E-Scooter and Micromobility Safety Webinar Series (Part I)

Research, Tools and Guidance

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U.S. Department of Transportation
Federal Highway Administration

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

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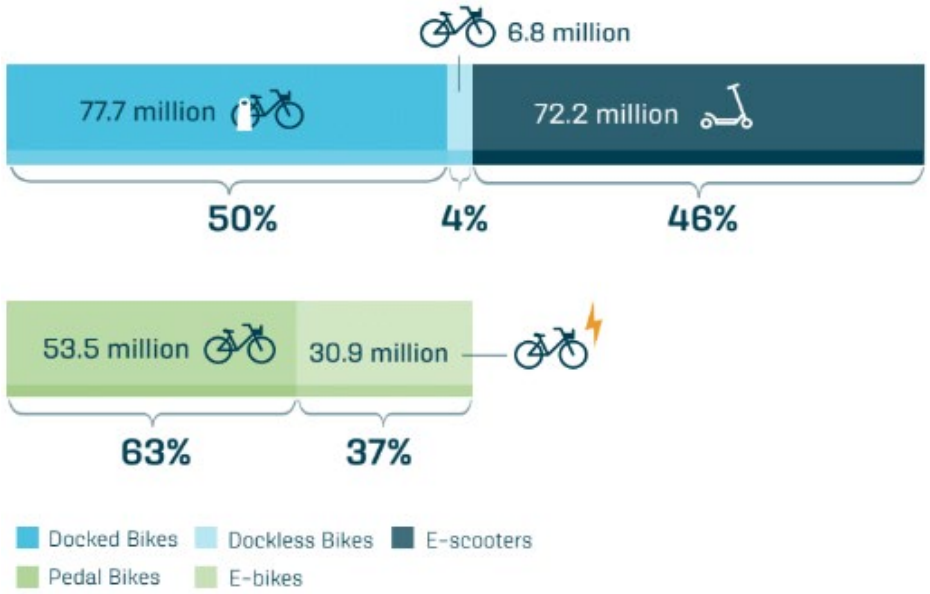
North Americans took an estimated 157 million trips on shared micromobility vehicles in 2022. This is approximately 23% more trips than the total taken during 2021, and equal to trip-making in 2019. Like 2021, e-scooters accounted for almost half of all trips. Pedal bike trips increased 14% from 2021,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

Sources: NABSA 2021 Shared Micromobility State of the Industry Report and U.S. Department of Transportation, Bureau of Transportation Statistics, Bikeshare and Scooter Systems, available at https://data.bts.gov/Bicycles-and-Pedestrians/Bikeshare-Docked-and-Dockless-and-E-scooter-System/cqdc-cm7d/about_data

Shifting to an Equity Approach

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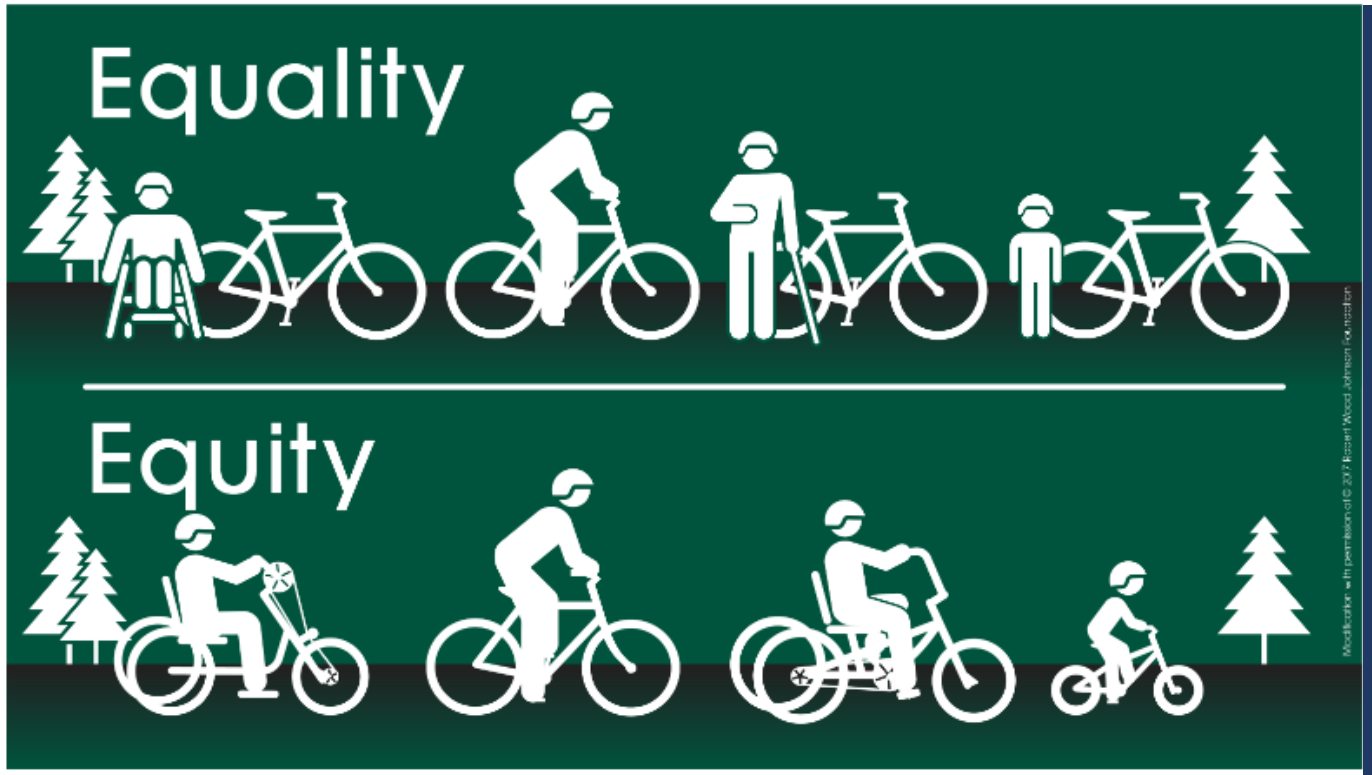

Sources: © 2017 Robert Wood Johnson Foundation. Modified, with permission, by FHWA & Quote from DOT Equity Action Plan

"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?

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

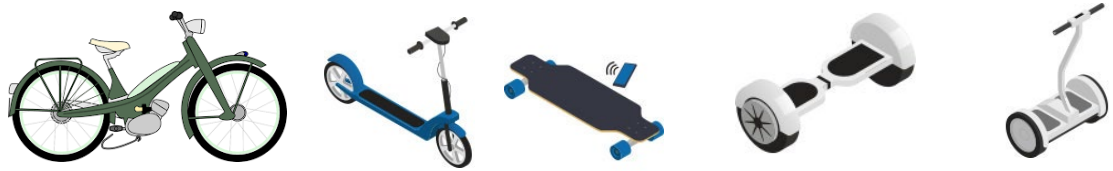
- bicycles
- scooters
- electric-assist bicycles (e-bikes)
- electric scooters (e-scooters)
- other small, lightweight, wheeled conveyances (e.g. hoverboard, skateboard, unicycle)

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

Three types of dockless bikes in Seattle, WA. Source: City of Seattle

A row of purple electric scooters, some including a helmet, rest on the sidewalk. Source: www.pedbikeimages.org / Laura Sandt



Various types of micromobility devices. Source: www.pedbikeimages.org

[Micromobility Fact Sheet - FHWA (dot.gov)]

Micromobility Devices Evolving Today

U.S. Department of Transportation
Federal Highway Administration

Source: www.istockphoto.com

Source: www.gettyimages.com

Source: www.gettyimages.com

Source: www.pexels.com

Source: Pelican Cycles

Source: www.gettyimages.com

Street Spaces Evolving Today

U.S. Department of Transportation
Federal Highway Administration

Source: National Association of City Transportation Officials

Source: Pedestrian & Bicycle Information Center / Toole Design Group

Source: New York City Department of Transportation

Source: National Association of City Transportation Officials

Source: Hagen Hammons / FHWA

Source: Pedestrian & Bicycle Information Center / Ann McGrane

Source: FTA

Federal Role

U.S. Department of Transportation
Federal Highway Administration

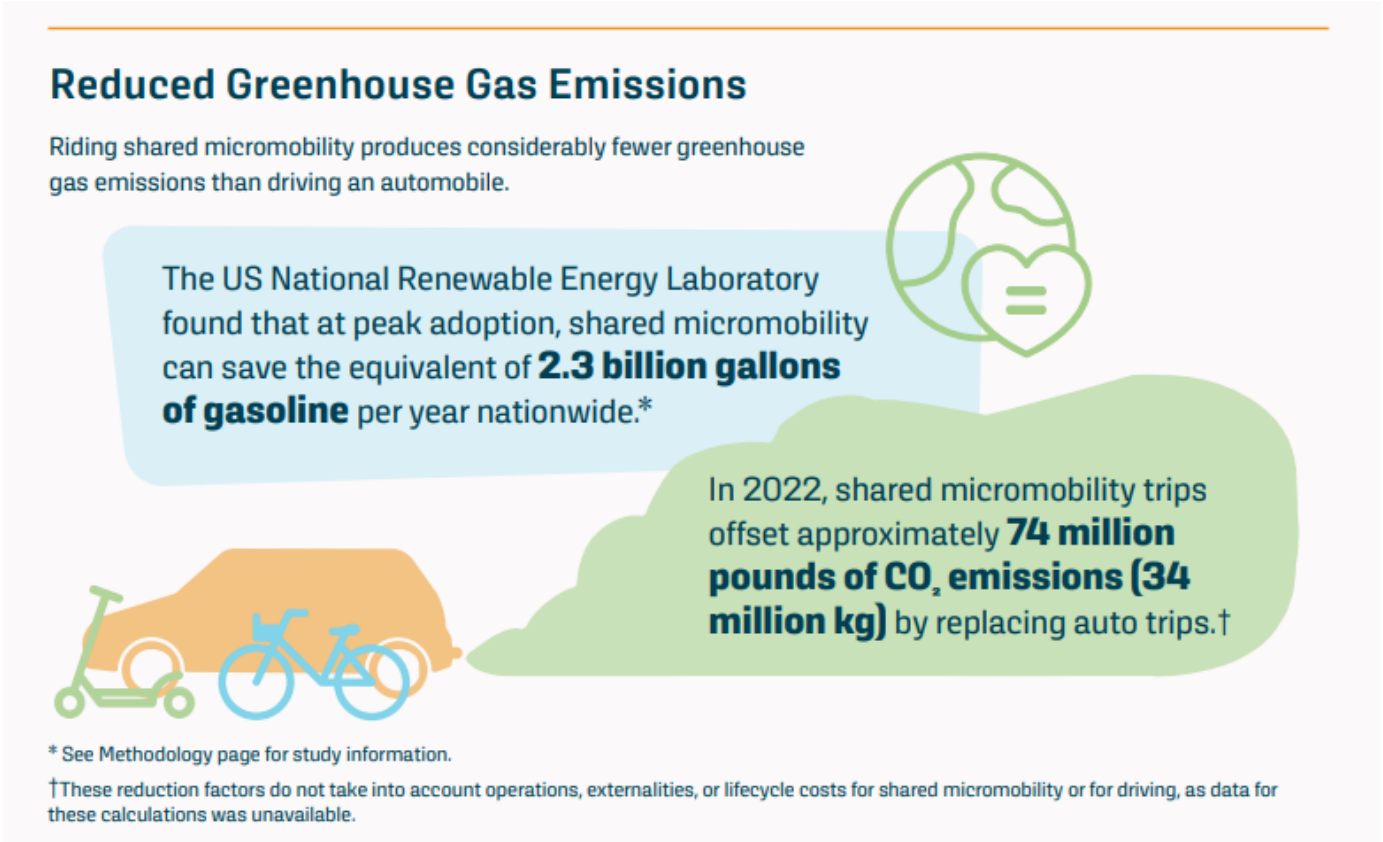
- States and local governments establish micromobility usage and safety policies
  - Where to ride
  - Age restrictions
  - License or ID
  - Helmets and lighting
  - Speed
  - Parking
- Federal laws prohibit some motorized vehicles on nonmotorized trails and pedestrian walkways using certain Federal 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

U.S. Department of Transportation
Federal Highway Administration

- **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**



Source: NABSA 2022 Shared Micromobility State of the Industry Report

For the Air Quality Specialist = Reduction of 101.36 tons/day of CO_2 in the US

Safety Considerations

U.S. Department of Transportation
Federal Highway Administration

- 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

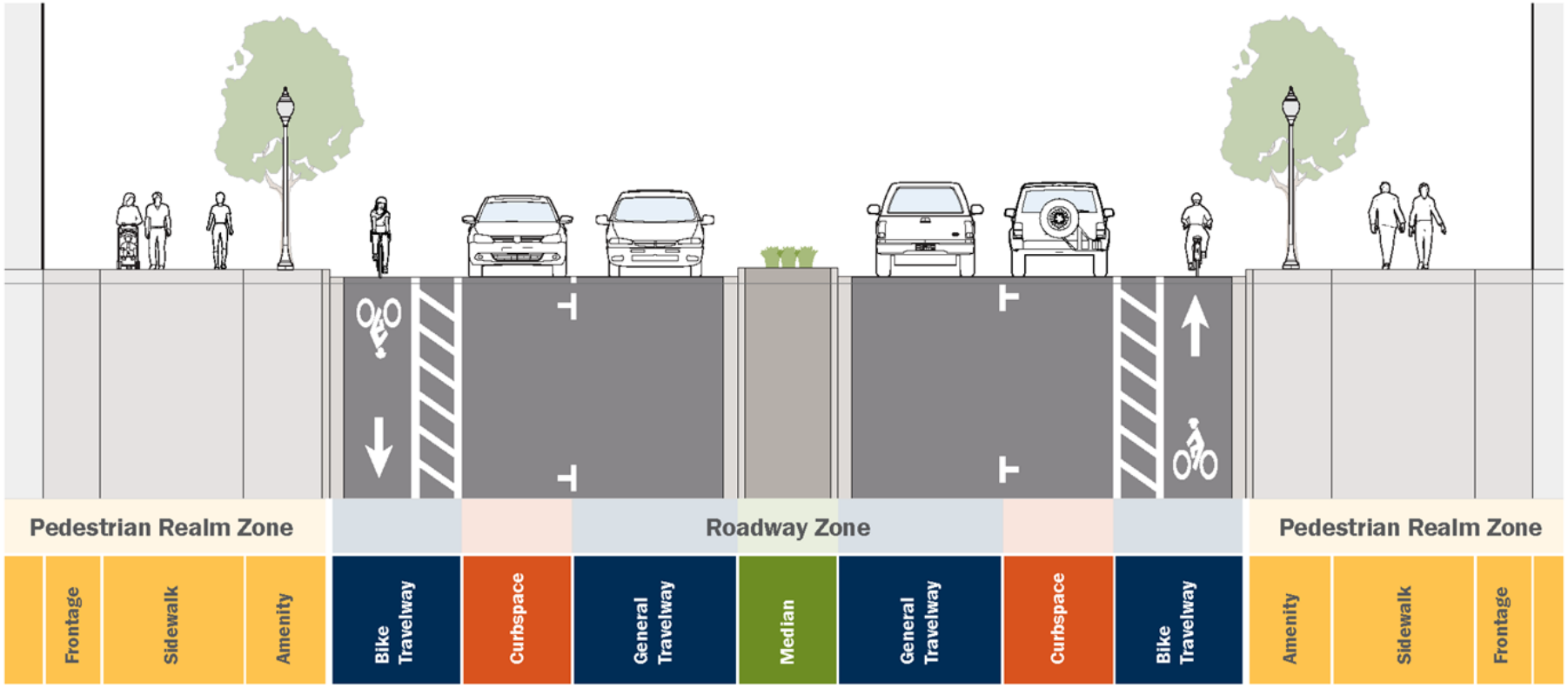
Source: https://highways.dot.gov/safety/proven-safety-countermeasures

Complete Streets for All Users is our Default

U.S. Department of Transportation
Federal Highway Administration

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

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



Source: Denver Complete Streets Design Guidelines 2020 (denvergov.org)

Mobility Hubs as a Trip Reduction Catalyst

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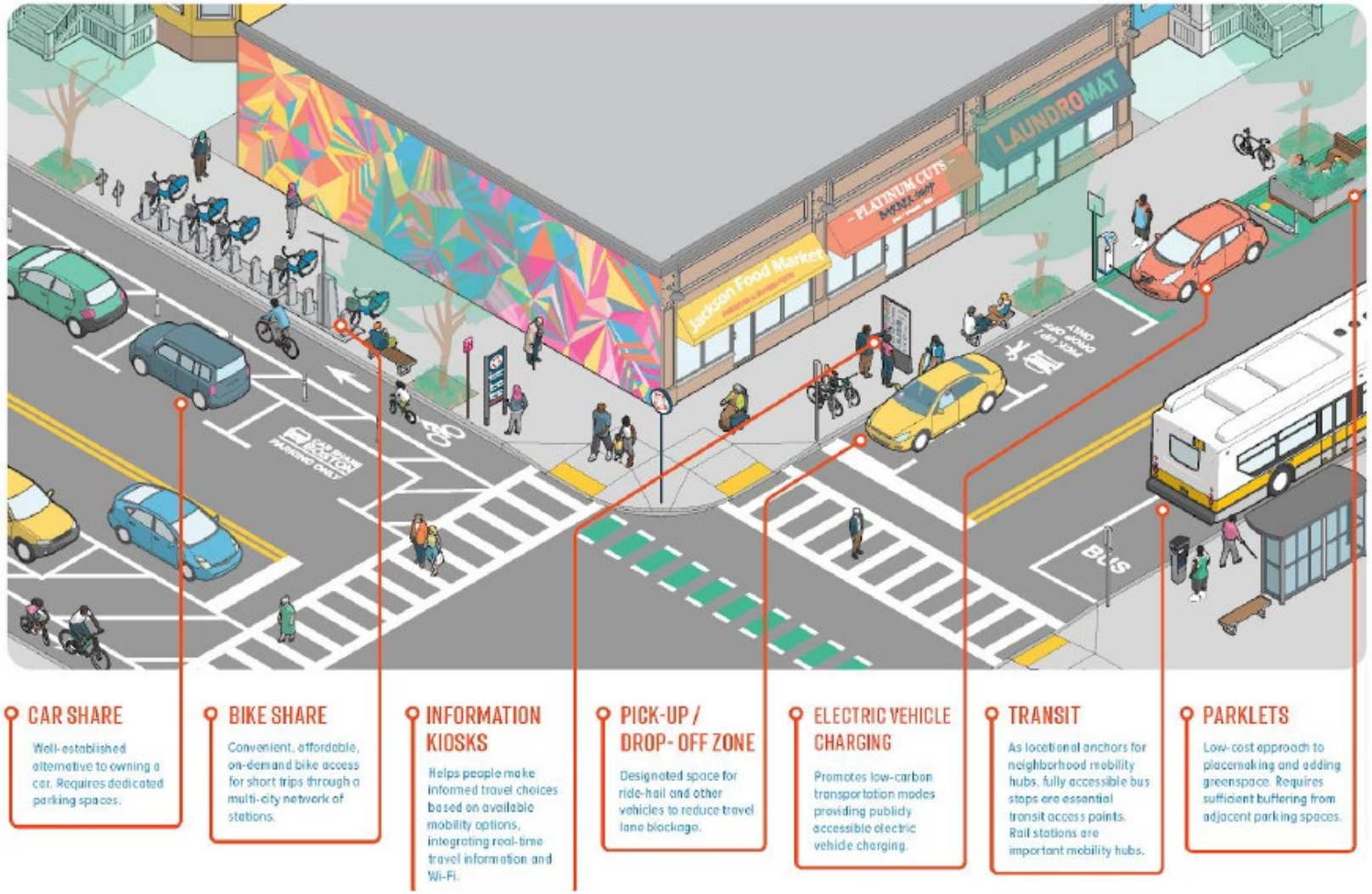

Concept for GoHubs! - Boston's Mobility Hub Pilot Program. Source: City of Boston Transportation

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

U.S. DOT's Micromobility Research

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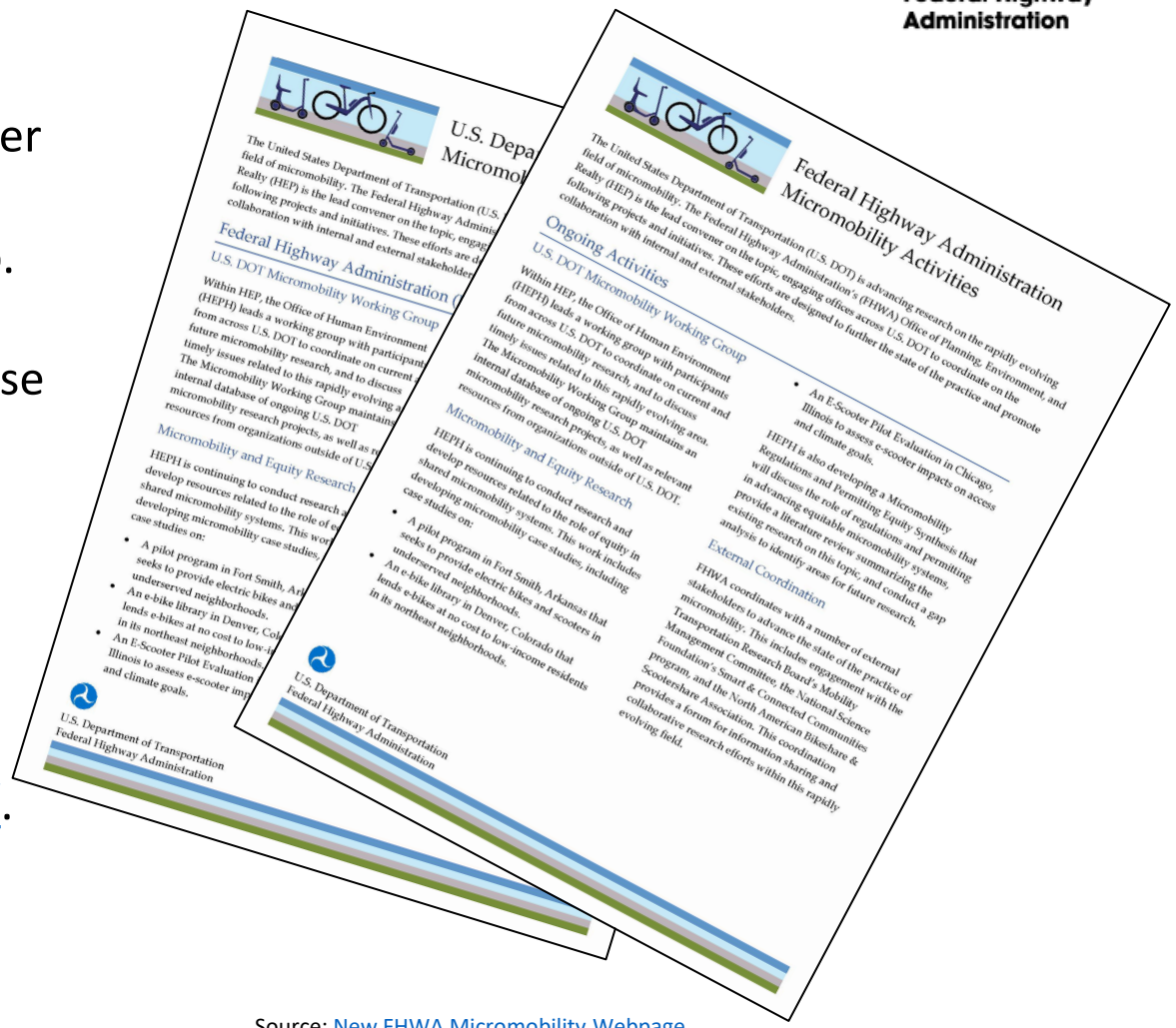
U.S. DOT is **advancing research** on the rapidly evolving field of micromobility. FHWA's Office of Planning, Environment, and Realty (HEP) is U.S. DOT's lead convener on the topic, coordinating with offices across U.S. DOT through the internal **Micromobility Working Group**.

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.

Visit our new webpage at https://www.fhwa.dot.gov/environment/micromobility/.



Source: New FHWA Micromobility Webpage

Advancing Innovative Ped/Bike Research

U.S. Department of Transportation
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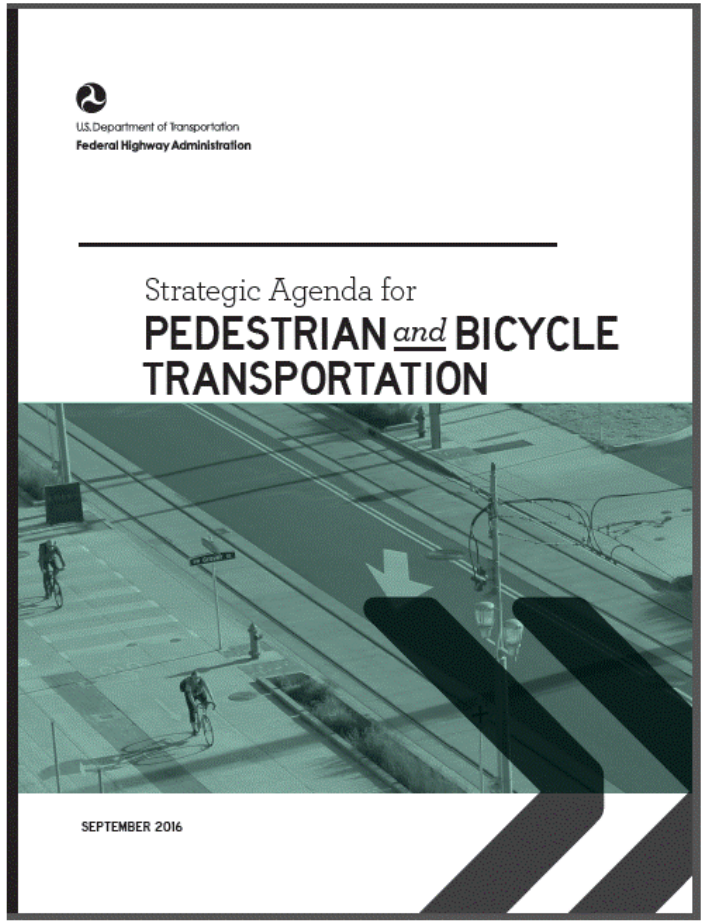
- **Strategic Agenda for Pedestrian & Bicycle Transportation (2024-2028)**
  - Roadmap of activities for the next 5 years
- **Vulnerable Road User Report to Congress**
  - Identifies micromobility research topic areas of interest
- **International Partnerships**
  - PIARC World Road Congress
  - Australasia 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

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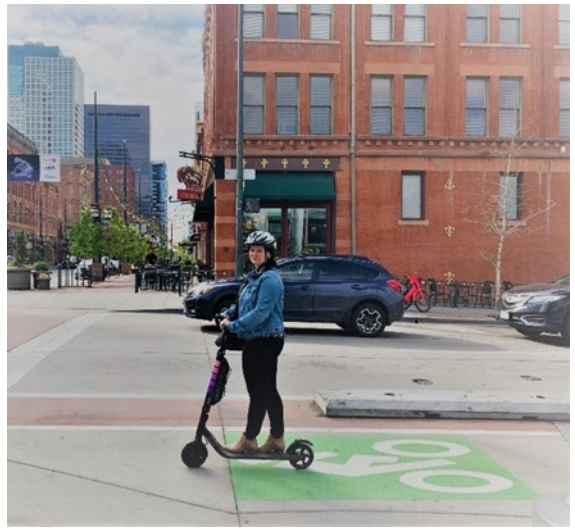
- **Center of Excellence on New Mobility and Automated Vehicles** created
  - Research the impacts of new mobility (includes shared docked and dockless bicycles and electric scooters) and highly automated vehicles on land use, urban design, transportation, real estate, equity, and municipal budgets *(Section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



Source: Pedestrian & Bicycle Information Center / Toole Design Group

Funding Opportunities - Eligibilities

U.S. Department of Transportation
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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
- Includes shared micromobility (23 U.S.C. 217(a)).
- In general, operations are not eligible.

Source: FHWA Stock Image

Micromobility Funding Opportunities

U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Funding Opportunities: U.S. Department of Transportation Highway, Transit, and Safety Funds

November 16, 2023

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.

	Pedestrian and Bicycle Funding Opportunities: Highway, Transit, and Safety Funds Key: $ = Activity likely eligible. Restrictions may apply, see program notes and guidance. ~$ = Eligible, but not competitive unless part of a larger project.																												
	Federal Highway Administration														Federal Lands			OST Grant						OST Loan		FTA			NHTSA	
Activity or Project Type	ATIIP	BRI	CRP	CMAQ	HSIP	RHCP	NHPP	PROT	STBG	TASA	RTP	SRTS	PLAN	NSBP	FLTTP	TTP	TTPSP	INFRA	RAISE	RCN	SS4A	SMART	Thrive	RRIF	TIFIA	FTA	AoPP	TOD	402	405
Access enhancements to public transportation (benches, bus pads, lighting)	$		$	$			$	$	$	$				$	$	$		$	$	$	~$			~$	~$	$				
Americans with Disabilities Act (ADA)/504 Self Evaluation / Transition Plan	$		$						$	$	$		$		$	$					$		TA				$	~$		
Barrier removal for ADA compliance	$	$	$				$	$	$	$	$	$		$	$	$		$	$	$	~$			~$	~$	$				
Bicycle plans	$		$					$	$	$		$	$		$	$	$			~$	$					$	$	~$		
Bicycle helmets (project or training related)	~$				$				$	$SRTS		$				$													$	
Bicycle helmets (safety promotion)	~$				$				$	$SRTS		$				$														
Bicycle lanes on road	$		$	$	$	$	$	$	$	$		$		$	$	$	$	~$	~$	$	$			~$	~$	$				
Bicycle parking (see Bicycle Parking Solutions)	$		$	$			$		$	$	$	$		$	$	$		~$	~$	$	~$			~$	$	$				
Bike racks on transit	$		$	$					$	$					$	$			~$	$	~$				~$	$				
Bicycle repair station (air pump, simple tools, electric outlets)	$		$						$	$					$	$			~$	$	~$			~$	~$	$				
Bicycle share (capital and equipment including charging stations and outlets; not operations)	$		$	$			$		$	$					$	$		~$	~$	$	~$			~$	~$	$				
Bicycle storage or service centers (e.g. at transit hubs) including charging stations and outlets; not operations)	$		$	$					$	$					$	$			~$	$	~$			~$	$	$				
Bridges / overcrossings for pedestrians and/or bicyclists	$	$	$	$	$	$	$	$	$	$	$	$			$	$	$	$	$	$	$			~$	~$	$				
Bus shelters and benches	$		$	$			$	$	$	$				$	$	$		$	$	$	~$			~$	~$	$				
Charging stations for electric bicycles and scooters NEW	$		$	$					$	$	$				$	$						~$		~$	~$					
Coordinator positions: State/local (CMAQ/STBG limited)				$					$	$SRTS		$				$					~$									
Community Capacity Building (develop organizational skills and processes)	~$												$			$				NAE	~$		TA				~$	~$		
Crosswalks for pedestrians, pedestrian refuge islands (new or retrofit)	$		$	~$	$	$	$	$	$	$	$	$		$	$	$	$	$	$	$	$			~$	~$	$				
Curb ramps	$	$	$	~$	$	$	$	$	$	$	$	$		$	$	$	$	$	$	$	$			~$	~$	$				
Counting equipment	$				$	$	$		$	$	$	$	$		$	$	$	$		$	~$				~$	$				
Data collection and monitoring for pedestrians and/or bicyclists	$		$		$	$	$		$	$	$	$	$		$	$	$	$	$	$	$				~$	$	~$	~$		
Emergency and evacuation routes for pedestrians and/or bicyclists	$		$				$	$	$	$	$	$			$	$		$	$	$	~$				$	$	~$	~$		
Encouragement and education activities related to safe access for bicyclists and pedestrians NEW	~$			$	$				$	$SRTS	$	$	$			$					~$	~$								
Historic preservation (pedestrian, bicycle, transit facilities)	~$		$						$	$				$	$	$			~$	~$	~$			~$	~$	$				
Landscaping, streetscaping (pedestrian/bicycle route; transit access); related amenities (benches, lighting, shade, trees, water fountains); usually part of larger project	$		$				~$	$	$	$					$	$		~$	~$	~$	~$			~$	~$	$				
Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project)	$		$	~$	$	$	$	$	$	$	$	$		$	$	$	$	$	$	$	$			~$	~$	$				
[redacted]	$		$	$					$	$		$	$	$		$					$					$				
Micromobility projects, including scooter share (capital and equipment, including charging stations and outlets; not operations)	$		$	$					$	$					$	$			$	$	~$	~$		~$	~$					
[redacted]	$	$	$	$	$	$	$	$	$	$		$		$	$	$	$	~$	$	$	$			~$	~$					
Pedestrian plans	$		$					$	$	$		$	$		$	$	$	~$	$	~$	$					$	$	$		
Public education and awareness programs to inform motorists and nonmotorized road users on nonmotorized road user safety NEW	~$				$				$	$SRTS		$				$													$	$

Latest Update Here!

Pedestrian and Bicycle Funding Opportunities: U.S. Department of Transportation Transit, Safety, and Highway Funds (dot.gov)

Formula Programs and Discretionary Grants

U.S. Department of Transportation
Federal Highway Administration

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.

Source: Bureau of Transportation Statistics

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.

Resources

U.S. Department of Transportation
Federal Highway Administration

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_digest/

- **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

U.S. Department of Transportation
Federal Highway Administration

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/

- **BICYCLE AND PEDESTRIAN PLANNING, PROGRAM, AND PROJECT DEVELOPMENT GUIDANCE:**
  Website: www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/guidance_2023.pdf

- **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

Questions?

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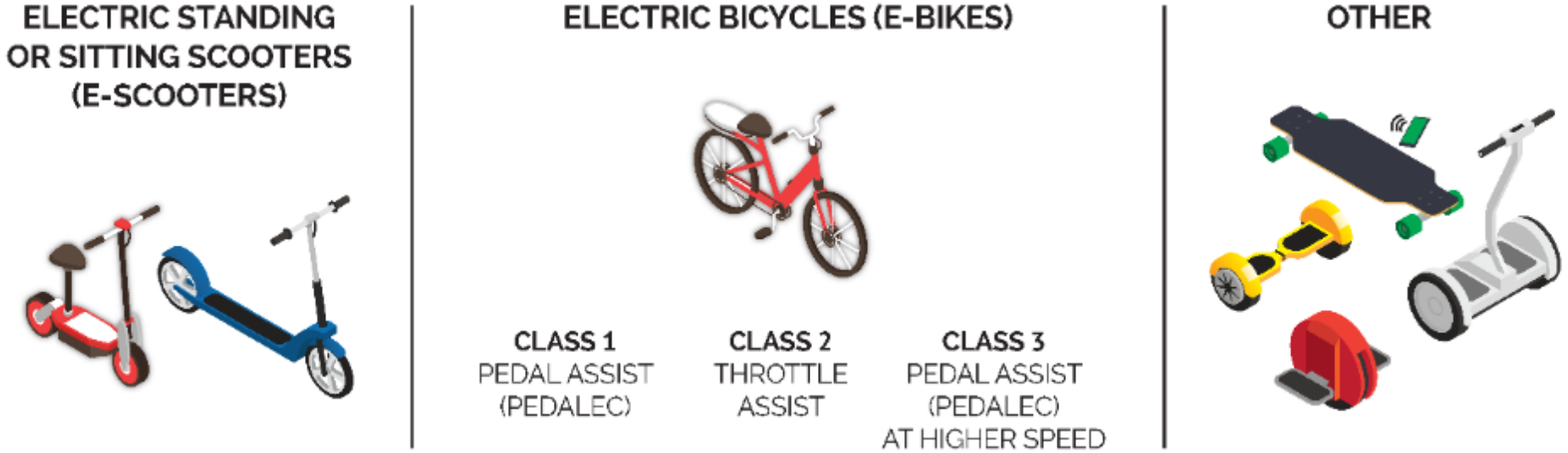
E-scooter Safety Issues and Solutions

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

Background

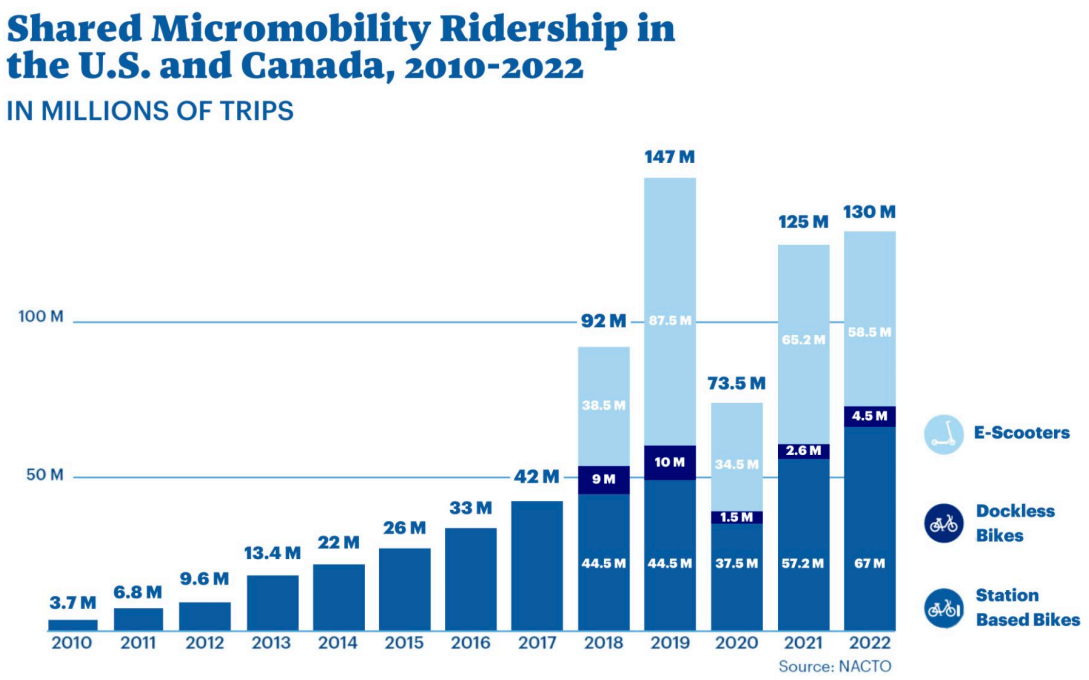
- E-scooters are a form of powered micromobility



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



Source: National Association of City Transportation Officials, *Shared Micromobility in 2022. https://nacto.org/publication/shared-micromobility-in-2022/*

BTS-10 project evidence base

Evidence	Description
Literature review	Reviewed and synthesized 349 studies identified between 2017 and October 2020, including peer-reviewed articles and pilot program reports
Practitioner survey	Asked about 70 different practices and approaches to safety management; received 207 responses from 85 cities in 38 states with existing micromobility programs.
Populus Groundtruth survey	Examined e-scooter ridership travel behavior and demographics using a sampling of 18 metro areas in an ongoing travel survey.
NC emergency department visit data	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.
Field observations of e-scooters and cyclists	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.
Interviews with micromobility program managers	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.

General findings: State of use, context, and safety issues

Characteristics	Pedestrians	E-scooter Riders	Bicycle Riders
Demographics	More females than males; all ages and income levels.	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.	Many more male riders than female riders; average age is slightly older than e-scooter riders and higher income.
Speed range	Walking speed is typically 3.5 ft/sec or 2 MPH.	Riding speed can be limited by policy or geographic location; range from 10-15 MPH.	Ranges from 8-13 MPH for traditional bikes and higher for e-bikes (10-15 MPH).
Travel behaviors	More likely to be accessing transit than e-scooter or bicycle modes.	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.	Similar to e-scooter riders, though less nighttime ridership and longer average trip length.
Facility preferences	Prefer sidewalks when provided the option.	Prefer separated bike facilities over sidewalks when provided the option.	Prefer separated bike facilities when provided the option.

General findings: E-scooter injury circumstances and contributing factors

Characteristics	Pedestrians	E-scooter Riders	Bicycle Riders
Impairment patterns	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).	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).	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).
Injury profile	Data on falls and crashes with modes other than drivers are lacking, but most fatal injuries involve a motor vehicle.	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.	Data on falls and crashes with modes other than drivers are lacking, but most fatal injuries involve a motor vehicle.

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**.

Source BTS-10 Project team: *Shared e-scooter rider safety behaviour and injury outcomes: a review of studies in the United States.* Transport Reviews. https://doi.org/10.1080/01441647.2023.2219838

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

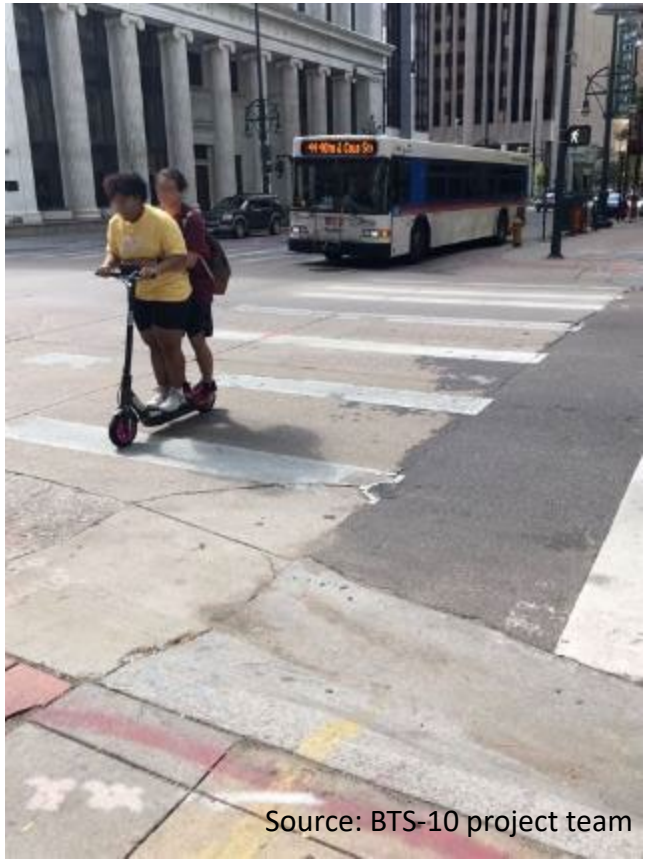
Source for all photos on this slide: BTS-10 project team

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


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)

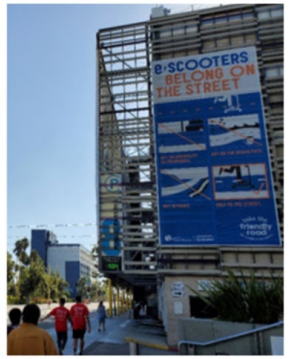
E-Scooter

Street Type	No Bike Lane		Bike Lane	
High Volume	Sidewalk Usage:	73%	Bike Lane Usage:	72%
	Travel Lane Usage:	26%	Sidewalk Usage:	22%
			Travel Lane Usage:	6%
Low Volume	Sidewalk Usage:	34%	Bike Lane Usage:	76%
	Travel Lane Usage:	66%	Sidewalk Usage:	12%
			Travel Lane Usage:	12%

Bicycle

Street Type	No Bike Lane		Bike Lane	
High Volume	Sidewalk Usage:	49%	Bike Lane Usage:	82%
	Travel Lane Usage:	51%	Sidewalk Usage:	10%
			Travel Lane Usage:	8%
Low Volume	Sidewalk Usage:	2%	Bike Lane Usage:	79%
	Travel Lane Usage:	98%	Sidewalk Usage:	12%
			Travel Lane Usage:	9%

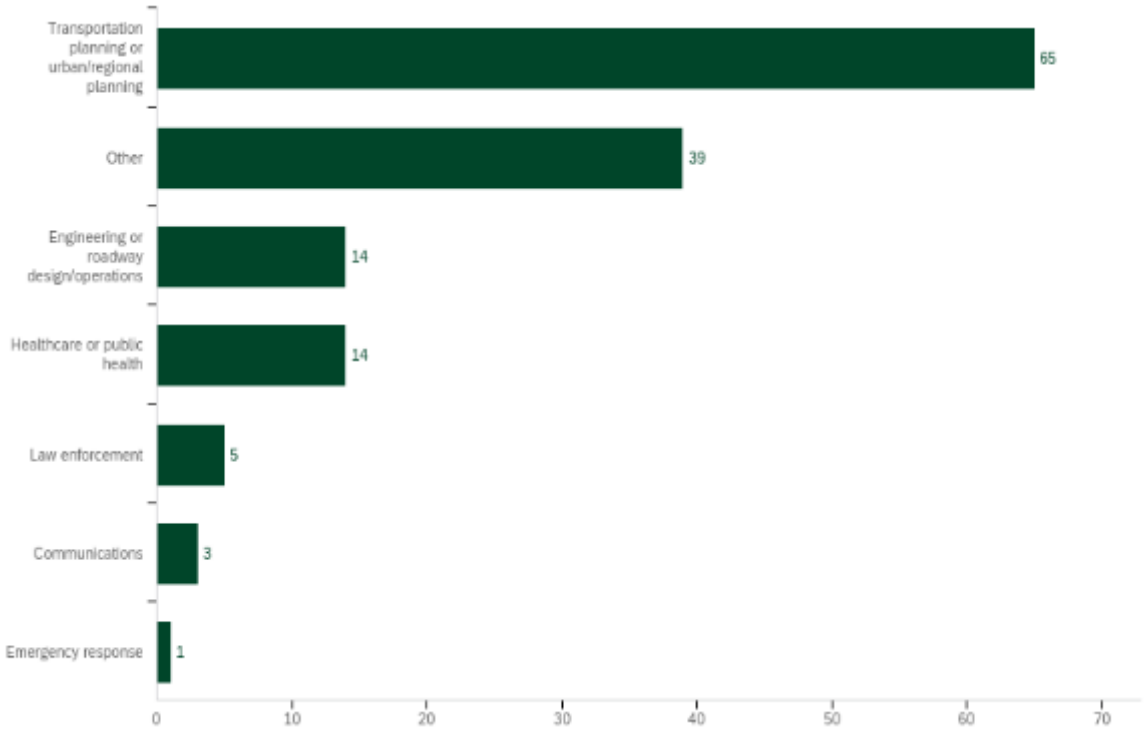
Source: BTS-10 project team
TRB Annual Meeting 2024 Paper



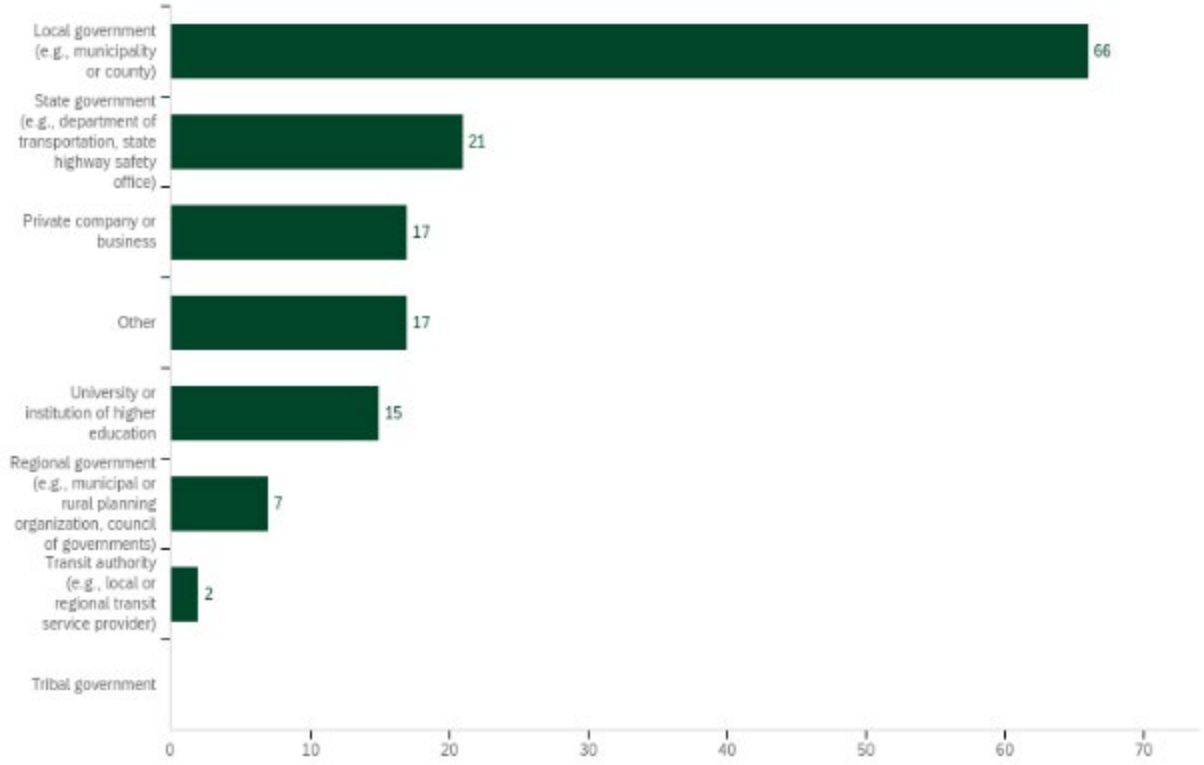
Nashville's Broadway "redesign"

Practitioner survey participant highlights

Position Type



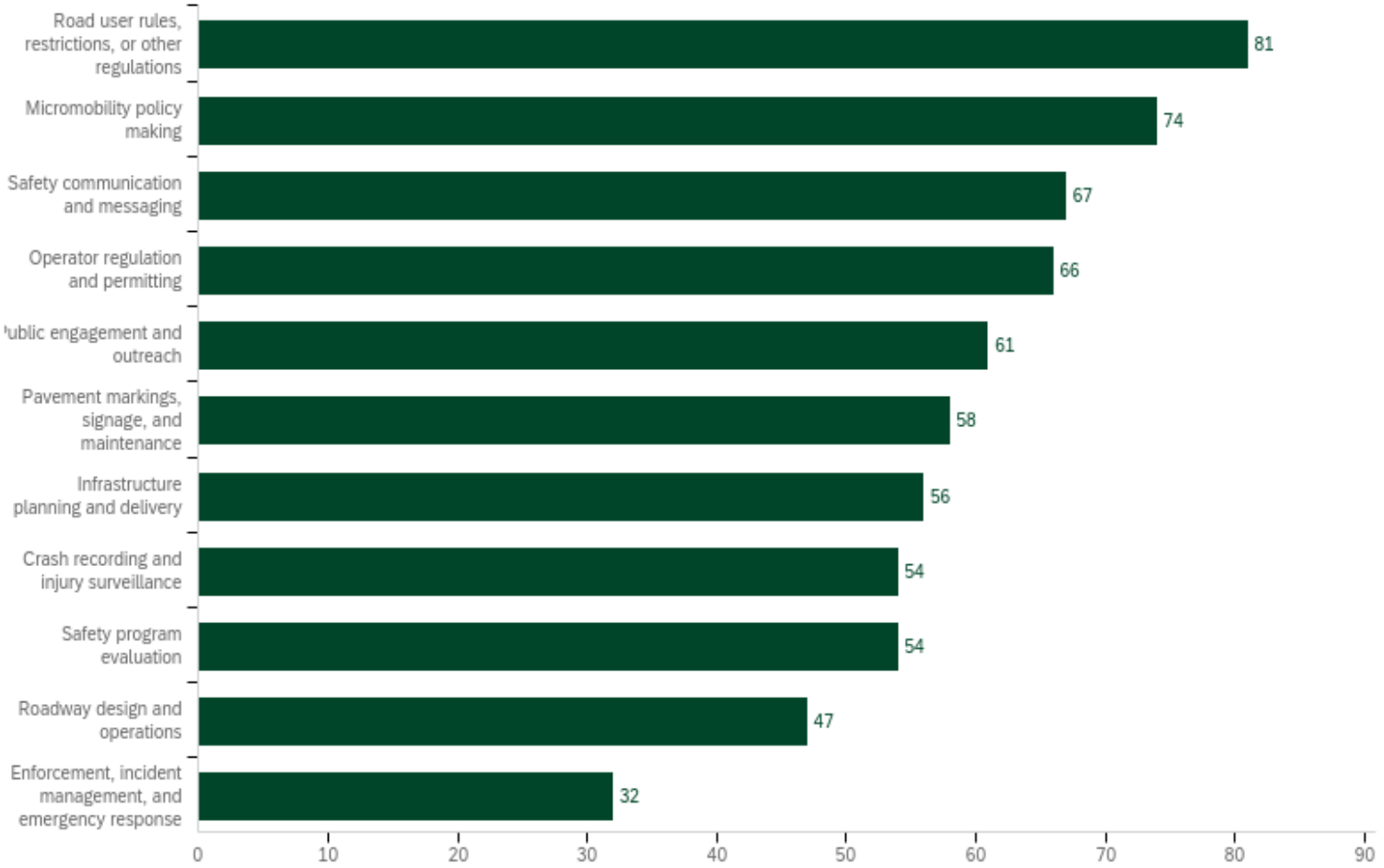
Organization Type



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

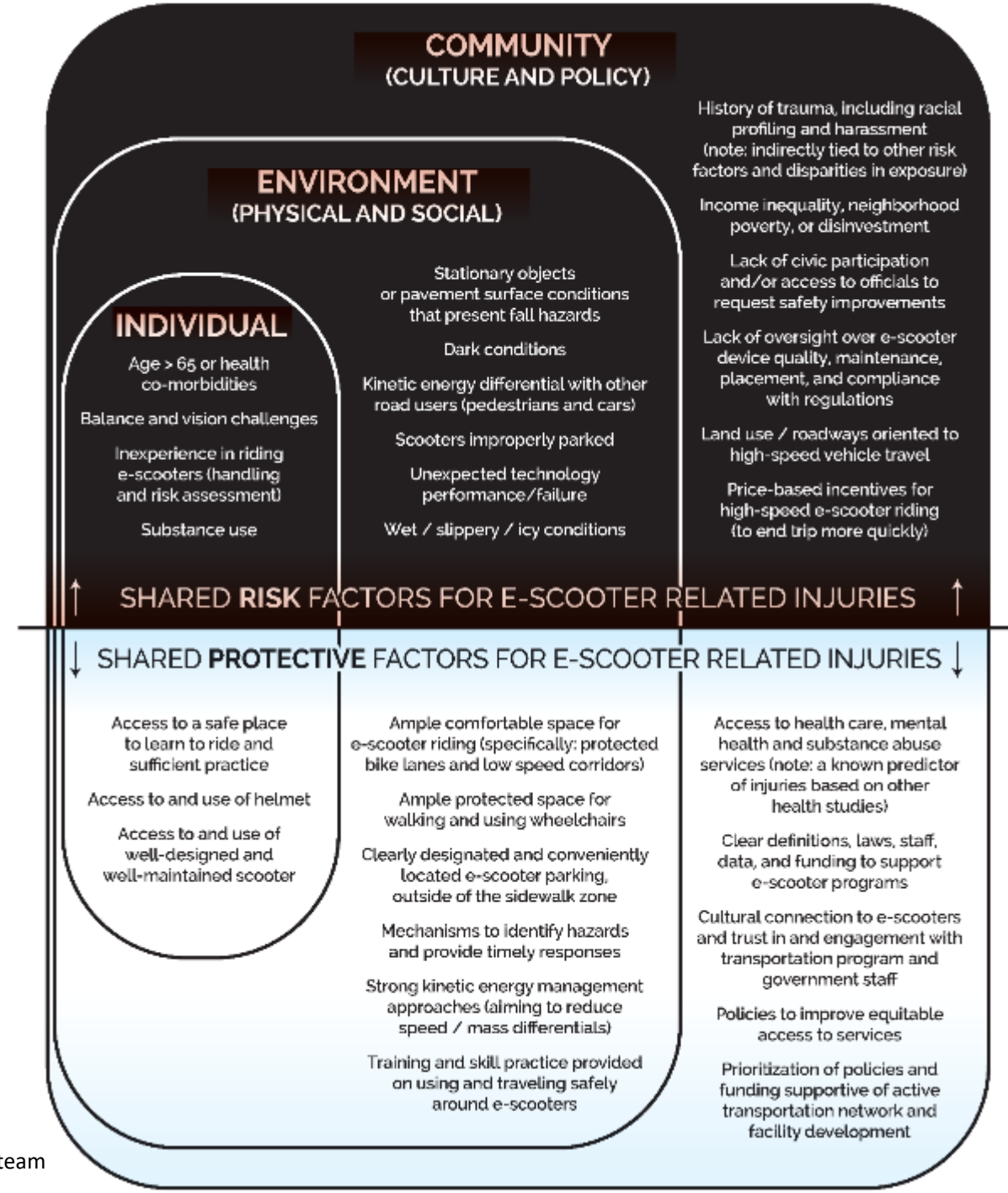


Source: BTS-10 project team

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



Source: BTS-10 project team

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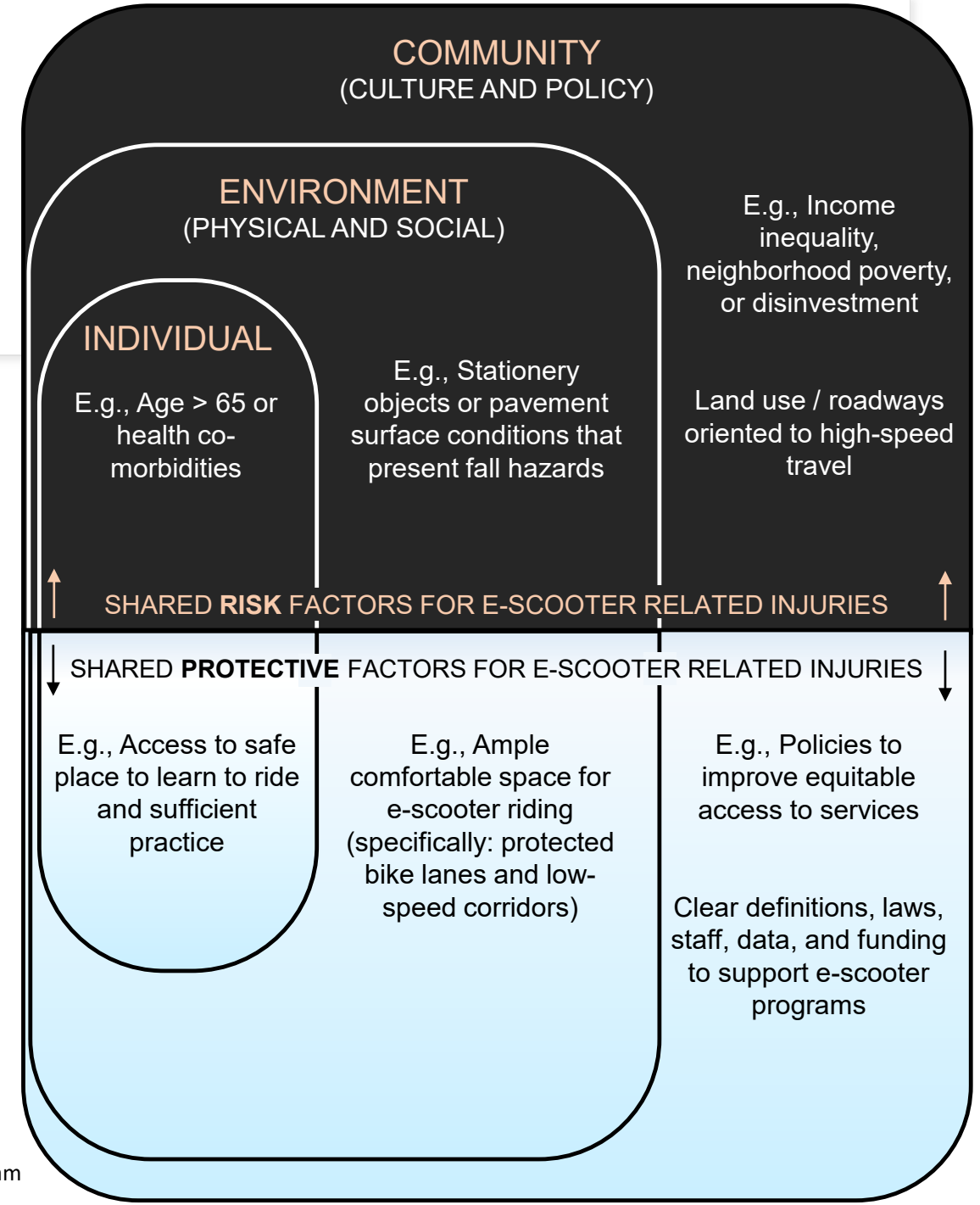


Source: BTS-10 project team

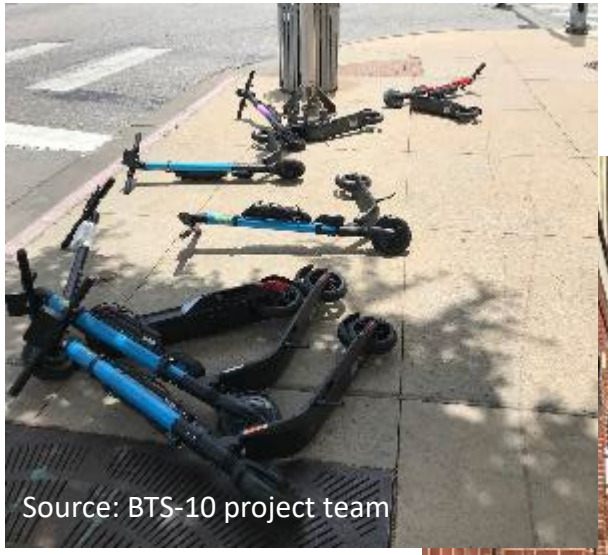
Key takeaways for local micromobility program managers

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



Source: BTS-10 project team

Source: BTS-10 project team

- “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

Source: www.pedbikeimages.org/ TREC


Source: BTS-10 project team


Source: BTS-10 project team

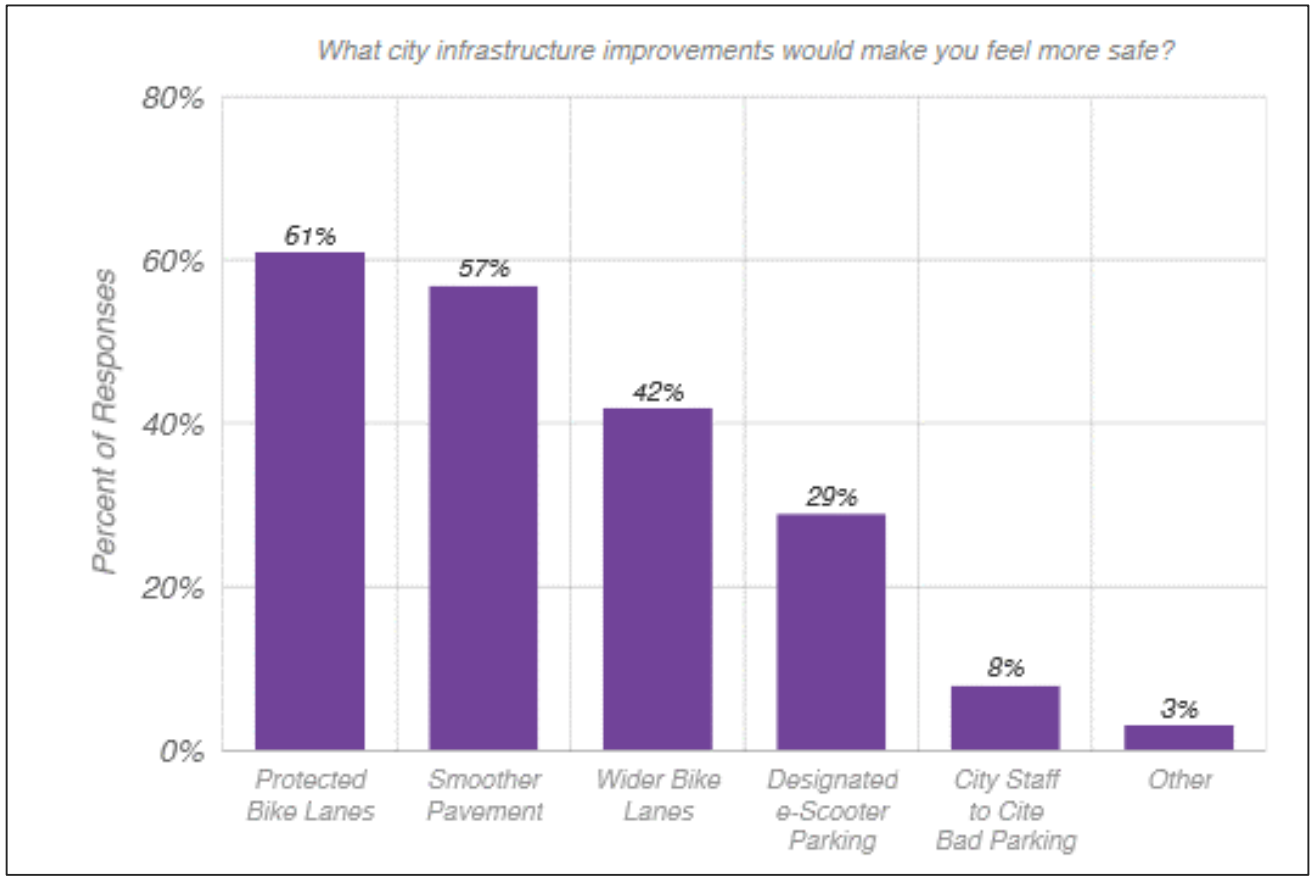
Micromobility programs will not succeed if riders have bad experiences or are injured

- 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

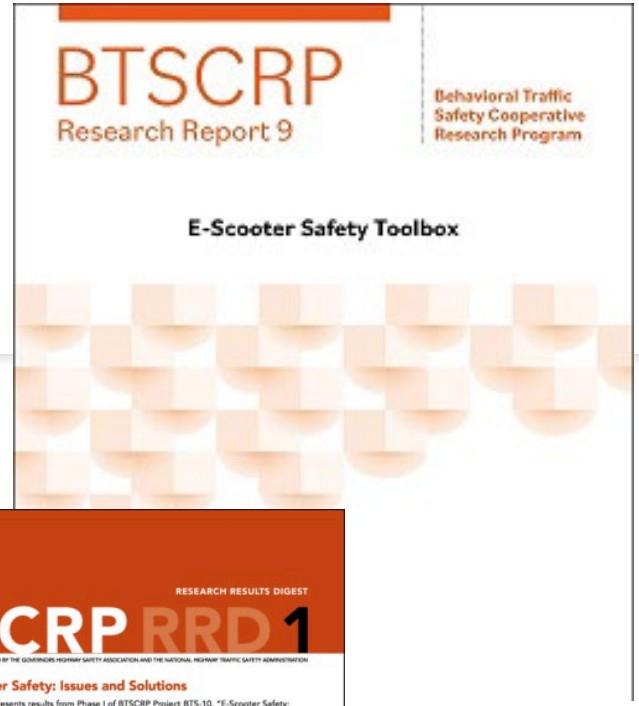
- Roads with bike lanes are associated with:
  - Fewer e-scooter injuries
  - Less sidewalk riding
  - More satisfied e-scooter riders

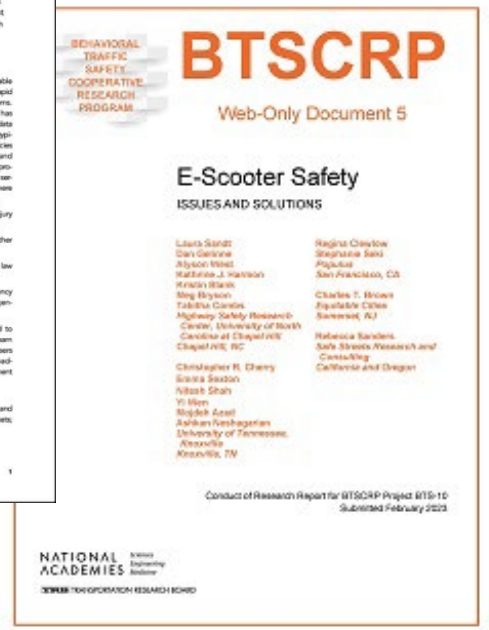


Source: Bird Report: *A Look at E-scooter Safety*, April 2019

BTS-10 Research Products

1. Research Results Digest: https://nap.nationalacademies.org/catalog/26756/e-scooter-safety-issues-and-solutions
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*
3. Final Report: https://www.trb.org/main/blurbs/183095.aspx
   - *Additional info and data collection tools*





Toolbox offering: A summary of safety management practices

Domain	Description of Safety Management Practice	Current Level of Adoption	Current Strength of Injury Prevention Evidence
Categorizes the practices in terms of which primary Safe Systems area it falls under: • Safe Roads • Safe Vehicles • Safe Speeds • Safe People • Post-Crash Harm Reduction • Safety Evaluation	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	Based on the BTS-10 survey and literature review, indicates low, medium, or high levels of current adoption	Based on the BTS-10 literature review and expert input, indicates the current evidence base supporting the practice: • No demonstrated effectiveness; • Limited or no high-quality evidence; • Promising/ Likely effective; or • High demonstrated effectiveness

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.

Question	Response
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/exiting 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)

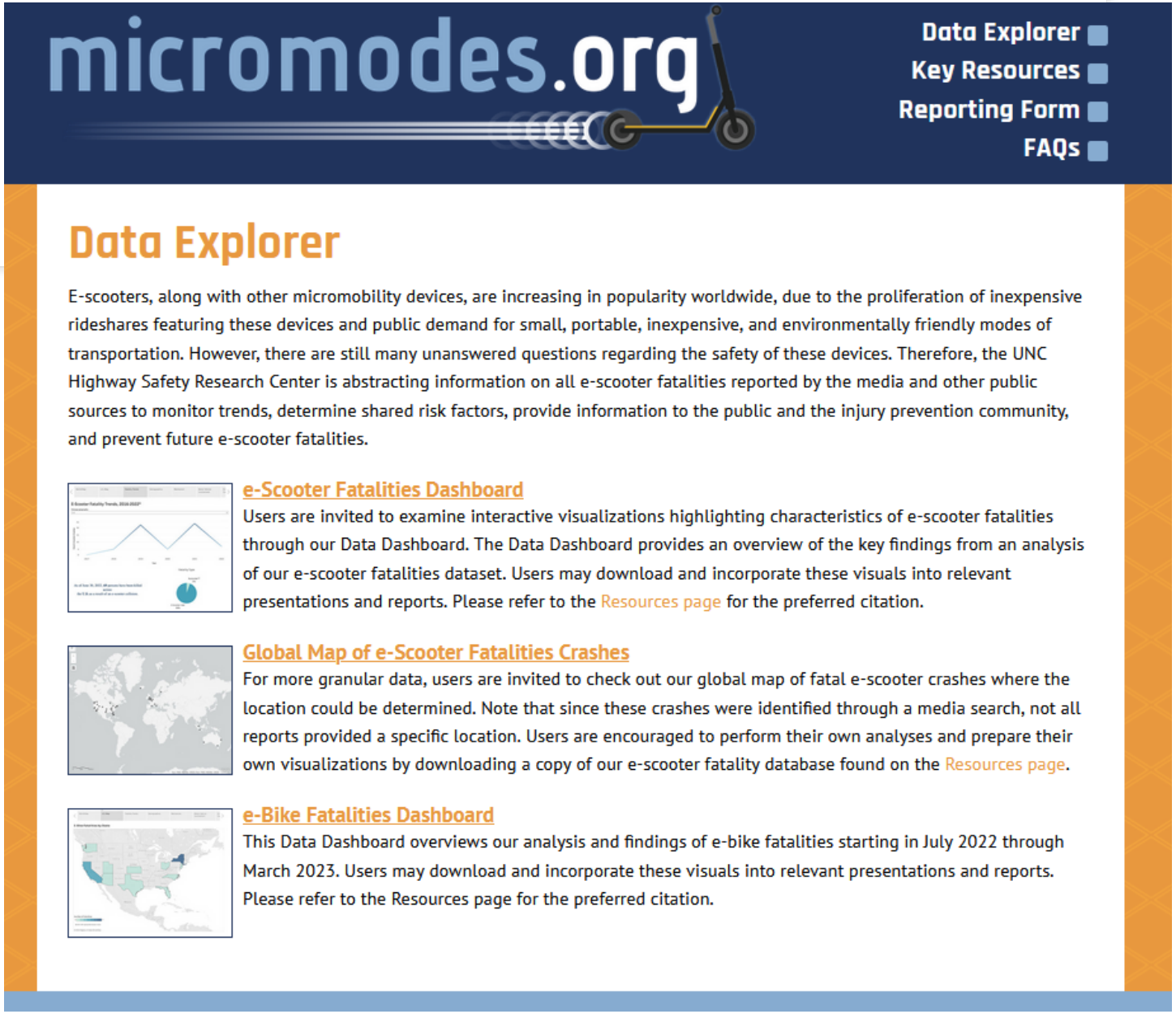
Table 5. Data needs and which collection methods can provide such data to augment crash and injury records.

Data Elements	(1) Intercept Survey	(2) Web-based Survey	(3) Direct Manual Observation	(4) Indirect Manual Observation (Video recording + processing)	(5) Indirect Automated Observation (automated counters, sensors, etc.)	(6) Mobility-firm provided data
Trip purpose	Yes	Yes	No	No	No	No
Trip length / distance	Yes	Yes	No	No	No	Yes
Trip duration / time spent riding	Yes	Yes	No	No	No	Yes
Trip location/ route	No	No	No	No	No	Yes
Roadway, lighting, traffic, and weather conditions	No	No	Yes	Yes	No	No, unless data are linked
E-scooter device characteristics	Yes	Yes	Possibly	Possibly	Possibly	Yes
E-scooter speed	Self-reported	Self-reported	Directly measured	Directly measured	Directly measured, depending on tech	Yes
Rider demographics	Yes	Yes	Possibly	Possibly	No	Yes
Rider characteristics (riding in group, carrying objects, etc.)	Yes	Yes	Yes	Yes	No	No
Helmet use	Self-reported	Self-reported	Directly measured	Directly measured	Directly measured, depending on tech	Possibly, if firm gathers
Rider interactions and conflicts with other road users	Self-reported	Self-reported	Possibly	Possibly	No	No
Perceptions of safety	Yes	Yes	Indirectly based on behaviors	Indirectly based on behaviors	No	Possibly, if firm gathers
Rider behaviors (signaling, gesturing, yielding, piggybacking, using devices, looking, dismounting, parking, etc.)	Self-reported	Self-reported	Directly measured	Directly measured	No	No

Source: BTS-10 project team

Toolbox offering: Additional resources

- E-scooter and e-bike data dashboards
- Fatality reporting form
- Links and FAQs

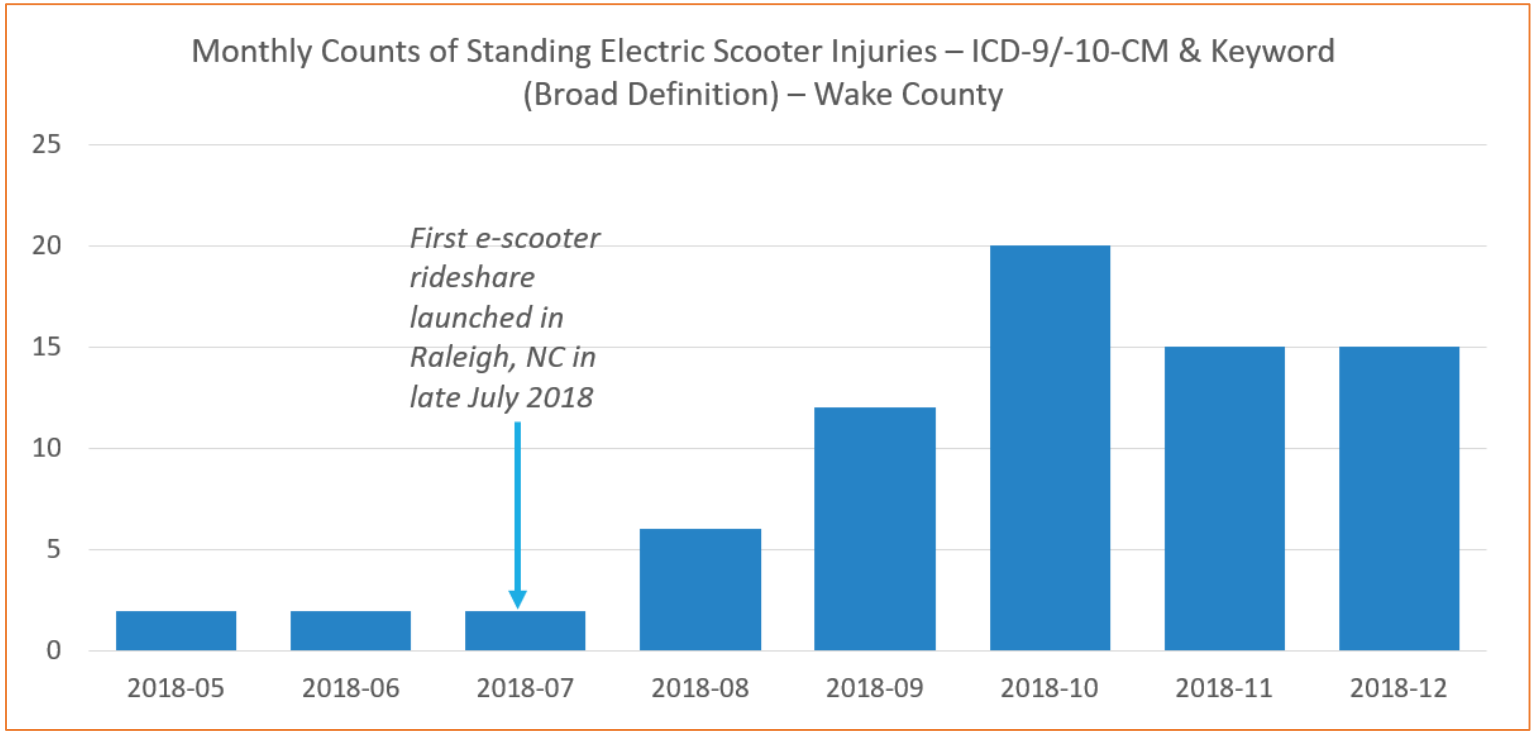


Source: UNC HSRC

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

Project team acknowledgment

This project involved contributions from the following individuals:

- Laura Sandt, UNC-HSRC (Principal Investigator)
- Alyson West, UNC-HSRC
- Katie Harmon, UNC-HSRC
- Kristin Blank, UNC-HSRC
- Meg Bryson, UNC-HSRC
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- Regina Clewlow, Populus
- Stephanie Seki, Populus
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