing these structural barriers, government, regulators, and industry can significantly reduce battery fires while improving the safety of riders and the communities in which they live and work.



\*All images shown were submitted by delivery riders and reviewed by the Electrical Safety First Technical Team. The team identified these images as showing e-bikes fitted with possibly recalled batteries, which is a significant safety concern. The analysis additionally identified modifications that further compromise electrical safety, including exposed wiring, oversized motors, additional frame-mounted batteries, and batteries secured to bicycle frames using tape. Together, these factors greatly increase the risk of battery overheating, electrical faults, short circuits, thermal runaway, and fire.

## 2. Introduction

The evidence presented in this research highlights a critical but poorly understood intersection between the rapid growth of e-bike use in the gig economy, the prevalence of modified or non-compliant devices, and the rising incidence of lithium-ion battery fires. While existing data suggest increasing risks, there remains a significant gap in understanding how these issues specifically affect food delivery workers, including the types of e-bikes used, charging and storage patterns, and the extent to which safety awareness, modification practices, and economic pressures contribute to unsafe behaviours. The purpose of this project is therefore to explore the risk of e-bike fires among food delivery workers, with a particular focus on identifying factors that may increase that risk and on the implications for policy, regulation, and prevention.

### 2.1 Context and Background

A legal e-bike in the UK is one that meets the requirements for an Electrically Assisted Pedal Cycle (EAPC). It must have a motor with a maximum continuous rated power of 250 watts and cut out motor assistance at 15.5 mph (25 km/h). The rider must be at least 14 years old, and the bike must be properly labelled. E-bikes that meet these rules can be ridden like normal bicycles on roads, cycle paths, and other places where cycling is permitted, without the need for registration, insurance, or a licence<sup>1</sup>.

E-bikes have become an important mode of transport for many urban-based food delivery workers operating in the gig economy. The gig economy consists of workers who are paid per task or 'piece rate,' whereby service providers connect with users through mobile phone apps run by digital companies, such as Uber and Deliveroo. The more workers deliver, the more they earn. These workers choose their own work hours to fit around other commitments or work full-time. They are classified as self-employed and are not covered by employment law<sup>2</sup>. Analysis of the ONS Labour Force Survey data<sup>3</sup> estimated that around half a million people in the UK work in the gig economy, with 18% of these working in food delivery, and more likely to rely on it as their main source of income.

1 See [EAPC standards and legal requirements](#).

2 Taylor et al, 2017.

3 Cockett and Willmott, 2023.

We know the nature of food delivery work, and the pressures to deliver food quickly can lead to greater risk-taking and a lack of safety. International research highlights significant road safety risks for food delivery riders, particularly in the gig economy<sup>4</sup>. Key hazards include speeding to meet tight deadlines or increase earnings,<sup>5</sup> riding in dangerous weather for higher pay, fatigue from long hours in busy urban areas<sup>6</sup>, phone distractions while managing orders and navigation<sup>7</sup> and minimal safety-focused training<sup>8</sup>. In Great Britain, in a survey of gig workers, 42% of riders reported vehicle damage from crashes, and 10% experienced injury, often to themselves<sup>9</sup>. The safety risks associated with the gig economy are recognised in the current National Road safety Strategy<sup>10</sup> and have led to the All-Party Parliamentary Group on Cycling and Walking<sup>11</sup> to call for reintroduction of 'worker' status for riders to ensure fair pay and safety rights and discourage risky riding on e-bikes; indicating a wider concern about the relationship between working arrangements and risks that some riders take to earn a wage.

We currently do not have accurate data on what proportion of food delivery workers use e-bikes. However, media reports<sup>12</sup> claim that most of the illegal e-bikes seized by the City of London Police in the past year were used by food delivery riders. An e-bike that is deemed 'not legal to ride on public roads' does not meet Electrically Assisted Pedal Cycle (EAPC) rules. This includes bikes with motors rated above 250 watts, bikes that continue to provide motor assistance

beyond 15.5 mph (25 km/h), models that can be powered solely by a throttle without pedalling, or any e-bike that has been modified to remove speed or power restrictions. E-bikes that fall into these categories are treated as motor vehicles and cannot be legally used on public roads, cycle paths, or pavements without meeting additional registration, licensing, and insurance requirements. E-bikes can be purpose-built as integrated, professionally tested products, or pedal cycles converted by adding a motor assist to the existing bicycle frame.

These distinctions are important from a safety perspective, as modified or converted e-bikes may be more likely to rely on non-compliant, incompatible, or poorly maintained battery systems. E-micromobility can pose serious fire risks when batteries are damaged or fail. Lithium-ion battery fires spread rapidly, an effect called thermal runaway<sup>13</sup>, which can be explosive and most often is unmanageable. Although we do not have national data on the number of dwelling fires caused by e-bike battery failures, media monitoring conducted by Electrical Safety First identified 37 house fires linked to e-bikes and e-scooters between April 2022 and March 2023. Where data is available, a darker reality emerges.

4 Bieber & Moggia, 2021; Shin et al., 2019; de Oliveira et al., 2024; Possible, 2024.

5 Zheng et al., 2019; Papakostopoulos & Nathanael, 2021; Adhikari et al., 2022; Oviedo-Trespalacios et al., 2022; Tran et al., 2022.

6 Wang et al., 2021; Nguyen-Phuoc et al., 2024; Chen, 2023.

7 Christie & Ward, 2019; RoSPA, 2024; Wu et al., 2023.

8 Christie & Ward, 2019; Yan et al., 2024.

9 Christie & Ward, 2019.

10 Department for Transport, 2026.

11 See APPGCW (2025) [Unregulated and Unsafe: The Threat of Illegal E-Bikes](#).

12 See BBC (2024) [Delivery riders getting illegal e-bikes seized](#).

13 See ESF – [Thermal runaway](#).

In 2025, there were 432 e-bike and e-scooter fires attended by fire and rescue services across the UK<sup>14</sup>. During the same year, the London Fire Brigade (LFB) responded to 228 fires involving lithium-ion batteries in e-bikes; equivalent to an average of one fire every two days, or 19 fires a month<sup>15</sup>. This represents a stark increase compared with just a few years earlier. Less than a decade ago, in 2019, LFB recorded only ten e-bike fire incidents for the entire year. The figure increased to 143 incidents in 2023, 172 in 2024 and 228 in 2025<sup>16</sup>.

While these statistics are deeply concerning, there is no greater loss than the loss of life. Tragically, as of September 2026, three young people and one mother have sadly lost their lives due to e-bike fires this year alone, bringing the national death toll associated with e-bike fires to nineteen individuals<sup>17</sup>. Behind these individuals are families, loved ones, and communities forever changed.

Unfortunately, due to limitations in incident reporting, current data collection does not capture how many of these e-bikes were used for food delivery. Yet the human cost of this issue is already being felt. In 2023, Mizanur Rahman (aged 41, living in Tower Hamlets, London) succumbed to smoke inhalation after a fire broke out in the two-bedroom flat he shared with 16 other roommates. The fire was caused by the combustion of a converted e-bike battery belonging to one of his roommates, who used the e-bike to deliver food.

There is evidence to suggest that fire safety issues related to e-bikes are more pervasive than officially recorded. A UK government survey from the Office for Product Safety & Standards (OPSS, 2025) suggests Personal Light Electric Vehicle (PLEV) fire safety issues are more common than LFB data indicate. Wave 9 of the consumer research (2025) found that 6% of UK adults currently own or have access to a personal light electric vehicle (PLEV).

Among these PLEV owners, 14% reported having experienced a safety issue with their battery or charger. Of those who experienced an issue, the types of problems were evenly split between electrical (such as electric shocks) and mechanical (such as sharp edges), each reported by 50%. A further third (34%) reported issues involving fire or explosion, such as signs of smoke. Wave 8 of the research (2024) looked specifically at battery purchasing habits. It found that among PLEV owners, 26% had bought a separate replacement battery, 23% had bought a separate replacement charger, and 20% had bought a battery and charger together as a single product. While these findings relate to PLEV owners and users in general, and not specifically to delivery riders, they highlight the prevalence of purchasing replacement batteries and replacement chargers.

14 According to Freedom of Information (FOI) requests carried out by the Press Association. This investigation analysed lithium-ion battery-related incidents attended by fire and rescue services, with 37 brigades providing data across the UK.

15 See [London Assembly Research Unit \(2026\) London Fire Brigade Data Analysis](#).

16 See [Fires in e-bikes and e-scooters – 2024 – GOV.UK](#).

17 Where those who have lost their lives have been named:

- Leah Wagstaff, aged 31 (Kent 2026)
- Coby Keogh, aged 13, and Joey Gregory, aged 19 (Blackpool, 2026)
- Tommy Ballay-Dean, aged 16 (London, 2026)
- Fabian Henry, aged 12 (London, 2025)
- Eden Abera Siem, aged 30 (London, 2025)
- Natasha Johnson-Mall, aged 27, and her partner Karlo Bogdan, aged 24 (Coventry, 2024)
- Gemma Germeney, aged 31, and her two children Lily Peden, aged 8, and Oliver Peden, aged 4 (Cambridge, 2023)
- Sofia Duarte, aged 21 (London, 2023)
- Bobby Lee, aged 74 (London, 2023)
- Mizanur Rahman, aged 41 (London, 2023)
- Abdul Jabar Oryakhel, aged 30 (Bristol, 2022)

In the case of e-bikes, these fires are often due to substandard or faulty products, incompatible chargers, or modifications. E-bikes, especially those that are converted, could create a greater fire risk due to several factors:

1. **Increased Power Demand:** More powerful motors and batteries lead to higher energy density and greater strain during charging, which increases the likelihood of overheating or thermal runaway.
2. **Unregulated Modifications:** Conversion kits may bypass standard safety measures, may not meet safety standards and may involve poor-quality or incompatible components that heighten the fire risk. Conversion kits purchased online may be substandard and are more likely to be low-quality products.
3. **Overuse and Stress:** In the delivery sector, there may be more frequent and intense usage, which can degrade the battery faster and increase the chances of malfunction during charging.

The employment structure of the gig economy limits oversight of equipment safety. Delivery riders are often classified as self-employed contractors rather than employees; therefore, responsibility for purchasing, maintaining, and charging e-bikes and their batteries typically rests with individual riders rather than companies. In practice, this may increase the likelihood that riders source lower-cost or unregulated batteries, replacement parts, or chargers.

Given that gig economy work is often characterised by low income and precarious employment conditions<sup>18</sup>, there may be financial incentives to purchase cheaper components or modify equipment to increase speed or range. When these batteries are charged in domestic dwellings, this may pose fire risks not only to riders themselves but also to other residents in the building. We know employment status does affect risky behaviour in food delivery. Christie and Ward (2023) showed that people in the UK delivering food on motorcycles in the gig economy, compared to those employed by restaurants, were much more likely to report violating traffic rules, wear less protective equipment, have more licence points and be involved in more crashes.

18 Taylor et al., 2017; Newham Community Project and London Borough of Newham, 2025.

# 3. Methodology

This study aimed to achieve an evidence-based research report with policy and voluntary recommendations to reduce fire risks associated with lithium-ion battery use in the gig economy. Our approach focused on identifying key risk factors and behaviours among food delivery workers, and on potential solutions to address them from a systems perspective. This involved examining the interrelationships among individual, organisational, and work factors across the system. To gain a full understanding across these areas, our data collection focused on two primary groups: delivery riders and strategic stakeholders. Findings across the research elements are summarised and used to make policy recommendations. Finally, behavioural science was used to frame intervention approaches.

The methods used in our data collection included:

- An online survey among people using e-bikes in delivery work, with further questions asked of a subsample of these riders to explore issues in greater depth.
- In-depth interviews with riders.
- In-depth interviews with strategic stakeholders.
- Photo submission of e-bikes owned and used by delivery riders.
- A stakeholder workshop to develop report recommendations.
- Behavioural science analysis using the COM-B model to understand the factors driving unsafe battery behaviours and identify the interventions most likely to reduce risk.

Aligning with Electrical Safety First's commitment to ethical practice and understanding their unique barriers to participation, delivery riders were remunerated for their contribution to the research<sup>19</sup>. Delivery rider engagement and data collection were managed by a fieldwork company that has existing relationships in this space. The UCL team conducted stakeholder interviews. All research materials were co-created and co-designed with Electrical Safety First and UCL and were approved by UCL's Research Ethics Committee.

## 3.1 Online survey of delivery workers using e-bikes

With support from a delivery platform and a fieldwork company, we recruited a nationally representative sample of workers who reported using e-bikes as their primary mode of transport for delivery work<sup>20</sup>. While the sample is geographically diverse, it is inevitably weighted towards London, which reflects the concentration of delivery rider activity in this area. The purpose of the online survey was to gather data on:

- Availability and uptake of safety training
- E-bike/charger purchasing behaviours
- Housing conditions and storage practices
- Use of e-bike conversion kits
- E-bike charging behaviours
- Shared usage of e-mobility devices
- Awareness of risks

<sup>19</sup> Delivery riders were remunerated with £10 for completing the survey (estimated at a 10-minute burden), and £40 for the interview (max 45-minute interview). The subsample of respondents were entered into a £250 prize draw for their participation.

<sup>20</sup> The delivery platform involved disseminated the survey across their e-bike rider network. The platform did not take part in producing or developing the survey, nor did they alter the survey in any way before circulating across their rider network.

- Experience with battery/charging overheating/fire issues
- Proposed solutions to managing risk

Summary results from the online survey are presented using percentages and were analysed using SPSS 29.

### 3.2 Interviews with riders

The main questions covered in the delivery rider interview guide were:

- Rider background and working context
  - Demographics, housing situation, and household composition
  - Employment conditions, income dependence, working hours, and platform use
  - Job satisfaction and reliance on delivery work
- E-bike ownership and usage
  - Length of e-bike use and reasons for choosing e-bikes over other modes
  - Ownership models (personal, company-provided, third-party)
  - Purchase decisions, costs, insurance, and replacement of components
  - Type of e-bike (manufactured vs converted) and battery sourcing
- Knowledge of e-bike regulations
  - Awareness of road legal e-bike specifications (e.g. top speed)
  - Understanding of compliance and safety markings
- Battery knowledge and charging practices
  - Awareness of battery type, brand, age, and compatibility with chargers
  - Charging locations, timing, and storage practices (especially in the home)
  - Use of safety measures (e.g. fire-safe boxes)
  - Recognition of warning signs of battery failure
  - Battery disposal practices and recall awareness
- Awareness of battery fire risks and incidents
  - Knowledge of e-bike battery fires and perceived level of risk
  - Direct or indirect experience of battery-related incidents
  - Responses to incidents and reporting behaviour
  - Behavioural changes following incidents or awareness of risks
- Impact of working conditions on safety
  - Influence of delivery time pressure on charging and usage behaviour
  - Risk-taking driven by work demands (e.g. unattended charging, extra batteries)
  - Financial barriers to safer equipment
  - Perceived necessity of e-bike use to earn a viable income
- Perceptions of risk among riders
  - Views on which riders are most likely to use unsafe bikes or batteries
  - Structural and social reasons for unsafe practices
- Solutions, communication, and support
  - Informal discussions of safety among riders
  - Responsibility for safety awareness (platforms, emergency services, peers)
  - Effective communication channels and languages
  - Prior exposure to safety information and unmet information needs
  - Attitudes toward leasing safe e-bikes or battery testing services
  - Suggested improvements to e-bike battery safety
  - Additional concerns or experiences not previously covered

Riders were interviewed either online or by phone by the fieldwork company. The fieldwork company transcribed interviews. Thematic analysis was undertaken using large language models<sup>21</sup>.

Interviews were transcribed using the transcription function in MS Teams and checked against the audio to ensure accuracy. Stakeholders were not paid for their participation. Thematic analysis was undertaken using large language models<sup>23</sup>.

### 3.3 Interviews with stakeholders

Ten in-depth online interviews were conducted with key strategic stakeholders to identify barriers and facilitators to managing risky behaviours and to identify potential solutions. Stakeholders were identified based on existing work/research in this area, as well as those with the power to influence meaningful change across the sector<sup>22</sup>.

The interview topic guide covered:

- Understanding of the problem
  - Stakeholders' awareness of e-bike battery fire risks
  - Perceived causes, severity, urgency and who is most affected
- Assessment of existing solutions
  - Awareness of current measures in place
  - Perceived effectiveness of technical, regulatory and educational approaches
  - Barriers, gaps and limitations in current responses
- Roles and responsibilities
  - Views on who should be responsible for addressing the risks
  - Expected roles of platforms, manufacturers, regulators, workers, and building managers
- Proposed solutions
  - Suggested regulatory, training, enforcement, or technical interventions
  - Practical considerations: implementation, responsibility, resources, challenges and success metrics
  - Prioritisation of solutions with the greatest potential impact

<sup>21</sup> Jenner et al., 2025.

<sup>22</sup> Initial outreach done by Electrical Safety First and UCL's Centre for Transport Studies.

<sup>23</sup> Jenner et al., 2025.

## 4. Results

### 4.1 Rider survey and interview participants

In total, 637 riders completed the survey (see Appendix, Table A1). Survey respondents were predominantly male (88%), most commonly aged 25–34 (57%), and the majority were from an Asian ethnic background (56%). Around half reported that English was their first language. As mentioned previously, the majority of participants were based in London and the South of England. Most respondents (79%) reported using manufactured e-bikes, while 21% used converted pedal bikes. Around 62% reported working for only one company, 24% for two, and 14% for three or more. All participants indicated that they worked for major platform delivery companies across the UK (Deliveroo, Uber Eats, Just Eat, Happy Panda). It should be noted that most of the survey participants were recruited through a single major platform, which may limit generalisability.

Our interview sample (n=20) comprised 18 males (90%), two females (10%), representing a diverse range of ethnicities and ages. Of the sample, 45% used a converted pedal cycle, and the remainder used a manufactured e-bike (see pg.53, Appendix: Table A2).

### 4.2 Rider survey and interview findings

We present the themes that emerged from the in-depth interviews with riders, alongside data from the online survey, as a means of ‘triangulation’ to strengthen key messages. Four interrelated themes capture how fire risk is understood, experienced, and managed.

### 4.3 Theme 1: Fire risk is recognised, but unevenly prioritised

Most riders know that lithium-ion batteries can catch fire, yet the attention paid to this risk varies. Awareness was typically acquired through informal channels – social media, peer stories, or lived experience rather than formal training.

Several riders described heightened concern after encountering online videos or stories:

**“I’ve seen videos of... e-bikes... catching fire, and... the batteries... exploding... that’s why... I do worry...” (Participant 10)**

**“I’ve seen [e-bike fires] on the internet.” (Participant 5)**

More proximate experiences, such as fires affecting friends, intensified perceived risk:

**“He charged the battery in the nighttime... and... the room, and the house as well is burned.” (Participant 19)**

In contrast, some riders, particularly those using newer or manufactured e-bikes, expressed little concern:

**“In terms of safety... I’ve not had any safety concerns with the batteries.” (Participant 12)**

**“Our battery is a small battery... [so]... I don’t [worry].” (Participant 6)**

For others, risk was acknowledged but normalised as an unavoidable feature of delivery work:

**“I am concerned... I know it’s a risk... That is my job... you have to accept that.” (Participant 11)**

These accounts suggest that fire risk awareness is not absent but is unevenly distributed and often outweighed by economic necessity.

The survey results showed that a large majority of riders expressed concern about the dangers posed by lithium-ion batteries, with 73% reporting worry about battery fires. Although most had not personally experienced a severe incident, 10% reported that their battery had overheated at some point, and 1% had experienced an actual battery fire. These findings highlight that while direct incidents remain relatively rare, a meaningful proportion of riders encounter warning signs of battery failure – reinforcing why fire risk should be a prominent concern across the workforce.

#### 4.4 Theme 2: Charging and storage practices are shaped by housing constraints and work rhythms

Housing conditions and fragmented working days strongly constrained riders' charging and storage practices. Indoor charging was often unavoidable, even when perceived as unsafe:

**"My house is so small... it's literally... in front of my bed... [I charge] overnight." (Participant 18)**

**"I keep my bike in my hall... right at my door... it's maybe not something I've actually thought about." (Participant 9)**

Some riders actively sought ways to externalise risk from the home, though such options were difficult to access:

**"I've been looking for a storage unit... where I can... charge my batteries there. So if there's a fire... it's not inside my house." (Participant 18)**

Overnight charging emerged as a key 'risk moment'. While some riders avoided it due to fear:

**"That's why I never charge them at night time... I really was concerned." (Participant 19)**

Others described it as routine or necessary due to late shifts and fatigue:

**"If I close my shift around 10, 11, I just plug them... and sleep..." (Participant 12)**

Even riders aware of recommended practices described leaving batteries unattended because they needed to sleep or work:

**"Watch when it's finished charging... Which I don't do, because I'm just sleeping." (Participant 11)**

Riders used informal 'rules of thumb' – placing batteries on hard surfaces or away from flammable items – often without formal guidance:

**"Not leaving it near a... flammable source... Keeping it on... a hard... surface." (Participant 17)**

Overall, practices frequently labelled as 'unsafe' were shown to be structurally produced rather than careless.

The survey results revealed that riders' charging and maintenance behaviours were a complex mix of safety awareness and unavoidable risk. Just over half (52%) reported charging their batteries in living areas at home, and while a large majority (72%) removed the battery from the bike before charging, 39% still charged overnight while sleeping. A smaller proportion engaged in potentially higher risk behaviours, such as purchasing secondhand batteries (12%) or charging multiple batteries at once (23%). At the same time, most riders demonstrated strong safety intentions: 93% said they used only manufacturer approved chargers, 89% routinely checked batteries for signs of damage, and 84% avoided charging in extreme temperatures. Together, these findings show a workforce that is attempting to act safely within the constraints of their living and working environments.

In a more detailed look among 171 respondents<sup>24</sup> we asked riders about the ‘accident’ and collision history of their current e-bikes, as well as their awareness of various battery safety strategies. While only a small proportion responded that they were unaware of strategies for managing battery safety (Figure 1), follow-up interviews made it clear that their knowledge of these issues was superficial. This disparity is highlighted by the fact that 79% of all riders surveyed reported knowing how to dispose of old batteries. However, further probing during rider interviews revealed that many resold batteries or may not yet have needed to change them.

Findings demonstrated that knowledge of safe battery disposal was varied. While some riders had never had to dispose of a battery or had sold them on, others admitted to being unsure of what to do, or suggested taking them to local recycling centres:

“To be honest, all the past batteries I’ve had, I sold them on eBay. I’ve sold them. Yeah. I’ve never had to dispose of them, like, myself.” (Participant 10)

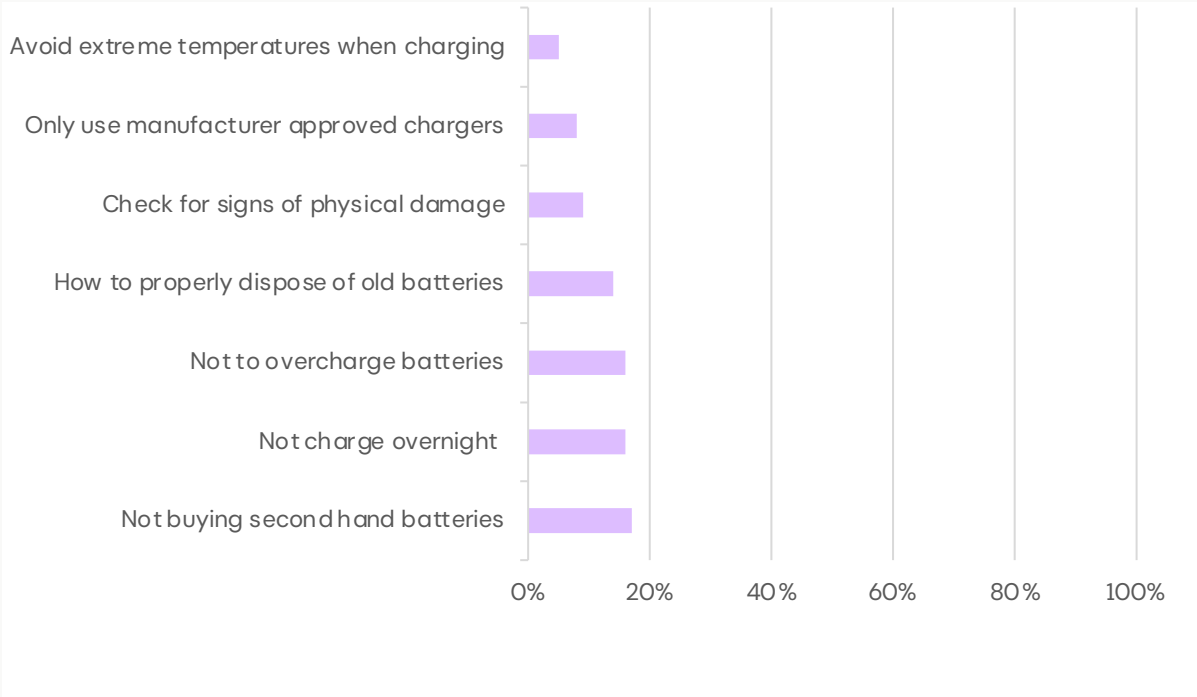
“I don’t know... what they would want me to do with that, but I don’t even know if it’s a case of... getting in touch with the... where I bought it, I wouldn’t know. I’d have to have a look... There’s probably something in the manual that I’ve not looked at.” (Participant 9)

“I’ll just take it to my local, you know, the dumpster.” (Participant 15)

Other participants seemed more knowledgeable or understood that specific recycling was required:

“Even my concierge, he said, put your e-bikes, batteries, in the bin downstairs. But obviously, I know better, so... and I kind of gave him a lesson. I said, no, because these batteries, they’re dangerous. I can put it there, and all of a sudden, I don’t know what could happen. Like, someone could dash liquid in there, because it’s a bin full of things, right? And alcohol, or anything of that matter. And then...That’s the building in flames. I mean, anytime I dispose of a battery, I take it to sort of a waste disposal site, where they’d know specifically what to do with a battery.” (Participant 5)

Figure 1: Proportion of respondents unaware of battery safety strategies (N=171)



24 These were additional questions asked to a subsample that were not covered in the main survey to reduce the response burden.

“I come from Portugal, and that is different, but here in the UK, I think we cannot put everything in a bin, like normal things in the bin. So, I think the better thing that I will do in that situation, maybe is just try to find on ChatGPT or something like that, what is the best solution to do with the battery, or where I can... put the battery, I think is what I will do in the future.”  
(Participant 3)

“If you’re on a budget... can’t afford... the main supplier... [you’re] more likely to... buy a damaged battery... off... Facebook Market...” (Participant 17)

Uncertainty about quality and provenance was common:

“I think all batteries come from China... Don’t mean because you bought it in the UK, that it’s gonna be better.”  
(Participant 11)

### 4.5 Theme 3: Informal supply chains and conversions increase fire risk

Many riders operated within fragmented and weakly regulated supply chains, sourcing batteries, chargers, and conversion kits through online platforms, second-hand markets, or peer networks. One rider described how he was able to source an alternative and, what he viewed as a superior, charger from an online platform:

“I custom bought my charger from AliExpress. It was... This was something unique and special to do with these cells as well, because these cells were able to charge really fast. And so I was able to buy, like, a 100 amp charger... which would charge the battery from zero to full in about one and a half hours, which was amazing.” (Participant 10)

This rider is highlighting a dangerous practice. Chargers and the charging rate are matched to the battery’s type and capacity by the manufacturer. Fast charging is not typical for standard e-bike batteries. If a rider is using an unmatched, generic fast charger, it is inherently unsafe. Others highlighted how budget constraints pushed riders toward lower-quality or uncertain equipment:

Engagement with informal markets was driven less by preference than by economic pressure, embedding fire risk within the political economy of gig work. Interestingly, modifications to e-bikes increasing their speed may be led by a lack of knowledge of the speed limit for EAPC e-bikes. Some riders noted in their interviews that 30mph was the limit and believed they could modify their bike accordingly. Such findings underline the importance of education and engagement with the Highway Code.

The survey results showed that many riders reported using bikes or batteries obtained through informal or higher-risk routes, with 17% saying they had modified their bikes and more than a quarter (27%) stating that their bikes could exceed the permitted speed limit. A significant minority (21%) were using a converted pedal bike rather than a manufactured e-bike, reflecting the economic pressures that often drive riders toward cheaper or improvised options. Patterns of bike acquisition further highlighted these dynamics: 33% bought their bike new online, 28% purchased from a dealer, and 18% bought second-hand (Figure 2), illustrating the fragmented and often weakly regulated supply chains shaping equipment quality and safety.

Importantly, the survey showed that compared with riders using unmodified bikes, riders with modified bikes were statistically<sup>25</sup> more likely to report having battery issues such as overheating (16% vs 9%) and that their bike went at higher speeds, e.g. 20 mph or higher (26% vs 17%).

Additional questions were asked in a sub-survey sample of 171 respondents. 71% of respondents reported using a manufactured e-bike, while 29% used a converted pedal

bike. Of these, 36% (n=61) of riders had made changes to their e-bike (Table 1), with most mentioning changing the battery, but other modifications were also noted that could make a bike not road-legal, such as adding a throttle. In most cases, these modifications were done by someone else. Of those who had made the changes themselves (Table 2) (n=26), most had used YouTube, and most found the information easy to understand (n=26) (Table 3) and trusted it (n=26).

Figure 2: How riders obtained their bike

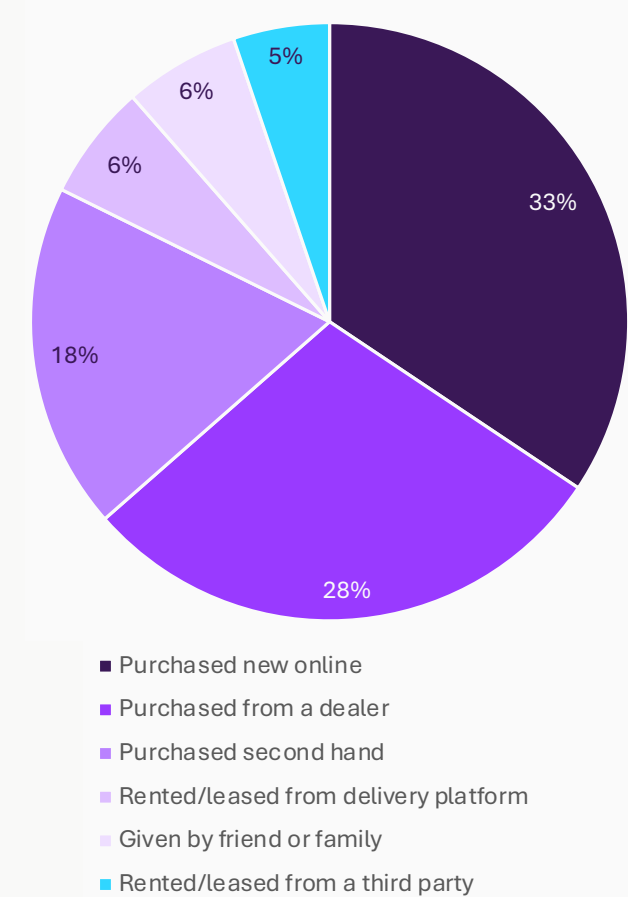


Table 1: Types of modifications (n=61)

| Modification                       | N  |
|------------------------------------|----|
| Added/changed battery              | 33 |
| Modified brakes                    | 25 |
| Upgrade/modified motor             | 20 |
| Changed original parts             | 18 |
| Added throttle                     | 11 |
| Customised wiring                  | 5  |
| Modified gears                     | 4  |
| Added Speedbox/ chip <sup>26</sup> | 2  |

Table 2: Who made the changes (n=61)

| A person modifying a bike               | N  |
|-----------------------------------------|----|
| Someone else                            | 35 |
| I made them all                         | 20 |
| I made some, and someone else made some | 6  |

25 The Chi Square test was used.

26 A SpeedBox chip is an electronic tuning device for electric bikes (e-bikes) that removes the standard 25 km/h (15.5 mph) or 20 mph motor assistance speed limiter.

We also asked the subset of riders whether they had been involved in a collision, as this could damage the battery and create a fire risk. 21% said they had been involved in a collision, after which seven riders had to replace their battery, presumably because it had been damaged. A higher proportion (38%) reported that their e-bike had fallen, and as a result, eight people replaced the battery. Most of this subsample (72%), however, reported no change with the battery. Of the 28% (71) who had experienced a change with the battery, the main cause was loss of charge (Table 4).

Of those experiencing problems, a further 28% said they had stopped using the battery as a result.

4.6 Theme 4: Responsibility for fire safety is unclear and weakly governed

Across interviews, responsibility for battery fire safety was perceived as fragmented across individuals, platforms, manufacturers, and regulators, with no clear actor taking ownership. Riders frequently noted the absence of platform-led fire or battery safety training:

“[Platform company] offers... so much training... but I’ve never seen anything on fire safety or e-bike safety... nothing ever... around battery... safety.”  
(Participant 17)

Some riders articulated a need for collective action:

“Every stakeholder... manufacturers... government agencies... everybody’s hands should be on deck.”  
(Participant 12)

Table 3: Information source used to modify bikes themselves (n=26)

| Information source | N  |
|--------------------|----|
| YouTube            | 18 |
| Friend             | 13 |
| TikTok             | 3  |
| Snapchat           | 3  |
| Rider forums       | 2  |
| Store              | 2  |
| Facebook           | 1  |
| Reddit             | 0  |

Table 4: Problems with batteries (n=71)

| Battery problems           | N  |
|----------------------------|----|
| Sudden loss of charge      | 29 |
| Overheated during charging | 17 |
| Battery swelled            | 11 |
| Overheated during use      | 10 |
| Battery smelt              | 2  |
| Battery smoked             | 1  |
| The battery caught fire    | 1  |

Knowledge of emergency response was uneven. While some riders mentioned fire blankets or extinguishers, others expressed uncertainty or fear about what to do in the event of an e-bike battery fire:

**“Not specifically, no... I wouldn’t know.”**  
(Participant 9)

**“I would run. Try to get away from it...”**  
(Participant 10)

Battery disposal and recall pathways were also unclear, creating secondary risks:

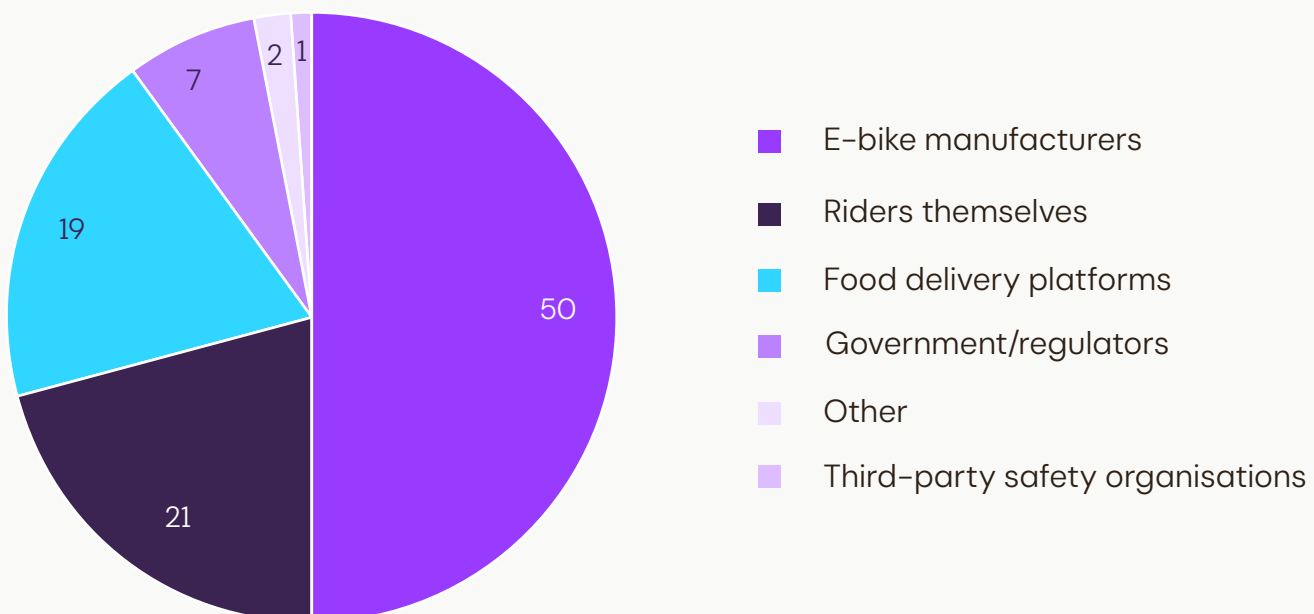
**“No, to be fair... I never had to actually dispose of it, not sure I’d know how to, to be fair, it’s probably, like, a certain centre that you’d have to take it to, I guess, or a certain facility.”** (Participant 20)

Riders were unclear where information concerning recalls would be available and how to act then:

**“I would imagine on the Engwe [e-bike manufacturer] Facebook page because... I’m a member of the... unofficial one and an official one. So I’d imagine either that or in the app for my phone... my bike’s registered into my phone... and I can track my bike and everything on that, so I’d like to think if there was an emergency or immediate sort of issue...”** (Participant 9)

In summary, there was little evidence of clear responsibility for preventing or responding to battery fires. Rider accounts show that responsibility for fire safety is effectively devolved to individual riders, despite their limited control over housing conditions, product quality, or work intensity and in the absence of clear safety guidance on preventing and responding to lithium-ion battery fires. Riders did not describe receiving structured fire safety training from delivery platforms, despite frequent app-based communications about performance and availability. In the online survey, we asked respondents who they believe is responsible for addressing battery safety risks. Half said that e-bike manufacturers should be responsible, followed by riders themselves (21%) and then food delivery platforms (19%) (Figure 3).

**Figure 3: Who riders felt was responsible for addressing battery safety risks.**



4.7 Views on support to manage battery safety

Riders were asked whether the following strategies would be helpful to them in managing battery safety. Most regarded all strategies as helpful, especially financial support for purchasing a safer battery (Table 5). In a further question, 65% said they would be prepared to pay more for a safer battery.

Riders were asked where they get their information about e-bike battery safety. Most riders said they obtained their information from e-bike manufacturers and nearly half from the delivery platforms, even though this was not top of mind for riders who were interviewed (Table 6):

Table 5: What riders would find helpful in managing battery safety (N=637)

|                                                        | Helpful |
|--------------------------------------------------------|---------|
| Financial support for purchasing safer batteries       | 90%     |
| Clear, simple guidelines in multiple languages         | 86%     |
| Easy access to safe charging stations                  | 86%     |
| A battery inspection service                           | 85%     |
| Reminders about battery safety from delivery companies | 84%     |
| Video demos                                            | 83%     |
| Insurance coverage for battery safety incidents        | 83%     |
| Battery certification schemes                          | 82%     |
| Shared e-bikes for delivery work                       | 64%     |

4.8 Riders’ views on leasing a bike

There were mixed views about leasing an e-bike for delivery work. For riders, bike ownership symbolised control and cost predictability, with some rejecting leasing due to recurring fees and restrictions:

**“Leasing, you have to pay... a regular amount of money. I don’t like that... if I don’t use it, I don’t have to pay anything to anyone [if I own it].” (Participant 13)**

However, many felt that a leasing scheme could help address safety, affordability, and convenience. Riders supported the idea of company-provided bikes, acknowledging the usefulness of maintenance, insurance, and theft protection and that such a scheme would help curb illegal work.

Table 6: where riders get information about battery safety (N=637)

|                                         |     |
|-----------------------------------------|-----|
| E-bike manufacturer                     | 57% |
| Delivery platforms                      | 49% |
| Social media, e.g. TikTok, Instagram    | 23% |
| Retailer where you purchased the e-bike | 20% |
| Government website                      | 16% |
| Other riders you know                   | 14% |
| Electrical Safety First                 | 12% |
| Online rider forums                     | 10% |
| Fire brigade                            | 9%  |
| None of the above                       | 0   |

**“If the company is giving those bikes, and if it has insurance, that would be a great idea, because...one of the biggest challenges for us is also the stealing of bikes.” (Participant 4)**

Safety was a central consideration in the acceptance of the leasing scheme, with riders mentioning the value of routine checks, approved batteries, and training in correct battery charging.

**“I think if the company offered it, I’d probably go down that instead, because I’d have more confidence that the bike’s going to be suitable, it’s going to be safe.” (Participant 17)**

## 4.9 Riders’ views on employment status

Employment choices hinged on balancing autonomy with security. Riders often prioritised flexibility, seeing self-employment as a way to fit work around studies or other jobs:

**“not connecting to a fixed schedule. I can work whenever it’s needed... and when I’m available.” (Participant 16)**

Others felt they could earn more money as self-employed workers:

**“I think we can earn more money like this, because we receive per order, not per hour... we can earn, like 130 to 150 pounds per day, sometimes 8 hours of work. If you want to do a little bit more, you still are allowed to do a little bit more, and that is good...and when it’s raining, they pay a little bit more as well.” (Participant 3)**

Some participants, especially those working full-time with families to support, expressed a preference for employment:

**“Probably, if I’m honest, yeah...[for] the usual things of having a, you know, employment contract and things like that, and, you know, sick days and pay, and holiday pay, or all that kind of stuff... paying into your pension.” (Participant 1)**

## 4.10 Riders’ views on what would improve safety

Riders were asked what they felt would improve e-bike fire safety. The key intervention approaches suggested by riders were:

- Battery and charger certification and checking services.
- Platform courses or videos on how you should look after an e-bike, how to look out for signs of battery failure, how to ensure batteries are secure on the bike, and how to protect them from rain.
- Use social media to raise awareness, e.g. Instagram or TikTok, on how you should store the bikes, the signs to look out for daily, e.g. three quick steps to check if your battery is in good working order.
- Platforms send emails to the riders about fire safety information via platforms.
- Information about managing risks needs to be provided in a variety of languages.
- Platforms introduce a bike lease scheme.
- Platform companies provide free fire-safe boxes.
- More checks on online product safety.
- Platforms provide research about the battery to help the rider choose the safest one for delivery work.
- Platforms to send ‘mandatory’ notifications to riders, focusing on managing battery safety (i.e., proper charging and storage practices), notifying them of any battery recalls or unsafe products. Riders must read these before being allowed to accept jobs.

4.11 Photo submissions of rider e-bikes: visual evidence of safety risks

As part of our data collection, we invited riders to submit photos of their e-bikes. In total, we received 96 unique images. The photo submissions provide valuable evidence, capturing real-world charging practices, storage conditions, and bike configurations that are often difficult to convey through surveys or interviews alone. Across the images submitted, a consistent pattern emerged: unsafe practices are widespread, normalised, and closely linked to the structural conditions in which riders live and work. One of the most concerning findings from the photo analysis, however, is the identification of recalled batteries still in active use. **Of the 96 images analysed, seven e-bikes (7.3%) were flagged by the Electrical Safety First technical team as almost certainly containing batteries subject to known safety recalls<sup>27</sup>.**

The classification of submitted photographs (Table 7) provides critical insight into the **types, conditions, and safety profiles of e-bikes currently used** by delivery riders. Across the images analysed, fewer than half (48.9%) were clearly identified as unmodified manufactured e-bikes, while the majority (51.1%) showed either converted, modified, or otherwise higher-risk configurations.

This distribution shows that higher-risk equipment is not marginal but constitutes **a substantial proportion of devices used by gig economy riders**. The presence of converted bicycles (26%) and modified manufactured e-bikes (17.8%) is particularly significant, as these categories are more likely to involve non-standard electrical systems, mismatched components, and varying levels of technical quality.

Table 7: Classification of submitted e-bike photos (N = 96)

| Category                          | Definition                                                        | Number of photos | % of sample |
|-----------------------------------|-------------------------------------------------------------------|------------------|-------------|
| Manufactured e-bikes (unmodified) | Factory-built, no visible modifications                           | 47               | 48.9%       |
| Converted pedal bikes             | Non-electric bikes fitted with conversion kits                    | 25               | 26%         |
| Modified manufactured e-bikes     | Factory-built but altered (e.g. wiring, battery, motor, throttle) | 17               | 17.8%       |
| *Recalled batteries identified    | Batteries subject to a known safety recall are still in use       | 7                | 7.3%        |
| Total                             |                                                                   | 96               | 100%        |

\* E-bikes fitted with recalled batteries have been classified separately due to the significantly higher safety risk they pose to riders.

27 Including unit pack power batteries, commonly referred to as UPP batteries, specifically the models U004 and U004-1. See [the Office for Product Safety and Standards recall notice here](#).

## Visibility of hidden risk in domestic environments

A key insight from the visual data is the extent to which battery risk is embedded within domestic spaces. Many photos showed e-bikes stored and charged indoors, frequently in small living areas, hallways, or directly adjacent to beds, heaters, and exit routes. These observations align with survey findings that 52% of riders charge batteries in living areas and 39% charge overnight, but the photos illustrate the severity and immediacy of this risk.

The submitted photos shown below illustrate batteries positioned near heaters and e-bikes blocking doorways. In the event of

a battery fire, these would not only ignite rapidly but also compromise escape routes. This reinforces concerns that battery fires in high-density or shared housing environments represent a significant risk to multiple occupants, not just riders themselves.

Importantly, these arrangements are not incidental. They reflect constrained housing conditions, including overcrowding and a lack of secure external storage. Even when e-bikes are from reputable sellers and unmodified, riders may have no alternatives for bike storage and charging, forcing them to engage in unsafe practices, such as storing e-bikes near heaters, as seen in Photo 3.

### Photo 1.

E-bike stored beside an indoor heater with a charger visible on the floor, indicating possible charging in a high-risk indoor location.



### Photo 2.

Converted pedal bike with a motor above 250W, two batteries, and a throttle, positioned near an exit doorway alongside a second e-bike, increasing fire and escape-route risk.



### Photo 3.

E-bike stored beside an indoor heater in a domestic setting, illustrating constrained indoor storage and elevated fire risk.

## Misclassification and misunderstanding of e-bike types

The photo data also reveals a substantial gap between riders' perceptions and the technical reality of their equipment. In several cases, bikes identified by riders as 'manufactured e-bikes' were assessed by the Electrical Safety First technical team as modified or converted.

This misclassification has important safety implications. Riders may assume that a bike is compliant and safe when in fact it has been altered in ways that increase electrical stress, expose wiring, or introduce incompatible

battery systems. The presence of exposed wiring, non-IP-rated connectors, and poorly integrated components indicates a lack of awareness of basic electrical safety principles.

This finding aligns with interview data showing confusion around legal definitions, battery compatibility, and safe modification practices. It suggests that education must go beyond general awareness of fire risk and include practical, visual guidance on identifying safe versus unsafe configurations.

Photo 4.



Photo 5.



Photos 4 and 5. Two bikes described by riders as manufactured e-bikes but assessed by the Electrical Safety First technical team as converted pedal bikes; Photo 4 also appears to show a potentially recalled UPP battery.



Photo 6.

Identified by the rider as a manufactured e-bike purchased second-hand with no additional modifications. The Electrical Safety First technical team has assessed this as a modified e-bike, with exposed wiring and non-IP-rated connectors. The e-bike is also placed beside an indoor heater and is obstructing a doorway.

## Prevalence of widespread modifications and battery configurations

The images submitted demonstrates that many riders are using bikes that diverge from manufacturer specifications, either through conversion kits or post-purchase modification. The most prevalent modifications seen in the photos, include:

- Dual battery setups, which increase load and complexity of electrical systems.
- High-powered motors and throttles exceeding EAPC limits.
- Wiring and aftermarket components lacking proper enclosure or protection.

Such configurations can increase the likelihood of overheating, short-circuiting, and thermal runaway, particularly when combined with intense usage patterns typical of delivery work.

The presence of these modifications reinforces our survey findings showing that 21% of riders use converted bikes and a significant proportion operate above the legal speed limit for EAPCs. The photos go further by demonstrating how these modifications are physically implemented; often in ways that indicate limited technical expertise and reliance on informal guidance (e.g. from online tutorials, as indicated by riders in their interviews and surveys).

**Photo 7.**

Converted e-bike fitted with a throttle, indicating non-standard modification.



**Photo 9.**

Converted bike with batteries mounted on the rear rack, taped electrical connections, and exposed wiring vulnerable to water ingress.



**Photo 8.**

E-bike fitted with a motor above 250W, indicating a high-powered configuration beyond standard EAPC limits.



**Photo 10.**

Converted pedal bike with two batteries mounted on the frame. The added battery increases the overall weight of the frame, making it prone to tipping-over impacting the structural internal integrity of the batteries.

This supports wider evidence that informal supply chains and peer networks play a central role in shaping equipment safety, often outside regulatory oversight.

### Continued use of recalled and potentially defective batteries

As noted in the beginning of this section, of the 96 submitted images received by delivery riders, seven (7.3%) were assessed by the Electrical Safety First technical team as highly likely to feature batteries subject to known safety recalls<sup>28</sup>. As the photo evidence shows, these were often paired with unsafe modifications such as exposed wiring, oversized motors, taped components, and additional battery attachments.

This highlights a critical breakdown in recall communication and lack of recourse for riders. These findings tell us:

- Riders may not be receiving recall notifications.
- Economic constraints may discourage riders from replacing recalled batteries (which may explain why some riders are using visibly degraded or poorly maintained components).

Combined with evidence that many riders purchase batteries through online marketplaces or second-hand channels, this suggests that current recall systems are not effectively reaching the highest-risk users.

**Photo 11.**

Converted bike with a large motor and two frame-mounted batteries, indicating a high-load configuration with elevated fire risk.



**Photo 12.**

Converted pedal bike powered by a recalled U004 battery, with exposed wiring, no protective casing or cable management, and visible rust on the rear hub motor.



<sup>28</sup> This figure should be interpreted as an informed, expert judgement rather than a confirmed count. The classification was based on visible characteristics such as battery casing, branding, form factor, and known design features associated with recalled models. However, definitive identification was not always possible, as serial numbers, model labels, and certification markings were often obscured, absent, or not visible in the submitted images.

**Photo 13.**

Converted pedal bike with a possible UPP battery, exposed wiring, a controller taped to the frame, and an oversized motor creating component strain.



**Photo 14.**

E-bike fitted with a possible recalled battery and an additional frame-mounted battery, illustrating how recalled products are being used alongside unsafe modifications.



**Photo 15.**

E-bike fitted with a possible recalled battery and an additional frame-mounted battery. During their interview, the rider disclosed they purchased this e-bike second-hand and replaced the motor and batteries watching online videos. Their account accompanied by this photo further illustrates the overlap between recalled components and unsafe modification practices.



## Normalisation of unsafe practices and risk adaptation

Across the photo dataset, unsafe practices appeared not as isolated incidents but as routine and normalised behaviours. This reflects a process of risk normalisation, where repeated exposure to hazard without immediate incident leads to reduced perceived urgency. It also illustrates how riders adapt their practices within constraints, developing informal rules and practices rather than relying on formal safety guidance. The visual evidence complements interview findings where riders describe accepting risk as 'part of the job' or adapting practices based on peer experiences rather than formal training.

## Implications for intervention design

The photo evidence demonstrates that effective responses must address not only knowledge gaps but also material and environmental constraints.

In particular, the findings suggest:

- Education interventions must be highly practical and visual, helping riders identify unsafe setups, recognise warning signs, and understand real-world risks.
- Infrastructure solutions are critical, particularly safe external charging and storage options to reduce reliance on domestic charging.
- Regulation of product supply chains must be strengthened, especially for online marketplaces and second-hand equipment.
- Recall systems must be redesigned to reach riders operating outside formal purchasing channels.
- Targeted communication strategies need to be tailored for riders, including multilingual materials and platform-based delivery, to ensure safety messages reach riders effectively.

## Strengthening the evidence base: what photos add

The photo evidence we received bridges the gap between reported behaviour and actual practice. While surveys and interviews capture perceptions and intentions, the photos reveal the physical realities of how risk manifests in everyday environments, the scale and visibility of unsafe practices, and the interaction between housing, equipment, and work demands.

This triangulation confirms that battery fire risk among delivery riders is not only widely recognised but deeply embedded within the systems and environments in which riders operate. These photos bolster the argument that 'unsafe' practices are often structurally produced rather than the result of individual negligence. These findings further reinforce the COM-B analysis presented in Section 9, particularly the role of constrained physical opportunity and incomplete capability in shaping unsafe practices.

# 5. Views of stakeholders

Interviews were conducted with ten stakeholders shown in Table 8.

**Table 8: Characteristics of stakeholder interview participants**

| Participant ID | Type                                         |
|----------------|----------------------------------------------|
| 1              | Local government (council)                   |
| 2              | Local government (transport)                 |
| 3              | Central government (transport)               |
| 4              | Central government (fire safety and housing) |
| 5              | Regulator (health & safety)                  |
| 6              | Emergency Services (fire and rescue)         |
| 7              | Emergency Services (police force)            |
| 8              | Charity                                      |
| 9              | Industry Association                         |
| 10             | Platform representative                      |

Interviews with key stakeholders revealed a shared concern over the intersection of economic vulnerability, regulatory gaps, and corporate accountability. This section presents the key themes emerging from these interviews, supported by direct quotes from participants.

## 5.1 Precarity, economic pressure and the transfer of safety responsibility

Participants felt that gig workers operate under precarious self-employed conditions, shifting legal responsibility for vehicle safety, maintenance, and training onto the riders themselves. Economic pressures drove long hours and the use of unsafe or unregulated vehicles, including conversion kits, multiple batteries, and DIY modifications, increasing fire risks:

“When they’re self-employed... the duty for their health and safety falls to them... but the education isn’t there that they are responsible for those risks.”  
(Participant 5 Regulator)

“If I’m out doing a 12-hour shift, how can I actually do it without getting exhausted?... using something that’s not road legal... getting the benefits of a moped without the need to register or insure it.” (Participant 3 Central government)

“It’s all to do with the price point... they’re looking to get the cheapest solution to work as long and as fast as they can.”  
(Participant 1 Local government)

“... they find themselves as part of a chain... charging these things... you’ve probably got nowhere to put them except on your bed or in the kitchen.”  
(Participant 9 Industry association)

**“If they were employees, we wouldn’t be having this conversation... there would be standards... batteries wouldn’t be chained together.” (Participant 7 Emergency services)**

Cost and accessibility were identified as key risk factors with financial constraints pushing riders towards cheaper, potentially unsafe batteries and equipment, compounded by cost-of-living pressures:

**“The upfront cost of a bike is quite expensive... many riders... rely on cheaper batteries.” (Participant 10 Platform representative)**

Participants felt that the self-employment model meant that platforms were limited in mandating equipment or behaviours; and riders may choose to ignore guidance:

**“We do still have a responsibility to provide awareness... but at the same time, we can tell a rider all of these information bits and they can still choose not to take us up on it.” (Participant 10 Platform representative)**

Stakeholders felt that platform companies needed to do more:

**“Delivery companies cannot absolve themselves, indemnify themselves to the risk and should not be rewarding bad behaviour as in the speed.” (Participant 7 Emergency services)**

**“I feel some of the gig economy companies are just doing a bare minimum where profit margins are still skyrocketing, but they’re not looking out because they’re not classed as employers, from my understanding, so they don’t have that same responsibility for them. Morally, I think they should. But legally they don’t. I think that’s a huge barrier. Huge barrier. They could do so much more to assist Fire Rescue services across the globe, not just London and the UK, just by investing into those gig economy workers.” (Participant 6 Emergency services)**

**“We think the companies are doing much more than they used to and they’re taking safety more seriously than they used to. However... the red line is always this business model and self-employment status and this sort of insistence that ...their hands are tied and they cannot mandate anything and they can’t set standards and they can’t monitor the riders because of the self-employment status.” (Participant 2 Local government)**

## 5.2 Safety risks and public impact

Participants described serious public health hazards from lithium-ion battery fires, including the use of substandard or modified batteries, homemade chargers, and common indoor charging practices. Housing situations were regarded as often exacerbating risks to others in the building, and traditional fire protections were viewed as potentially inadequate due to the ferocity and toxic fumes of battery fires. It was felt that there were wider societal implications of this situation including threats to public trust and active travel agendas:

“Dodgy batteries, dodgy chargers causing fire... stored in communal spaces... charged in bedrooms...”  
(Participant 4 Central government)

“Quite often they’re in high-density housing... charging the bike in the hallway. If you’ve got two or three bikes, you only need one cell to go into thermal runaway.” (Participant 8 Charity)

“They’re wiring up quite a few batteries together... blocking exit routes from their home... even if they’ve got a battery that’s not liable to go up in flames, if the charger isn’t original, that’s potentially an issue... It will unfortunately result in more injuries and deaths... not just the riders, but whoever else is living in that property.” (Participant 1 Local government)

“Traditional fire doors are not designed to cope with this type of ferocious fire... we need dedicated charging areas in buildings.” (Participant 8 Charity)

“The toxic fumes... are a bigger risk than the fire itself... and most people don’t know what to do.”  
(Participant 5 Regulator)

“Our concern is around delivering the government’s active travel policy agenda, and concerns around battery safety have worked their way into the public domain. There’s been a lot of media reporting that, in turn, compromises people’s confidence in the safety of e-bikes.” (Participant 3 Central government)

Participants felt that battery fires posed severe human and financial risks, underscoring the urgency of safety improvements:

“The actual cost is somebody’s life... if your e-bike is charging and it explodes in your house, you have seconds before everything goes up in flames.”  
(Participant 10 Platform representative)

## 5.3 Regulatory and enforcement gaps

Governance around e-bike battery safety was seen as fragmented, with unsafe kits sold online and limited local authority power. Enforcement was described as ineffective, with rapid resupply after seizures and difficulties identifying illegal bikes. Police also faced storage issues with seized vehicles:

“So any assurance that is made, for on an online marketplace listing about CE marking<sup>29</sup> compliance or it meets this standard or another standard, has very little credibility or it’s incredibly hard to substantiate... even if you had all the knowledge... I would find it very difficult to substantiate most claims of Product Safety compliance, so it is absolutely a Wild West in terms of what comes in from these online marketplaces... that’s a very steep contrast to the very answerable and thoroughly compliant products you see in high streets and the high street sellers want to protect themselves.” (Participant 9 Industry association)

“As quick as we seize them, more are coming in... platforms take down a battery, and the same battery’s back with a different name.” (Participant 1 Local government)

“We have to take the bike... even though it could be made legal, we have to destroy it... We only have a stick. We don’t have a carrot.” (Participant 7 Emergency services)

“If a county police force was to seize as many as the Met did last year, they would bankrupt all of their garages.” (Participant 7 Emergency services)

Stronger regulations on manufacturing, imports, and national awareness campaigns were viewed as critical to reduce battery fire risks:

“There definitely needs to be stricter and stronger regulation... the government itself should do awareness campaigns.” (Participant 10 Platform representative)

## 5.4 Data deficiencies and evaluation challenges

Participants highlighted a lack of reliable data on battery fires, potential misclassification by fire services, and poor evaluation of interventions like rental schemes. Local and national government actors often relied on informal networks and anecdotal evidence, underscoring the need for centralised data collection:

“I’d like to see better and more nuanced information on battery fires collected by Fire and Rescue services.” (Participant 3 Central government)

## 5.5 Impact of consumer demand for fast food delivery

Participants felt that consumer demand for cheap, fast delivery contributed to unsafe practices among riders, while the public rarely connects expectations with risks faced by riders:

“The consumer wants immediate delivery... but equally, they want free delivery. Who’s paying for that?” (Participant 5 Regulator)

29 A CE marking is a symbol placed on certain products to show that the manufacturer declares the product complies with relevant European Union health, safety, and environmental protection requirements before it is sold in the European Economic Area (EEA). CE stands for Conformité Européenne (“European Conformity”).

## 5.6 Communication barriers and information needs

It was felt that language and literacy barriers limit the reach of safety messages to riders, and misinformation spreads rapidly through peer networks:

**“Well, the problem is again delivery riders statistically are likely to live in multiple occupancy premises. So it’s going to be everyone you know we are talking about one of the poorest sections of society. Often with limited or no English as well, so the ability to convey safety information to them is difficult. And geographically, where you go in London depends on what language the majority of the gig economy workers are going to speak. For example, at the moment in Stratford it’s Uzbekistan. I have zero copies of my forms in that language. So it can be really difficult to reach out and communicate. Insular communities don’t share information or even worse they share misinformation. So one person will have a device that is not legal and they will convince other people to take previously legal bikes and say you can do this to go faster to make more money.”** (Participant 7 Emergency services)

Engaging with riders with safety messages such as Charge Safe was also seen as problematic:

**“London Fire Brigade where they gave loads of information to their (platform company) riders, but it’s helped. It felt from those attending...that the riders were just there to get their new kit and it wasn’t necessarily the most engaging thing.”** (Participant 4 Central government)

It was also felt that more societal education and awareness was required, and many consumers sourcing e-bikes, components or the conversion kits may assume products bought online are safe:

**“85% of consumers believe products from online marketplaces have been tested and are perfectly safe.”** (Participant 8 Charity)

## 5.7 Promising solutions and models

Participants proposed several solutions, including subscription or rental schemes with safe, maintained bikes and centralised charging; battery certification programmes or passports; multilingual safety campaigns; employment reform for accountability; new vehicle classifications for commercial e-bikes; licensing schemes for sellers and operators; and public awareness campaigns such as “E-bike Positive”:

**“A low-cost subscription service is possibly a way forward... where riders pay to use safe devices from reputable manufacturers.”** (Participant 6 Emergency services)

**“delivery companies could be somehow or other obliged, that their riders used public hire bikes. At a special rate... or have a fleet of readily identifiable fit for purpose delivery bikes.”** (Participant 9 Industry Association)

However, barriers such as political inertia, platform lobbying, and affordability were felt to exist, and meaningful change may require legal reform regarding employment status and responsibilities of gig workers:

**“... ultimately I do wonder whether all of this is really just driven by the delivery business models of these companies, and unless that’s actually addressed and the fact they’re using illegal e-bikes is just a downstream consequence of their business model.”** (Participant 3 Central government)

## 5.8 Infrastructure barriers to safety solutions

Urban land-use and funding constraints were felt to limit the rollout of charging hubs and secure storage, especially in high density areas:

**“Land use is a big one... not having the space to have hubs that could support things like this.” (Participant 10 Platform representative)**

## 5.9 Collaboration and institutional constraints

Participants felt that some cross-government task forces and inter-agency groups exist, but progress was slow due to resource limitations and siloed responsibilities. Multi-agency coordination was seen as essential, combining education, regulation, and enforcement:

**“We all have our own priorities and limited resources... but it’s slow progress.” (Participant 4 Central government)**

**“It needs to be all of them... a mixture of education, regulation, and enforcement... everyone involved.” (Participant 1 Local government)**

Multi-stakeholder collaboration involving platforms, emergency services, and government bodies was regarded as essential to raise awareness and deliver practical safety guidance:

**“It’s something that can only really be sorted out if all stakeholders come together and address it.” (Participant 10 Platform representative)**

## 5.10 International approaches and good practices

This research noted several international approaches (e.g., New York City, Singapore, New South Wales) that combine battery certification, delivery worker-focused programmes, enforcement, and rider education as potential models to inform UK policy.

These approaches shared key measures across their interventions:

- Battery certification and product safety standards
- Public education on safe battery use and charging
- Regulation and enforcement to improve compliance
- Recognition that protecting delivery riders requires action beyond individual behaviour

The measures unique to individual jurisdictions include:

- New York City: Public charging hubs, battery-swapping network and trade-in programme for unsafe batteries.
- Singapore: Mandatory registration, rider licensing and routine compliance inspections.
- New South Wales: Systematic monitoring of battery fire incidents and targeted warnings about battery modifications, alongside broader workplace reforms.

However, it should be noted there is a lack of evidence illustrating the probable effectiveness of these approaches if applied to the UK context.

## 6 Stakeholder workshop

In February 2026, a workshop was held with invited representatives from industry, public services, housing, and regulatory bodies to explore the growing safety challenges surrounding e-bikes used in the delivery sector<sup>30</sup>. After a presentation of the research key findings, including rider survey and interview findings, participants worked in small groups on how to address the primary issues raised. Throughout the workshop participants were encouraged to identify challenges, possible solutions and collaborative pathways forward. The views from participants were collated and thematically analysed and used to inform policy recommendations.

The stakeholder workshop found strong consensus that e-bike battery fire risk in the delivery sector is driven by a combination of unsafe products, limited regulation, housing constraints and the pressures faced by riders. Participants agreed that substandard batteries, chargers and conversion kits remain widely available, particularly through online marketplaces, while weak oversight, unclear disposal routes and limited recall systems allow unsafe equipment to remain in circulation.

There was broad agreement that reducing risk requires coordinated action rather than relying on individual riders. Key priorities identified included stronger product regulation and enforcement, safer charging and storage infrastructure, clearer responsibilities for platforms and other stakeholders, improved battery disposal and replacement schemes, and better rider training and support. Participants emphasised that effective prevention would require collaboration across government, regulators, industry, housing providers and delivery platforms to create safer conditions for both riders and the wider public.

<sup>30</sup> We were unable to secure representation from delivery riders to take part in the workshop.

# 7 Summary of research findings

Across delivery rider interviews, surveys, stakeholder interviews, and the stakeholder workshop, there is a strong agreement on the nature of the problem, its causes, and the types of solutions required.

## 7.1 Battery fire risk is real, growing, and taken seriously

Both riders and stakeholders recognise battery fires as a serious and escalating risk. Riders commonly describe awareness shaped by personal experience, peer stories, and online videos of fires, while stakeholders draw on fire service data, incident response experience, and regulatory knowledge. There is shared concern about the intensity and unpredictability of battery fires and their potential to cause injury, death, and widespread property damage which can affect the wider community.

## 7.2 Indoor and overnight charging is widespread and often unavoidable

Riders consistently describe charging batteries inside their homes often in bedrooms, hallways, or near exits and often overnight due to long, fragmented working hours. Stakeholders also mention the same practices as a major driver of fire risk, particularly in high-density and shared housing. These practices are not framed as careless choices but as constrained decisions shaped by housing conditions, lack of alternatives, and work demands.

## 7.3 Informal and weakly regulated supply chains increase risk

Riders and stakeholders agree that unsafe batteries, chargers, and conversion kits are widely available through online marketplaces, second-hand sales, and peer networks. Riders describe buying cheaper or replacement components due to cost pressures and uncertainty about quality; stakeholders describe the same markets as a “Wild West” with limited oversight, repeated relisting of unsafe products, and weak import controls. Both groups recognise that economic pressure, rather than preference, drives engagement with these markets. These factors mean that riders may not be aware of which batteries are safe.

## 7.4 Responsibility for fire safety is fragmented and unclear

Riders frequently report receiving little or no battery or fire safety training from delivery platforms and are unsure who is responsible for recalls, disposal, or emergency guidance. The research shows that ‘e-battery disposal’, in particular, is not universally understood by riders. This highlights the need for clear messaging and straightforward battery disposal guidance, providing accessible options for riders (e.g. convenient locations with no wait time). Stakeholders echo this, describing a system where responsibility is diffused across platforms, manufacturers, landlords, regulators, and riders resulting in gaps where no actor takes ownership. Both groups note that platforms are highly involved in performance monitoring but fire safety governance is variable and currently lacks a consistent approach. Particularly notable is the contrast between platforms’ active use

of in-app communications to monitor rider performance, track availability, and enforce equipment checks, and their near-total absence from fire safety governance. The infrastructure to reach riders directly and consistently already exists, it is simply not being applied to battery safety. This is not a case of platforms lacking the means to act, but of fire safety not yet being treated as a platform responsibility.

## **7.5 Education is necessary but not sufficient on its own**

There is shared recognition that knowledge gaps exist. Riders acknowledge confusion about safe practices (e.g. battery disposal, charger compatibility, modifications), and stakeholders emphasise lack of information and awareness. However, both groups also stress that education alone cannot resolve the problem if riders lack safe infrastructure, affordable equipment, or institutional support. Riders explicitly call for clearer, multilingual guidance and mandatory platform-based training; stakeholders similarly recommend education alongside regulation, enforcement, and infrastructure provision.

## **7.6 Economic pressure is a core driver of unsafe conditions**

Riders describe financial necessity, low margins, and pressure to maximise working time as shaping decisions around charging, equipment choice, and bike modifications. Stakeholders independently identify the same pressures, linking precarious self-employment, piece-rate pay, and cost-of-living pressures to increased safety risk. Both groups recognise that without addressing economic constraints, riders will continue to be pushed toward cheaper, riskier options.

## **7.7 Infrastructure solutions are widely supported**

Riders express strong interest in safe, external charging options, battery lockers/ fire safe boxes, inspection services, and leasing or subscription schemes that provide certified bikes and batteries. Stakeholders echo these preferences, highlighting charging hubs, secure storage, rental schemes, and planning-based solutions as among the most promising interventions. There is agreement that such infrastructure would reduce household risk and protect the wider public, not just riders.

## **7.8 Action must be coordinated and multi-level**

Both riders and stakeholders reject the idea that any single actor can solve the problem alone. There is consensus that effective prevention requires joined-up action across platforms, regulators, manufacturers, housing providers, emergency services, and national government – combining education, regulation, infrastructure, and enforcement.

In summary, rider and stakeholder perspectives lead to a clear conclusion: battery fire risk among delivery riders is systemically produced, not simply behaviourally chosen. Education is necessary, but without safer infrastructure, clearer governance, tighter product regulation and regulation of online marketplaces, and economic support, riders remain exposed to risks they cannot reasonably avoid. This alignment strengthens the case for policy responses that move decisively beyond individualised blame toward structural prevention.

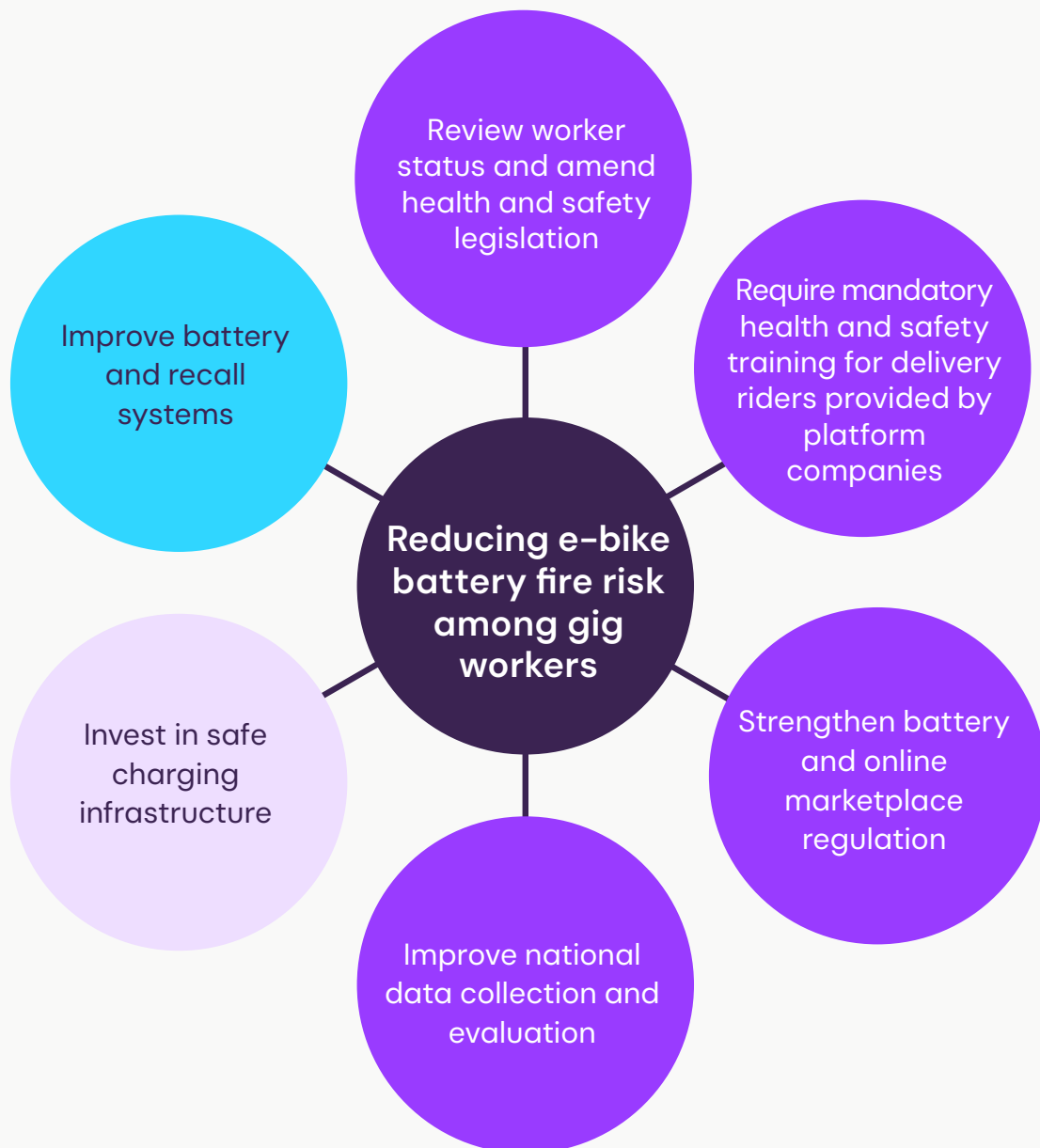
## 8 Policy recommendations

This research indicated that e-bike battery fire risk among delivery riders is not primarily the result of individual negligence or lack of awareness, but is systemically produced through precarious work, constrained housing conditions, informal supply chains, and fragmented governance. Riders already want to be safe. Effective policy responses therefore need to move beyond rider-focused education toward multi-level intervention. The dominant constraints sit in physical and social opportunity, meaning that from a behavioural science perspective environmental restructuring, regulation, and enablement are the most appropriate and ethical intervention functions underpinned by good quality data. Policy recommendations are summarised below (Table 9), with Figure 4 indicating the potential intervention approaches.

E-bike battery fires should be treated as a structural public safety issue, shaped by economic pressures, housing conditions, product safety failures and platform working models. Safety campaigns that focus solely on “best practice” charging are unlikely to be effective unless riders are provided with realistic alternatives. Behavioural guidance should be explicitly paired with material and infrastructural support. As with any intervention, the following recommendations must be designed and developed around riders’ needs. Government, delivery platforms and public bodies need to ensure that policies and communications reflect the realities of gig economy work, including language barriers, insecure work and housing conditions.

**Table 9. Policy Recommendations**

| Recommendation                                                                                  | Who?                                                                               | Suggested action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Review employment status and health and safety responsibilities for gig economy delivery riders | UK Government                                                                      | <p>The UK Government should review the current employment status framework for gig economy delivery riders, including the use of ‘worker’ status, to determine whether the existing framework provides an appropriate basis for clear and enforceable health and safety responsibilities where delivery platforms exercise significant control over working arrangements.</p> <p>As part of this review, the Government should consider how delivery platforms can be required to provide mandatory e-bike battery and fire safety training before riders begin work, supported by regular refresher training, multilingual guidance, and mandatory in-app safety and product recall notifications.</p> <p><b>The purpose of the review would not be to predetermine a change in employment status, but to establish whether the current framework enables appropriate and proportionate safety protections to be applied consistently across the sector.</b></p> |
| Strengthen battery and online marketplace regulation                                            | UK Government;<br>Product safety regulators                                        | <p>Strengthen the regulation and enforcement of lithium-ion batteries, chargers and conversion kits through improved product standards, mandatory third-party certification for e-bike batteries, enhanced traceability, and more effective product recall arrangements.</p> <p>Make online marketplaces legally accountable for the safety and compliance of products sold on their platforms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Invest in safe charging infrastructure                                                          | UK Government;<br>Local authorities;<br>Housing authorities;<br>Delivery platforms | Update building regulations and planning policy to require safe communal charging facilities in new high-density residential developments, alongside investment in secure communal charging hubs and battery lockers in existing communities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Improve battery disposal and recall systems                                                     | UK Government;<br>Local authorities;<br>Manufacturers;<br>Delivery platforms       | Establish simple disposal routes for lithium-ion batteries and strengthen recall systems so safety information reaches riders quickly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Improve national data collection and evaluation                                                 | UK Government;<br>Fire and Rescue Services                                         | Develop a consistent national approach to collecting data on e-bike battery fires and develop targeted approaches to identify the most effective ways to reduce fire risk.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Figure 4: Recommendations and intervention approaches****Key**

- Policy and regulation
- Environment
- Education, training and awareness

# 9 Using behavioural science to identify voluntary intervention approaches

People who deliver food and parcels using e-bikes generally want to use their batteries safely. However, many work in situations where the safest choice is not always the easiest or most affordable. Outside of changes to legislation and regulation there are behaviour change techniques that can help reduce risks of lithium battery fires in delivery rider sector. The **COM-B** behaviour change model<sup>31</sup> helps explain why these behaviours happen. It shows that people's behaviour is influenced by three things: whether they have the knowledge and skills to do something (**Capability**), whether their surroundings make it possible (**Opportunity**), and whether they have the motivation to do it (**Motivation**). The framework is closely linked to evidence-based Behaviour Change Techniques that can be used to design effective interventions<sup>32</sup>.

Our findings suggest that most unsafe battery practices are not caused by people ignoring the risks. Instead, they are often the result of limited access to safe charging facilities, uncertainty about which batteries and chargers are safe to use, and financial pressures that encourage the purchase of cheaper equipment. Many riders also develop routines, such as charging batteries overnight after long shifts, because these fit around their working lives.

This means that simply telling people to “charge safely” is unlikely to be enough. Making battery use safer requires practical support as well as better information.

From a COM-B perspective, interventions should therefore move beyond information campaigns alone. Instead, they should combine **education, environmental restructuring, and enablement**, while recognising the shared responsibility of delivery platforms, manufacturers, local authorities, housing providers and regulators in creating safer working conditions. There are several ways this could be achieved:

- **Provide clear, practical information:** Riders need easy-to-understand advice about choosing safe batteries and chargers, recognising warning signs of battery damage, responding to product recalls, and what to do if a battery becomes unsafe. This information should be available in different languages and shared through the apps and social media channels that riders already use.
- **Help people develop practical skills:** Free battery health checks, demonstrations, and local events could help riders learn how to identify damaged or unsafe batteries before they become dangerous.
- **Make safe choices easier:** Many riders have no choice but to charge batteries inside their homes because there are few safe alternatives. Providing secure charging hubs, battery lockers, and fire-resistant storage boxes would reduce the need for risky indoor charging.
- **Work with rider communities:** Safety messages are often shared between riders. Training trusted

31 Michie et al., 2011.

32 Michie et al., 2014.

community members to promote good practice and providing information in multiple languages can help replace misinformation with reliable advice.

- **Support safer decisions:** Delivery companies could encourage safer behaviour by offering discounts on approved batteries and chargers, providing regular safety reminders, and making battery safety part of routine training.
- **Change everyday habits:** Small changes, such as reminders in delivery apps before common charging times or prompts about battery recalls, could help people build safer routines over time.

Overall, improving battery safety is not just the responsibility of individual riders. Delivery companies, manufacturers, local authorities, housing providers, and regulators all have an important role in making safe behaviour easier, more affordable, and more practical. When people have the right knowledge, the right equipment, and the right support, they are much more likely to use e-bike batteries safely.

We acknowledge that delivery platforms are developing and supporting interventions. These include the #ChargeSafe campaign with London Fire Brigade and rider road shows across the UK and partnerships with bike leasing companies to provide subsidised compliant e-bike subscriptions and a recycling/trade-in scheme specifically for non-compliant e-bikes and batteries. However, more needs to be understood about the effectiveness of these initiatives using a behavioural science framework such as APEASE<sup>33</sup>.

# 10 Conclusions

This research set out to understand and address the growing risk of lithium-ion battery fires associated with e-bikes used by food delivery riders in the gig economy. Drawing on survey data, in-depth interviews with delivery riders, stakeholder perspectives, and workshop insights, the findings highlight that fire risk is not simply the result of individual rider behaviour, but is produced by the interaction of economic pressures, weakly regulated supply chains, constrained living conditions, and fragmented governance structures.

Across all research strands, there is clear evidence that delivery riders are operating within systems that limit their ability to act safely. While many riders demonstrate awareness of battery fire risks and express strong intentions to behave safely, their knowledge is often partial, inconsistent, or shaped by informal sources such as social media and peer networks. As a result, important gaps remain in understanding safe charging practices, battery compatibility, warning signs of failure, and appropriate disposal methods. In this context, practices such as indoor and overnight charging, use of modified or converted e-bikes, and reliance on informal supply chains emerge not as isolated risk behaviours, but as structurally constrained adaptations.

The research also highlights significant gaps in accountability. Responsibility for battery safety is dispersed across multiple actors, including riders, platforms, manufacturers, regulators, and housing providers, yet in practice is often devolved to individual riders. This is despite their limited capacity to influence key determinants of risk, such as product quality, housing conditions, or work intensity. At the same time, regulatory and enforcement mechanisms struggle to respond to the rapid growth of e-micromobility and the proliferation of online marketplaces supplying batteries and conversion kits.

Importantly, both riders and stakeholders converge on the need for action that goes beyond awareness-raising. Education is a critical component of risk reduction: riders themselves consistently call for clearer, practical guidance, delivered in accessible formats and multiple languages, and embedded within the platforms they use daily. However, education alone is insufficient. Without access to safe and affordable equipment, appropriate charging infrastructure, and stronger regulation of products and supply chains, riders will continue to face conditions in which safe behaviour is difficult to achieve.

This research demonstrates that the risk of e-bike battery fires among delivery riders is an urgent and growing public safety issue with implications extending beyond individual workers to households, communities, and urban safety systems more broadly. Addressing this challenge requires a shift in perspective from focusing on individual behaviour to tackling the structural conditions that produce risk, while ensuring that riders are equipped with the knowledge and tools needed to recognise and manage fire risk in their daily work. The recommendations set out in this report provide a framework for coordinated action across government and industry to reduce harm, improve safety, and support a more sustainable and equitable future for e-micromobility in the gig economy.

There are limitations to this research. We had limited involvement from a variety of delivery platform representatives in the stakeholder interviews and therefore we cannot say how their practices differ. The riders in the online survey were also largely recruited through one platform and again this may limit the generalisability of the research to riders working for other platforms, though many riders do 'multi-app' work (as shown in this sample). We also acknowledge that the use of e-bikes is potentially a minority mode used in delivery work.

# 11 Acknowledgements

We would like to thank: the staff of Electrical Safety First for their input into the design and reporting of this study and for facilitating access to key stakeholders; the riders and stakeholders who gave their time and valuable insights; and *Further Afield* for carrying out rider interviews and supporting the online survey.

# 12 References

- Adhikari, B. N., Behera, A. K., Mahapatra, R. N., & Das, H. C. (2022).** Analysis of traffic rule violations among bike riders: A structural equation model. *Operations Research and Decisions*, 32(3).
- Bieber, F., & Moggia, J. (2021).** Risk shifts in the gig economy: The normative case for an insurance scheme against the effects of precarious work. *Journal of Political Philosophy*, 29(3), 281–304.
- Chen, C.F. (2023).** Investigating the effects of job stress on the distraction and risky driving behaviors of food delivery motorcycle riders. *Safety and Health at Work*, 14(2), 207–214. <https://doi.org/10.1016/j.shaw.2023.03.004>
- Christie, N., & Ward, H. (2019).** The health and safety risks for people who drive for work in the gig economy. *Journal of Transport & Health*, 13, 115–127. <https://doi.org/10.1016/j.jth.2019.02.007>
- Christie, N., & Ward, H. (2023).** Delivering hot food on motorcycles: A mixed method study of the impact of business model on rider behaviour and safety. *Safety Science*, 158, 105991. <https://doi.org/10.1016/j.ssci.2022.105991>
- Cockett, J., & Willmott, B. (2023).** *The gig economy: What does it really look like?* London: Chartered Institute of Personnel and Development
- Department for Transport (2026).** *Road Safety Strategy*. <https://assets.publishing.service.gov.uk/media/695e2cff8832ab3a48513809/road-safety-strategy.pdf>
- de Oliveira, L. K., Cordeiro, C. H. D. O. L., de Oliveira, I. K., & Andrade, M. (2024).** Exploring the relationship between socioeconomic and delivery factors, traffic violations, and crashes involving motorcycle couriers. *Case Studies on Transport Policy*, 15, 101111.
- Jenner, S., Raidos, D., Anderson, E., Fleetwood, S., Ainsworth, B., Fox, K., Kreppner, J., & Barker, M. (2025).** Using large language models for narrative analysis: A novel application of generative AI. *Methods in Psychology*, 12, 100183. <https://doi.org/10.1016/j.metip.2025.100183>
- Michie, S., Atkins, L., & West, R. (2014).** *The behaviour change wheel: A guide to designing interventions*. Silverback Publishing.
- West, R., & Michie, S. (2019, January).** UBC Briefing 7: Evaluating behaviour change interventions using APEASE. Unlocking Behaviour Change. <https://www.unlockingbehaviourchange.com/pdfs/5c766be7b6281890464249.pdf>
- Michie, S., van Stralen, M. M., & West, R. (2011).** The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42. <https://doi.org/10.1186/1748-5908-6-42>
- Newham Community Project and London Borough of Newham. (2025).** *E-Bike Battery Fire Safety Project Report*.
- Nguyen-Phuoc, D.Q., Mai, N.X., Ho-Mai, N.T., Nguyen, M.H., & Oviedo-Trespalacios, O. (2024).** What factors contribute to in-role and extra-role safety behavior among food delivery riders? *Transportation Research Part F: Traffic Psychology and Behaviour*, 102, 177–198. <https://doi.org/10.1016/j.trf.2024.01.013>
- Office for Product Safety and Standards (OPSS) (2025).** *Personal Light Electric Vehicle (PLEV) Battery Safety Research*.
- Oviedo-Trespalacios, O., Rubie, E., & Haworth, N. (2022).** Risky business: Comparing the riding behaviours of food delivery and private bicycle riders. *Accident Analysis & Prevention*, 177, 106820. <https://doi.org/10.1016/j.aap.2022.106820>

**Papakostopoulos, V., & Nathanael, D. (2021).** The complex interrelationship of work related factors underlying risky driving behavior of food delivery riders in Athens, Greece. *Safety and Health at Work*, 12(2), 147–153.

**Possible (2024).** *Hot Wheels*.

**RoSPA (2024).** Driver distraction. Available at: <https://www.rospace.com/policy/road-safety/advice/riders/driver-distraction>

**Shin, D. S., Byun, J. H., & Jeong, B. Y. (2019).** Crashes and traffic signal violations caused by commercial motorcycle couriers. *Safety and Health at Work*, 10(2), 213–218.

**Taylor, M., et al. (2017).** *Good work: The Taylor review of modern working practices. Vol. 116*. London: Department for Business, Energy & Industrial Strategy.

**Tran, N.A.T., Nguyen, H.L.A., Nguyen, T.B.H., Nguyen, Q.H., Huynh, T.N.L., Pojani, D., Nguyen Thi, B., & Nguyen, M.H. (2022).** Health and safety risks faced by delivery riders during the Covid-19 pandemic. *Journal of Transport & Health*, 25, 101343. <https://doi.org/10.1016/j.jth.2022.101343>

**Wang, Z., Neitzel, R.L., Zheng, W., Wang, D., Xue, X., & Jiang, G. (2021).** Road safety situation of electric bike riders: A cross-sectional study in courier and take-out food delivery population. *Traffic Injury Prevention*, 22(7), 564–569. <https://doi.org/10.1080/15389588.2021.1895129>

**Wu, G., Huang, C., & He, D. (2023).** Exploration of social-psychological factors leading to distracted e-bike riding among delivery workers in China. *Transportation Research Record: Journal of the Transportation Research Board*, 2678(5), 127–137. <https://doi.org/10.1177/03611981231188371>

**Yan, X., Yang, L., Ye, X., Chen, J., Wang, T., & Du, M. (2024).** Unpacking the hazards: An analytic study of injury patterns and risk factors in urban instant delivery. *Injury*, 55(9), 111706. <https://doi.org/10.1016/j.injury.2024.111706>

**Zheng, Y., Ma, Y., Guo, L., Cheng, J., & Zhang, Y. (2019).** Crash involvement and risky riding behaviours among delivery riders in China: The role of working conditions. *Transportation Research Record: Journal of the Transportation Research Board*, 2673(4), 1011–1022. <https://doi.org/10.1177/0361198119841028>

# 13 Glossary of terms

## **Battery Fire / Lithium-ion Battery Fire**

A fire caused by the failure of a lithium-ion battery, often involving rapid energy release, intense heat, and toxic smoke.

## **Behaviour Change Wheel (BCW)**

A behavioural science framework used to design interventions by linking behavioural analysis (COMB) to intervention functions and policy options.

## **COM-B Model**

A framework for understanding behaviour, proposing that behaviour (B) results from interactions between Capability, Opportunity, and Motivation.

## **Converted E-Bike (or E-Bike Conversion)**

A pedal bicycle that has been adapted to electric operation using a motor, battery, and controller, typically via a conversion kit. These bikes vary widely in quality and safety and may not meet legal requirements.

## **Delivery Platform**

A digital company (e.g. food delivery or courier services) that connects customers, restaurants or retailers, and riders via an app, typically classifying riders as self-employed contractors rather than employees.

## **Domestic Charging**

The practice of charging e-bike batteries within residential dwellings (e.g. bedrooms, kitchens, hallways), often overnight. Identified as a key fire risk context in this report.

## **E-Bike (Electric Bicycle)**

A bicycle equipped with an electric motor and battery that provides pedal assistance. In the UK, a legal e-bike must meet Electrically Assisted Pedal Cycle (EAPC) requirements.

## **EAPC (Electrically Assisted Pedal Cycle)**

The UK legal classification for e-bikes. To qualify, an e-bike must have a maximum motor power of 250W, provide assistance only while pedalling, and cut out at 15.5 mph (25 km/h).

## **Gig Economy**

A labour market characterised by shortterm, taskbased work mediated by digital platforms, where workers are commonly classified as self-employed and paid per task rather than per hour.

## **Illegal E-Bike**

An e-bike that does not meet EAPC requirements, including bikes with higher powered motors, throttles enabling motoronly use, modified speed limiters, or unregistered motor vehicle equivalent systems.

## **Informal Supply Chains**

Nonregulated or weakly regulated markets for e-bikes, batteries, chargers, and conversion kits, including online marketplaces, second hand sales, and peer-to-peer transactions.

## **Modified E-Bike**

An e-bike, manufactured or converted, that has been altered after purchase (e.g. battery replacement, throttle addition, speed-limiting removal), potentially affecting legality and fire risk.

## **Platform-Delivered Training**

Education or guidance provided directly to riders via delivery apps, including onboarding materials, in-app messages, videos, or mandatory acknowledgements.

## **Recall**

A safety action whereby manufacturers or regulators advise users to stop using a product (e.g. batteries) due to identified safety defects, often requiring return, disposal, or replacement.

**Self-Employed Contractor**

A worker classification commonly used by delivery platforms, where riders are responsible for their own equipment, maintenance, insurance, and safety, and are not covered by standard employment protections.

**Structural (or Systemic) Risk**

Risk arising from broader economic, regulatory, housing, or organisational conditions—rather than individual choice—shaping behaviour and safety outcomes.

**Thermal Runaway**

A failure process in lithium-ion batteries where internal heating causes uncontrollable reactions, leading to fire, explosion, or rapid release of energy.

**Workplace Safety (in the Gig Economy)**

In this report, refers to risks arising directly from work activities (e.g. battery charging, equipment use) regardless of whether they occur in traditional workplaces or domestic settings.

# 14 Appendix

Table A1: Characteristics of online survey respondents (N=637)

| Age        |  | Percentage of sample |
|------------|--|----------------------|
| 18–24      |  | 15%                  |
| 25–34      |  | 57%                  |
| 35–44      |  | 20%                  |
| 45 or over |  | 7%                   |

| Sex    |  |     |
|--------|--|-----|
| Male   |  | 88% |
| Female |  | 12% |

|                             |  |     |
|-----------------------------|--|-----|
| English as a first Language |  | 50% |
|-----------------------------|--|-----|

| Ethnicity                   |  |     |
|-----------------------------|--|-----|
| Asian                       |  | 56% |
| White                       |  | 12% |
| Prefer not to say / Unknown |  | 10% |
| Black                       |  | 8%  |
| Middle Eastern              |  | 8%  |
| Latino/ Latin American      |  | 6%  |
| Other                       |  | <1% |

| Housing situation                                      |  |     |
|--------------------------------------------------------|--|-----|
| Private house                                          |  | 40% |
| Apartment/flat                                         |  | 32% |
| Shared accommodation e.g. house in multiple occupation |  | 19% |
| Temporary accommodation                                |  | 6%  |
| Hostel                                                 |  | 1%  |
| Caravan or trailer                                     |  | <1% |
| Other                                                  |  | <1% |

### Hours worked

|                    |     |
|--------------------|-----|
| Less than 10 hours | 15% |
| 10–20 hours        | 27% |
| 21–30 hours        | 23% |
| More than 30 hours | 35% |

### Current bike

|                                          |     |
|------------------------------------------|-----|
| Manufactured e-bike (bought as electric) | 79% |
| Pedal bike converted to an e-bike        | 21% |

### Number of platforms worked for

|             |     |
|-------------|-----|
| 1 platform  | 62% |
| 2 platforms | 24% |
| 3 or more   | 14% |

### Region

|                          |     |
|--------------------------|-----|
| London                   | 58% |
| Midlands                 | 8%  |
| North                    | 8%  |
| Northern Ireland         | 1%  |
| Scotland                 | 6%  |
| South (excluding London) | 17% |
| Wales                    | 2%  |

Table A2 Characteristics of rider interview participants

| Participant ID | Ethnicity      | E-bike type          | Age group  | Gender | First language | Housing situation       |
|----------------|----------------|----------------------|------------|--------|----------------|-------------------------|
| 1              | Black British  | Manufactured e-bike  | 30–39      | Female | English        | Apartment/flat          |
| 2              | White British  | Manufactured e-bike  | 30–39      | Male   | English        | Apartment/flat          |
| 3              | European       | Converted pedal bike | 25–29      | Male   | Portuguese     | Private house           |
| 4              | Asian          | Manufactured e-bike  | 25–29      | Male   | Urdu           | Private house           |
| 5              | European       | Converted pedal bike | 25–29      | Male   | Portuguese     | Apartment/flat          |
| 6              | Asian British  | Converted pedal bike | 25–29      | Male   | English        | Temporary accommodation |
| 7              | Asian          | Converted pedal bike | 30–39      | Male   | Hindi          | Apartment/flat          |
| 8              | Asian          | Converted pedal bike | 30–39      | Male   | English        | Private house           |
| 9              | White British  | Manufactured e-bike  | 18–24      | Male   | English        | Apartment/flat          |
| 10             | Middle Eastern | Converted pedal bike | 18–24      | Male   | English        | Private house           |
| 11             | European       | Converted pedal bike | 40 or over | Male   | Spanish        | Shared accommodation    |
| 12             | Black British  | Manufactured e-bike  | 40 or over | Male   | English        | Apartment/flat          |
| 13             | Middle Eastern | Manufactured e-bike  | 18–24      | Male   | Arabic         | Apartment/flat          |
| 14             | Black British  | Manufactured e-bike  | 40 or over | Male   | English        | Private house           |
| 15             | Middle Eastern | Converted pedal bike | 18–24      | Male   | English        | Private house           |
| 16             | Middle Eastern | Manufactured e-bike  | 40 or over | Male   | English        | Private house           |
| 17             | Asian          | Manufactured e-bike  | 30–39      | Female | English        | Apartment/flat          |
| 18             | Italian        | Converted pedal bike | 18–24      | Male   | English        | Apartment/flat          |
| 19             | Asian          | Manufactured e-bike  | 40 or over | Male   | Arabic         | Shared accommodation    |
| 20             | Asian          | Converted pedal bike | 40 or over | Male   | English        | Apartment/flat          |

## E-bike Safety Resources (1/2):

### Government recall notices:

Find out if your e-bike is safe here:  
[e-bike – Product Safety Alerts, Reports and Recalls – GOV.UK](#)

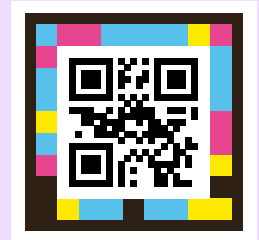
### QR code:



### Video links:

[E-bike conversion kits | STAY SAFE | ELECTRICAL SAFETY FIRST](#)

### QR code:



[How to use e-bikes and e-scooters safely | BATTERY BREAKDOWN | ELECTRICAL SAFETY FIRST](#)



[Why do e-bike and e-scooter batteries explode? | BATTERY BREAKDOWN | ELECTRICAL SAFETY FIRST](#)



## E-bike Safety Resources (2/2):

### Web links:

[E-bikes and e-scooters: Fire safety advice | London Fire Brigade](#)

### QR code:



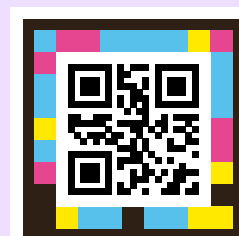
[Electrical Safety Advice for e-bikes](#)



[E-Bike & E-Scooter Safety Tips | Battery Guidance](#)



[Battery safety for e-cycle users – GOV.UK](#)



University College London  
Gower Street,  
London,  
WC1E 6BT  
+44 (0) 20 7679 2000  
[ucl.ac.uk](http://ucl.ac.uk)