

# Appendix D: **Multnomah County Health Department** **Injury Data 2019**

2019 E-Scooter Findings Report

The following three memos from the Multnomah County Health Department summarize e-scooter-related injuries in Multnomah County for each quarter during which e-scooters were permitted to operate in the City of Portland in 2019.

Q1, an abbreviated quarter, covers April 26 through June 30, 2019.

Q2 covers July 1 through September 30, 2019.

Q3 covers October 1 through December 31, 2019.

## Scooter-related Injuries in Multnomah County

April 26 - June 30, 2019

12/12/2019

### Key points

- This report presents data on scooter injuries for the first reporting period of the 2019 City of Portland e-scooter pilot, with the aim of providing decision support to the Portland Bureau of Transportation in their ongoing management of this emerging travel option.
- We identified 46 visits at emergency departments and participating urgent care facilities for scooter-related injuries during the first 66 days of the 2019 pilot.
- The injury rates during this time period were 1.8 visits per 10,000 trips and 1.5 visits per 10,000 miles traveled.
- Sixteen of 46 (35%) injuries were severe enough to warrant transport by ambulance.
- Multnomah County Health Department supports Vision Zero, the City of Portland's effort to eliminate serious and fatal traffic crash injuries. A key component of Vision Zero is ensuring that streets have safe spaces for all users. EHS supports the city's efforts by providing analytical review of state injury surveillance data, and reporting on the rate, type and severity of injuries, contributing factors, and the populations most at risk.

### Background

The Health Department's Environmental Health Services team works to make neighborhoods healthier and more equitable in Multnomah County. As part of this effort, we partner with the Portland Bureau of Transportation (PBOT) to understand and monitor traffic crash injuries, a leading cause of injury-related death in the County. As PBOT continues to monitor the 2019 e-scooter pilot, information on scooter injuries can shape responses to safety concerns. Emergency department and urgent care visits for scooter-related injuries provide a near real-time metric of injuries resulting from scooter crashes. The primary purpose of this report is to minimize injuries by informing the evaluation of this emerging mobility option. See appendix B for more information on the 2019 pilot and descriptions of e-scooters.

This is an emerging and dynamic area of public health practice, and methods for monitoring scooter injuries continue to evolve. Published examples of approaches that inform this report include the [City of Austin's scooter injury study](#) and a [2019 study published in the Journal of the American Medical Association](#). We are not aware of examples of tested programs that have been successful in reducing

scooter-related injuries, though there are many examples of interventions that protect all road users. The overarching goals of [Vision Zero](#) and related tools have helped to achieve traffic crash injury reductions in many cities and countries.

We examined data related to scooter injuries for the first quarter of the 2019 pilot, a period covering April 26 - June 30. This follows a previous report on injuries during the 2018 pilot. Future reports will align with the quarterly reporting schedule for PBOT.

## Methods

We used Oregon ESSENCE (Electronic Surveillance System for the Early Notification of Community-Based Epidemics) to search for injuries related to scooters reported to emergency departments and participating urgent care clinics in Multnomah County. ESSENCE includes all emergency departments in the county and all urgent care clinics associated with hospital systems. Multiple jurisdictions have identified ESSENCE as a best fit for the task of monitoring scooter injuries. With near real-time data, such systems are among the only sources available for quickly identifying potential scooter injuries. Reports on scooter injuries published by other agencies use a similar approach.

Methods and a data dissemination plan are detailed in a project proposal approved by the Oregon Health Authority, last amended July 2019. Within ESSENCE, we searched triage notes, chief complaints, and discharge diagnosis using a query that was previously validated (see Appendix A at the end of this document for the query definition). The query extracts visit records that mention the term “scooter”. Details from the records are coded from triage notes, which are free-text fields that contain statements such as, “Patient fell from scooter, presents with complaint of wrist pain.” The notes may or may not include additional information pertaining to the causes and mechanism of injury, as well as other relevant factors such as helmet use.

Two reviewers examined the triage notes and categorized records as confirmed, probable, suspect, or not a case using a standard case definition (Table 1). We looked specifically for visit records that contained evidence that an injury related to a rental e-scooter occurred. The case definitions are structured so that such visits are “confirmed”, and those with partial evidence are considered probable or suspect. The chief difference between probable and suspect cases is that probable cases include evidence that an injury was related to an *electric* scooter, whereas suspect cases only mention a scooter as a contributor to injury.

In a small number of cases, evidence did not permit a conclusion about whether a scooter injury occurred, and these cases were categorized as “undetermined”. For example, one part of the record may state that the patient was on a bicycle while another states that the patient was on a scooter, and reviewers were unable to conclude that one was more likely than the other.

Exclusion criteria included: age less than 16 years, wrong type of scooter (e.g. mobility assistance device or moped), injury taking place outside of Multnomah County, reference to unrelated medical

history, or reference to a scooter as a means of transportation unrelated to the mechanism of injury. We calculated injury visit rates per ten thousand trips and per ten thousand miles traveled. For these rates, we used the combined count of confirmed, probable, and suspect cases as the numerator. The denominators (trips and miles) were supplied by scooter companies to PBOT.

**Table 1.** Case definition and criteria for categorizing scooter-related visits using Oregon ESSENCE

<b>Case definition</b>	<b>Criteria</b>
Confirmed	Evidence that the visit was related to a rental e-scooter
Probable	Evidence that the visit was related to an e-scooter
Suspect	Evidence that the visit was related to a scooter, but not sufficient to determine whether it was rental or electric
Not a case	Evidence that the injury was not related to a rental e-scooter
Undetermined	Evidence does not permit a conclusion about whether a scooter-related injury occurred

We reviewed cases for evidence of helmet use, intoxication, riding on the sidewalk, arrival by ambulance, and characteristics of crashes between scooters and another mode of travel. Records also include some basic demographic data, such as age and sex. We chose not to report race and ethnicity due to a high proportion of missing records and uncertainty regarding how race is recorded in visit records.

## Results

We identified 3 confirmed, 9 probable, and 34 suspect cases, totalling 46 visits from April 26 through June 30. To simplify interpretation, we present the aggregated count below unless otherwise noted.

### Injury Visit Demographics

There were 46 suspected, probable, and confirmed cases. Table 2 details the counts and proportions by demographic trait. A majority of patients were female, and most visits were made by patients age 45 or older.

**Table 2.** Injury visit demographics

	Count (%) of XX visits
Female	26 (57%)
Male	20 (43%)
Age 16-29	11 (24%)

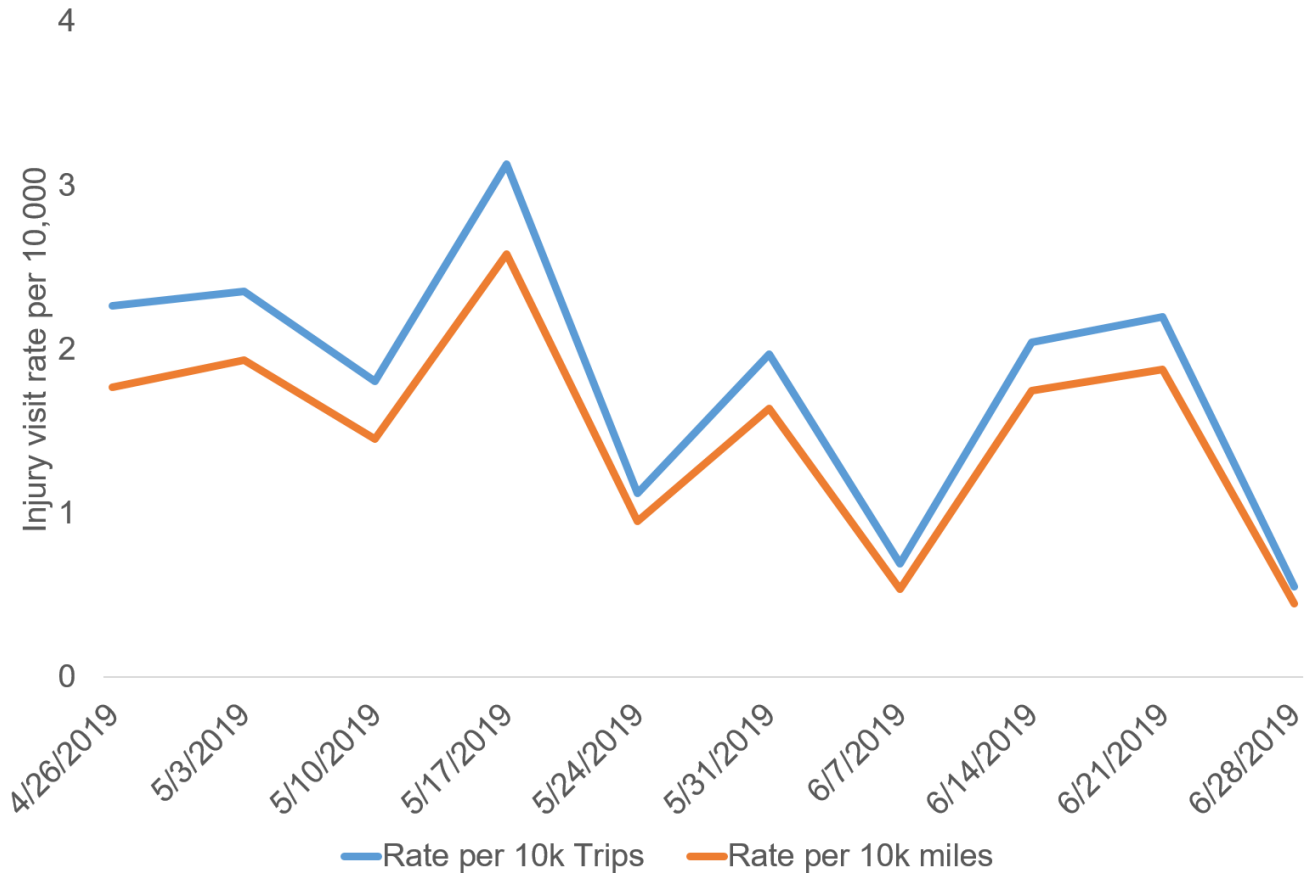
Age 30-44	10 (22%)
Age 45+	25 (54%)

**Injury trends and rates**

The average weekly visit count was 5, with a low of 2 and a high of 7. Calculating visit rates per mile traveled and per trip account for this variation.

Figure 1 below displays weekly visits as a rate per 10,000 trips and per 10,000 miles traveled. No strong trend is apparent. Table 3 contains injury visit rates and 95% confidence intervals per trip and per mile traveled. Rates account for changes in exposure to injury risk over time, which fluctuates with the number of available scooters and the amount that they are used.

**Figure 1. Weekly rate of scooter-related injury visits per mile traveled and per trip, April 26 - June 30, 2019**



**Table 3.** Rate of visits for scooter-related injuries\* (95% confidence interval)

	April 26-June 30
Per 10,000 trips	1.8 (1.3-2.4)
Per 10,000 miles traveled	1.5 (1.1-2.0)

\*Includes suspect, probable, and confirmed

### Injury types

The records do not include enough information for us to categorize the severity of every injury. As a proxy for severity, we identified cases in which there was evidence that a patient arrived by ambulance, assuming that these injuries are likely to be among the more severe. Records from emergency medical services are not currently linked to ESSENCE data; this measure reflects only the mode of arrival and not any other details about emergency transport. About 35% of visits (16 of 46) included evidence that the patient arrived by ambulance.

No fatal scooter injuries were identified during this reporting period of the 2019 pilot.

### Causes of injury and contributing factors

A large majority of the 46 visits included no evidence of a colliding mode and were categorized as “none/fall”. Visits with “scooter” as the colliding mode could refer to a patient using any mode, including another scooter user. During this reporting period, all 4 patients injured in a collision with a scooter were bicycle riders. “Infrastructure” was used for visits that reference a part of the roadway as a contributing factor, such as a pothole or train tracks. We found no injuries related to riding scooters on the sidewalk.

**Table 4.** Colliding mode for scooter crash injury visits

Colliding mode	Count (%) of 46 visits
None/fall	35 (76%)
Car or truck	2 (4%)
Scooter	4 (9%)
Infrastructure	5 (11%)

Most of the visit records did not include information about helmet use; 37 records (80%) made no mention of helmets. Four records (9%) indicated that a helmet was used, and 5 (11%) included evidence that a helmet was not used.

Five of 46 records (11%) included evidence of intoxication.

### Limitations

Not all scooter-related injuries are related to rental e-scooters, and very few visit records include any indication of whether the scooter referenced is rental or electric. We are not able to distinguish between the sitting-style scooter and the standing models. The records are not confined to the City of Portland, so it is possible that some of the injuries happened outside city limits. The records are for visits rather than patients, meaning that a person visiting the emergency department multiple times is counted more than once if they make multiple visits for the same injury or have multiple scooter injuries. There is no way to estimate the number of false negatives: visits that were in fact for a scooter-related injury, but no reference to a scooter appears in the visit record. The same applies for any of the characteristics coded from triage notes. For example, we are unable to identify visits related to a scooter malfunction if no mention of it was made in the record. Finally, emergency department and urgent care visits do not constitute complete data on scooter-related injury. It is likely that not all injured people sought medical treatment for their injuries, especially for minor injuries. Some injured people likely sought care through their primary care provider, records of which are not included in ESSENCE. We can reasonably assume that injuries treated in emergency departments and urgent care clinics were among the more severe.

We do not present comparisons of injury rates between modes due to a lack of comparable data. This concern relates to both the numerator of the rate (a consistent definition of “injury”) and the denominator (estimates of miles traveled, time spent in travel, and number of trips). Such comparisons may be possible as more data become available and methods are refined among public health practitioners.

## **Conclusions**

There were 46 scooter-related injury visits identified in the first quarter of the 2019 pilot. Of these visit records, 3 in 4 did not include evidence of a collision and are presumed to result from a one-person crash or fall. Injury prevention strategies that focus exclusively on collisions are may not effectively reduce this type of injury. About 1 in 3 visits (35%) were serious enough to require transport by ambulance.

Like all parts of the transportation system, using e-scooters entails risks. For any injury hazard, we would expect injuries to increase as exposure to the hazard increases. That is what we observed during the e-scooter pilot programs in 2018 and 2019. Importantly, there may be health benefits or risks from scooters not captured by these data. For example, it would benefit both scooter users and non-users if scooters decrease noise and air pollution from traffic. To the extent that scooters facilitate walking and transit trips, they may encourage physical activity, which has many health benefits. Conversely, if scooter trips replace trips that would have otherwise been made by a more active mode, they could diminish physical activity among users.

## **Contact**

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## Appendix A. Essence scooter query

(^scooter^,or,^scotter^,or,^lime scooter^,or,^bolt scooter^,or,^spin scooter^,or,^shared scooter^,or,^spin scooter^,or,^razor scooter^,or,^e-scooter^,or,^schooter^,or,^skooter^),andnot,(^lime disease^,or,^knee scooter^,or,^mobility scooter^,or,^power scooter^,)

Apply To : triage note, also apply to CC and DD

## Appendix B. Description of pilot & e-scooters

Dockless rental e-scooters are rechargeable electric motorized scooters deployed in the public right of way and accessible for short-term rental by users via a mobile app. They are owned and maintained by private companies. Both standing and seated models are available. In Portland such companies are permitted through the Portland Bureau of Transportation (PBOT).

Following a 2018 pilot that introduced e-scooters in Portland, the Bureau initiated a second pilot anticipated to last from Spring 2019 to Spring 2020. By law, youth under 16 are prohibited from using shared e-scooters, sidewalk riding is prohibited, and users are required to wear helmets. PBOT has implemented the pilots with features that promote equity, including a requirement that scooters be distributed throughout the city, a low-income payment plan, and options for using scooters without a smartphone or a credit card. Full details are available [on the PBOT website](#).



## Scooter-related Injuries in Multnomah County

July 1 - September 30, 2019

12/12/2019

### Key points

- This report presents data on scooter injuries for the second reporting period of the 2019 City of Portland e-scooter pilot, with the aim of providing decision support to the Portland Bureau of Transportation in their ongoing management of this emerging travel option.
- We identified 137 visits at emergency departments and participating urgent care facilities for scooter-related injuries during the 3-month period of July 1- September 30.
- The injury rates during this time period were 2.8 visits per 10,000 trips and 2.6 visits per 10,000 miles traveled.
- 37 of 137 (27%) injuries were severe enough to warrant transport by ambulance.
- Multnomah County Health Department supports Vision Zero, the City of Portland's effort to eliminate serious and fatal traffic crash injuries. A key component of Vision Zero is ensuring that streets have safe spaces for all users. EHS supports the city's efforts by providing analytical review of state injury surveillance data, and reporting on the rate, type and severity of injuries, contributing factors, and the populations most at risk.

### Background

The Health Department's Environmental Health Services team works to make neighborhoods healthier and more equitable in Multnomah County. As part of this effort, we partner with the Portland Bureau of Transportation (PBOT) to understand and monitor traffic crash injuries, a leading cause of injury-related death in the County. As PBOT continues to monitor the 2019 e-scooter pilot, information on scooter injuries can shape responses to safety concerns. Emergency department and urgent care visits for scooter-related injuries provide a near real-time metric of injuries resulting from scooter crashes. The primary purpose of this report is to minimize injuries by informing the evaluation of this emerging mobility option. See appendix B for more information on the 2019 pilot and descriptions of e-scooters.

This is an emerging and dynamic area of public health practice, and methods for monitoring scooter injuries continue to evolve. Published examples of approaches that inform this report include the [City of Austin's scooter injury study](#) and a [2019 study published in the Journal of the American Medical Association](#). We are not aware of examples of tested programs that have been successful in reducing

scooter-related injuries, though there are many examples of interventions that protect all road users. The overarching goals of [Vision Zero](#) and related tools have helped to achieve traffic crash injury reductions in many cities and countries.

We examined data related to scooter injuries for the second quarter of the 2019 pilot, a period covering July 1 - September 30. This follows previous reports on injuries during the current pilot and the 2018 pilot. Future reports will align with the quarterly reporting schedule for PBOT.

## Methods

We used Oregon ESSENCE (Electronic Surveillance System for the Early Notification of Community-Based Epidemics) to search for injuries related to scooters reported to emergency departments and participating urgent care clinics in Multnomah County. ESSENCE includes all emergency departments in the county and all urgent care clinics associated with hospital systems. Multiple jurisdictions have identified ESSENCE as a best fit for the task of monitoring scooter injuries. With near real-time data, such systems are among the only sources available for quickly identifying potential scooter injuries. Reports on scooter injuries published by other agencies use a similar approach.

Methods and a data dissemination plan are detailed in a project proposal approved by the Oregon Health Authority, last amended July 2019. Within ESSENCE, we searched triage notes, chief complaints, and discharge diagnosis using a query that was previously validated (see Appendix A at the end of this document for the query definition). The query extracts visit records that mention the term “scooter”. Details from the records are coded from triage notes, which are free-text fields that contain statements such as, “Patient fell from scooter, presents with complaint of wrist pain.” The notes may or may not include additional information pertaining to the causes and mechanism of injury, as well as other relevant factors such as helmet use.

Two reviewers examined the triage notes and categorized records as confirmed, probable, suspect, or not a case using a standard case definition (Table 1). We looked specifically for visit records that contained evidence that an injury related to a rental e-scooter occurred. The case definitions are structured so that such visits are “confirmed”, and those with partial evidence are considered probable or suspect. The chief difference between probable and suspect cases is that probable cases include evidence that an injury was related to an *electric* scooter, whereas suspect cases only mention a scooter as a contributor to injury.

In a small number of cases, evidence did not permit a conclusion about whether a scooter injury occurred, and these cases were categorized as “undetermined”. For example, one part of the record may state that the patient was on a bicycle while another states that the patient was on a scooter, and reviewers were unable to conclude that one was more likely than the other.

Exclusion criteria included: age less than 16 years, wrong type of scooter (e.g. mobility assistance device or moped), injury taking place outside of Multnomah County, reference to unrelated medical

history, or reference to a scooter as a means of transportation unrelated to the mechanism of injury. We calculated injury visit rates per ten thousand trips and per ten thousand miles traveled. For these rates, we used the combined count of confirmed, probable, and suspect cases as the numerator. The denominators (trips and miles) were supplied by scooter companies to PBOT.

**Table 1.** Case definition and criteria for categorizing scooter-related visits using Oregon ESSENCE

Case definition	Criteria
Confirmed	Evidence that the visit was related to a rental e-scooter
Probable	Evidence that the visit was related to an e-scooter
Suspect	Evidence that the visit was related to a scooter, but not sufficient to determine whether it was rental or electric
Not a case	Evidence that the injury was not related to a rental e-scooter
Undetermined	Evidence does not permit a conclusion about whether a scooter-related injury occurred

We reviewed cases for evidence of helmet use, intoxication, riding on the sidewalk, arrival by ambulance, and characteristics of crashes between scooters and another mode of travel. Records also include some basic demographic data, such as age and sex. We chose not to report race and ethnicity due to a high proportion of missing records and uncertainty regarding how race is recorded in visit records.

## Results

We identified 1 confirmed, 25 probable, and 111 suspect cases, totalling 137 visits from July 1 through September 30. To simplify interpretation, we present the aggregated count below unless otherwise noted.

### Injury Visit Demographics

There were 137 suspected, probable, and confirmed cases. Table 2 details the counts and proportions by demographic trait. A majority of patients were male, and nearly three quarters of visits were made by patients between the ages of 16 and 45.

**Table 2.** Injury visit demographics

	Count (%) of 137 visits
Female	57 (42%)
Male	80 (58%)
Age 16-29	51 (37%)

Age 30-44	50 (36%)
Age 45+	36 (26%)

**Injury trends and rates**

The average weekly visit count was 10.5, with a low of 6 and a high of 15. The number of scooters available fluctuated between a minimum of 1,975 in July to a maximum of 2,873 in September. Calculating visit rates per mile traveled and per trip account for this variation.

Figure 1 below displays weekly visits as a rate per 10,000 trips and per 10,000 miles traveled. No strong trend is apparent. Table 3 contains injury visit rates and 95% confidence intervals per trip and per mile traveled. Rates account for changes in exposure to injury risk over time, which fluctuates with the number of available scooters and the amount that they are used.

**Figure 1. Weekly rate of scooter-related injury visits per mile traveled and per trip, July 1 - September 30, 2019**



**Table 3. Rate of visits for scooter-related injuries\* (95% confidence interval)**

	July 1 - Sept 30
Per 10,000 trips	2.8 (2.3-3.2)
Per 10,000 miles traveled	2.6 (2.2-3.1)

\*Includes suspect, probable, and confirmed

### Injury types

The records do not include enough information for us to categorize the severity of every injury. As a proxy for severity, we identified cases in which there was evidence that a patient arrived by ambulance, assuming that these injuries are likely to be among the more severe. Records from emergency medical services are not currently linked to ESSENCE data; this measure reflects only the mode of arrival and not any other details about emergency transport. About 27% of visits (37 of 137) included evidence that the patient arrived by ambulance.

No fatal scooter injuries were identified during this reporting period of the 2019 pilot.

### Causes of injury and contributing factors

A large majority of the 137 visits included no evidence of a colliding mode and were categorized as “none/fall”. Visits with “scooter” as the colliding mode could refer to a patient using any mode, including another scooter user. “Infrastructure” was used for visits that reference a part of the roadway as a contributing factor, such as a pothole or train tracks. Six visits (4%) were coded “other”, which includes visits in which the colliding mode was not identified or did not fit another definition. The category “other” also includes 2 visits in which a scooter was involved in an assault. We found one injury related to riding scooters on the sidewalk.

**Table 4.** Colliding mode for scooter crash injury visits

Colliding mode	Count (%) of 137 visits
None/fall	96 (70%)
Car or truck	7 (5%)
Scooter	5 (4%)
Infrastructure	23 (17%)
Other	6 (4%)

Most of the visit records did not include information about helmet use; 101 records (74%) made no mention of helmets. Seven records (5%) indicated that a helmet was used, and 29 (21%) included evidence that a helmet was not used.

Ten records (7%) included evidence of intoxication.

## Limitations

Not all scooter-related injuries are related to rental e-scooters, and very few visit records include any indication of whether the scooter referenced is rental or electric. We are not able to distinguish between the sitting-style scooter and the standing models. The records are not confined to the City of Portland, so it is possible that some of the injuries happened outside city limits. The records are for visits rather than patients, meaning that a person visiting the emergency department multiple times is counted more than once if they make multiple visits for the same injury or have multiple scooter injuries. There is no way to estimate the number of false negatives; visits that were in fact for a scooter-related injury, but no reference to a scooter appears in the visit record. The same applies for any of the characteristics coded from triage notes. For example, we are unable to identify visits related to a scooter malfunction if no mention of it was made in the record. Finally, emergency department and urgent care visits do not constitute complete data on scooter-related injury. It is likely that not all injured people sought medical treatment for their injuries, especially for minor injuries. Some injured people likely sought care through their primary care provider, records of which are not included in ESSENCE. We can reasonably assume that injuries treated in emergency departments and urgent care clinics were among the more severe.

We do not present comparisons of injury rates between modes due to a lack of comparable data. This concern relates to both the numerator of the rate (a consistent definition of “injury”) and the denominator (estimates of miles traveled, time spent in travel, and number of trips). Such comparisons may be possible as more data become available and methods are refined among public health practitioners.

## Conclusions

There were 137 scooter-related injury visits identified in the second quarter of the 2019 pilot. Of these visit records, 7 in 10 did not include evidence of a collision and are presumed to result from a one-person crash or fall. Injury prevention strategies that focus exclusively on collisions are may not effectively reduce this type of injury. About 1 in 4 visits (27%) were serious enough to require transport by ambulance.

Like all parts of the transportation system, using e-scooters entails risks. For any injury hazard, we would expect injuries to increase as exposure to the hazard increases. That is what we observed during the e-scooter pilot programs in 2018 and 2019. Importantly, there may be health benefits or risks from scooters not captured by these data. For example, it would benefit both scooter users and non-users if scooters decrease noise and air pollution from traffic. To the extent that scooters facilitate walking and transit trips, they may encourage physical activity, which has many health benefits. Conversely, if scooter trips replace trips that would have otherwise been made by a more active mode, they could diminish physical activity among users.

## Contact

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## Appendix A. Essence scooter query

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Apply To : triage note, also apply to CC and DD

## Appendix B. Description of pilot & e-scooters

Dockless rental e-scooters are rechargeable electric motorized scooters deployed in the public right of way and accessible for short-term rental by users via a mobile app. They are owned and maintained by private companies. Both standing and seated models are available. In Portland such companies are permitted through the Portland Bureau of Transportation (PBOT).

Following a 2018 pilot that introduced e-scooters in Portland, the Bureau initiated a second pilot anticipated to last from Spring 2019 to Spring 2020. By law, youth under 16 are prohibited from using shared e-scooters, sidewalk riding is prohibited, and users are required to wear helmets. PBOT has implemented the pilots with features that promote equity, including a requirement that scooters be distributed throughout the city, a low-income payment plan, and options for using scooters without a smartphone or a credit card. Full details are available [on the PBOT website](#).

## **Scooter-related Injuries in Multnomah County**

**October 1 - December 31, 2020**

LAST UPDATED 2/11/2020

### **Key points**

- This report presents data on scooter injuries for the third reporting period of the 2019-2020 City of Portland e-scooter pilot, with the aim of providing decision support to the Portland Bureau of Transportation in their ongoing management of this emerging travel option.
- We identified 66 visits at emergency departments and participating urgent care facilities for scooter-related injuries during the 3-month period of October through December, 2019.
- Injury visit rates during this time period were 2.5 visits per 10,000 trips and 2.6 visits per 10,000 miles traveled.
- 15 of 66 (23%) injuries were severe enough to warrant transport by ambulance.
- Multnomah County Health Department supports Vision Zero, the City of Portland's effort to eliminate serious and fatal traffic crash injuries. A key component of Vision Zero is ensuring that streets have safe spaces for all users. EHS supports the city's efforts by providing analytical review of state injury surveillance data, and reporting on the rate, type and severity of injuries, contributing factors, and the populations most at risk.

### **Background**

The Health Department's Environmental Health Services team works to make neighborhoods healthier and more equitable in Multnomah County. As part of this effort, we partner with the Portland Bureau of Transportation (PBOT) to understand and monitor traffic crash injuries, a leading cause of injury-related death in the County. As PBOT continues to monitor the 2019-2020 e-scooter pilot, information on scooter injuries can shape responses to safety concerns. Emergency department and urgent care visits for scooter-related injuries provide a near real-time metric of injuries resulting from scooter crashes. The primary purpose of this report is to minimize injuries by informing the evaluation of this emerging mobility option. See appendix B for more information on the 2019-2020 pilot and descriptions of e-scooters.

This is an emerging and dynamic area of public health practice, and methods for monitoring scooter injuries continue to evolve. Published examples of approaches that inform this report include the [City of Austin's scooter injury study](#) and a [2019 study published in the Journal of the American Medical](#)



[Association](#). We are not aware of examples of tested programs that have been successful in reducing scooter-related injuries, though there are many examples of interventions that protect all road users. The overarching goals of [Vision Zero](#) and related tools have helped to achieve traffic crash injury reductions in many cities and countries.

We examined data related to scooter injuries for the third quarter of the 2019-2020 pilot, a period covering October 1 - December 31. This follows previous reports on injuries during the current pilot and the 2018 pilot. Future reports will align with the quarterly reporting schedule for PBOT.

## Methods

We used Oregon ESSENCE (Electronic Surveillance System for the Early Notification of Community-Based Epidemics) to search for injuries related to scooters reported to emergency departments and participating urgent care clinics in Multnomah County. ESSENCE includes all emergency departments in the county and all urgent care clinics associated with hospital systems. Multiple jurisdictions have identified ESSENCE as a best fit for the task of monitoring scooter injuries. With near real-time data, such systems are among the only sources available for quickly identifying potential scooter injuries. Reports on scooter injuries published by other agencies use a similar approach.

Methods and a data dissemination plan are detailed in a project proposal approved by the Oregon Health Authority, last amended July 2019. Within ESSENCE, we searched triage notes, chief complaints, and discharge diagnosis using a query that was previously validated (see Appendix A at the end of this document for the query definition). The query extracts visit records that mention the term “scooter”. Details from the records are coded from triage notes, which are free-text fields that contain statements such as, “Patient fell from scooter, presents with complaint of wrist pain.” The notes may or may not include additional information pertaining to the causes and mechanism of injury, as well as other relevant factors such as helmet use.

Two reviewers examined the triage notes and categorized records as confirmed, probable, suspect, or not a case using a standard case definition (Table 1). We looked specifically for visit records that contained evidence that an injury related to a rental e-scooter occurred. The case definitions are structured so that such visits are “confirmed”, and those with partial evidence are considered probable or suspect. The chief difference between probable and suspect cases is that probable cases include evidence that an injury was related to an *electric* scooter, whereas suspect cases only mention a scooter as a contributor to injury.

In a small number of cases, evidence did not permit a conclusion about whether a scooter injury occurred, and these cases were categorized as “undetermined”. For example, one part of the record may state that the patient was on a bicycle while another states that the patient was on a scooter, and reviewers were unable to conclude that one was more likely than the other.

Exclusion criteria included: age less than 16 years, wrong type of scooter (e.g. mobility assistance device or moped), injury taking place outside of Multnomah County, reference to unrelated medical history, or reference to a scooter as a means of transportation unrelated to the mechanism of injury. We calculated injury visit rates per ten thousand trips and per ten thousand miles traveled. For these rates, we used the combined count of confirmed, probable, and suspect cases as the numerator. The denominators (trips and miles) were supplied by scooter companies to PBOT.

**Table 1.** Case definition and criteria for categorizing scooter-related visits using Oregon ESSENCE

<b>Case definition</b>	<b>Criteria</b>
Confirmed	Evidence that the visit was related to a rental e-scooter
Probable	Evidence that the visit was related to an e-scooter
Suspect	Evidence that the visit was related to a scooter, but not sufficient to determine whether it was rental or electric
Not a case	Evidence that the injury was not related to a rental e-scooter
Undetermined	Evidence does not permit a conclusion about whether a scooter-related injury occurred

We reviewed cases for evidence of helmet use, intoxication, riding on the sidewalk, arrival by ambulance, and characteristics of crashes between scooters and another mode of travel. Records also include some basic demographic data, such as age and sex. We chose not to report race and ethnicity due to a high proportion of missing records and uncertainty regarding how race is recorded in visit records.

## Results

We identified 3 confirmed, 14 probable, and 49 suspect cases, totalling 66 visits from October through December. To simplify interpretation, we present the aggregated count below unless otherwise noted.

### Injury Visit Demographics

There were 66 suspected, probable, and confirmed cases. Table 2 details the counts and proportions by demographic trait. A majority of patients were male, and about 8 in 10 visits were made by patients between the ages of 16 and 45.

**Table 2.** Injury visit demographics

	Count (%) of 66 visits
Female	25 (38%)

Male	41 (62%)
Age 16-29	24 (36%)
Age 30-44	29 (44%)
Age 45+	13 (20%)

### Injury trends and rates

The average weekly visit count was 4.7, with a low of 1 and a high of 11. The number of scooters permitted ranged between 2,673 and 2,887 during this period. Calculating visit rates per mile traveled and per trip account for this variation.

Figure 1 below displays weekly visits as a rate per 10,000 trips and per 10,000 miles traveled. No strong trend is apparent. During this reporting period, 262,059 trips were made covering 253,992 miles. Table 3 contains injury visit rates and 95% confidence intervals per trip and per mile traveled. Rates account for changes in exposure to injury risk over time, which fluctuates with the number of available scooters and the amount that they are used.

**Figure 1. Weekly rate of scooter-related injury visits per mile traveled and per trip, October 1 - December 31, 2019**



**Table 3.** Rate of visits for scooter-related injuries\* (95% confidence interval)

	October 1 - December 31, 2019
Per 10,000 trips	2.5 (1.9-3.2)
Per 10,000 miles traveled	2.6 (2.0-3.3)

\*Includes suspect, probable, and confirmed

### Injury types

The records do not include enough information for us to categorize the severity of every injury. As a proxy for severity, we identified cases in which there was evidence that a patient arrived by ambulance, assuming that these injuries are likely to be among the more severe. Records from emergency medical services are not currently linked to ESSENCE data; this measure reflects only the mode of arrival and not any other details about emergency transport. About 23% of visits (15 of 66) included evidence that the patient arrived by ambulance.

No fatal scooter injuries were identified during this reporting period of the 2019-2020 pilot.

### Causes of injury and contributing factors

A large majority of the 66 visits included no evidence of a colliding mode and were categorized as “none/fall”. Visits with “scooter” as the colliding mode could refer to a patient using any mode, including another scooter user. “Infrastructure” was used for visits that reference a part of the roadway as a contributing factor, such as a pothole or train tracks. Three visits (5%) were coded “other”, which includes visits in which the colliding mode was not identified or did not fit another definition. We found one injury related to riding scooters on the sidewalk.

**Table 4.** Colliding mode for scooter crash injury visits

Colliding mode	Count (%) of 66 visits
None/fall	45 (68%)
Car or truck	3 (5%)
Scooter	3 (5%)
Infrastructure	11 (17%)
Other	3 (5%)

Most of the visit records did not include information about helmet use; 54 records (82%) made no mention of helmets. One record (2%) indicated that a helmet was used, and 11 (17%) included evidence that a helmet was not used.

14 records (21%) included evidence of intoxication.

## **Limitations**

Not all scooter-related injuries are related to rental e-scooters, and very few visit records include any indication of whether the scooter referenced is rental or electric. We are not able to distinguish between the sitting-style scooter and the standing models. The records are not confined to the City of Portland, so it is possible that some of the injuries happened outside city limits. The records are for visits rather than patients, meaning that a person visiting the emergency department multiple times is counted more than once if they make multiple visits for the same injury or have multiple scooter injuries. There is no way to estimate the number of false negatives; visits that were in fact for a scooter-related injury, but no reference to a scooter appears in the visit record. The same applies for any of the characteristics coded from triage notes. For example, we are unable to identify visits related to a scooter malfunction if no mention of it was made in the record. Finally, emergency department and urgent care visits do not constitute complete data on scooter-related injury. It is likely that not all injured people sought medical treatment for their injuries, especially for minor injuries. Some injured people likely sought care through their primary care provider, records of which are not included in ESSENCE. We can reasonably assume that injuries treated in emergency departments and urgent care clinics were among the more severe.

## **Conclusions**

There were 66 scooter-related injury visits identified in the third quarter of the 2019-2020 pilot. Of these visit records, 7 in 10 did not include evidence of a collision and are presumed to result from a one-person crash or fall. Injury prevention strategies that focus exclusively on collisions are may not effectively reduce this type of injury. Just under a quarter of visits (23%) were serious enough to require transport by ambulance.

Like all parts of the transportation system, using e-scooters entails risks. For any injury hazard, we would expect injuries to increase as exposure to the hazard increases. That is what we observed during the e-scooter pilot programs in 2018 and 2019. Importantly, there may be health benefits or risks from scooters not captured by these data. For example, it would benefit both scooter users and non-users if scooters decrease noise and air pollution from traffic. To the extent that scooters facilitate walking and transit trips, they may encourage physical activity, which has many health benefits. Conversely, if scooter trips replace trips that would have otherwise been made by a more active mode, they could diminish physical activity among users.

## Contact

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## Appendix A. Essence scooter query

(,^scooter^,or,^scotter^,or,^lime scooter^,or,^bolt scooter^,or,^spin scooter^,or,^shared scooter^,or,^spin scooter^,or,^razor scooter^,or,^e-scooter^,or,^schooter^,or,^skooter^,),andnot,(^lime disease^,or,^knee scooter^,or,^mobility scooter^,or,^power scooter^,)

Apply To : triage note, also apply to CC and DD

## Appendix B. Description of pilot & e-scooters

Dockless rental e-scooters are rechargeable electric motorized scooters deployed in the public right of way and accessible for short-term rental by users via a mobile app. They are owned and maintained by private companies. Both standing and seated models are available. In Portland such companies are permitted through the Portland Bureau of Transportation (PBOT).

Following a 2018 pilot that introduced e-scooters in Portland, the Bureau initiated a second pilot anticipated to last from Spring 2019 to Spring 2020. By law, youth under 16 are prohibited from using shared e-scooters, sidewalk riding is prohibited, and users are required to wear helmets. PBOT has implemented the pilots with features that promote equity, including a requirement that scooters be distributed throughout the city, a low-income payment plan, and options for using scooters without a smartphone or a credit card. Full details are available [on the PBOT website](#).