# E-scooter Injury and Policy

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INJURY PREVENTION RESEARCH CENTER AT EMORY (IPRCE)

BROWN BAG LECTURE SERIES

# About Injury

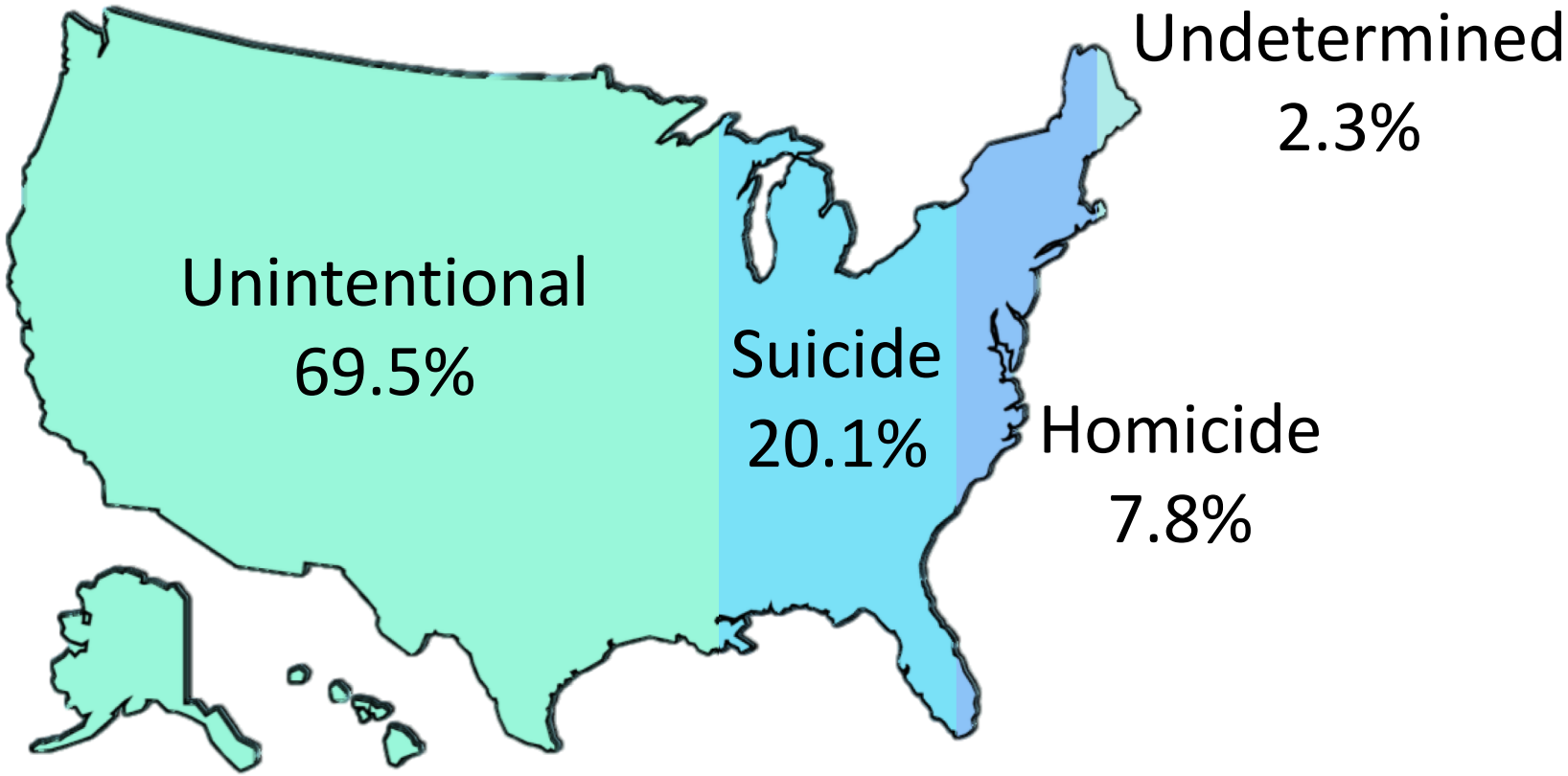
## 10 Leading Causes of Death by Age Group, United States – 2017

| Rank | Age Groups | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | <1 | 1-4 | 5-9 | 10-14 | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ | |
| 1 | Congenital Anomalies 4,580 | Unintentional Injury 1,267 | Unintentional Injury 718 | Unintentional Injury 860 | Unintentional Injury 13,441 | Unintentional Injury 25,669 | Unintentional Injury 22,828 | Malignant Neoplasms 39,266 | Malignant Neoplasms 114,810 | Heart Disease 519,052 | Heart Disease 647,457 |
| 2 | Short Gestation 3,749 | Congenital Anomalies 424 | Malignant Neoplasms 418 | Suicide 517 | Suicide 6,252 | Suicide 7,948 | Malignant Neoplasms 10,900 | Heart Disease 32,658 | Heart Disease 80,102 | Malignant Neoplasms 427,896 | Malignant Neoplasms 599,108 |
| 3 | Maternal Pregnancy Comp. 1,432 | Malignant Neoplasms 325 | Congenital Anomalies 188 | Malignant Neoplasms 437 | Homicide 4,905 | Homicide 5,488 | Heart Disease 10,401 | Unintentional Injury 24,461 | Unintentional Injury 23,408 | Chronic Low. Respiratory Disease 136,139 | Unintentional Injury 169,936 |
| 4 | SIDS 1,363 | Homicide 303 | Homicide 154 | Congenital Anomalies 191 | Malignant Neoplasms 1,374 | Heart Disease 3,681 | Suicide 7,335 | Suicide 8,561 | Chronic Low. Respiratory Disease 18,667 | Cerebro-vascular 125,653 | Chronic Low. Respiratory Disease 160,201 |
| 5 | Unintentional Injury 1,317 | Heart Disease 127 | Heart Disease 75 | Homicide 178 | Heart Disease 913 | Malignant Neoplasms 3,616 | Homicide 3,351 | Liver Disease 8,312 | Diabetes Mellitus 14,904 | Alzheimer's Disease 120,107 | Cerebro-vascular 146,383 |
| 6 | Placenta Cord. Membranes 843 | Influenza & Pneumonia 104 | Influenza & Pneumonia 62 | Heart Disease 104 | Congenital Anomalies 355 | Liver Disease 918 | Liver Disease 3,000 | Diabetes Mellitus 6,409 | Liver Disease 13,737 | Diabetes Mellitus 59,020 | Alzheimer's Disease 121,404 |
| 7 | Bacterial Sepsis 592 | Cerebro-vascular 66 | Chronic Low. Respiratory Disease 59 | Chronic Low Respiratory Disease 75 | Diabetes Mellitus 248 | Diabetes Mellitus 823 | Diabetes Mellitus 2,118 | Cerebro-vascular 5,198 | Cerebro-vascular 12,708 | Unintentional Injury 55,951 | Diabetes Mellitus 83,564 |
| 8 | Circulatory System Disease 449 | Septicemia 48 | Cerebro-vascular 41 | Cerebro-vascular 56 | Influenza & Pneumonia 190 | Cerebro-vascular 593 | Cerebro-vascular 1,811 | Chronic Low. Respiratory Disease 3,975 | Suicide 7,982 | Influenza & Pneumonia 46,862 | Influenza & Pneumonia 55,672 |
| 9 | Respiratory Distress 440 | Benign Neoplasms 44 | Septicemia 33 | Influenza & Pneumonia 51 | Chronic Low. Respiratory Disease 188 | HIV 513 | Septicemia 854 | Septicemia 2,441 | Septicemia 5,838 | Nephritis 41,670 | Nephritis 50,633 |
| 10 | Neonatal Hemorrhage 379 | Perinatal Period 42 | Benign Neoplasms 31 | Benign Neoplasms 31 | Complicated Pregnancy 168 | Complicated Pregnancy 512 | HIV 831 | Homicide 2,275 | Nephritis 5,671 | Parkinson's Disease 31,177 | Suicide 47,173 |

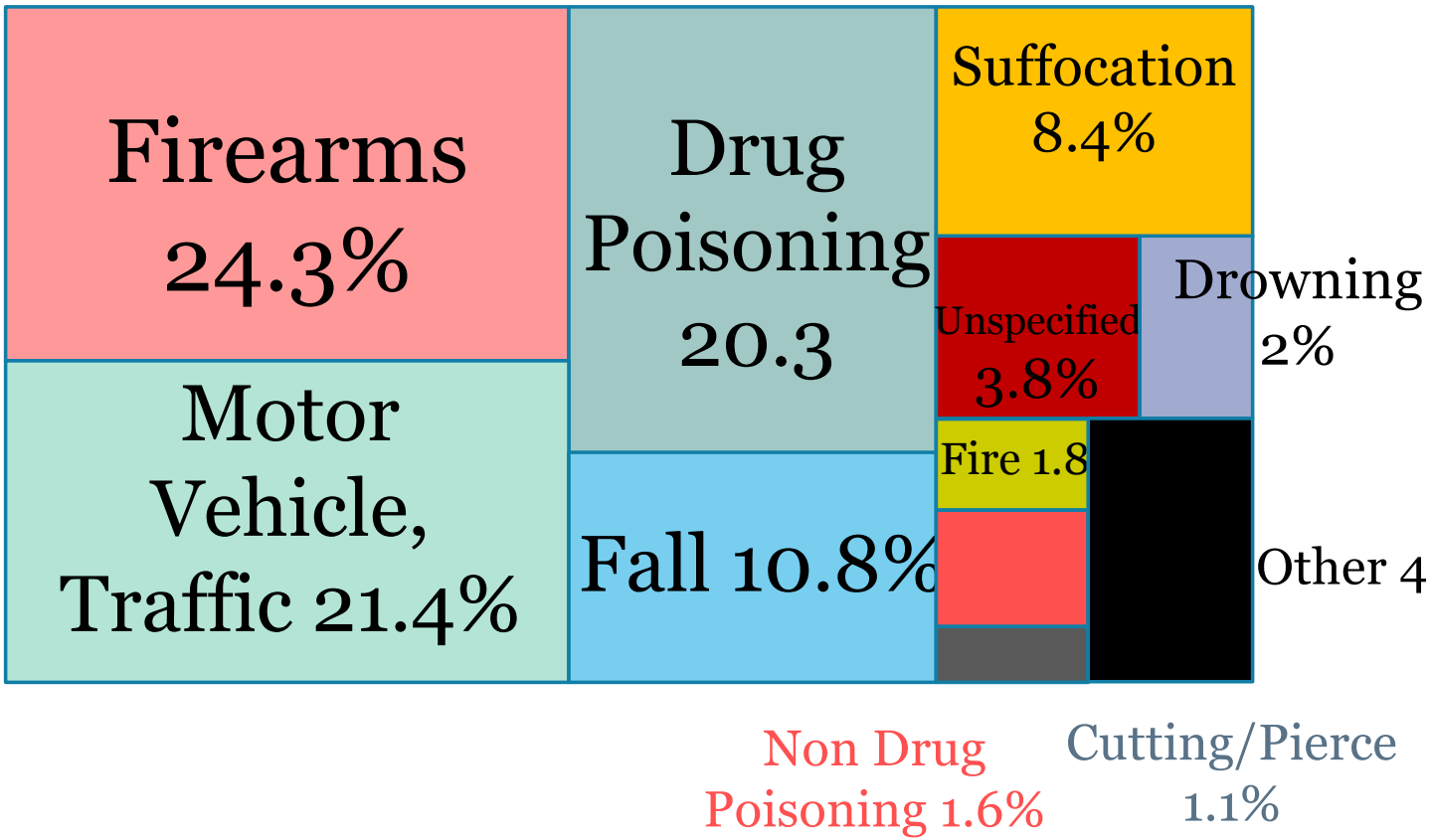
**Data Source:** National Vital Statistics System, National Center for Health Statistics, CDC.
**Produced by:** National Center for Injury Prevention and Control, CDC using WISQARS™.

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

# Injury Deaths by Intent, 2018



# Mechanisms of Injury Death




# About IPRCE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# Injuries Associated with Shared Electric Dockless Micromobility Devices

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FEBRUARY 21, 2020

IPRCE BROWN BAG LECTURE

# What are dockless electric micro-mobility devices?


Bird 2


Jump

Boaz


Razor

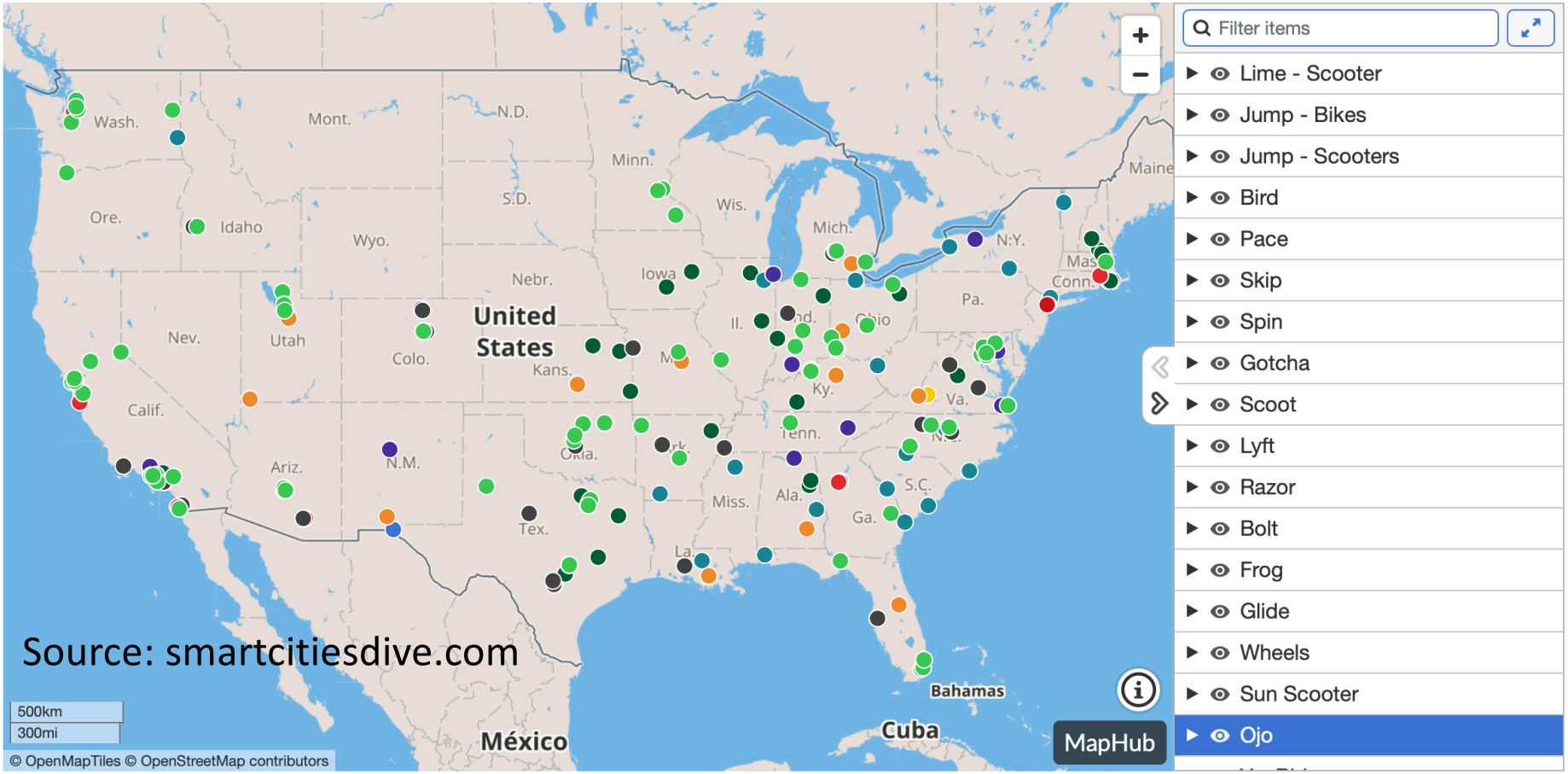
Ojo


Wheelz

# US e-Scooter and e-Bike Deployments, 2.14.20

~352 deployments from 20 companies (14 e-scooter, 4 e-bike, 2 both)

Banned in 31 cities



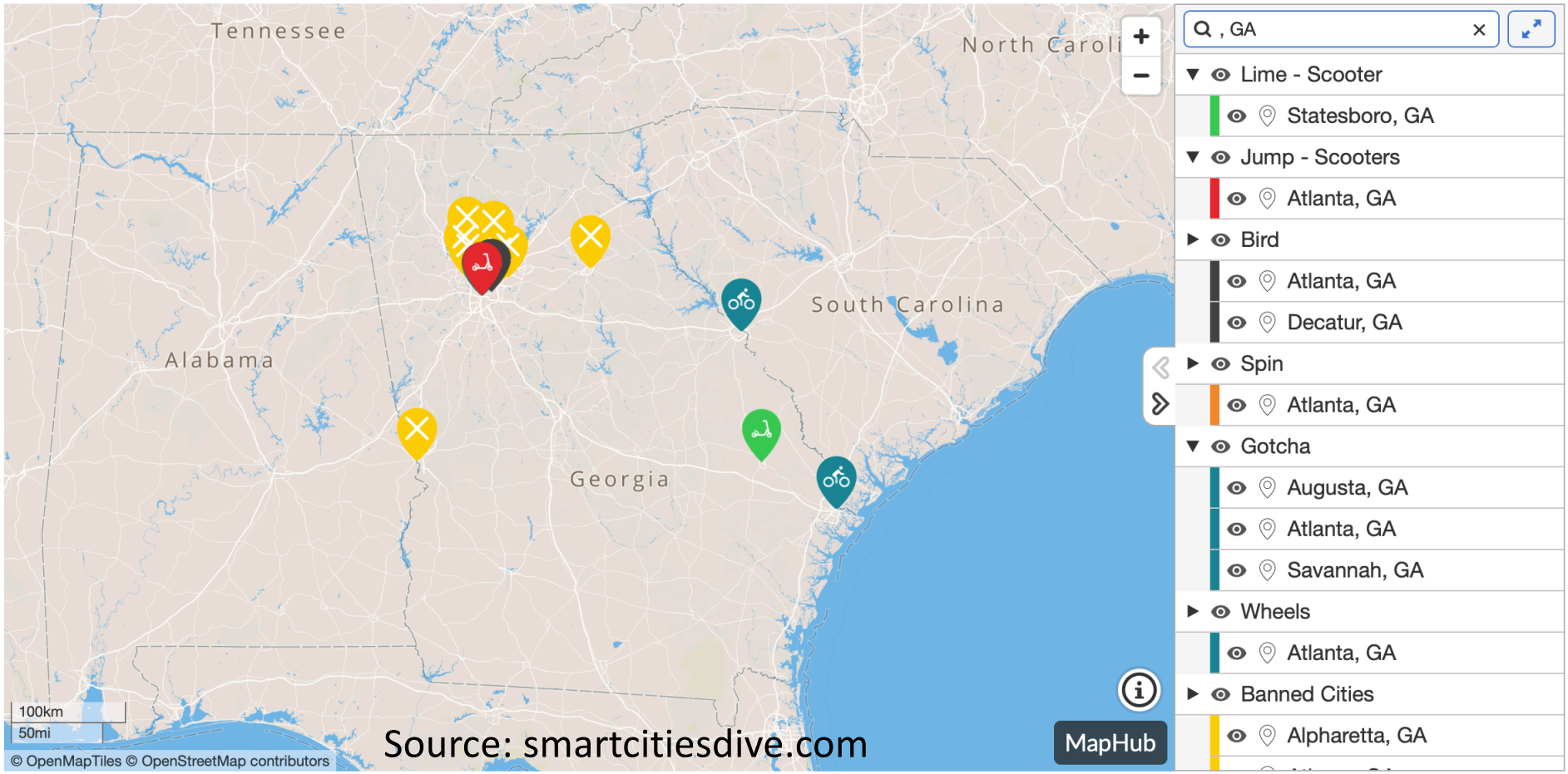

Source: smartcitiesdive.com

Research

# GA e-Scooter and e-Bike Deployments, 2.14.20

Metro ATL: Bird, Jump, Spin, Wheelz, Gotcha*

Banned in Alphretta, Athens, Columbus, Lilburn, Marietta, Smyna, Tucker, Woodstock




Source: smartcitiesdive.com

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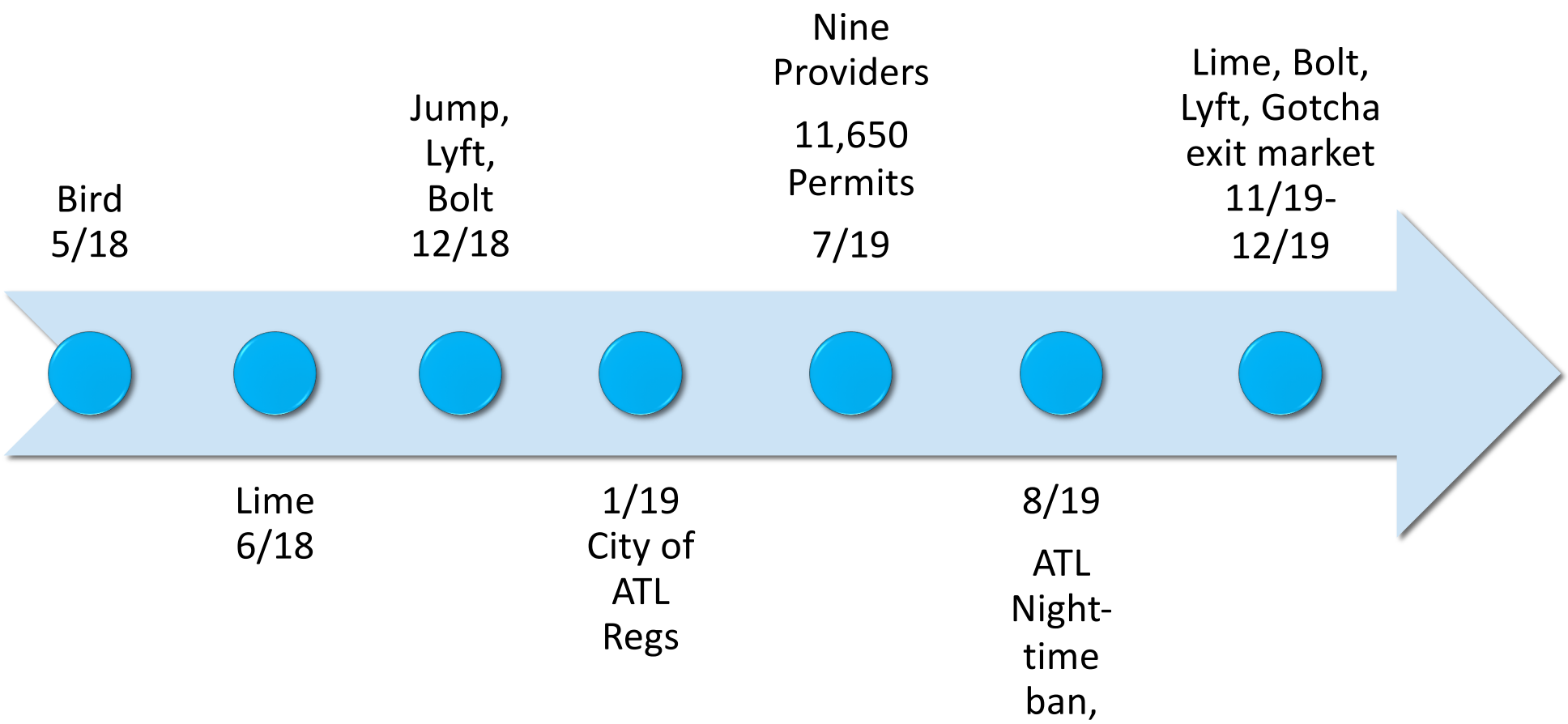
# Atlanta Timeline



# E-scooter Injury—Data Sources

- NEISS Analyses through 2017 (Bressler et al. 2019, Aizpuru et al. 2019)
- Hospital records
  - ED data: Trivedi et al. 2019 (UCLA hospitals, Sept 2017- Aug 2018, 249 patients, data from EMR); Badeau et al. 2019 (U. Utah, June-Nov 2018, 50 pts)
  - Trauma registry analyses (Kobayashi et al. 2019)
- In-Depth Studies of Deployments
  - CDC/City of Austin DPH (Sept-Nov 2018, 190 patients, data from EMR+follow up survey)
  - PBOT 2018 (pilot deployment, July-Nov 2018)

# E-scooter injury—What do we know?

- Injured riders are more likely to be male (50%-60% depending on the study)
- Helmet Use (<10% from field observations, <5% from hospital data)
- Alcohol Impairment (ED: 5%-16% EtOH>0.08g/dL, much higher in trauma data)
- First time riders at higher risk (~1/3 of injuries associated with first trip)
- Time of crash (39% of injuries and 28% of trips were between 6pm and 6am)
- Vehicle Involvement (10% to 12.5%)
- Injured Body Regions (ED data: head, UX, LX most prevalent)

# Some Unanswered Questions

- Location (spatial factors, type)
- Behavioral factors influencing injurious events (helmet use, riding behavior as f(environment)…)
- Interventions (will more bike lanes help? Use of parking areas, how to address impairment, discounted rates for safe behaviors…)
- Device characteristics that influence safety
- Effective policy (e.g., ATL nighttime ban, how to incentivize operators, speed limits…)
- Equity issues (can e-scooters expand mobility options for underserved communities)

# Objectives

- Describe how hospitals currently identify and record mechanisms of injuries
- Describe the challenges specific to identifying electric scooter injuries
- Share Grady's initial e-micromobility (scooter) injury data
- Next steps

# Hospital Injury Data - How could we identify e-scooter injuries?

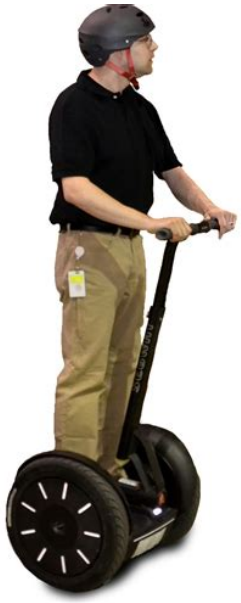
- ICD 10 codes
  - Numerous non-specific codes for scooters
  - Most commonly V-codes (mechanism), often unbillable
- Trauma registry data
  - Skewed towards seriously injured cases (admissions)
- Chart reviews
  - The term “Scooter” is not defined or used consistently

# Challenges - What are we looking for?

"Motorized" Scooter

"Non powered" Scooter

"Mobility" Scooter



"Segway" Scooter

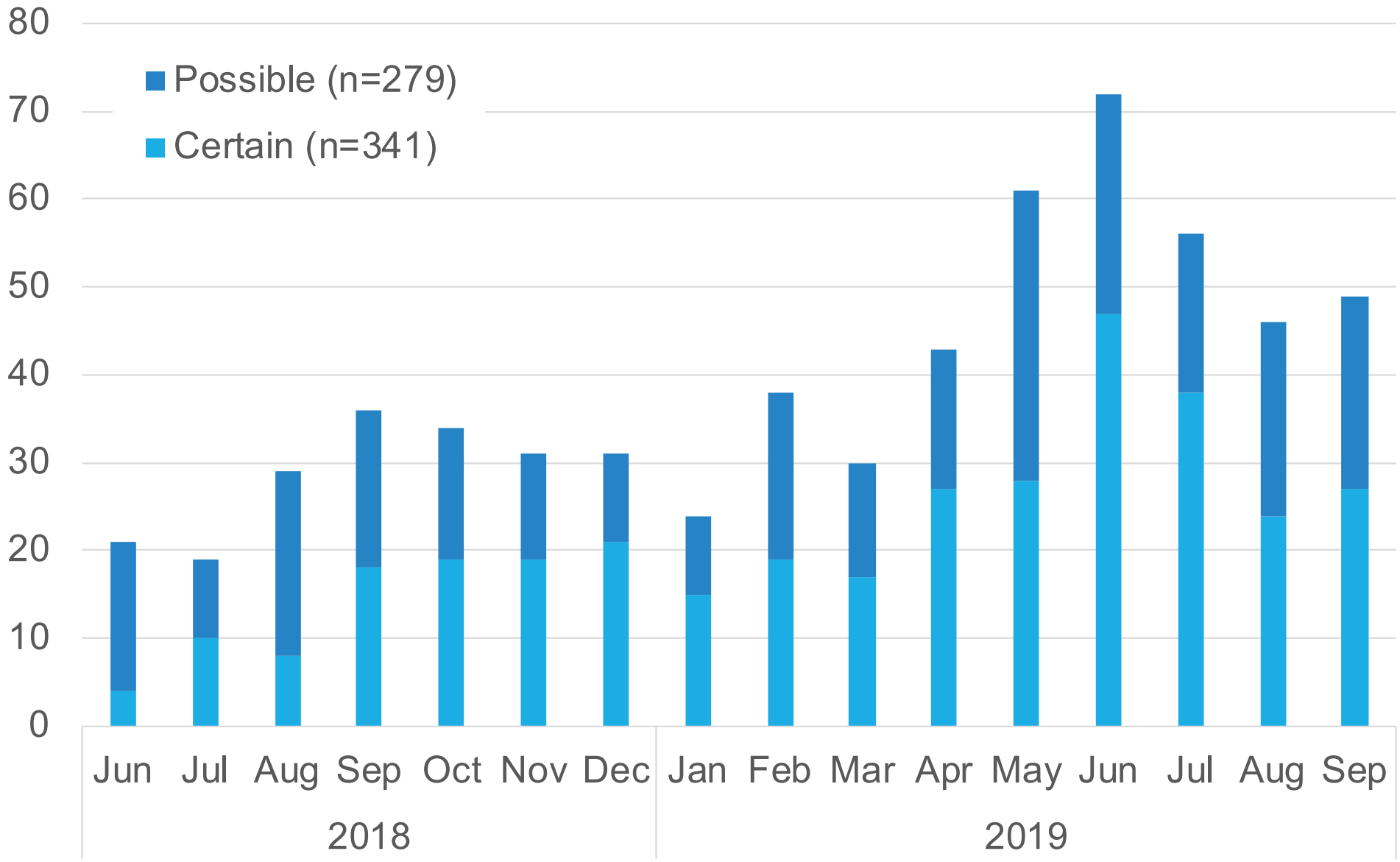
# Challenges - What's in a Name?

- Scooter
- Electric Scooter
- Standing Scooter
- Dockless Scooter
- Motorized Scooter
- Micro-Mobility Scooter
- Brand name (Bird/Lime/Lyft/Jump/Bolt/Boaz/Wheels/Spin/Gotcha)

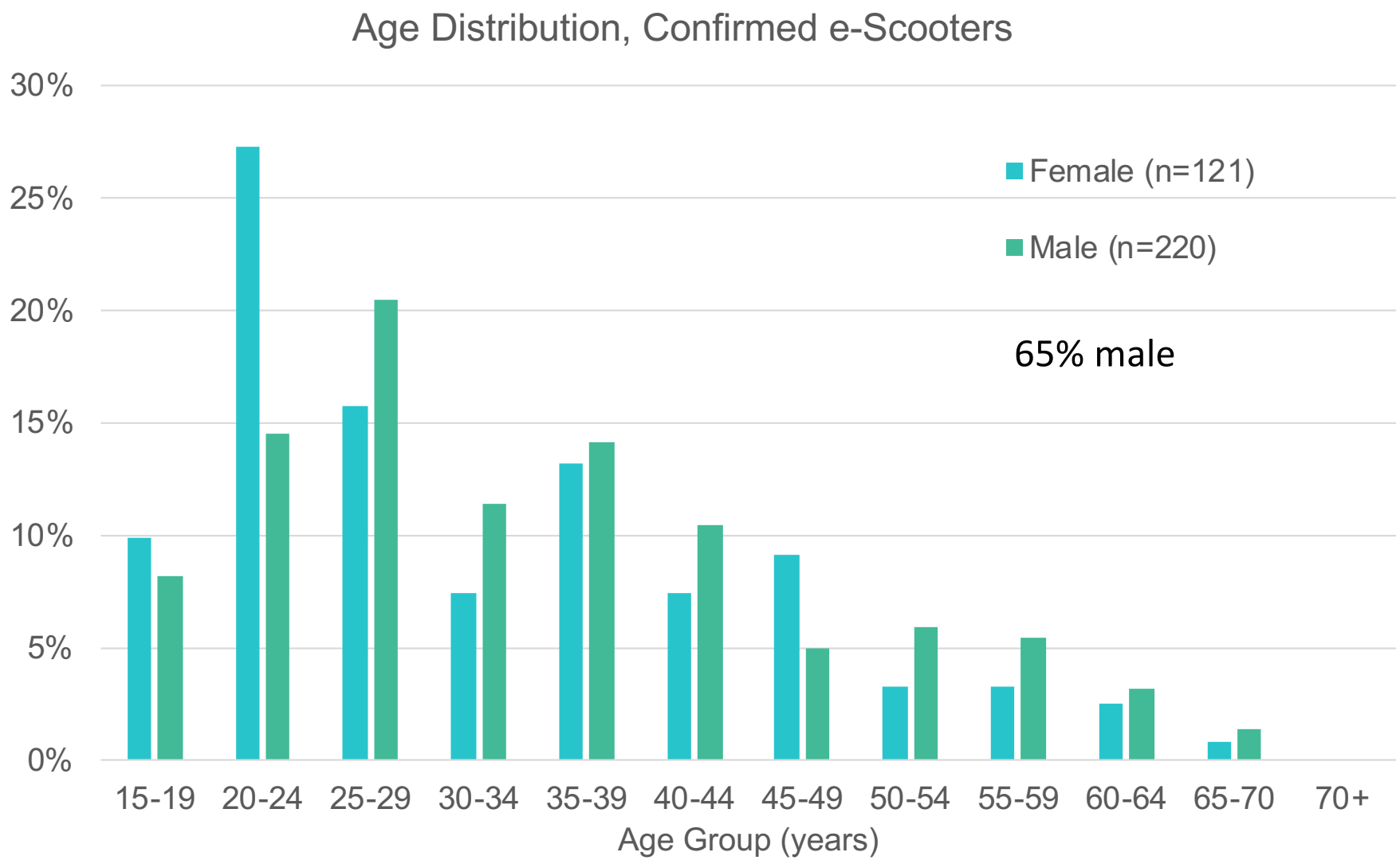
# Our Approach

- Created **SCRATCH** injury registry (Scooter CRash And Trauma CoHort)
- Searched all ED notes from June 2018 – Sept 2019 for key words (i.e. – scooter, eScooter, company name, etc.)
- Manual chart review to confirm case involved a standup electric scooter
  - Classified Not e-scooter/Certain/Possible
  - Coded helmet use
  - Coded mechanism (MVC, fall on roadway, fall of roadway, fall unknown location, struck by, struck against, other, unk.)
- Extracted demographics, labs, notes, diagnoses (ED/hospital), charges, LOS…

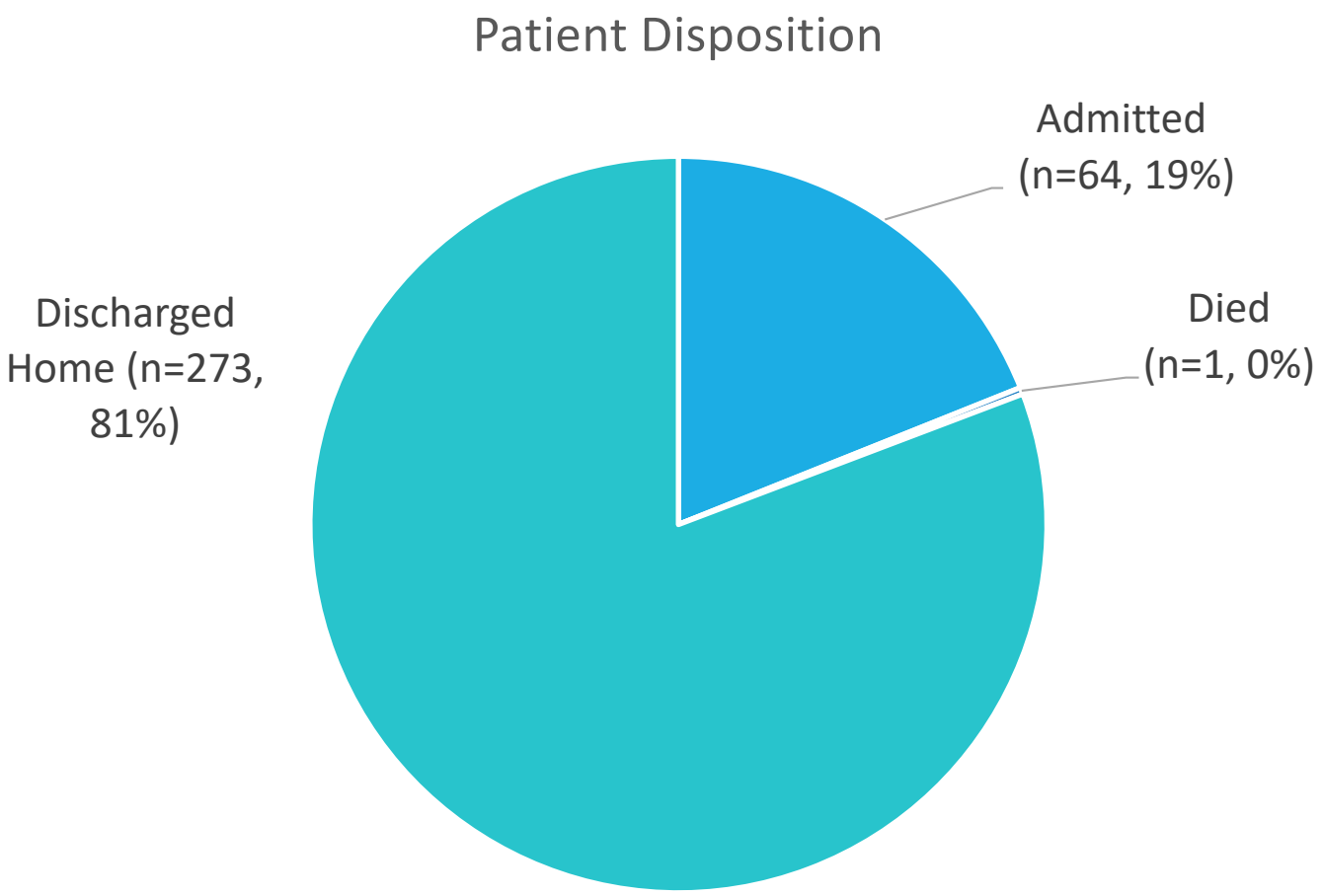
# Numbers of Injuries per Month



# Age Distribution by Sex



# ED Disposition



# Additional Findings

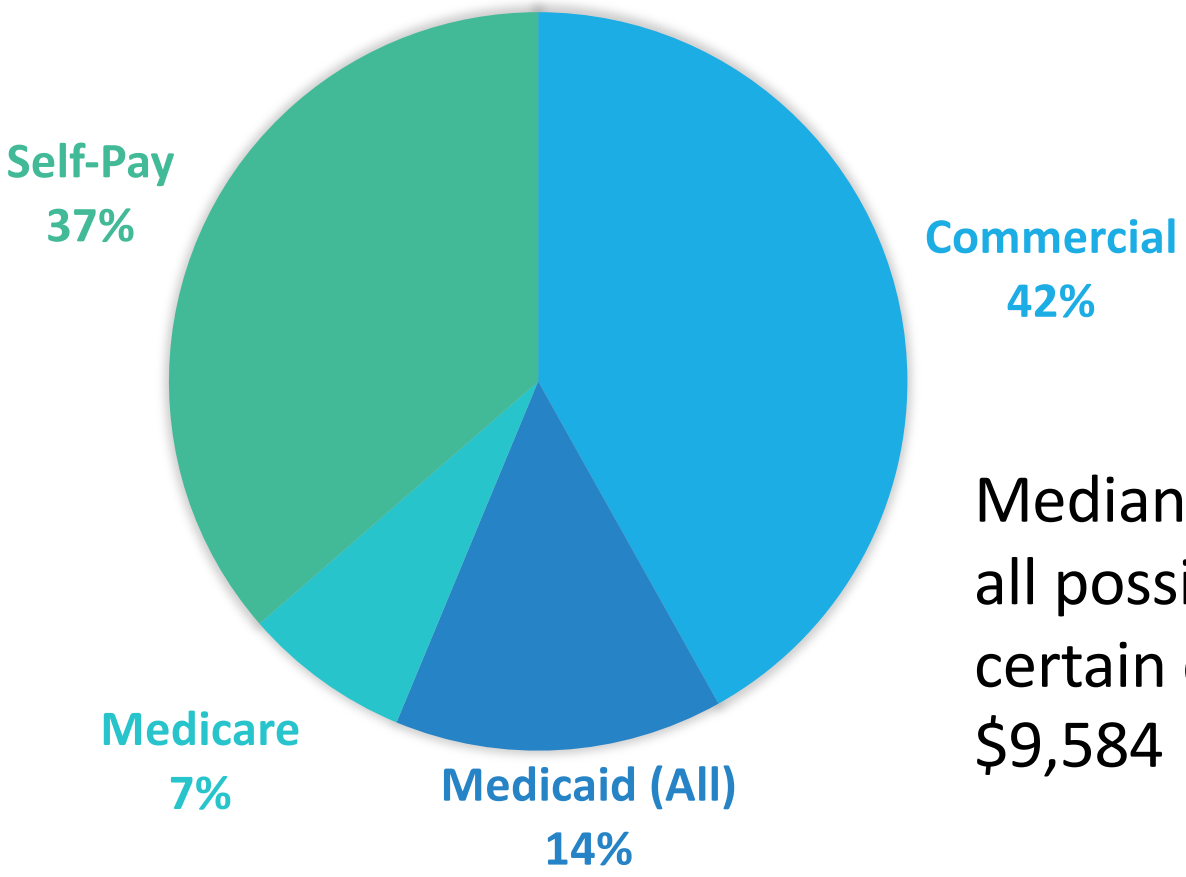
- Built environment commonly noted (~18%)
- Mechanical issues (~5%)
- 16% Motor Vehicle Collision
- Helmets rarely used
- ETOH common (27% of 158 pts tested had EtOH≥0.08 g/dL)

# Additional Findings, continued

- Most common chief complaints (58 total over 337 patients):
  - Fall (32%),
  - Motorcycle crash (14%),
  - Trauma (10%),
  - Motor-vehicle crash (4%)

# Financial Distribution

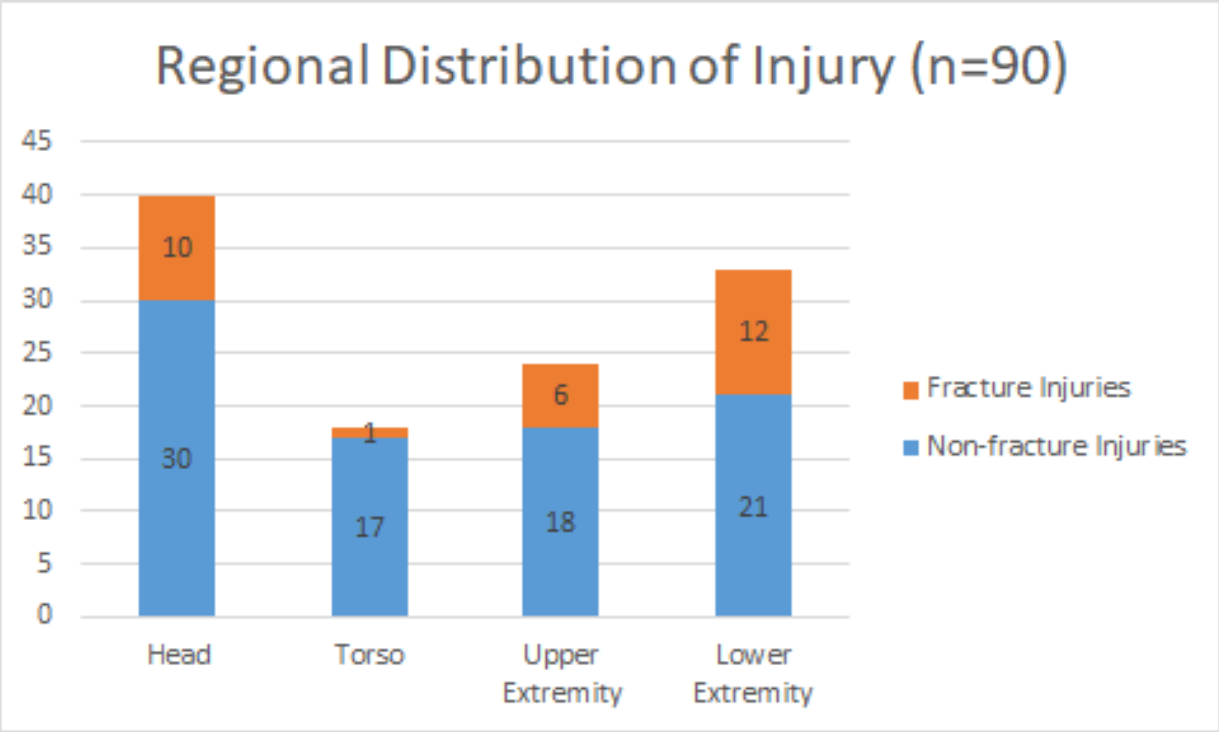
DISTRIBUTION OF CHARGES BY PAYER TYPE, CONFIRMED E-SCOOTERS (N=341)



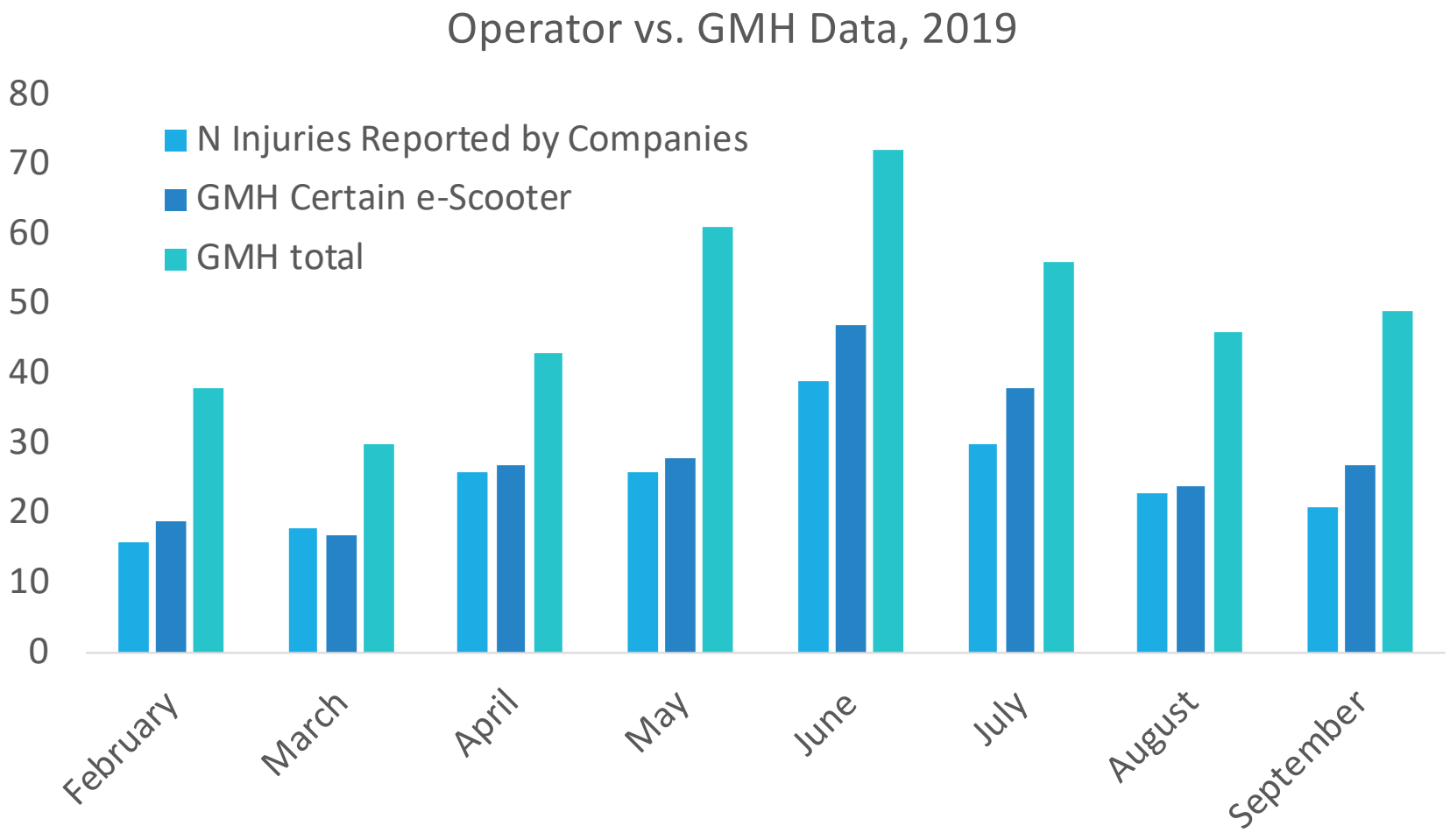

Median Charge for all possible and certain cases: $9,584

# Injury Patterns (Subset Analysis from GMH NEISS)

- 44% of patients had head injuries (included face)
- 37% had lower extremity injuries
- Severe ankle injuries most common (10/12)
- Of UE injuries, distal are more common than proximal



# Operator Reported vs. GMH Data



# How to complete the injury picture

- Hospital data will identify the most severe injuries
- Urgent Care Centers
- Student Health Centers at local Universities
- Robust rider feedback

# Next Steps

- In-Depth analysis of SCRATCH data
- Engage patients prospectively for better data collection (obtain accident related factors like helmet use, EtOH, travel behavior, role of built environment)
- Urgent care data
- Identify and implement injury prevention interventions
- Long-term→site based observational study