



Standards &
Engagement



Raising the Risk:

How Safety Oversights of E-Mobility Riders
Threaten More Lithium-Ion Battery Fires

UL STANDARDS & ENGAGEMENT INSIGHTS AND POLICY ANALYSIS

The e-mobility device landscape in the United States — comprised primarily of e-bikes and e-scooters — is undergoing a significant expansion fueled by advances in lithium-ion batteries and the allure of convenience. Market analysts report a surge in e-bike sales in recent years, with the sector now valued in the billions.

This rise is driven not just by consumer preference, but also by practicality. Commuters are drawn to the time and cost savings offered by e-bikes, while the delivery sector has embraced their versatility. ULSE surveys estimate roughly 23.2 million Americans have used e-bikes and e-scooters for work-related tasks, including 16.7 million who have done so in the past 12 months. In New York City alone, more than [65,000 gig workers](#) rely on e-bikes and e-scooters to make deliveries.

The rental market reflects this growing adoption. As of 2022, [more than a quarter-million e-mobility devices](#) were available across 363 U.S. cities, catering to both commuters and tourists. Significantly, a growing number of riders report integrating e-bikes and e-scooters into their daily

routines, with an estimated [20 million e-bikeshare and 57 million shared e-scooter trips](#) recorded in the U.S. in 2022.

However, amid this rapid growth has come a troubling knowledge gap. Recent UL Standards & Engagement surveys, reveal a surprising lack of understanding among e-bike and e-scooter riders about the main technology powering their devices: lithium-ion batteries. Compounding this issue, many users report receiving inadequate information — or little to no information — from manufacturers and retailers regarding battery safety and proper charging practices.

This educational deficit extends to neglecting routine maintenance, another factor that increases the risk of batteries going into thermal runaway — a state of uncontrollable heat that can result in fire or explosion if the lithium-ion battery is damaged, overcharged, or defective. The New York City Fire Department reported a dramatic rise in such fires in 2023, with [268 incidents](#) leading to 150 injuries and 18 deaths. San Francisco tells a similar story, with [215 battery fires](#)

documented since e-bikes and e-scooters gained popularity there in 2017. Both cities have taken legislative action, requiring that e-mobility devices conform to safety standards. This risk and these fires, however, do not have geographic boundaries and are happening everywhere.

While some riders are aware of the risks associated with their e-bike batteries specifically, more than half of owners are unaware that their e-bike is powered by a lithium-ion battery. Even more concerning, when presented with common e-mobility charging and battery-related hazards, users perceived little threat to themselves, underestimating the severity.

These public awareness gaps and misconceptions further underscore the urgent need for standards to support safer products. Promoting responsible use and dispelling misconceptions are paramount to ensuring the safe future of e-mobility.

Below is an in-depth look at key trends across two separate UL Standards & Engagement online surveys of 2,200 U.S. adults on e-mobility safety, fielded in January and April 2024.



More than half of e-bike owners

are unaware that their e-bike is powered by a lithium-ion battery.





54% of current e-bike and e-scooter owners purchased it to support work-related tasks such as delivery gigs.

E-Bike and E-Scooter Market Grows as Consumers Seek Mobility Alternatives

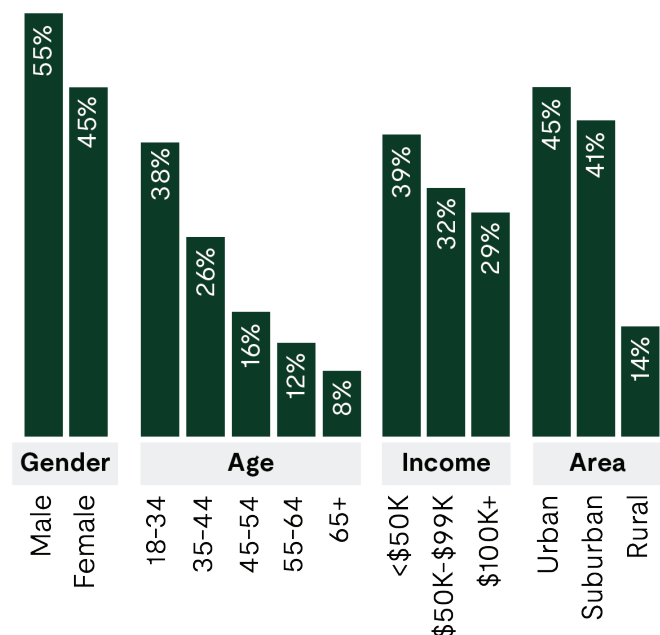
The U.S. e-bike market — inclusive of sales and rentals — continues to grow as more Americans are drawn by convenience and cost savings versus driving. Moreover, shifting consumer mobility choices and needs are driving greater reliance on these two-wheelers, with three-quarters of riders using e-mobility devices at least once a week and 55% saying they use their e-bike or e-scooter more often now compared to last year.



Market footprint expands as e-mobility options proliferate:

E-bike sales in the U.S. [leaped by 269%](#) between 2019 and 2022 according to analyst firm Circana. The [market size is expected to have grown further](#) in 2023, to be worth \$2.59 billion. E-bikes also drive a strong rental market via bike share programs: 12% of U.S. adults in ULSE surveys say they rent e-bikes once a month or more often, while 4% do so once a week or more often. An estimated 20 million e-bikeshare and 57 million shared e-scooter trips were taken in the U.S. in 2022.

Demographics of E-mobility Device Owners



Nearly half of riders (45%) live in urban areas, far more than the national average (32%).



Portrait of average rider is urban, young, and male:

UL Standards & Engagement's surveys revealed that 55% of e-bike and e-scooter adult riders are male. The majority are young, with 38% of riders ages 18-34 and 26% ages 35-44. Nearly half of riders (45%) live in urban areas, far more than the national average (32%). So many riders living in close proximity emphasizes the importance of increasing awareness of e-mobility risks, as lithium-ion battery fires are fast and fierce, and can spread quickly from apartment to apartment and even from building to building.



Buyers are attracted by convenience and cost savings:

Convenience of charging e-bikes and e-scooters at home (89%), saving money on gas (84%), and saving money on commuting costs (81%) are the primary motivators behind e-mobility use. For 54% of current owners, they purchased an e-bike or e-scooter to support work-related tasks such as package or food delivery gigs. Riders tend to be low or middle income, with 39% of riders reporting household incomes below \$50K and 32% reporting incomes between \$50K-99K.



72%

of e-mobility owners who bought their device for work have used it in the past 12 months



53% of e-bike owners and 54% of e-scooter owners do not know that their device is powered by a lithium-ion battery.

Limited Awareness, High Belief the Risk Isn't Personally Relevant

Consumer safety education regarding e-mobility continues to lag behind market growth. Many riders do not even know what powers their device and are uninformed about battery safety or best practices for charging and care. Though many consumers have heard about e-bike or e-scooter related battery fires in the news, the predominant lack of awareness translates to miscalculating the relevance of those risks and hazards to themselves.



Consumers unaware of power source and its risk:

A separate ULSE survey from March 2024 revealed that more than half of e-bike owners (53%) and e-scooter owners (54%) are unaware that their devices are powered by lithium-ion batteries. Not understanding the power source leads to not appreciating the risk, as 44% of Americans in the same March 2024 survey said they were unaware of risks associated with overheating batteries that can lead to thermal runaway.



Riders are downplaying the risks:

Consumers exhibit a worrying awareness gap, with nearly a quarter of riders (23%) and 55% of non-owners unaware of electric shock risks from damaged or overcharged batteries. Despite the documented dangers of faulty charging cables and equipment, 45% of e-mobility users dismiss personal relevance to fire or electric shock risks. A similarly concerning number (47%) underestimate the threat of electric shock from damaged or overcharged batteries. This complacency hinders efforts to promote safe practices and could lead to a surge in preventable accidents.



Lack of familiarity with safety standards:

The safety standards that ULSE develops for e-mobility devices and lithium-ion batteries support consumer safety and protect against risk. However, among e-mobility owners, 64% have heard or read little to nothing at all about safety standards for lithium-ion batteries. Similarly, 63% have heard or read little to nothing about safety standards for e-bikes and e-scooters. That said, e-mobility owners tend to be more educated about safety standards than the average U.S. adult. On average, 89% and 93% of all Americans, respectively, admit to hearing little to nothing about standards for lithium-ion batteries or e-mobility devices.



49% of e-bike owners who charge at home are blocking their home's fire exit paths with their devices.

Unsafe Behavior is Raising the Risk of Fire

The lack of rider awareness is contributing to behaviors that further increase the safety risks of e-mobility devices. Many of the devastating fires that have been caused by lithium-ion batteries were the result of damaged batteries or substandard or counterfeit replacement batteries. Further, in several cases in which death occurred, the victim's exit was blocked by the device. Increasing e-bike and e-scooter owner education at the point of purchase may help solve some of these concerning behaviors.



Users are blocking exits in the event of fire:

Charging habits of e-bike and e-scooter owners are increasing risks of overheated batteries and fires. More than half (55%) leave them plugged in after reaching full charge. Further, a significant number (42%) routinely charge overnight, and nearly a quarter (23%) charge them unattended while away from home. Nearly half (49%) of those who charge e-bikes at home charge them in a location that blocks egress in the event of a battery fire, such as an entryway, by the front door, or in a hallway. Amplifying the danger is the speed of battery fires: testing from the Fire Safety Research Institute shows an e-bike fire can fully engulf a room in flames in less than 20 seconds.



Battery replacement practices introduce safety variables:

Nearly half of e-bike owners (48%) say they have replaced an old e-bike battery with a new battery (44%) or a used battery (4%). Further, those who did replace the battery did so because of circumstances that threaten safety: 11% did so because the old battery caught on fire; 16% because the old battery was damaged from a crash or collision; 24% because the old battery was overheating; and 28% because they noticed swelling or bulging on the old battery.



Consumers lack adequate understanding of safe charging practices and routine maintenance:

There are missed opportunities for safety education during the sale of e-bikes and e-scooters. More than one in five (21%) never received any information from the manufacturer or retailer about battery safety or best practices for charging. Further, 66% haven't sought out this crucial information online. The educational deficit extends to preventative maintenance as well: 57% admit to neglecting regular checks on battery health, while 66% forgo routine inspections for signs of wear and tear on the battery or electrical components.

Keeping Life in Progress Through Battery Safety Standards



At UL Standards & Engagement, we work with stakeholders to achieve a safer world through standards.

There are more than 80 standards developed by ULSE that address lithium-ion battery risks, offering a layer of protection for consumers. For e-bikes and scooters, ULSE has three standards that cover the devices and the batteries that power them: [UL 2849](#), the standard for electrical systems for e-bikes; [UL 2272](#), the standard for personal e-mobility devices; and [UL 2271](#), the standard for lithium-ion batteries in e-mobility vehicles. These standards are designed to protect against thermal runaway and the devastating fires it can produce.

Several local governments have decided the risk is significant enough to require safety standards. In 2023, New York City enacted a law that states all e-mobility devices sold, leased, or rented in the city must comply with the three standards developed by UL Standards & Engagement. San Francisco approved ordinances that emphasize clear guidelines for safe charging and storage practices, along with requiring certified batteries to minimize fire risks associated with e-bikes and e-scooters. Other areas, including Washington, D.C., and Denver, are incorporating ULSE safety standards into their incentive programs.

These initiatives highlight the growing recognition of the need for stronger safety requirements as e-bike use continues to rise. Several pieces of legislation are currently pending in Congress that aim to reduce the risk of lithium-ion related fires, one of which would direct the U.S. Consumer Product Safety Commission to require all e-mobility batteries be tested to multiple safety standards published by UL Standards & Engagement.

Beyond regulation, many manufacturers and e-mobility companies are choosing to have their products tested and certified to safety standards. This accountability to safety is critical to ensuring that the proven and growing market for e-bikes and e-scooters can continue to thrive.

Methodology:

The results are taken from two separate ULSE Insights surveys, each consisting of responses from 2,200+ U.S. adults, conducted January 8-12, 2024, and April 12-21, 2024. E-mobility owners were oversampled in order to provide more precise estimates of their opinions and experiences. Responses for this group are weighted to reflect their correct demographic proportions in the overall population.

After data collection was completed, completed interviews were weighted by five variables: age, sex, geographic region, race, and education, to ensure reliable and accurate representation of the total U.S. population, 18 years of age and older. In the analysis and presentation of some data, calculations reference U.S. online adult population estimated at 240.2 million using two sources of publicly available data: 2020 wave of the U.S. Census for U.S. adult population estimate of 258.3 million, and Pew Research Center's Internet/ Broadband Fact Sheet which estimates 93% of U.S. adults use the internet, as of 2021.

The margin of sampling error at 95% confidence for aggregate results is +/- 2.2%. Sampling error is larger for subgroups of the data. As with any survey, sampling error is only one source of possible error. While non-sampling error cannot be accurately calculated, precautionary steps were taken in all phases of the survey design and the collection and processing of the data to minimize its influence.

All studies were designed and formulated by UL Standards & Engagement. Surveys were administered online by BV Insights. As a member of the Insights Association and ESOMAR (the European Society for Opinion and Marketing Research), BV Insights adheres to industry ethics and best practices, including maintaining the anonymity of respondents.

Note: All numbers are percentages unless otherwise noted. Figures may not total 100% due to rounding.

Perceptions of E-mobility Battery Safety

Lithium-ion batteries are widely used by e-bike and e-scooter manufacturers but these batteries can present safety hazards to owners if damaged, improperly charged, poorly manufactured, or counterfeit. Educating consumers about safety hazards and associated risks such as thermal runaway are paramount to ensuring the safe future of electric micromobility.

01 E-mobility devices are critical to the work lives of urban residents



45%
of riders are in urban areas



54%
of owners purchased e-bikes or e-scooters for work, 72% have used it for delivery gigs in the past 12 months



39%
of riders are low income and 32% are middle income

Source: ULSE E-mobility Insights Surveys Jan-April 2024

02 Battery replacement practices bring concerning safety variables

Nearly half of e-bike owners (48%) have replaced their old e-bike battery. Many did so as a result of circumstances that threaten safety:

11%
caught on fire

24%
were overheating

16%
damaged from a crash or collision

28%
were swelling or bulging

03 Lack of awareness translates to behaviors that increase fire risk



Nearly half of riders who charge at home are blocking their home's fire exits, a contributing factor in several cases where death occurred.

It takes only 20 seconds from the first sign of smoke to a room being engulfed in flames from a lithium-ion battery. A traditional fire typically takes about three minutes, according to tests conducted by Fire Safety Research Institute.

04 There is little awareness of the power source or its risk

The majority of owners of these devices are unaware that their devices are powered by a lithium-ion battery.

e-bike

53% unaware

e-scooter

54% unaware

