



# Syndromic Surveillance of Electronic Scooter Injuries – Denver, Colorado January 2019 – December 2024

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## Summary

### **What is already known about this topic?**

Shared electric scooters have become an increasingly popular mode of transportation since they were first introduced to Denver, CO in 2018. Scooter riders say they enjoy the convenience and low cost of shared electric scooters, while many non-riders are concerned about safety. Over the last 6 years, the number of scooter rides have increased, leading to an increased prevalence of scooter-related injuries and Emergency Department (ED) visits.

### **What is added by this report?**

The purpose of this report is to describe scooter-related ED visits from 2019-2024 to better understand the hazards of shared scooter transport. Ridership frequency data were provided by the Denver Department of Transportation and Infrastructure, allowing for rate calculations to better assess risk.

### **What are the implications for public health practice?**

Increasing scooter-related ED visits are expected with the growing popularity of shared scooter usage in Denver, CO over the last 5 years. While the rate of scooter-related ED visits has steadily decreased since they were introduced in 2018, there is still benefit in improving scooter infrastructure and increasing safe riding practices. Emergency Department data shows inconsistencies in reporting methods of electric scooter-related incidences, indicating an opportunity to improve data collection to more thoroughly understand the circumstances of scooter-related injuries.

## Introduction

Denver launched the Shared Bike and Scooter Program in March of 2018, providing residents and visitors with alternative transportation options. Over the last 6 years, shared bikes and scooters have become a popular, convenient option for traversing Denver, particularly the downtown area. The program, currently operated by Lime and Bird, provides on-demand access for electric bike and scooter rentals through mobile applications. While both bikes and scooters are available to rent, scooter ridership makes up approximately 90% of the overall ridership in Denver and therefore was the primary focus of this analysis<sup>3</sup>.

Riders across Denver praise the program for offering reliable, affordable transportation that can access most neighborhoods throughout the city; however, there are several safety concerns associated with these transportation methods. Hospital admissions for scooter-related injuries are increasing across the nation<sup>1</sup> as are the costs associated with treatment. One trauma center in Denver alone reported a mean annual sum of hospital charges of USD 10.4 million between 2020 to 2023<sup>2</sup>.

Echoing national concerns when surveyed, 83% of non-scooter riders in Denver noted concerns of people on scooters riding dangerously<sup>3</sup>. Primary concerns include widespread sidewalk riding and lack of enforcement associated with these violations. In addition, helmets are not provided when renting a scooter and therefore very few riders wear them.

Because scooters offer a convenient alternative to car travel, there is a perception that many scooter rides are taken while the rider is intoxicated, leading to a much more dangerous trip. 79% of non-scooter riders also noted that inappropriate parking of scooters poses a hazard to walking paths and sidewalks.

As the popularity of this transit method grows, there is a mounting need to assess the hazards associated with shared electric scooters and the circumstances surrounding scooter-related injuries.

## Methods

The CDC's National Syndromic Surveillance Program provides the ESSENCE tool to state and local health departments for monitoring and responding to emerging health trends. ESSENCE enables the voluntary, de-identified submission of visit data from emergency care centers, hospitals, and urgent care facilities in near-real-time. Electric scooter-related injury data was collected through the ESSENCE platform, which allowed for comprehensive surveillance across participating healthcare facilities.

Due to great variability in ICD-10 code usage for scooter-related incidences, injuries were identified by searching for specific terms in patient chief complaints, including: "scooter," "e-scooter," "lime," "bird," "razor," "lyft," "electric scooter," or "standing electric scooter." The dataset was refined by excluding records referencing scooter types that didn't fit the profile (such as non-motorized scooters). The final ESSENCE dataset included injuries from 1/1/2019-12/31/24.

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<sup>1</sup> Kim, W.C., Campbell, A.R. Common Injury Patterns from Standing Motorized Scooter Crashes. *Curr Surg Rep* 9, 8 (2021). <https://doi.org/10.1007/s40137-021-00283-9>

<sup>2</sup> Kahan R, Higinbotham S, Garoosi K, Lauder A. Electric Scooter-related Injuries Are Becoming More Frequent and Costly in Denver, CO. *Clin Orthop Relat Res*. 2025 Feb 1;483(2):318-326. doi: 10.1097/CORR.0000000000003212. Epub 2024 Aug 13. PMID: 39136941; PMCID: PMC11753755.

<sup>3</sup> DOTI Shared Scooter Community Survey Summary. (2025).

<https://www.denvergov.org/files/assets/public/v/2/doti/documents/programsservices/micromobility/shared-scooter-survey-results.pdf>

Scooter-related ED visits were stratified by home address zip code, age, race/ethnicity, intake time of day, substance use, bodily location of injury, and if they were fall-related.

Annual ridership data were provided by the Denver Department of Transportation and Infrastructure (DOTI) and used to calculate ED visit rates by year. The data includes all trips taken on Lime, Lyft, and Bird vehicles, excluding any trips taken on personal devices. To protect the privacy of the traveling public, no information about individual rides is provided.

Data were suppressed if too few cases to protect confidentiality and/or report reliable rates.

## Results

From January 1, 2019, to December 31, 2024, 4,398 shared scooter-related ED visits were reported through ESSENCE among seven hospital EDs. Over this 6-year period, the number of shared scooter rides has steadily increased yearly as scooter transport grew progressively popular in Denver, CO (Table 1, Figure 1). Over the same 6-year period, the rate of ED visits per 100,000 scooter rides has steadily decreased (Table 1, Figure 2, Figure 3). Between 2019 and 2024, less than 5 scooter-related deaths were indicated by ESSENCE records.

Year	Ridership Total <sup>a</sup>	Scooter-related ED <sup>b</sup>	ED visits per 100,000 rides
2019	1,570,301	417	27
2020	2,003,875	360	18
2021	3,862,960	971	25
2022	4,892,580	987	20
2023	5,240,070	850	16
2024	5,922,868	813	14

**Table 1.** Overview of shared scooter-related ED visits.

<sup>a</sup> Denver Department of Transportation and Infrastructure.

<sup>b</sup> Centers for Disease Control and Prevention. (2025). National Syndromic Surveillance Program (NSSP), Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE).

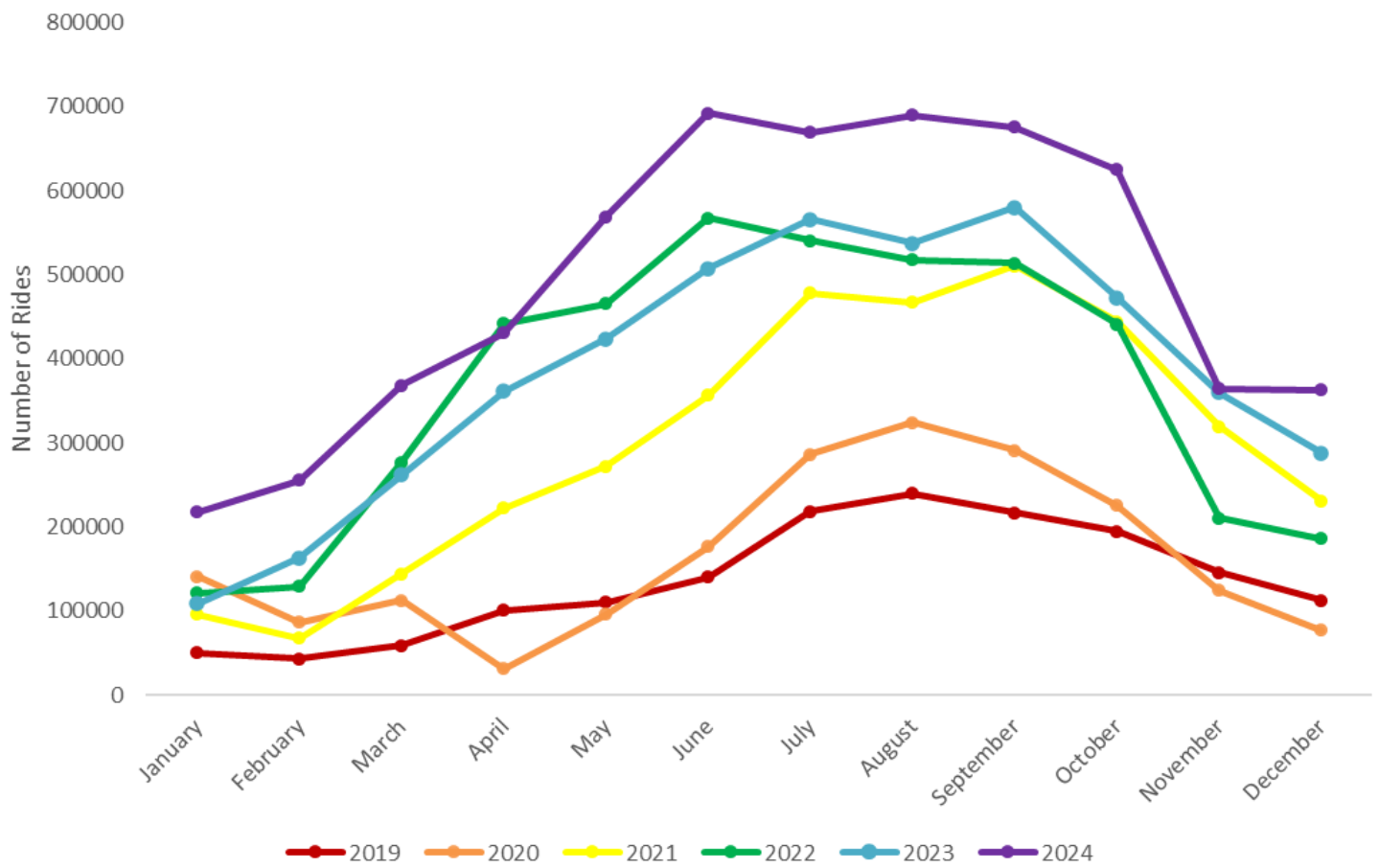


Figure 1. Number of electric scooter rides 2019-2024 by month.

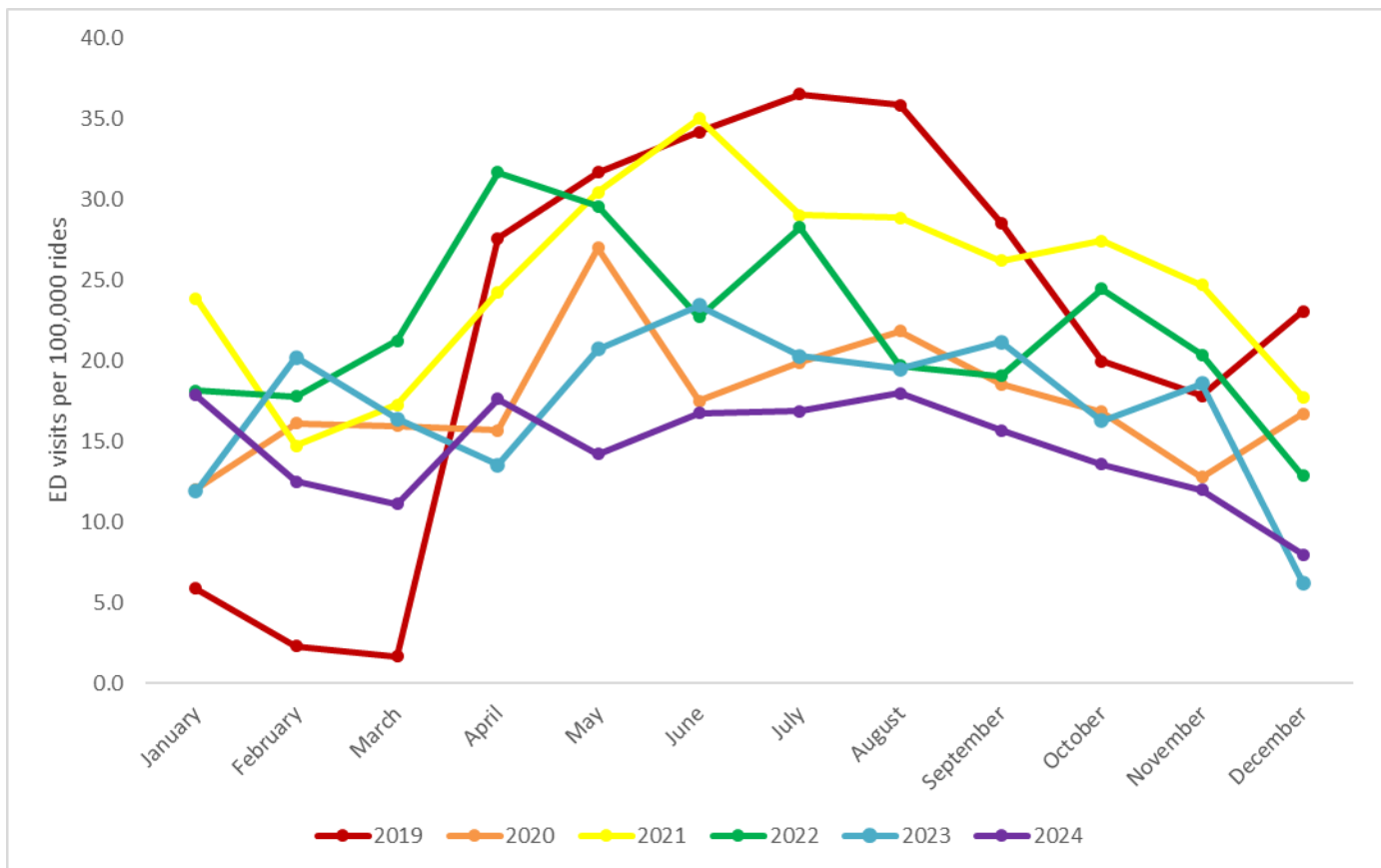


Figure 2. Electric scooter-related ED visits per 100,000 rides 2019-2024 by month.

All scooter-related ED visits were stratified by sex, race/ethnicity, and age group (Figure 5). The demographic categories used within these larger groups were taken from the original ESSENCE dataset to ensure greater accuracy of self-reported demographics. Across all years 2019-2024, there were more scooter-related ED visits for men than for women (Figure 5). In addition, all years 2019-2024 indicated the highest percentage age group for scooter-related ED visits was 25-34 years old. From 2019-2022, the second highest percentage age group remained 18-24 years old, however in 2023 and 2024, the second highest percentage age group changed to 35-44 years old (21.3% in 2023 and 20.4% in 2024) (Figure 5). The percentage of 0-17 year old riders increased from 4.3% in 2019 to 8.1% in 2024 (p-value<0.05). Across all years 2019-2024, White (Non Hispanic) did not change as the majority race/ethnicity group for scooter-related ED visits. The percentage of Black or African American (Non Hispanic) riders out of all ED visits increased from 6.0% in 2019 to 10.7% in 2024 (p-value<0.05). Likewise, the percentage of Hispanic or Latino riders out of all ED visits increased from 13.2% in 2019 to 29.3% in 2024 (p-value<0.05).

11% of all scooter-related ED visits indicated that alcohol was somehow involved. 1% of all scooter-related ED visits indicated some type of substance use besides alcohol. These categories were not mutually exclusive. Records mentioning a history of substance use disorders but not an impaired state or toxicology during the ED visit were not included in these categories.

46% of all scooter-related ED visits were designated as falls. This category was defined by the presence of key words including: "fall", "fell", "fell off". Entries were coded as a fall if these key words were present and if no other vehicle or pedestrian was indicated as being involved in the incident. Key words used to find multi-modality collisions included, "scooter vs auto", "auto vs scooter", "car vs scooter", "MVC vs scooter", "hit by car", "struck by car", "scooter vs car". It should be noted that very few logistic details were able to be ascertained about accidents, as most of the information in

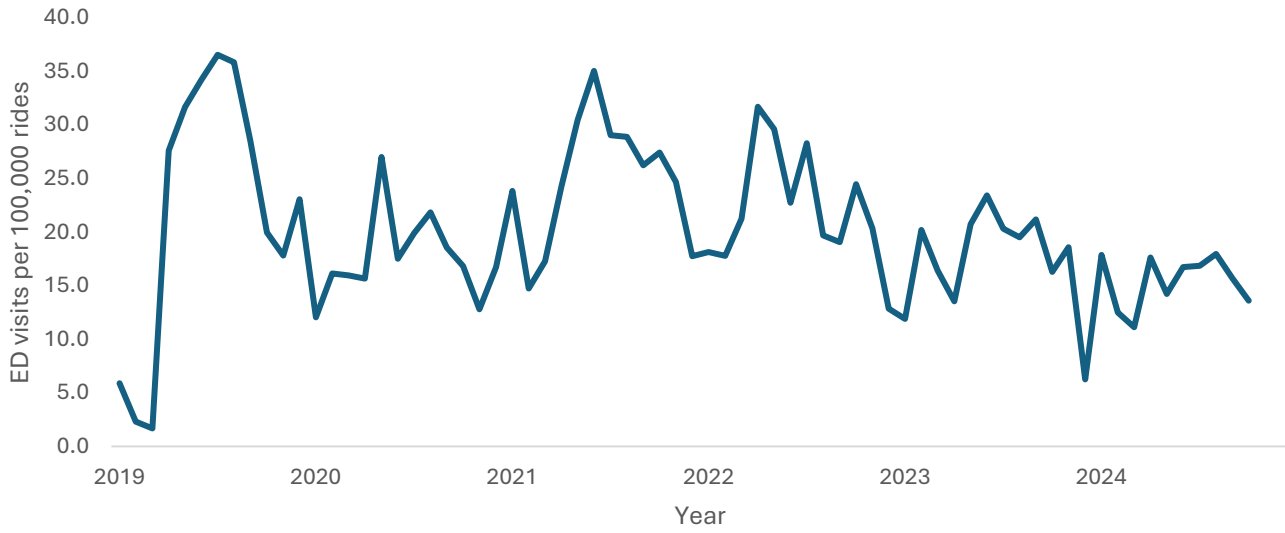
ESSENCE records is in regard to physical injuries and not the circumstances surrounding those injuries. Therefore, there were very few scooter entries coded as a multi-modality collision, including pedestrian-related crashes. For this reason, these numbers have been suppressed and not included in this analysis. Less than 5 deaths were recorded in ESSENCE from 2019-2024.

62% of all scooter-related ED visits between 2019-2024 were Denver County residents. 20% of visits were by patients with a Colorado address outside Denver County, and 18% of visits were by patients with a home address outside Colorado ([Figure 4](#)).

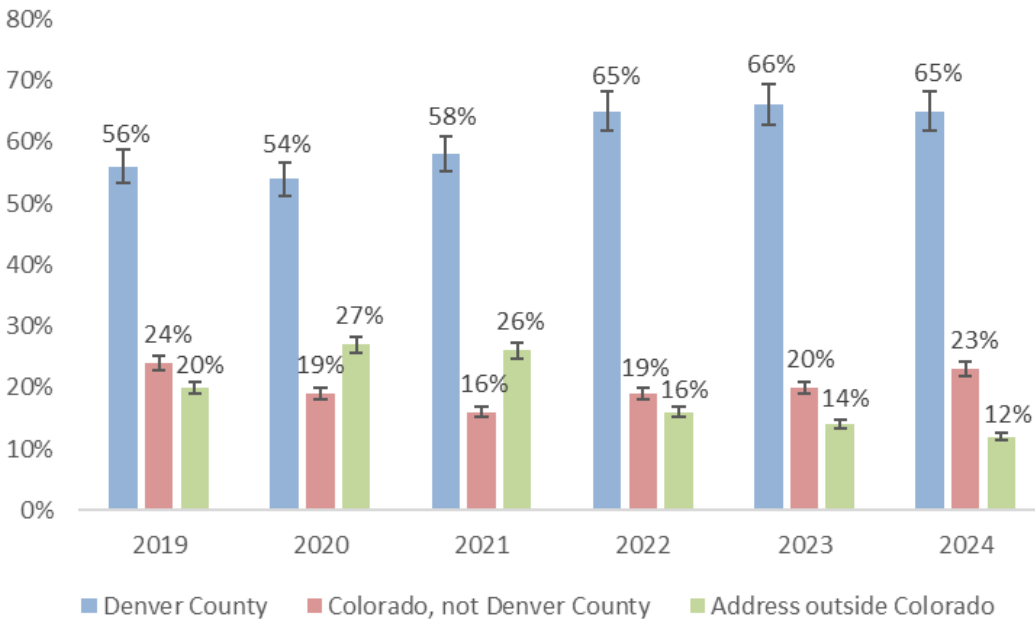
The bodily location of injury was broken down into three larger categories: “Head Injury”, “Midsection Injury”, and “Limb Injury”. “Head Injury” included any mention of injuries to the face, head, or neck. “Midsection Injury” included any mention of injuries to the chest, abdomen, pelvis, hips, tailbone or back. “Limb Injury” included any mention of injuries to the shoulders, arms, wrists, hands, fingers, legs, ankles, feet, or toes. These categories were not mutually exclusive. 58% of scooter-related ED visits included a head injury, 33% included a midsection injury, and 37% included a limb injury ([Figure 6](#)).

Intake time of day was broken up into three categories: “Early”, “Middle”, and “Late”. “Early” was defined as any ED visit that occurred between 3am and 10:59 am, “Middle” between 11am-6:59pm, and “Late” between 7pm-2:59am. 47% of scooter-related ED visits were coded as “Late”, while 38% and 15% were coded as “Middle” and “Early”, respectively ([Figure 7](#)).

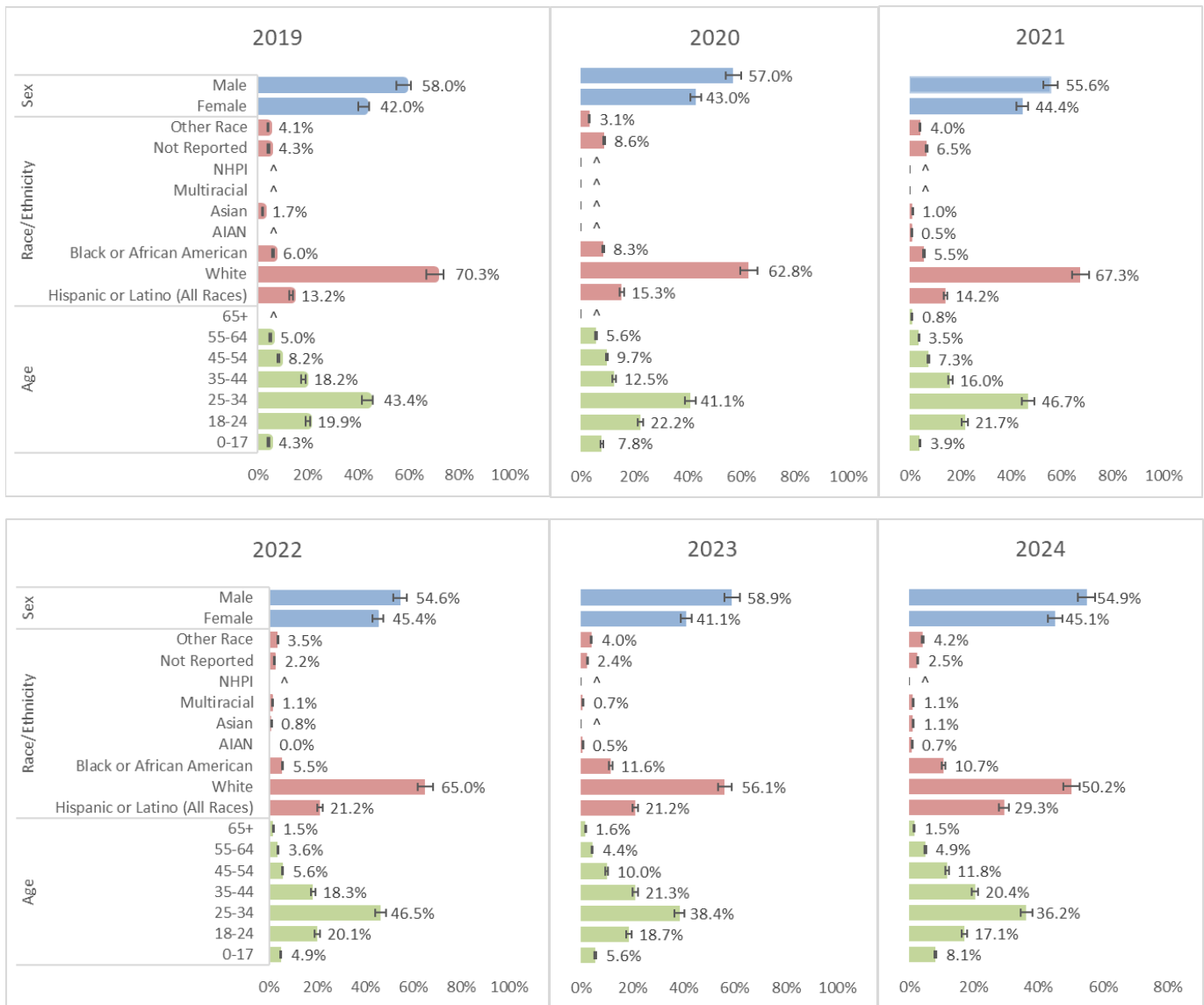
The ICD-10 codes, originally used to categorize the medical conditions reported in the ED records, varied greatly across the original scooter dataset. “Pedestrian conveyance accident” was the most common code used to indicate a scooter-related incident (51% of all records, 2019-2024). Other ICD-10 codes used included “motor - or nonmotor – vehicle accident type of vehicle unspecified” (2.5%), “unspecified fall” (2.5%), “pedestrian injured in collision with car pick-up truck or van” (1.5%), “Traffic accident of specified type but victims mode of transport unknown” (0.7%), and “Pedal cycle rider injured in other and unspecified transport accidents” (0.5%).



**Figure 3.** Electric scooter-related ED visits per 100,000 rides 2019-2024 by year.



**Figure 4.** Electric scooter-related ED visits by home address by year.

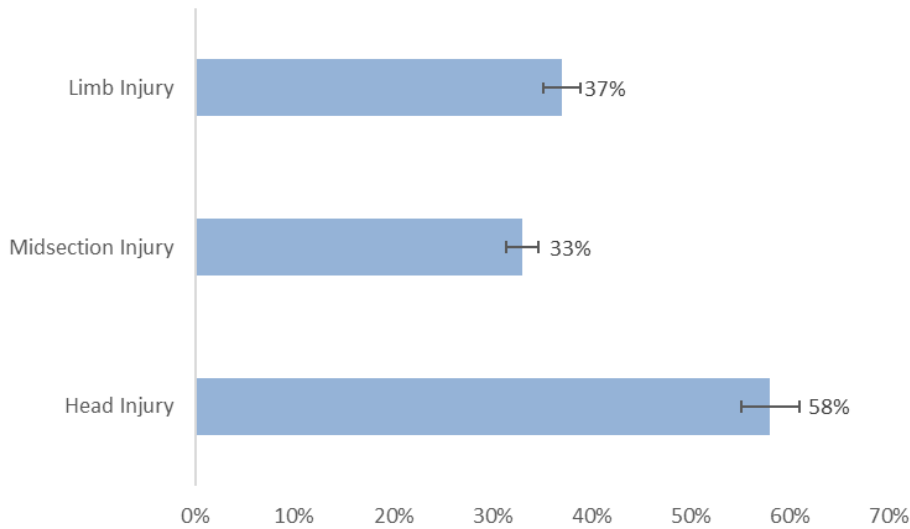


**Figure 5.** Demographic Characteristics of electric scooter-related ED Visits, 2019-2024.

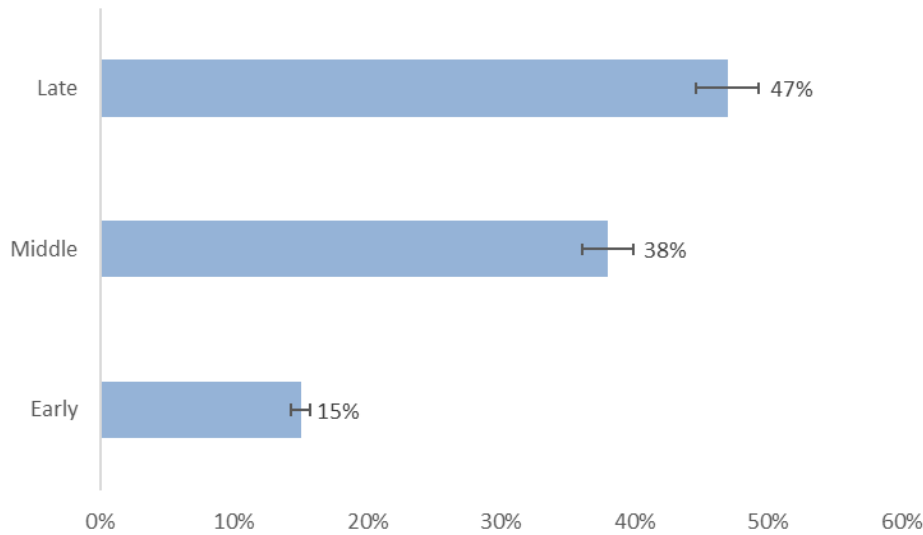
AIAN= American Indian or Alaska Native.

NHPI= Native Hawaiian or Other Pacific Islander.

^= data are suppressed if too few cases to protect confidentiality and/or report reliable rates.



**Figure 6.** Bodily Location of Injury Among Patients in Shared Scooter-Related ED Visits, 2019-2024. Injury categories are not mutually exclusive. Head injuries encompass trauma to the head, face, or neck region. Midsection injuries include trauma to the chest, back, pelvis, hips, tailbone, or abdomen. Limb injuries comprise trauma to the shoulders, arms, elbows, wrists, hands, fingers, legs, ankles, feet, or toes.



**Figure 7.** ED Intake Time of Day by Category (Early, Middle, Late) for Shared Scooter-Related Visits, 2019-2024. Time categories are defined as follows: Early (3:00 AM - 10:59 AM), Middle (11:00 AM - 6:59 PM), and Late (7:00 PM - 2:59 AM).

## Data Limitations

The data reported did not reflect the full burden of injury among shared electric scooter riders in Denver, Colorado. Many riders sustained injuries that did not warrant an ED visit and therefore sought alternative care that was not captured in these data. Primary care visits and specialty care visits are not included in the final dataset. Some data fields, such as alcohol use, might also be incomplete in some cases. In addition, demographic information was not available for

overall ridership data, making it impossible to assess changes over time to the composition of the scooter rider population in Denver.

## Discussion

These findings suggest progress and continued opportunity for increasing the safety of shared scooter rides. The decreased rate of ED visits per 100,000 scooter rides over the past 6 years is encouraging, pointing to ongoing improvement to bike and scooter infrastructure as well as safer riding. Advocating for safer riding practices like wearing a helmet, sober riding, and proper road safety will help further decrease the rate of scooter-related ED visits. Supplementary study into safety, specifically for children, and an additional analysis focused on intoxicated riding is recommended. Furthermore, the ESSENCE data used in this report indicated inconsistencies in ED data related to scooter incidents. The variability in ICD-10 code designation led to an extensive amount of data cleaning to achieve a more accurate dataset. Therefore, there is a need for consistency in reporting scooter-related data for better hazard monitoring in the future.