

DOCKLESS ELECTRIC SCOOTER-RELATED INJURIES STUDY



AUSTIN, TEXAS

SEPTEMBER - NOVEMBER 2018

Dockless Electric Scooter-Related Injuries Study — Austin, Texas, September–November 2018

Background

Rentable dockless electric scooters (e-scooters) are shared electric-assisted scooters that are an emerging transportation modality being introduced in cities nationwide. E-scooters are rented for short periods of time via a phone application, have a narrow platform where the rider generally stands with one foot in front of the other, and travel at speeds up to approximately 15 miles per hour. In early April 2018 e-scooters first appeared in Austin, Texas. From September 5 through November 30, 2018, a total of 936,110 e-scooter trips were taken. These trips were associated with 182,333 hours of e-scooter use and 891,121 miles ridden on e-scooters.

Concurrently with this appearance, doctors at local hospitals and the local emergency medical services began observing injuries associated with this emerging mode of transportation. This was not unique to Austin. In January 2019, researchers from Los Angeles, California published findings characterizing injuries associated with e-scooter use among patients seen at two emergency departments.¹

To further advance knowledge on the public health impact of e-scooter use, the Austin Public Health Department (APH), with assistance from the Centers for Disease Control and Prevention and others, launched an epidemiological investigation to collect data on injuries involving rentable dockless electric scooters in Austin. In addition, to identify risk factors associated with injuries telephone interviews were conducted with injured e-scooter riders. This is believed to be the first study to conduct interviews with injured e-scooter riders.

Methodology

Potential e-scooter related injury incidents occurring in Austin, Texas between September 5, 2018 and November 30, 2018 were identified by using two data sources: (1) Austin-Travis County Emergency Medical Services (ATCEMS) incident reports, and (2) Emergency Department (ED) syndromic surveillance chief complaint data from nine area hospitals.

For ATCEMS reports, incident narratives for all incidents occurring during the study period were searched for the word “scooter”. Syndromic surveillance ED chief complaints occurring during the study period were searched using the following words: “scoot”, “scoter”, ”skoot”, “scotter”, “schoot”, or ”scot.” As some injured patients may have used both ATCEMS and ED services or have multiple visits stemming from the e-scooter-related incident, results were examined to identify unique individuals using first and last name, incident date, ED name, age and, in some instances, the patient’s contact information. If patient contact information was unavailable through the ATCEMS or ED record, viable contact information was searched using LexisNexis® public databases or the Central Texas Indigent Care Collaboration information system.

¹ *Injuries Associated With Standing Electric Scooter Use. JAMA Open. 2019 Jan 4;2(1):e187381.*

Patients were contacted to request an interview via telephone calls, text messages, and mailed letters. An interviewer-administered questionnaire collected information on confirmation of rentable, dockless electric scooter use, demographic characteristics, types of injuries, situational factors associated with the injury incident, and e-scooter use history. For injured persons who were not interviewed, their ATCEMS and/or ED medical records were abstracted for injury and situational information.

Scooter injury incidents were classified as confirmed, probable, suspect, or not a case. Only incidents that occurred within the City of Austin during the study period, September 5 through November 30, 2018 were included. The classification descriptions are noted below:

1. **Confirmed:** injury related to a *rentable dockless electric scooter (e-scooter)*.
2. **Probable:** injury related to an *electric scooter*, not otherwise specified as rentable or dockless.
3. **Suspect:** information not sufficient to determine if an injury was related to a *rental dockless, electric scooter* or an *electric scooter*.
4. **Not a case:** information sufficient to classify that an injury was NOT related to *rentable dockless electric scooter*, or the incident occurred outside the City of Austin, or occurred outside the study period.

Descriptive statistics, including means and frequencies, were calculated. The location of the incident associated with the e-scooter injury was geocoded for confirmed and probable incidents. The National Transportation Safety Board's (NTSB) definition of severe injury was used for this investigation. The NTSB defines severe injury as: (1) requires hospitalization for more than 48 hours, commencing within seven days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third degree burns, or any burns affecting more than 5% of the body surface.

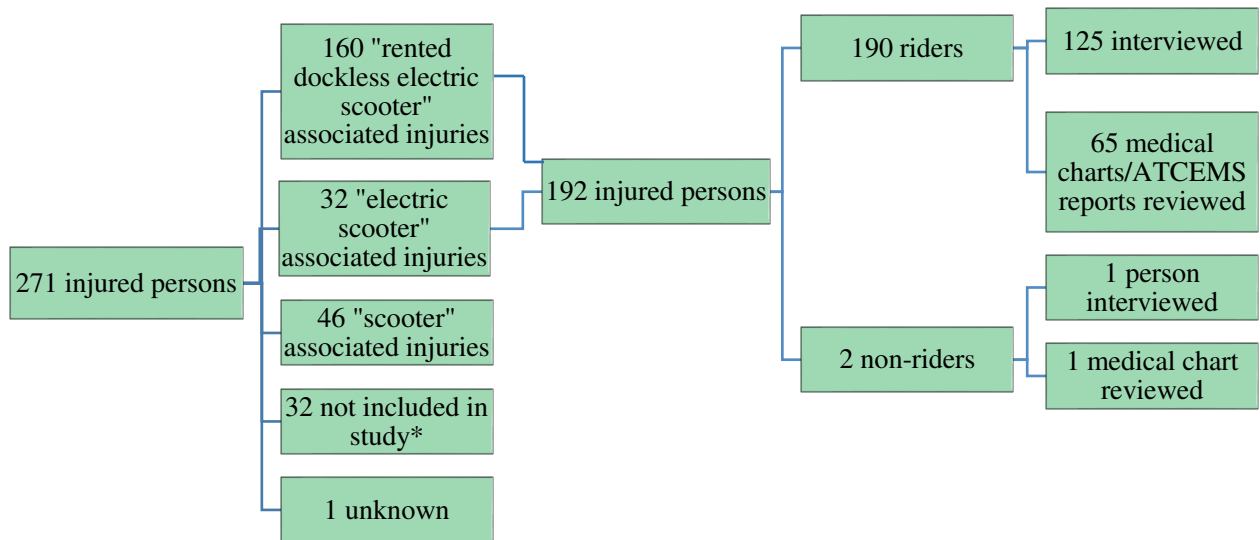
Incidence rates were calculated by using the number of confirmed and probable scooter injured riders as the numerator and the number of e-scooter trips occurring during the study period, provided by the Austin Transportation Department, as the denominator.

Results

A total of 271 persons with potential e-scooters-related injuries were identified during the study period. Figure 1 shows the outcomes of classifying persons and data sources for demographic characteristics, types of injuries and factors associated with the incident.

All but one of the 271 individuals were classified into the four case classifications: 160 were confirmed cases, 32 were probable cases, 46 were suspect cases, and 32 were not cases. The specific vehicle was unknown for one person.

Figure 1. Outcomes of Classifying Individuals with Potential Rentable, Dockless Electric Scooters Injuries



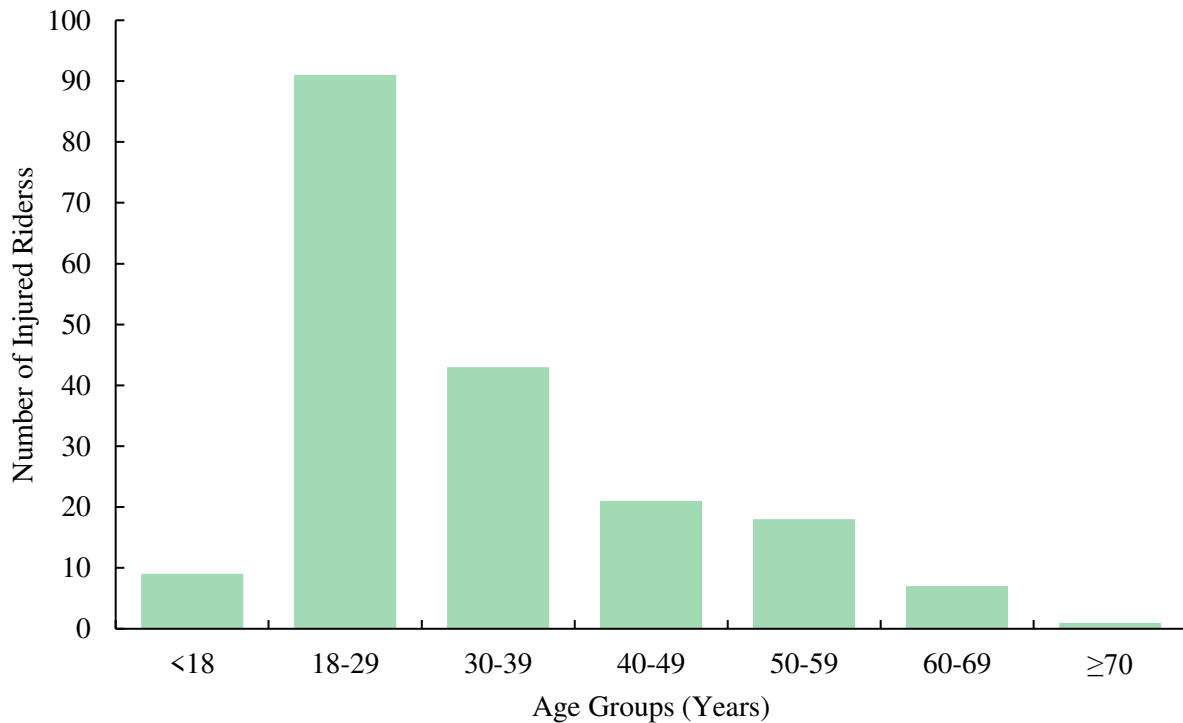
**Not related to rentable dockless e-scooter, or the incident occurred outside the City of Austin, or occurred outside the study period (September 5-November 30, 2018).*

Further analyses in this report use the combined number of confirmed (160) and probable (32) cases, unless otherwise noted. Of these 192 individuals, 190 were riding the scooter at the time of their injury and two were non-riders (one pedestrian and one bicyclist). Of these 190 riders, 125 riders were interviewed. The characteristics of the 190 riders and 125 interviewed riders are described below.

People

Of the 190 injured riders 55% identified as male. Riders ranged in age from 9 to 79 years. As Figure 2 shows, nearly half (48%) were aged 18-29 years. The median age was 29 years. Nearly two-thirds (65%) identified as White; 41 (22%) individuals identified as Hispanic/Latino.

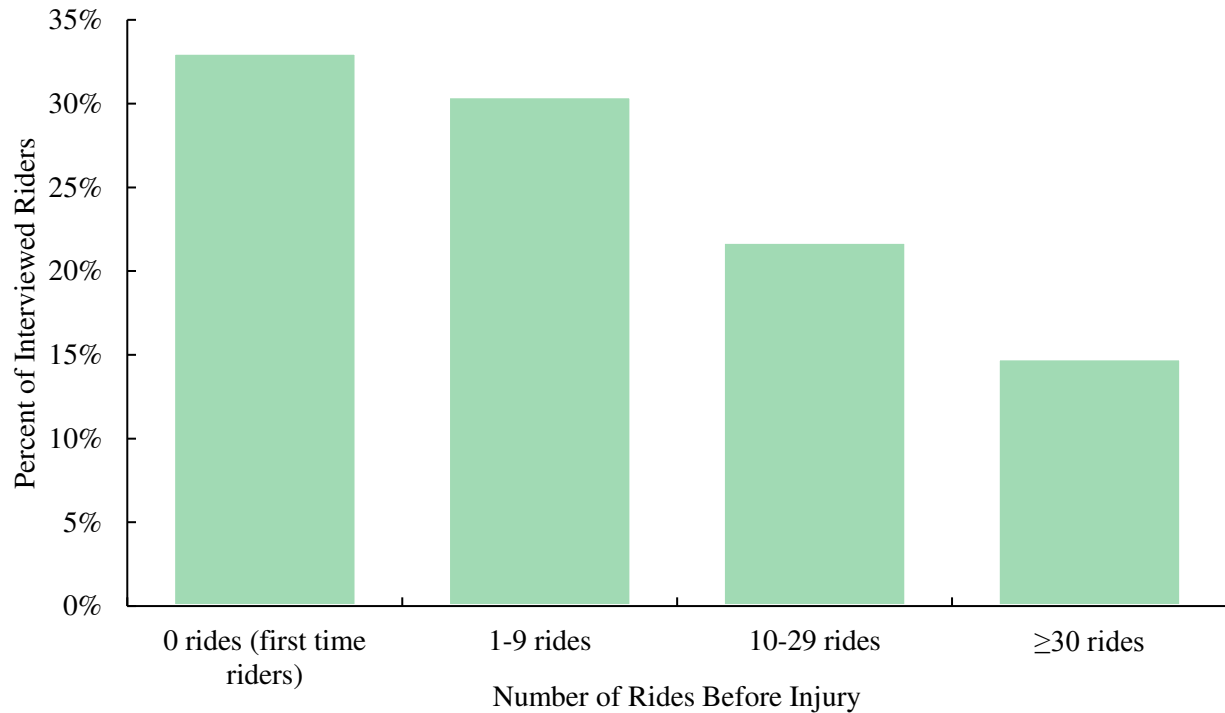
Figure 2. Number of Injured Riders by Age Group (Years)



Sixty percent of the riders resided in Austin at the time of their injury. For the one-third of riders who resided outside of Austin, 22 riders resided in other Texas cities, 37 were from 22 other states, two were from international countries, and one individual's residence was unknown.

As Figure 3 shows, 33% of the interviewed riders were injured during their first scooter ride. Of all interviewed riders, 38% indicated they will use a-scooter again.

Figure 3. Percent of Interviewed Riders by Number of Scooter Rides Before Injury



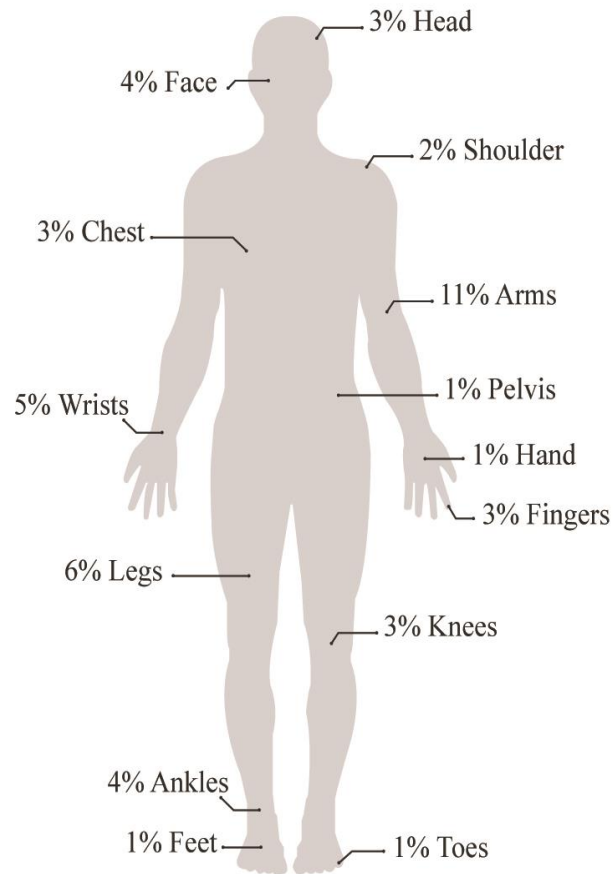
Of the 190 injured riders, 183 riders were alone on the scooter.

Types of Injuries

Of the 190 injured riders, nearly half (48%) had injuries (e.g., fractures, lacerations, abrasions) to the head. In addition, 70% sustained injuries to the upper limbs (hands/wrist/arm/shoulder), 55% to the lower limbs (leg/knee/ankle/feet), and 18% to the chest/abdomen; multiple injuries across body regions were possible. Many individuals sustained injuries on their arms (43%), knees (42%), face (40%), and hands (37%).

Over a third (35%) of the injured riders sustained a bone fracture(s) (excluding nose/fingers/toes). Among this group, 19% had bone fractures (excluding nose/fingers/toes) involving multiple body regions. Figure 4 shows the bone fracture locations for injured riders. A high number experienced fractures on their arms and legs. Notably, six persons (3%) had fractures involving the head.

Figure 4. Bone Fracture Locations for Injured Riders



Almost half (80) of the injured riders had a severe injury. The severe injury for these riders included:

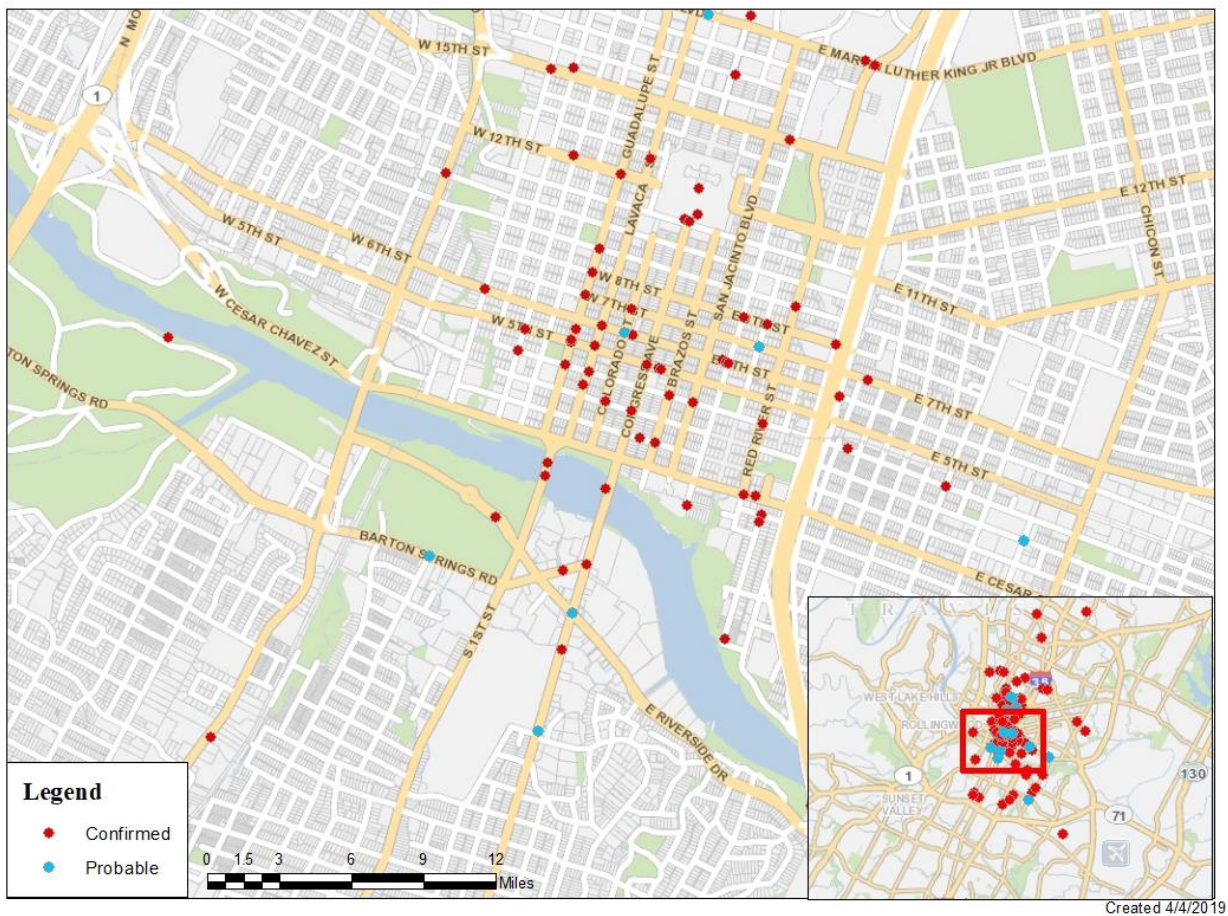
1. bone fractures (excluding nose/fingers/toes) (84%),
2. nerve, tendon, or ligament injuries (45%),
3. spending more than 48 hours in the hospital (8%),
4. severe bleed (5%), and
5. sustained organ damage (1%).

Traumatic brain injuries include concussions and other forms of altered mental status or bleeding such as subarachnoid hemorrhage and subdural hematoma. Fifteen percent of riders had evidence suggestive of a traumatic brain injury. Less than one percent of individuals was wearing a helmet at the time of injury. Eighty-eight percent of injured riders were seen at an emergency department. Fourteen percent of all injured riders were hospitalized. None of the injured riders died during the study period.

Places

Figure 5 shows a map of the location in the city where the injury incident occurred for 77% (147) of the injured riders. Thirty-one percent occurred in the downtown area (defined as an area with a western border of South Lamar Blvd., a southern border of Cesar Chavez St., an eastern border of IH-35 and a northern border of 12th St.). Additionally, 16% of the injury incidents were located on the University of Texas at Austin campus (defined as an area with a western border of Guadalupe St., a southern border of Martin Luther King Blvd., an eastern border of Interstate 35 and a northern border of East Dean Keaton Street). Almost half (47%) of the injured riders were injured within these two areas.

Figure 5. Map of Locations of Scooter-Related Injury Incidents



More than half (55%) of the interviewed riders were injured in the street; one-third (33%) were injured on the sidewalk. Eight individuals were injured in a path where no motor vehicle was allowed, four were injured in a parking lot, and one was injured in a parking garage. Two individuals did not know the type of surface they were on at the time of the injury.

Sixteen percent of the incidents with injured riders involved a motorized vehicle. These incidents include colliding and swerving, stopping, and jumping off the scooter to avoid a collision.

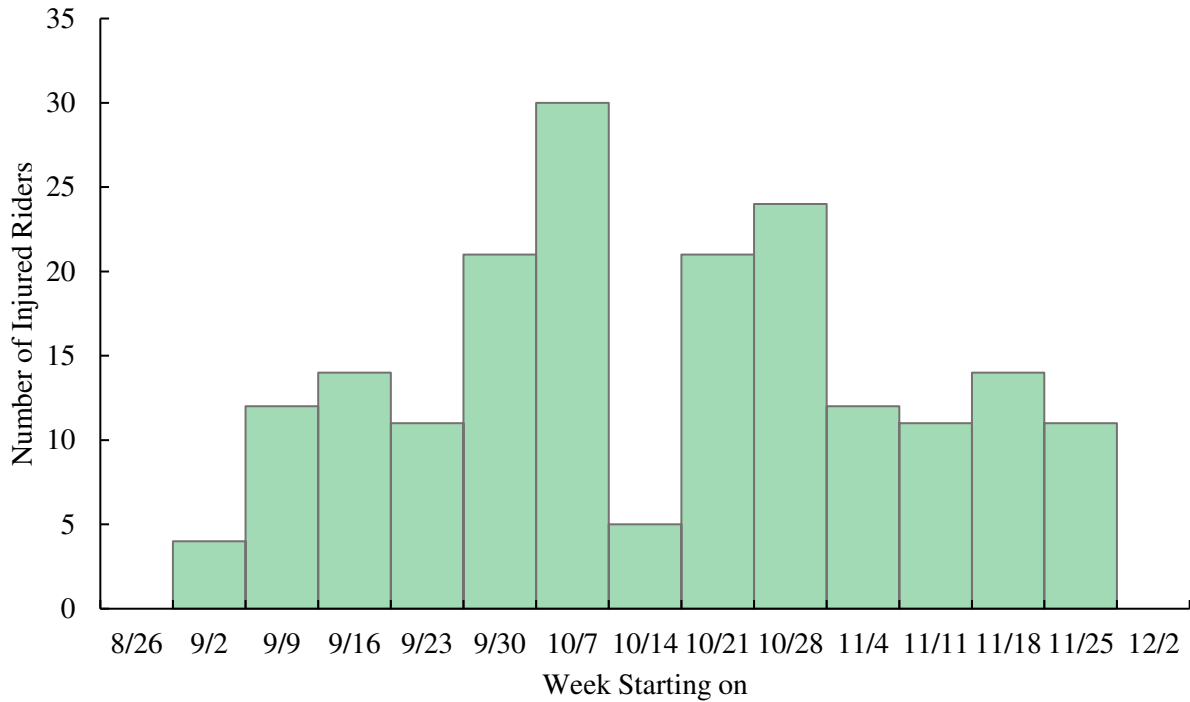
Ten percent of the injured riders collided with a motor vehicle. In addition, 10% of the incidents with injured riders involved a curb and 7% involved an inanimate object, such as a light pole or manhole cover.

Nearly two-thirds (65%) of interviewed riders were traveling on a level surface, 24% were traveling downhill, and 6% were traveling uphill. Interviewed riders started their trips at a variety of locations. The three most frequently reported known starting points for their scooter trip were home (16%), restaurant/food truck (16%), and school/library (11%). Interviewed riders' final destinations also varied. The three most frequently reported known final destinations for their scooter trip were home (25%), restaurant/food truck (14%), and joy ride/testing it out (10%). Among interviewed riders, 50% believed surface conditions like a pothole or crack in the street contributed to their injuries.

Time

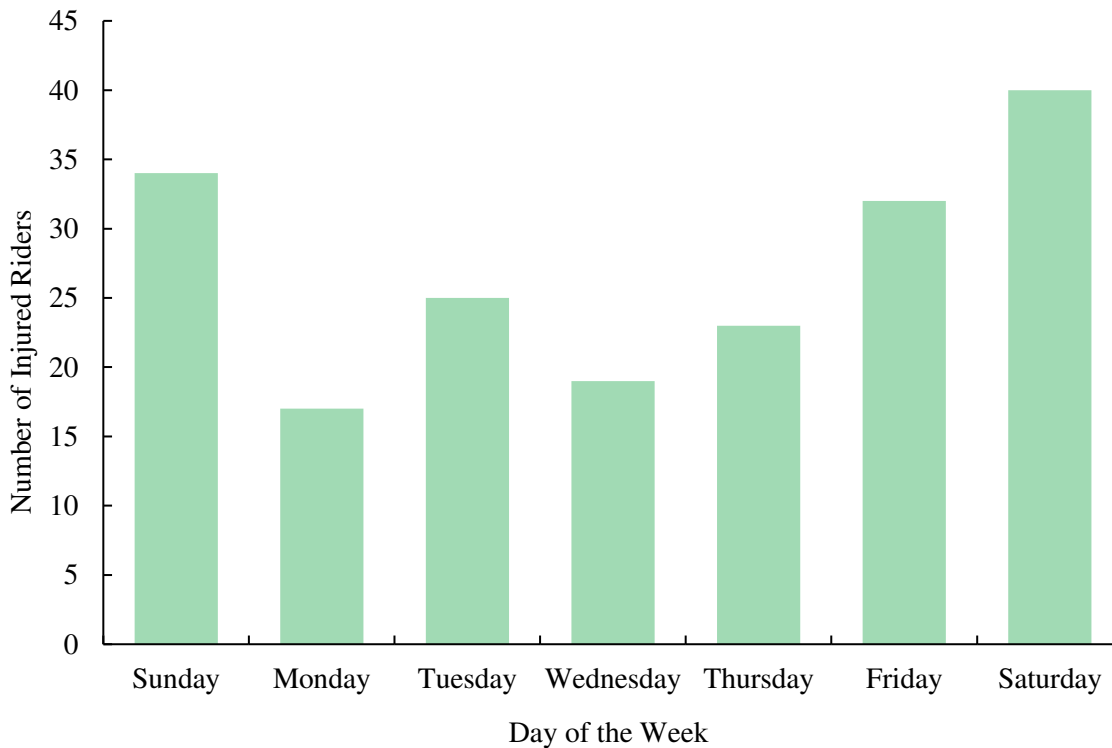
During the study period, 24% of the riders were injured in September, 45% in October, and 31% in November. Figure 6 shows the highest number (30) of injured riders occurred during the week of October 7 through 13, 2018. With the exception of the weeks starting on September 2 (the first week of the study period) and October 14 (flooding and inclement weather that week), there were at least 11 injuries per week. On average, two injuries occurred per day. The highest number (10) of injured riders occurred on Saturday, October 13.

Figure 6. Number of Injured Riders by Week of Injury Occurrence



As Figure 7 shows, 39% of the injured riders were injured on the weekend (Saturday and Sunday).

Figure 7. Number of Injured Riders by Day of the Week of Injury Occurrence



Overall, of the injured riders, 39% were injured between 6pm and 6am. Of the 74 interviewed riders who were injured during the work week (Monday through Friday), almost half (47%) of the injuries occurred between 6pm and 6am. Other noted time periods are listed below:

- 4% occurred between 6am and 9am (morning rush hour),
- 8% between 11am and 1pm (lunch hour),
- 16% between 4pm and 6pm (afternoon rush hour)
- 22% between 9am and 11am, 1pm to 4pm (work hours)

Additional Information

Drinking an alcoholic beverage in the 12 hours preceding their injury was reported by 29% of interviewed riders. More than one-third (37%) reported that excessive scooter speed contributed to their injury. Nineteen percent believed the scooter malfunctioned (e.g., brakes, wheels, etc.). Seventy percent received training on scooter use. Most (60%) received that training via the scooter companies' phone application. One person was injured while on a phone call; six persons reported listening to music/podcast when injured.

During the study period, there were a total of 182,333 hours of e-scooter use, a total of 891,121 miles ridden on e-scooters, and a total of 936,110 e-scooter trips. Our calculations show that there were 20 individuals injured per 100,000 e-scooter trips taken during the study period.

Discussion

Rentable, dockless, electric scooters are a new emerging mode of transportation. Austin Public Health initiated this investigation with the assistance of others in an effort to advance the knowledge on the public health impact of e-scooter use. Interviewing the e-scooter riders was an important contribution to furthering this knowledge. This study is believed to be the first to conduct interviews with injured e-scooter riders.

This study likely underestimates the prevalence of e-scooter related injuries. The number and characteristics of injured riders seeking medical care at an urgent care center or physician's office were not determined. This study was limited to investigating only those injured e-scooter riders and non-riders who sought care at a hospital emergency department or had care provided by emergency medical services. These riders are believed to experience more severe injuries compared with injured e-scooter riders whose injuries did not require care from a hospital emergency department or EMS.

Almost half of the injured riders in this study sustained an injury to the head. A traumatic brain injury was experienced by 15%. These injuries may have been preventable. Only one of 190 injured scooter riders was wearing a helmet. Studies have shown that bicycle riders reduce the risk of head and brain injuries by wearing a helmet. Helmet use might also reduce the risk of head and brain injuries in the event of an e-scooter crash.

Perceptions may be that most e-scooter riders are injured because of collisions with motorized vehicles. The findings of this study does not support that perception. While more than half of the interviewed riders were injured while riding a scooter in the street, few (10%) riders sustained injuries by colliding with a motor vehicle. Nevertheless, continuing education for motorized vehicle drivers and e-scooter riders is needed to prevent collisions. Another perception is that excessive e-scooter speed contributes to injuries. This perception may be true. More than one-third (37%) of injured riders reported that excessive e-scooter speed contributed to their injury.

A key finding is a third of the interviewed riders were injured during their first e-scooter ride. Overall, 63% of the injured riders had ridden an e-scooter nine times or fewer before injury. While most (60%) of the riders in this study received training on using the e-scooter via a phone application, additional training may be necessary.

Limitations

Our study has several limitations. First, this investigation focused only on those who were seen by Austin-Travis County Emergency Medical Services (ATCEMS) or presented to an emergency department. The investigation did not identify those who sought medical care at urgent care facilities or private physician offices or those who were treated later in time. For this reason more severely injured patients were likely represented in this study.

Second, it is also possible that injured individuals may not have been identified because some keywords were not used in the ATCEMS and emergency department reports/records.

Third, potential recall bias exists since interviews with injured individuals occurred up to several months after their injuries. Some participants may not have remembered everything that happened or may have recalled it differently than if they were interviewed shortly after their injury.

Fourth, the individuals who did agree to be interviewed and provide responses may have differed from those who did not, leading to potential bias in the information presented in this study.

Next Steps

Considering the limitations and the study findings, Austin Public Health proposes the following:

- 1) Establish and strengthen injury surveillance related to emerging transportation vehicles. Questions will be asked about the risk of and types of injuries associated with the potential increased use of electric scooters, electric skateboards, unicycles, and Segway-type vehicles. Routine surveillance for injuries will be needed.
- 2) Increase the frequency and methods of educational messages on safe e-scooter riding practices. These educational messages should emphasize both wearing a helmet and maintaining a safe speed while riding an e-scooter. Educational messages should especially target young adults 18 to 29 years of age.

Acknowledgements

We want to acknowledge the injured individuals we interviewed who graciously contributed information for this investigation. We would also like to acknowledge the following organizations, agencies, and individuals for their cooperation, collaboration, and assistance in this investigation:

Ascension Seton Family of Hospitals

St. David's HealthCare

Austin Transportation Department

Austin Public Health

Ashley Hawes
Flor Hernandez-Ayala
Rachel Holder
Dr. Phil Huang
Anna Klioueva
Marissa Paz
Janet Pichette
Jessica Stradford
Jeff Taylor
Alice Tisdale
David Zane

Austin-Travis County Emergency Medical Services

Pamela Quarles

Centers for Disease Control and Prevention – Epidemic Intelligence Service (EIS) Team

Dr. Anjoli Anand
Dr. Sarah-Blythe Ballard
Laurel Harduar-Morano
Dr. Talia Pindyck

Centers for Diseases Control and Prevention Supervisors

Ann Dellinger
Alexis Peterson
Erin Sauber-Schatz