E-Scooter and Micromobility Safety Webinar Series (Part I)
Research, Tools and Guidance

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Serving All People, All Abilities

Pedestrian and Bicycle Information Center Webinar Series on Micromobility and E-Scooter Safety, Part 1: Research, Tools, and Guidance
Tuesday, March 5, 2024

Bronwen Keiner, Bernadette Dupont, and Christopher Douwes
Office of Human Environment
Federal Highway Administration
Disclaimer

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Trips Peaked in 2022

North Americans took an estimated 157 million trips on shared micromobility vehicles in 2022. This is approximately 23% more trips than the total taken during 2021, and equal to trip-making in 2019. Like 2021, e-scooters accounted for almost half of all trips. Pedal bike trips increased 14% from 2021, and e-bike trips grew 64% from 2021.

157 Million Trips Across North America in 2022

Country-by-Country Shared Micromobility Trip Breakdown

363 cities in the U.S. have a shared scooter or bikeshare system!

Docked bikeshare continued to grow in 2023.

“Equity means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.”

-- DOT Equity Action Plan
How Do We Define Micromobility?

**Micromobility** refers to any small, low-speed, human or electric-powered transportation device, including:

- bicycles
- scooters
- electric-assist bicycles (e-bikes)
- electric scooters (e-scooters)
- other small, lightweight, wheeled conveyances (e.g. hoverboard, skateboard, unicycle)

**Shared micromobility** refers to docked or dockless fleets of micromobility devices that are available to the public for shared use.

- Unlocked with a smartphone, key, or kiosk
- Fee to ride

*Micromobility Fact Sheet - FHWA (dot.gov)*
Micromobility Devices Evolving Today

Source: www.istockphoto.com

Source: www.pexels.com

Source: www.gettyimages.com

Source: www.gettyimages.com

Source: www.gettyimages.com

Source: Pelican Cycles

Source: www.pexels.com

Source: www.gettyimages.com
Street Spaces Evolving Today
Federal Role

• States and local governments establish micromobility usage and safety policies
  • Where to ride
  • Age restrictions
  • License or ID
  • Helmets and lighting
  • Speed
  • Parking

• Federal laws prohibit some motorized vehicles on nonmotorized trails and pedestrian walkways using certain Federal funding

• Micromobility providers stipulate guidelines and operating instructions

Image: Some cities are exploring how to incentivize helmet use to improve the safety of micromobility transportation. Source: © Andrey_Popov / www.shutterstock.com
Climate Sustainability and Environmental Benefits

- 37% of shared micromobility trips replaced a car trip
  - Reduction in traffic congestion
- Zero / low GHG emissions
  - device production, battery charging, fleet redistribution, and other lifecycle costs may impact environmental benefits
- Improved health outcomes
  - active transportation
  - improved air quality
- Increased mobility options


For the Air Quality Specialist = Reduction of 101.36 tons/day of CO₂ in the US
Safety Considerations

- Planning and prioritization
- Defined micromobility facilities (e.g. separated bike lanes, off-street paths)
- Corridor improvements (e.g. lowering speed)
- Intersections and crossing improvements
- Device parking and curbside management
- Lighting
- Safety education
- Equitable enforcement

FHWA's Safety Countermeasures Can Help Address Some of the Safety Challenges

Source: https://highways.dot.gov/safety/proven-safety-countermeasures
Complete Streets for All Users is our Default

A complete streets approach means **improving safety and access for all road users, on every FHWA-funded project.**

- Update FHWA processes
- Educate and train staff and practitioners
- Support data initiatives

Source: Denver Complete Streets Design Guidelines 2020 (denvergov.org)
Mobility Hubs as a Trip Reduction Catalyst

A mobility hub is a place where people can connect to multiple modes of transportation to make their trip as safe, reliable, and convenient as possible.

- Minneapolis Public Works

Concept for GoHubs! - Boston’s Mobility Hub Pilot Program. Source: City of Boston Transportation
U.S. DOT’s Micromobility Research

U.S. DOT is **advancing research** on the rapidly evolving field of micromobility. FHWA’s Office of Planning, Environment, and Realty (HEP) is U.S. DOT’s lead convener on the topic, coordinating with offices across U.S. DOT through the internal **Micromobility Working Group**.

FHWA’s **Micromobility Research Roadmap** charts a course for research we are conducting with our partners.

Our **Micromobility Regulations & Permitting Equity Synthesis** was published in October 2023.

Advancing Innovative Ped/Bike Research

• Strategic Agenda for Pedestrian & Bicycle Transportation (2024-2028)
  • Roadmap of activities for the next 5 years
• Vulnerable Road User Report to Congress
  • Identifies micromobility research topic areas of interest
• International Partnerships
  • PIARC World Road Congress
  • Australasia Report: Implementation of Findings and Global Benchmarking Webinar Series
• Publications
  • 2023, e.g., E-bike Trends, Trails and Resilience
  • 2024, e.g., Quick Build Accessibility, Rails with Trails
• Pooled Fund Study
  • Focuses on bicycle and pedestrian network planning, safety, and design issues

Source: FHWA
Bipartisan Infrastructure Law (BIL) Updates

• Center of Excellence on New Mobility and Automated Vehicles created
  • Research the impacts of new mobility (includes shared docked and dockless bicycles and electric scooters) and highly automated vehicles on land use, urban design, transportation, real estate, equity, and municipal budgets (Section 13006)

• Nonmotorized road user definition updated to include:
  • An individual using a low-speed or low-horsepower motorized vehicle, including an electric bicycle, electric scooter, personal mobility assistance device, personal transporter, or all-terrain vehicle (ATV) (Section 24105)

• Bicycle and micromobility activities eligible under several discretionary grant and formula programs
  • Pedestrian and Bicycle Funding Opportunities table

• Shared micromobility was added as an eligible project
  • Congestion Mitigation & Air Quality (CMAQ) funds (23 U.S.C. 149(b)(7))
  • Surface Transportation Block Grant (STBG) Program funds (23 U.S.C. 217(a))
Funding Opportunities - Eligibilities

Micromobility eligible for several programs:

• FHWA programs *can* fund bicycles, ebikes, and shared micromobility devices (scooters).

• Pedestrian and Bicycle Funding Opportunities table: [fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.pdf](https://fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.pdf)

• Includes shared micromobility (23 U.S.C. 217(a)).

• In general, operations are not eligible.
Pedestrian and Bicycle Funding Opportunities: U.S. Department of Transportation Highway, Transit, and Safety Funds

This table indicates likely eligibility for pedestrian and bicycle activities and projects under U.S. Department of Transportation surface transportation funding programs. Activities and projects need to meet program eligibility requirements. See notes and basic program requirements below, with links to program information. Project sponsors should integrate the safety, accessibility, equity, and convenience of walking and bicycling into surface transportation projects.

### Activity or Project Type

<table>
<thead>
<tr>
<th>Activity or Project Type</th>
<th>Federal Highway Administration</th>
<th>Federal Aid</th>
<th>ODOT Grant</th>
<th>ODOT Loan</th>
<th>FHWA</th>
<th>NAFES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access enhancements to public transportation (bicycle, bus, park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Americans with Disabilities Act (ADA/504 Self Evaluation)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bicycle repair stations for public transportation (bicycle, bus, park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bicycle repair stations for public transportation (bicycle, bus, park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bicycle storage or maintenance (e.g., bus, park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bridge overcrossing for pedestrians and/or bicyclians</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bus shelters and benches</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Charging stations for electric bicycles and associates (park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Community Capacity Building (develop organizational skills and processes)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Crosswalks for pedestrians, bicyclists, and associates (park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Data collection and monitoring for pedestrians and/or bicyclists</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Emergency and evacuation routes for pedestrians and/or bicyclists</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Encouragement and education activities related to safe access for bicyclists and pedestrans (park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Facilities associated with pedestrian/bicyclist projects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Mobility projects, including scooter share (capital and equipment, including charging stations and stations, net operations)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Roadway projects, including scooter share (capital and equipment, including charging stations and stations, net operations)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Public education and awareness programs to inform motorists and nonmotorized road users on nonmotorized road user safety (park, lighting)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Key: $ = Activity likely eligible. Restrictions may apply. See program notes and guidance. $ = Eligible, but not competitive unless part of a larger project.
Formula Programs and Discretionary Grants

Formula Programs:
• Transportation Alternatives Set-Aside
  • Single largest fund source for pedestrian and bicycle projects; $7.2 billion over 5 years, 2022-2026, set-aside from Surface Transportation Block Grant; 10% Set-Aside, 59% suballocated.
• Carbon Reduction Program
  • New BIL program; Projects to reduce carbon emissions; $6.4 billion over 5 years; 65% of funds suballocated by population.

Discretionary Grants:
• Active Transportation Infrastructure Investment Program
  • New Discretionary BIL Program provides $45 million in FY 2023 Funds
• Safe Streets and Roads for All (SS4A) Program
  • New Discretionary BIL Program provides $5 billion in appropriated funds over 5 years, 2022-2026.

Source: Bureau of Transportation Statistics
Resources

For more information visit fhwa.dot.gov/environment/micromobility and/or subscribe to the following newsletters:

• **FOSTERING MULTIMODAL CONNECTIVITY NEWSLETTER:** This quarterly publication provides real-world examples (case studies) about multimodal transportation investments.
  Website: www fhwa dot gov/livability/newsletter/

• **HUMAN ENVIRONMENT DIGEST:** This monthly publication shares the latest information from a range of federal and nonfederal sources, addressing transportation and its relationship to the human environment.
  Website: www fhwa dot gov/livability/he_dig es t/

• **PBIC MESSENGER:** This monthly publication features the latest news, resources, webinars, upcoming events, and more.
  Website: www.pedbikeinfo.org/newsroom/newsletters.cfm

• **PEDESTRIAN FORUM NEWSLETTER:** This publication is issued 2-3 times per year by the FHWA Office of Safety.
  Website: https://safety fhwa dot gov/ped bike/pedforum/
Resources, Continued

Additional resources are available here:

- **RESEARCH REVIEW:** This quarterly publication provides information about the most recent research that has been completed by the Office of Human Environment. Website: [www.fhwa.dot.gov/hep/hep_research/newsletter/](http://www.fhwa.dot.gov/hep/hep_research/newsletter/)


- **PROVEN SAFETY COUNTERMEASURES (PSC):** This is a collection of 28 countermeasures and strategies effective in reducing fatalities and serious injuries. Website: [https://highways.dot.gov/safety/proven-safety-countermeasures](https://highways.dot.gov/safety/proven-safety-countermeasures)
Questions?

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US Department of Transportation
Federal Highway Administration
Office of Human Environment
E-scooter Safety Issues and Solutions

Takeaways from the Behavioral Traffic Safety Cooperative Research Program, BTS-10 Project, and Related Efforts
Background

- E-scooters are a form of powered micromobility

Source: BTS-10 project team
Background

• E-scooter usage continues to grow, both with personally-owned devices and shared ones
• E-scooters offer convenience, access to transit and other travel modes, and are generally considered low-cost, highly efficient, and low-impact forms of travel
• As a legitimate and growing transportation mode, e-scooter safety risks deserve attention from transportation policy makers, practitioners, and injury prevention partners

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature review</td>
<td>Reviewed and synthesized 349 studies identified between 2017 and October 2020, including peer-reviewed articles and pilot program reports</td>
</tr>
<tr>
<td>Practitioner survey</td>
<td>Asked about 70 different practices and approaches to safety management; received 207 responses from 85 cities in 38 states with existing micromobility programs.</td>
</tr>
<tr>
<td>Populus Groundtruth survey</td>
<td>Examined e-scooter ridership travel behavior and demographics using a sampling of 18 metro areas in an ongoing travel survey.</td>
</tr>
<tr>
<td>NC emergency department visit data</td>
<td>Compared patient (age 14-59) injuries from 487 e-scooter riders, 1,581 bicyclist, and 1,440 pedestrians from same Emergency Departments (in 5 NC counties) and time period.</td>
</tr>
<tr>
<td>Field observations of e-scooters and cyclists</td>
<td>Examined social and environmental factors affecting or constraining e-scooter rider behaviors related to sidewalk riding and decisions around parking. Gathered field and video data from two cities in October 2021.</td>
</tr>
<tr>
<td>Interviews with micromobility program managers</td>
<td>Interviewed staff from five city agencies to help fill gaps identified through the literature review and practitioner survey related to community engagement, engagement with State Highway Safety Offices (SHSOs), planning and operations, and data and analysis.</td>
</tr>
</tbody>
</table>
General findings: State of use, context, and safety issues

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pedestrians</th>
<th>E-scooter Riders</th>
<th>Bicycle Riders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>More females than males; all ages and income levels.</td>
<td>Slightly more males than females (though highly variable by location); majority of shared e-scooter users are between the ages of 18-35 years old; skew white and middle-income.</td>
<td>Many more male riders than female riders; average age is slightly older than e-scooter riders and higher income.</td>
</tr>
<tr>
<td>Speed range</td>
<td>Walking speed is typically 3.5 ft/sec or 2 MPH.</td>
<td>Riding speed can be limited by policy or geographic location; range from 10-15 MPH.</td>
<td>Ranges from 8-13 MPH for traditional bikes and higher for e-bikes (10-15 MPH).</td>
</tr>
<tr>
<td>Travel behaviors</td>
<td>More likely to be accessing transit than e-scooter or bicycle modes.</td>
<td>Seasonal ridership similar to bicycles; helmet use is lower for e-scooters than for bicyclists; more likely to be using shared devices than owned devices, in comparison to bicycles.</td>
<td>Similar to e-scooter riders, though less nighttime ridership and longer average trip length.</td>
</tr>
<tr>
<td>Facility preferences</td>
<td>Prefer sidewalks when provided the option.</td>
<td>Prefer separated bike facilities over sidewalks when provided the option.</td>
<td>Prefer separated bike facilities when provided the option.</td>
</tr>
</tbody>
</table>
### General findings: E-scooter injury circumstances and contributing factors

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pedestrians</th>
<th>E-scooter Riders</th>
<th>Bicycle Riders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impairment patterns</strong></td>
<td>In 2020, about 10% of non-fatally injured pedestrians and 31% of fatally injured pedestrians are reported as being alcohol or drug impaired. 16% of drivers involved in pedestrian crashes were impaired, not counting hit and run incidents where driver condition is unknown (National Center for Statistics and Analysis 2022).</td>
<td>About 6% of non-fatally injured e-scooter riders reported as being alcohol or drug impaired. Of the 69 known e-scooter fatalities in the US, an estimated 4% involved reportedly impaired riders, another 4% were ruled to have not involved impairment, and the remaining cases were unknown or missing impairment data (Cherry et al 2022).</td>
<td>In 2019, about 6.5% of non-fatally injured bicyclists and 20% of fatally injured bicyclists (involved in motor vehicle crashes, only) were reported as being alcohol or drug impairment. Around 12% of drivers involved in bicycle crashes were impaired, not counting hit and run incidents where driver condition is unknown (National Center for Statistics and Analysis 2021).</td>
</tr>
<tr>
<td><strong>Injury profile</strong></td>
<td>Data on falls and crashes with modes other than drivers are lacking, but most fatal injuries involve a motor vehicle.</td>
<td>More falls and fewer motor vehicle involved crashes than other modes: 90% of injuries occur off road and/or do not involve a motor vehicle; 70% of fatal injuries involve a motor vehicle. May be more vulnerable to roadway surface irregularities (including stormwater grates, rail crossings, cracks, etc.) than bicycles. Hardware failure or malfunction and rider inexperience are also contributing factors.</td>
<td>Data on falls and crashes with modes other than drivers are lacking, but most fatal injuries involve a motor vehicle.</td>
</tr>
</tbody>
</table>
Proper helmet-wearing reduces public healthcare costs, but current e-scooter helmet use is low

- **Head injuries**, including abrasions to traumatic brain injuries, are the most common *location* of e-scooter injury requiring medical treatment (28-40%).

- **Fractures**, particularly involving the lower arm and wrist, are the most common *type* of injury (25-31%).

- **Severity** is generally low, about **10% emergency department visits** are classified as Severe (e.g., requiring admission to hospital)

- Studies of injured pedestrians in one state found that **more than half rely on publicly funded healthcare programs**.

- This study and others have observed **e-scooter helmet use is low, and consistently lower than bicyclist helmet use**.

Key issue: pavement hazards at rail crossings, intersections, and transitions to sidewalk

Source for all photos on this slide: BTS-10 project team
Mitigating harmful behaviors

- Humans being humans, we are likely to continue seeing:
  - Social (double) riders
  - Stunt/trick riders
  - Wrong-way riders
  - Inexperienced or confused road users
  - Impatient or indifferent road users
  - Impaired road users
  - Riders without helmets

- Not all these behaviors pose serious injury risks, and not all occur at the same frequency

- Some of these behaviors can be mitigated through thoughtful roadway design practices and community engagement

Source: BTS-10 project team
Field data collection highlights

Nashville sites

Portland sites

Source: BTS-10 project team
Field data collection highlights

E-scooter and bicycle rider location by infrastructure and traffic volume (Nashville and Portland)

<table>
<thead>
<tr>
<th>Street Type</th>
<th>No Bike Lane</th>
<th>Bike Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-Scooter</td>
<td></td>
</tr>
<tr>
<td>High Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sidewalk Usage: 73%</td>
<td>Bike Lane Usage: 72%</td>
</tr>
<tr>
<td></td>
<td>Travel Lane Usage: 26%</td>
<td>Sidewalk Usage: 22%</td>
</tr>
<tr>
<td>Low Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sidewalk Usage: 34%</td>
<td>Bike Lane Usage: 76%</td>
</tr>
<tr>
<td></td>
<td>Travel Lane Usage: 66%</td>
<td>Sidewalk Usage: 12%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Street Type</th>
<th>No Bike Lane</th>
<th>Bike Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bicycle</td>
<td></td>
</tr>
<tr>
<td>High Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sidewalk Usage: 49%</td>
<td>Bike Lane Usage: 82%</td>
</tr>
<tr>
<td></td>
<td>Travel Lane Usage: 51%</td>
<td>Sidewalk Usage: 10%</td>
</tr>
<tr>
<td>Low Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sidewalk Usage: 2%</td>
<td>Bike Lane Usage: 79%</td>
</tr>
<tr>
<td></td>
<td>Travel Lane Usage: 98%</td>
<td>Sidewalk Usage: 12%</td>
</tr>
</tbody>
</table>

Source: BTS-10 project team
TRB Annual Meeting 2024 Paper
Practitioner survey participant highlights

**Position Type**

- Transportation planning or regional planning: 95
- Other: 39
- Engineering or facility design/commissions: 14
- Healthcare or public health: 14
- Law enforcement: 6
- Communications: 3
- Emergency response: 1

**Organization Type**

- Local government (e.g., municipality or county): 66
- State government (e.g., department of transportation, state highway safety office): 21
- Private company or business: 17
- Other: 17
- University or institution of higher education: 15
- Regional government (e.g., municipal or rural planning organization, council of governments, transit authority, etc.): 7
- Tribal government: 2

Source: BTS-10 project team
General findings: Safety management practices

• Wide range of practices taking place

• Very few robust evaluations of safety interventions and/or impacts

Source: BTS-10 project team
What makes e-scooter riders safe?

Safe System principles of:

- Separation of road users (in space or in time of facility use)
- Spaces for practice and opportunities to gain experience
- Inclusive, friendly streets designed for e-scooter usage
- Slow vehicle speeds
What makes e-scooter riders safe?

Safe System principles of:

- Separation of road users (in space or in time of facility use)
- Spaces for practice and opportunities to gain experience
- Inclusive, friendly streets designed for e-scooter usage
- Slow vehicle speeds

Source: BTS-10 project team
Key takeaways for local micromobility program managers

1. Micromobility parking is a civil rights issue and a safety issue
   • *Planning for equitable allocation of parking infrastructure is a must*

2. Micromobility programs will not succeed if riders have bad experiences or are injured
   • *Proactive community engagement and hazard identification can pre-empt injuries and complaints*

3. Seek ways to mitigate harmful behaviors, as well as reduce the harm when injuries do occur
   • *Partner and plan for harm reduction and addressing the deadliest combinations of risk factors*
   • *Community engagement offers opportunities to address equity and build a culture around safety*
Micromobility parking is a civil rights issue and a safety issue

- “Public rights-of-way and facilities are required to be accessible to persons with disabilities through the following statutes: Section 504 of the Rehabilitation Act of 1973 (Section 504) (29 U.S.C. §794) and Title II of the Americans with Disabilities Act of 1990 (ADA) (42 U.S.C. §§ 12131-12164). These statutes prohibit public agencies from discriminating against persons with disabilities by excluding them from services, programs, or activities. These statutes mean that the agency must provide pedestrian access for persons with disabilities to the agency's streets and sidewalks, whenever a pedestrian facility exists. Regulations implement this requirement by imposing standards for accessible features such as curb cuts, ramps, continuous sidewalks, and detectable warnings." (FHWA).

- Planning for parking helps preempt ADA concerns and complaints and reduce tripping and fall hazards

- Where you place the parking matters
Plan for equitable allocation of parking infrastructure
Micromobility programs will not succeed if riders have bad experiences or are injured

- Percent of injuries involving first time or novice riders: 30%

- Some agencies and operators indicated that injured riders quit riding after an incident

Source: www.pedbikeimages.org/ Toole Design Group
Connected, low stress bike networks also work for e-scooter safety and perceptions of comfort

- Roads with bike lanes are associated with:
  - Fewer e-scooter injuries
  - Less sidewalk riding
  - More satisfied e-scooter riders

Source: Bird Report: A Look at E-scooter Safety, April 2019
BTS-10 Research Products

1. Research Results Digest:  

2. Toolbox: https://www.trb.org/Main/Blurbs/183094.aspx  
   • Fundamental concepts related to e-scooter safety  
   • Promising practices to improve e-scooter safety  
   • Data tools and methods for safety evaluation  
   • Key resources and case examples

   • Additional info and data collection tools
## Toolbox offering: A summary of safety management practices

<table>
<thead>
<tr>
<th>Domain</th>
<th>Description of Safety Management Practice</th>
<th>Current Level of Adoption</th>
<th>Current Strength of Injury Prevention Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorizes the practices in terms of which primary Safe Systems area it falls under:</td>
<td>Based on the BTS-10 survey and literature review, indicates low, medium, or high levels of current adoption</td>
<td>Based on the BTS-10 literature review and expert input, indicates the current evidence base supporting the practice:</td>
<td></td>
</tr>
<tr>
<td>• Safe Roads</td>
<td>Provides a description of the practice and indicates the typical agency lead (S = SHSO; D= State DOT; L = Local agency); also links to the relevant section of the final report to find additional resources or supporting literature</td>
<td></td>
<td></td>
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<tr>
<td>• Safe Vehicles</td>
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<td>• Safe Speeds</td>
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<td>• Safe People</td>
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</tr>
<tr>
<td>• Post-Crash Harm Reduction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| • Safety Evaluation | | | #
Putting it all together: How can communities be proactive and systemic about e-scooter safety?

• Is your **risk reporting program** adequately staffed?
• Do you have a system in place to provide **equitable** responses?
• Are you leveraging opportunities for **community members** to share data?
• Is your **roadway network** ready for e-scooters?
  • Pavement conditions
  • Transition zones
  • Separated bicycle facilities
• Do you have a program in place to respond to **systemic** issues?
Proactive risk identification can pre-empt injuries and complaints

- 90% of e-scooter injuries occur off road and/or do not involve a motor vehicle
- Screen the network for:
  - Stationary objects: curbs, light poles, manhole covers, grates, railroad tracks
  - Poor roadway surface conditions (potholes, pavement cracks, lips)
  - Topography challenges
  - Poor lighting

Source: BTS-10 project team
Source: www.pedbikeimages.org/ Reed Huegerich
Toolbox offering: E-scooter risk assessment tool

- Provides a list of discussion prompts
- Can be used in “road safety audit” like activities, or could be integrated into routine travel surveys

Table 3. List of discussion prompts to examine if an area is supportive of safe and inclusive e-scooter travel.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
</table>
| 1. Is there a comfortable physical space to ride for people of all ages and abilities? | ☐ Yes, there are protected spaces (i.e., separated from vehicle traffic and pedestrians) for bicyclists that can also be used by e-scooter riders.  
☐ No, the space has the following problems (check all that apply):  
   ☐ People must ride on sidewalks because there are no other protected spaces to ride  
   ☐ The space is not wide enough to be shared by e-scooters and people walking, bicycling, or using wheelchairs  
   ☐ The space to ride abruptly ends  
   ☐ The space is often blocked by parked cars, delivery vans, signs, trash cans, etc.  
   ☐ The space is often encroached by drivers entering/exitng driveways or parking spaces  
   ☐ Pedestrians often encroach into the space  
   ☐ Nearby traffic is moving too fast  
   ☐ Lighting of the space is poor  
   ☐ The space is not well-maintained (e.g., litter and trash are present)  
   ☐ Other (please describe):__________________________ |
| 2. Does the available space to ride connect people to where they need or want to go? | ☐ Yes, there is a supportive network of spaces for e-scooters riders to use.  
☐ No, the space has the following problems (check all that apply):  
   ☐ People can’t cross a bridge because the protected space ends  
   ☐ People can’t get through an intersection because there is no protected space  
   ☐ There are not enough opportunities to cross the street  
   ☐ The space to ride does not extend to the locations where buses or trains depart  
   ☐ There aren’t enough curb cuts in places where e-scooters need to access the sidewalk or parking locations  
   ☐ Other (please describe):__________________________ |

Source: BTS-10 project team
Addressing e-scooter data gaps

• Gaps in data limit our ability to effectively plan for and evaluate e-scooter safety improvements:
  • Lack of data on e-scooter exposure to risks, including privately owned e-scooters
  • Lack of data standards and case definitions for e-scooter related falls, injuries, and other safety outcomes
  • Lack of measures of e-scooter safety, comfort, and access disaggregated by age, gender, race, ethnicity, and income
  • Lack of data integration to link injury data to spatial/roadway context

Source: pedbikeinfo.org/Toole Design Group
Toolbox offering: Data improvement support

• Principles of quality data
• Overview of key data sources and elements for examining e-scooter risks
• Community “checklist” (shown previously)
• Protocols and data collection forms for manual and video data collection (provided in Final Report)

Source: BTS-10 project team
Toolbox offering: Additional resources

- E-scooter and e-bike data dashboards
- Fatality reporting form
- Links and FAQs
Toolbox offering: Partners and practices for data improvement

• Engage Traffic Records Coordinating Committees (TRCCs) on e-scooter data improvements
• Partner with State/local Departments of Health and utilize injury surveillance systems
• Share and standardize best practices in police and healthcare system e-scooter injury coding and reporting

Source: UNC Highway Safety Research Center, 2020
General findings: Additional research needs

• Studies on the **experiences, attitudes, and perceptions**, and injury rates and outcomes of different subpopulations (e.g., based on age, gender, race, ethnicity, income, disability status)

• Studies/evaluations of **local e-scooter practices** related to speed management, pavement quality management/maintenance, design of transition zones, parking policy/design, and communications/engagement techniques

• Studies/evaluations of the **equity** of various e-scooter practices (geofencing, service restrictions, enforcement, data or other program and permitting requirements)

• Evaluations, resources, or guidance on equitable **community practices to build civic engagement** in e-scooter programs, network planning, and policy decisions
This project involved contributions from the following individuals:

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- Katie Harmon, UNC-HSRC
- Kristin Blank, UNC-HSRC
- Meg Bryson, UNC-HSRC
- Tab Combs, UNC-DCRP
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- Charles T. Brown, Equitable Cities
- Regina Clewlow, Populus
- Stephanie Seki, Populus
- Chris Cherry, UTK
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