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The Emergence of Shared E-scooters: Prioritizing Safety

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Introduction

Innovation continues to create efficient and sustainable means of travel. Among these alternative mobility choices are e-scooters. To accommodate for this burgeoning new transportation market, cities have been tasked with adopting new policies and regulations to promote safety and multi-modal integration. Some cities have been reluctant to permit shared e-scooter companies without agreed upon stipulations involving publicly shared data, safety education, e-scooter supply limitations, and subsidized rides for low-income residents. A survey conducted by the City of Oakland in 2019 found that 41% of e-scooter trips would have been taken by car if riders did not have the option to use e-scooters. The survey also showed that 37% of riders use e-scooters to make connection to public transportation at least once a week[1]. "According to the National Association of City Transportation Officials, e-scooter riders logged 86 million trips in 2019.[2]" Allowing for the growth of inter-connections between transit networks while reducing acreage previously reserved for motor-vehicle parking may enable cities to reallocate space for multi-modal transportation as well as additional social welfare needs, such as housing. They also have the potential to provide first/last mile solutions for getting to and from public transit. E-scooters show promise for providing new opportunities to connect people and transit systems, but they also will require deliberate and effective efforts to ensure safety to prevent injury.

E-scooter equipped with light at an intersection at night

1 "City of Oakland Announces 2021 E-Scooter Service Providers, Safety…."
2 Preston, "New Study Shows Safety Risks of Riding E-Scooters on the Sidewalk."

E-Scooter Injury Studies

Since the deployment of shared e-scooters in 2017, e-scooter related injuries have gradually increased each year in the US between 2017 and 2020. “According to the Consumer Product Safety Commission, e-scooters resulted in an estimated 50,000 emergency department visits and at least 27 fatalities between 2017 and 2019[3].” Effectively identifying a means to track the size and scale of e-scooter related injuries remains a barrier for cities because of the novelty of the mode of transportation. However, there have been studies conducted to quantify the number of injuries sustained and identify prevention strategies for the future. Nellamattathil and Amber (2020) conducted a study based on a radiology report database from September 1, 2017 through December 1, 2018. They were able to identify 54 patients who were treated with mostly upper extremity musculoskeletal injuries. Notable findings include 76% of patients identifying as male, no patients reported wearing a helmet, and 44% of crashes occurring on sidewalks[4]. The authors caution deriving concrete conclusions related to injury patterns, given the small sample size and lack of image sourcing from additional radiology databases. However, an Insurance Institute of Highway Safety (IIHS) study had similarly found 66% of e-scooter riders were injured while riding on sidewalks and only about 1 out of 5 people were injured while riding in the bike lane, multiuse trail or other off-road location in Washington DC between March to December 2019[5].

Several US studies have found high-rates of head and limb trauma that e-scooter riders sustain[6]. The IIHS found that e-scooter riders sustained from more injuries per mile compared to bicyclists, but they ranged in similar severity. Although the injuries reported were of similar severity – the type of injuries sustained varied – e-scooter riders suffered more skull fractures and loss of consciousness. The study found that only 2% of e-scooter riders interviewed when receiving emergency treatment reported wearing a helmet compared to 66 percent of cyclists[7]. Kobayashi, et. al. (2019) conducted a similar study in which they queried three Level I trauma centers for patients with e-scooter related injuries from September 1, 2018 through October 31, 2018. The study found 103 patients were admitted during the study period, 65% of whom were male-identifying. A notable finding in this study was that 48% of these patients were found to be legally intoxicated at the time of admission. Although the sample size is limited, the rate of intoxicating substances found is notably higher than similar studies conducted for bicyclists (15-20%) and skateboarders (18-28%)[8].

Glenn, et. al. (2020) conducted surveys among e-scooter riders near two college campuses in Provo, Utah. Notable findings include the majority (56.2%) of riders were between the ages of 18-24 and a large portion (42.2%) of riders said they rode e-scooters to have fun. Although these sample populations are largely influenced by the study’s proximity to college campuses, survey respondents’ feedback about the need for safer road conditions and increased protective barriers from motor-vehicles mirror alternative studies.

3 ibid.
4 Nellamattathil and Amber, “An Evaluation of Scooter Injury and Injury Patterns Following Widespread Adoption of E-Scooters in a Major Metropolitan Area.”
5 “Most E-Scooter Rider Injuries Happen on Sidewalk, Study Finds.”
6 Glenn et al., “Considering the Potential Health Impacts of Electric Scooters.”
7 Preston, “New Study Shows Safety Risks of Riding E-Scooters on the Sidewalk.”
8 “The E-Merging e-Pidemic of e-Scooters | Trauma Surgery & Acute Care Open.”

Yang, et. al. (2020) mined media reports from 2017 – 2019 for e-scooter related crashes and found 169 reported incidents across the United States. After collecting the resources, the authors performed a descriptive and spatial analysis of the reported crashes. They found that reported crashes tend to involve more males within the age range of 18 to 40 and crashes are more likely to occur during the summer months at night. This study is limited to published news reports and may underreport minor injuries and overreport severe injuries. Yang found that no crashes were reported to have occurred in bike lanes, which can be a possible indicator that dedicated infrastructure can reduce conflicts with alternative modalities[9].

Cherry and Shah conducted a study in Nashville Tennessee, which analyzed car-involved crashes with 52 e-scooters and 79 bicycles between April 2018 and April 2020[10]. The authors chose to focus on car involved crashes because 80 percent of e-scooter fatalities occur when cars are involved. Contrary to Yang's findings of e-scooter crashes mainly occurring at night and Kobayashi's study finding nearly half of the injured e-scooter patients were intoxicated, Cherry and Shah found that most scooter crashes occurred during the day and alcohol was not a factor in the crash. Although e-scooter and bicycle crashes occurred mostly at intersections, more than half of e-scooter crashes occurred when riders were coming off sidewalks into driveways and crosswalks. In the aforementioned manner, e-scooter crashes occurred at approximately twice the rate of bicyclist crashes, showing that the type of crashes between bicyclists and e-scooter riders vary considerably.

The size of e-scooters' wheels compared to bicycle wheels makes e-scooters more prone to balancing difficulties – especially with reference to potholes and street design. In Portland, Oregon, a pilot e-scooter program found that street design largely influenced riders' decisions on using sidewalks – 18% rode on sidewalks with a 20-mph speed limit compared to 66% with a 35-mph speed limit, and 39% rode on sidewalks when there was no bicycle infrastructure, and just 8% rode on sidewalks if protected bike lanes were present[11]. IIHS found that e-scooters were more than twice as likely to be injured because of potholes, pavement cracks, lampposts, and signposts compared to bicyclists[12]. In addition to infrastructure factors, studies point towards e-scooters' lack of directional tools (e.g., turn signals, headlights), as well as rider inexperience, failure to obey traffic laws, reluctance or availability of helmets, and alcohol use as potential reasons for higher-injury rates for e-scooter riders compared to cyclists.

Methods to Improve and Monitor Safety

The infrastructure related injury findings align with user preferences identified by surveys. Glenn, et. al. (2020) found that the highest requested improvements were additional bike lanes (74%) and better roads conditions (16%). In California, Caltrans has committed to providing communities with transportation projects that foster comfortable and convenient spaces for people walking, biking, and using public transit[13]. Creating a multi-use environment that supports the Complete Streets approach could help promote safety for pedestrians on sidewalks, as well as create an inviting and safe space for all modalities.

9 Yang et al., "Safety of Micro-Mobility."
10 Owen, "New Study Addresses E-Scooter Safety."
11 Glenn et al., "Considering the Potential Health Impacts of Electric Scooters."
12 Preston, "New Study Shows Safety Risks of Riding E-Scooters on the Sidewalk."
13 "Caltrans Officially Embraces Complete Streets in All Projects."

In addition to providing a safe and protected environment for e-scooter riders, additional educational efforts to reduce serious injury outcomes may focus on helmet use. Innovative technology has created collapsible helmets that are compactable and more convenient for users to carry. Additional studies should also be considered to evaluate the potential impact of head injuries before and after California's implementation of AB2989, which modified helmet wearing requirements to only apply to riders under the age of 18.

E-scooter injury studies are currently reliant on hospital records and news reports, likely resulting in an underreporting of minor injuries that may be documented at urgent care centers or go unreported. To improve injury reporting consistency, billing codes may be updated to include e-scooter as an option of vehicle injury. To capture a more accurate depiction of all injuries by e-scooter riders, at the time of permitting, cities may consider requiring shared mobility companies to share and implement sensor data that indicate when scooters may have crashed[14]. Some cities already require open data sharing of trip data for shared e-scooter rides. If sensor data for crashes and falls is made available, researchers will be able to better prioritize infrastructure improvements to prevent future injuries.

Conclusion

Shared e-scooters presents ample opportunities to solve first-last mile problems, reduce annual vehicle miles traveled, decrease our carbon footprint, and provide additional modes to increase accessibility and mobility. Government regulations and educational outreach programs can help minimize the magnitude of injuries on riders, but these efforts should be coupled with Complete Streets infrastructure improvements. Fostering additional data sharing by shared e-scooter companies may provide a framework to support infrastructure improvements that increase safety of all travel modes. Since shared e-scooters are a novel modal option, additional safety and injury research should be considered to help better inform cities on priority improvement projects. Further understanding the differences and similarities of bicycle and e-scooter injuries may allow these cities to make multi-functional safety improvements with targeted safety outreach programs.

E-Scooter Safety: Issues and Solutions
https://nap.nationalacademies.org/catalog/26756/e-scooter-safety-issues-and-solutions
The University of North Carolina at Chapel Hill in conjunction with the University of Tennessee, Knoxville; Safe Streets Research and Consulting; Equitable Cities; and Populus have recently published a Research Results Digest from Phase I of the Behavioral Traffic Safety Cooperative Research Program (BTSCRP) Project BTS-10, "E-Scooter Safety: Issues and Solutions." The digest identifies emerging behavioral safety issues arising from the expanding use of e-scooters and summarizes how communities are working to prevent and mitigate injuries.

14 Tabei, Askarian, and Chong, "Accident Detection System for Bicycle Riders."

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For more information about the CPBST or to bring activities to your California community, contact Katherine Chen at kchen@berkeley.edu

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