



Making Micromobility More Equitable For All

*Shared Mobility: Results to Guide Equity and Resilience
Northwest Transportation Conference— March 4, 2024*

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Portland State University



Micromobility

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

- bicycles
- electric-assist bicycles (e-bikes)
- powered standing scooters (e-scooters)
- powered seated scooters (scooter/moped)
- electric personal assistive mobility device (EPAMD)
- other small, lightweight, wheeled device



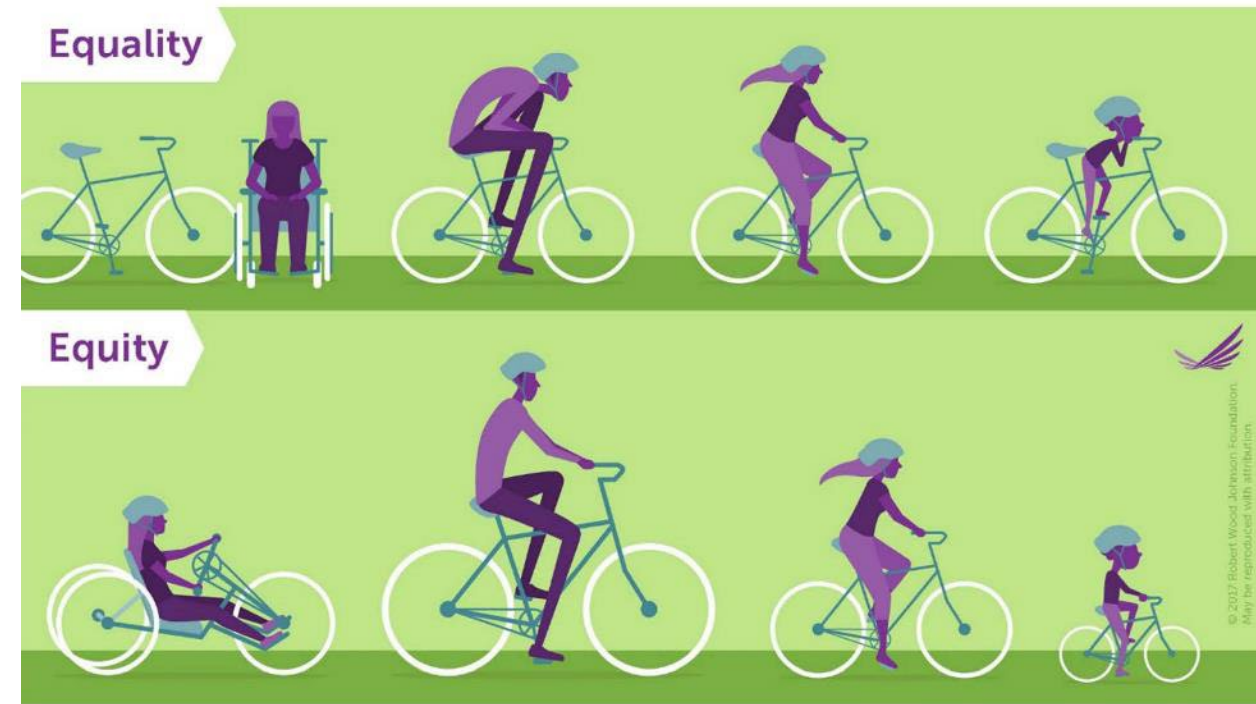
Image: joyride.city

Defining Equity for Micromobility

Equity is empowering marginalized communities and eliminating barriers to opportunity through inclusive, accessible, and authentic engagement processes and the creation of programs and policies that result in fair and just distribution of benefits and burdens across all segments of a community, prioritizing those with highest need.

Source: The Greenlining Institute

Mobility-for-All or Inclusive Mobility

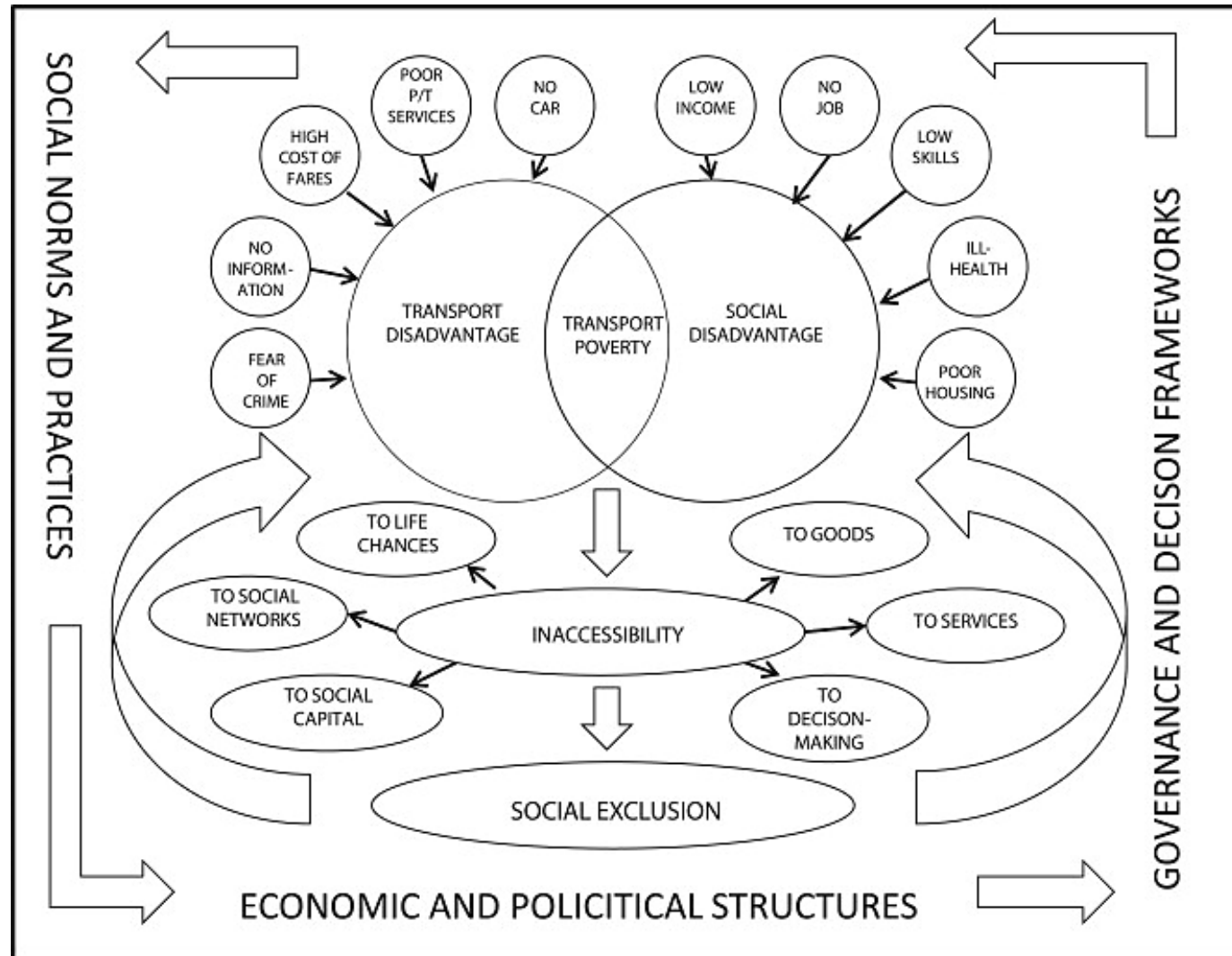


Source: Robert Wood Johnson Foundation

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Dimensions of transportation disadvantage

- Income
- Race/ethnicity
- Mobility challenges
- Age
- English proficiency



Lucas (2012) Transport and social exclusion: Where are we now?

<https://doi.org/10.1016/j.tranpol.2012.01.013>

Equity is an Outcome and a Process

Outcomes

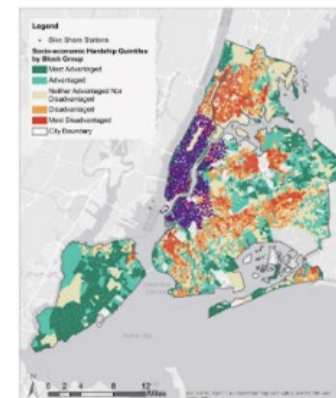
- Increased Access to Opportunity
- Affordable Options
- More Healthy & Safe Communities
- Reduced Income Inequality & Underemployment



Processes

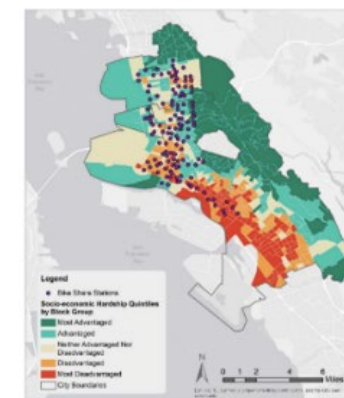
- Spatial equity & access
- Procedural & programs
- Performance measures & monitoring
- Outreach and engagement

New York City, NY



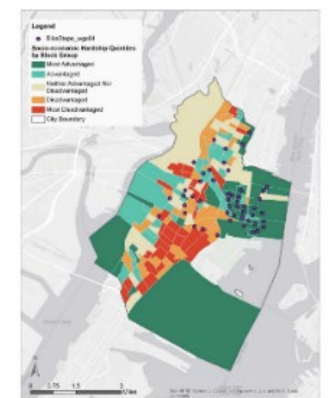
Map 9: Bike share stations and socio-economic categories in New York City, NY

Oakland, CA



Map 8: Bike share stations and socio-economic categories in Oakland (East Bay), CA

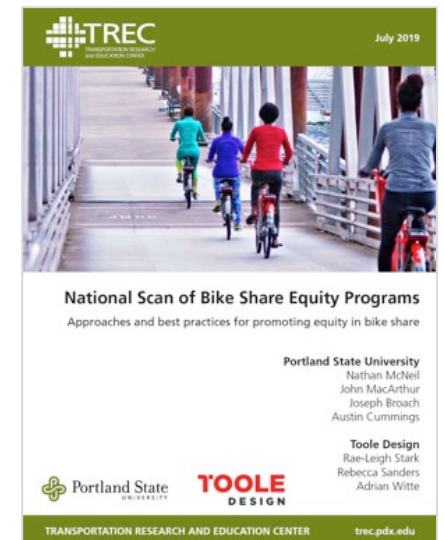
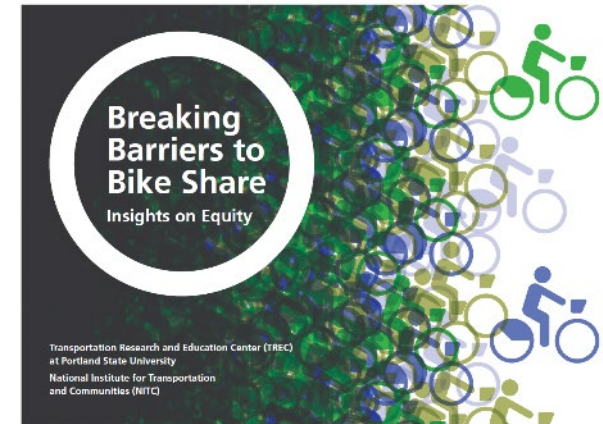
Jersey City, NJ



Map 13: Bike share stations and socio-economic categories in Jersey City, NJ

Equity Research

- **Breaking Barriers Research**
- **National Scan of Bike Share Equity Programs**
- **Portland E-Scooter Survey Analysis**
- **E-bike Incentive Programs**
- **Adaptive Mobility**



What we know about bike share equity

Past research tells us:

- Bike share stations are less likely to be located nearby for people who are
 - Lower Income
 - African-American or Black
- Bike share users are disproportionately:
 - White or Caucasian
 - Higher income
 - Male
 - Age 25-34
- Even when stations are placed in low-income and minority communities, usage has been low.



Image: BBSP

Breaking barriers key findings

- **Potential:**

- Micromobility can fill a mobility gap
 - though viewed more as recreational
- Overall positive views toward bike share (and scooters)
- Interest in using more

- **Barriers:**

- Cost
- Fees and liability
- Insufficient knowledge or misconceptions about how to use
- Traffic safety

- **Outreach needs:**

- Spreading information about existing programs and discounts
- Program element education
- Make people familiar with how to use micromobility



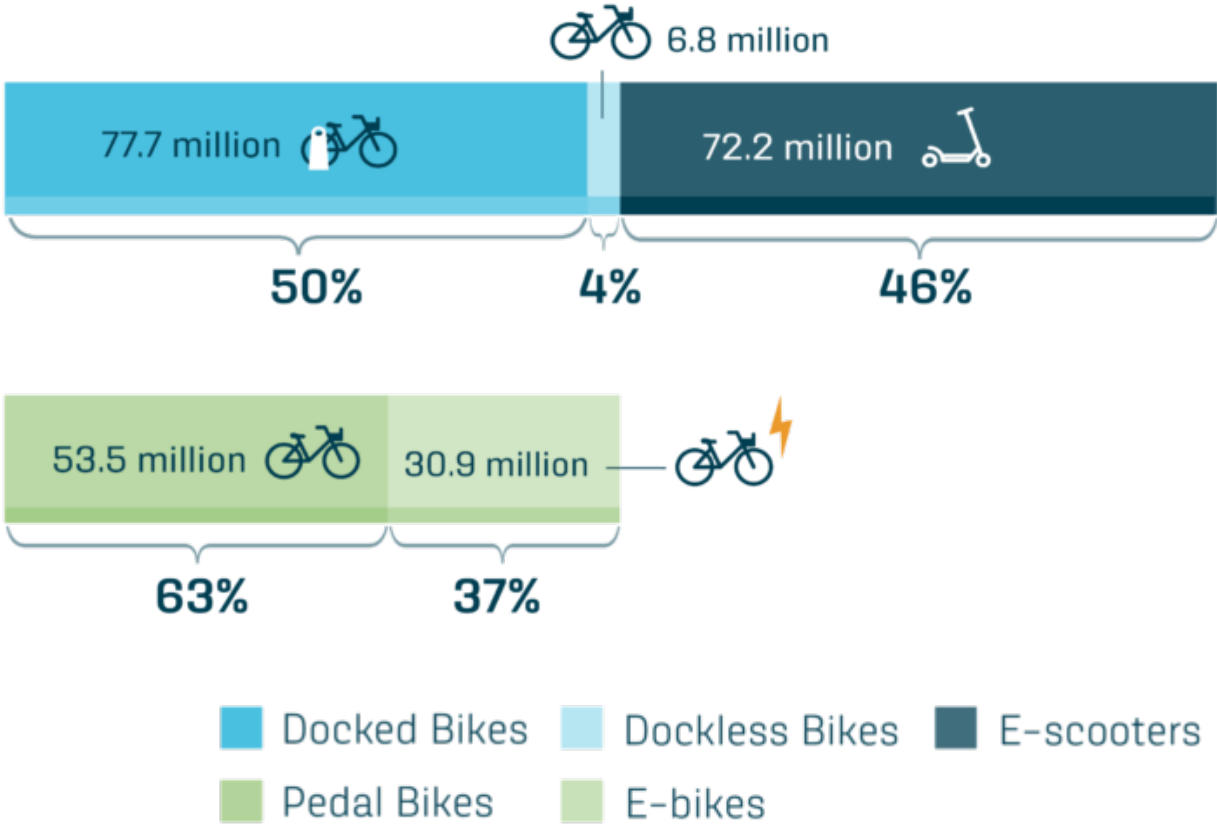
Image: BBSP

SHARED MICROMOBILITY

Find out more here: <https://trec.pdx.edu/bikeshare-research>

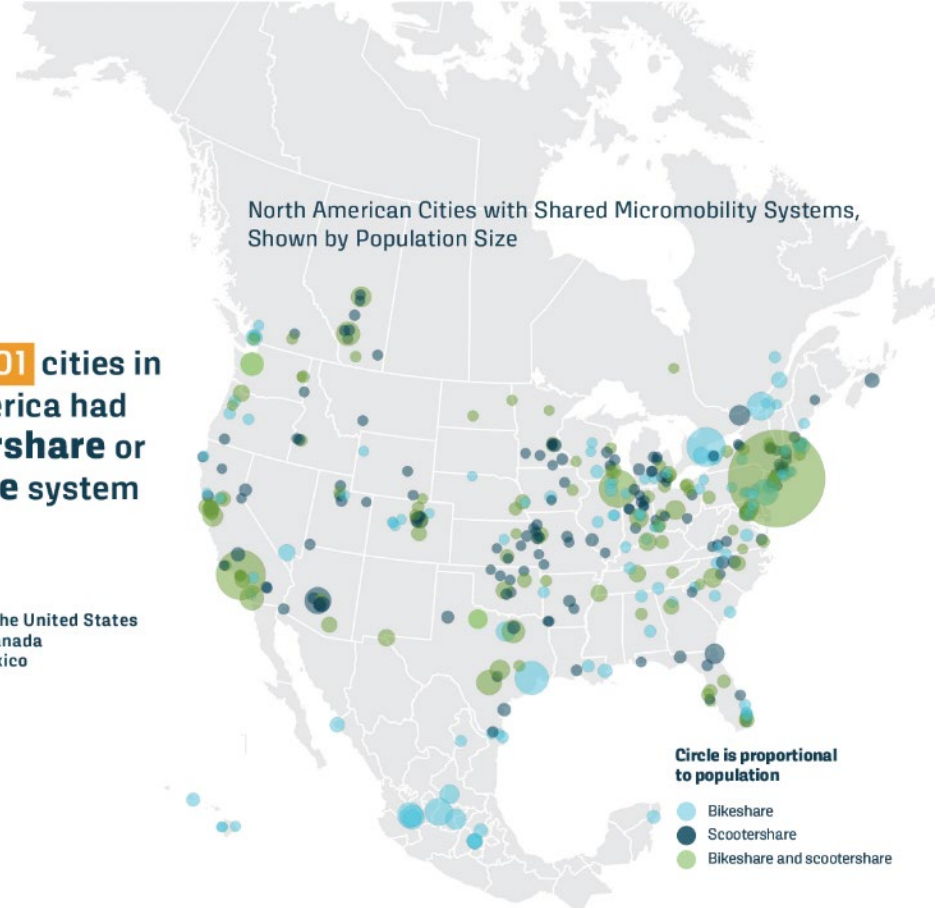
Shared Micromobility in the US

157 Million Trips Across North America in 2022
Up from 128 Million in 2021



At least **401** cities in North America had a **scootershare** or **bikeshare** system in 2022.

- This includes:
- 363 cities in the United States
 - 29 cities in Canada
 - 9 cities in Mexico



Source: National Association of City Transportation Officials, *Shared Micromobility in the U.S.: 2023*

BIKETOWN by the Numbers

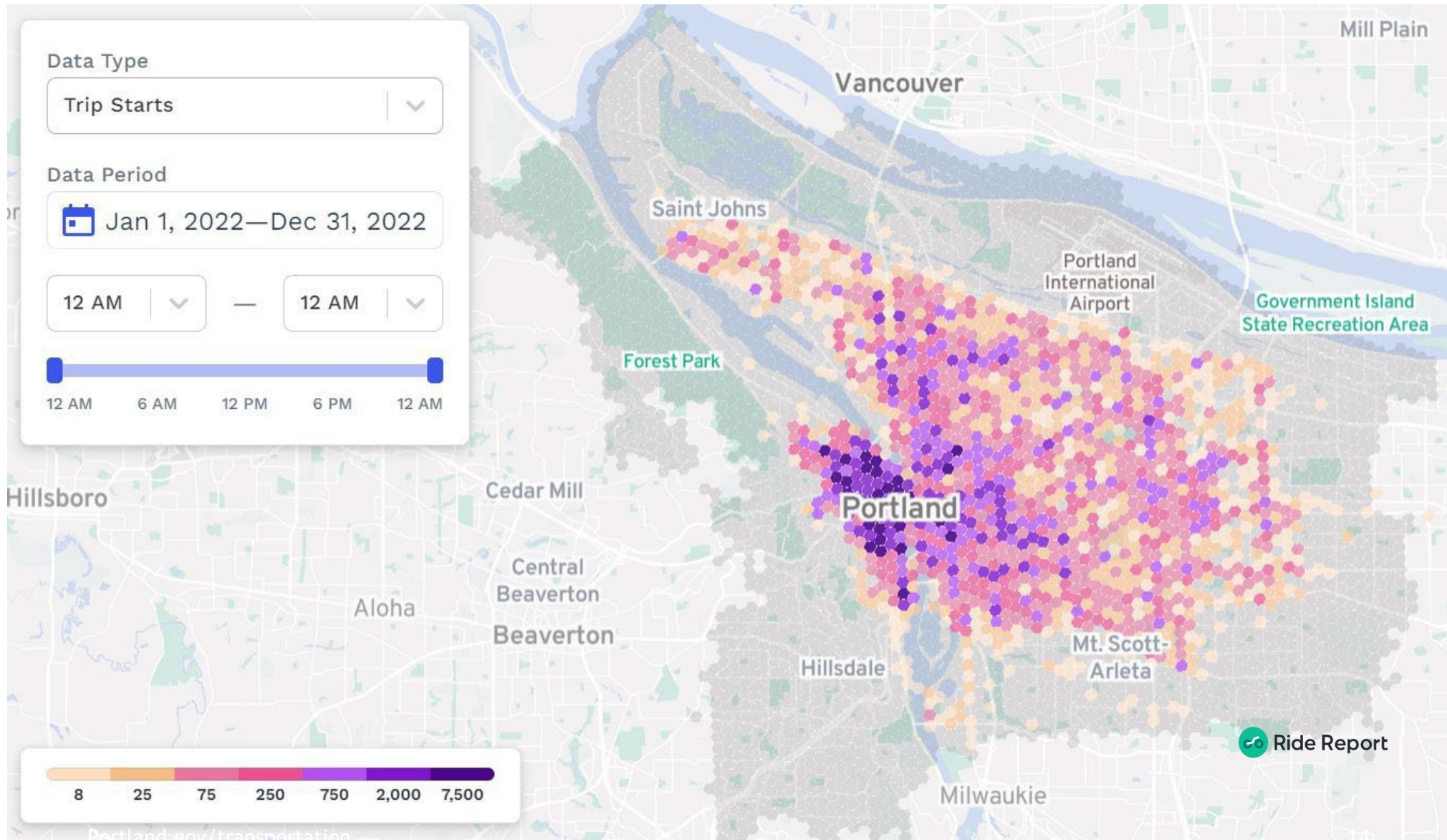
Number of bikes	1,500 (all e-bike)
Service area	41 mi ²
Total stations	232
System trips in 2022 ¹	565,000
<i>System trips in 2023 ¹</i>	<i>647,200</i>
Total equity users (BIKETOWN for All)	2,630
BIKETOWN for All trips in 2022 ¹	202,000 (35%)

(¹ Approximate numbers)



2022 Snapshot, BPOT [Portland.gov/transportation](https://portland.gov/transportation)

BIKETOWN 2022 Ridership Overview



E-Scooters by the Numbers

Number of e-scooters permitted to operate 2,990

Service area (*citywide*) 145 mi²

Current number of e-scooter companies 3

Number of trips in 2022 ¹ 1,011,000

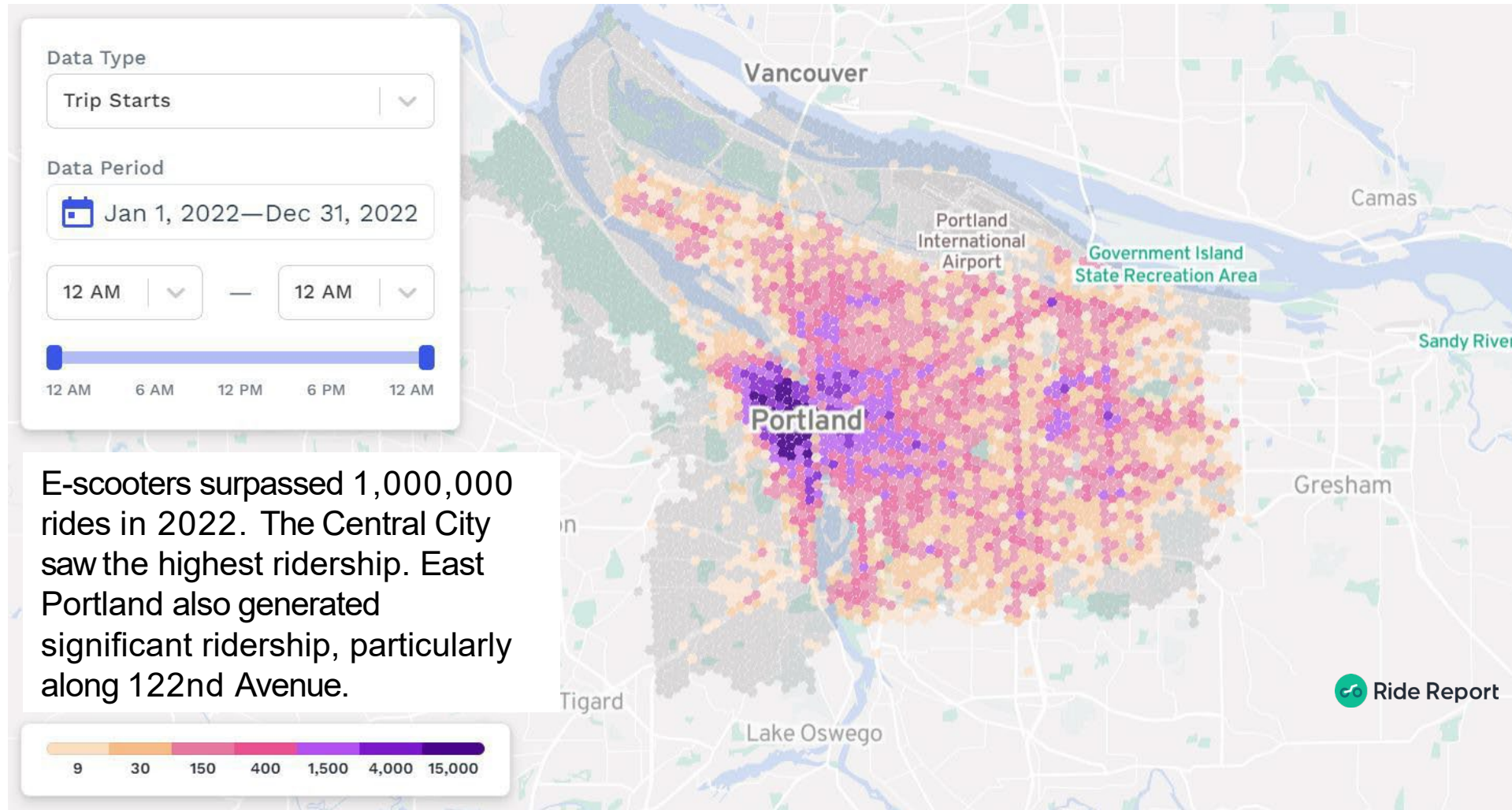
Total Equity Users ² 6,229

Total Equity Trips 2022 ^{1 2} 146,000

(¹Approximate numbers, ² Spin and Lime only)

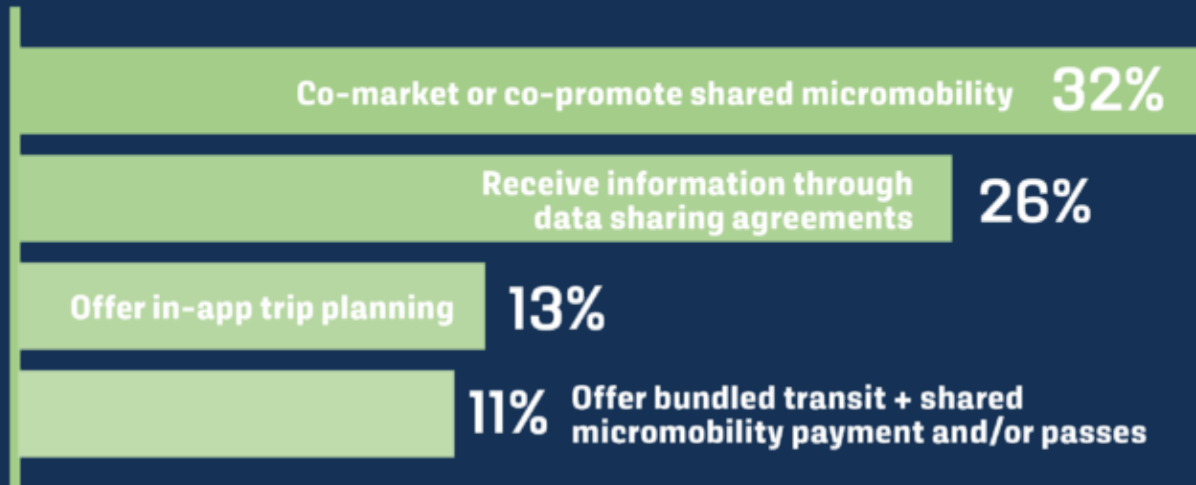


E-Scooters 2022 Ridership Overview



Shared Micromobility as Public Transportation

Some of the ways that transit agencies are integrating with shared micromobility include the following:



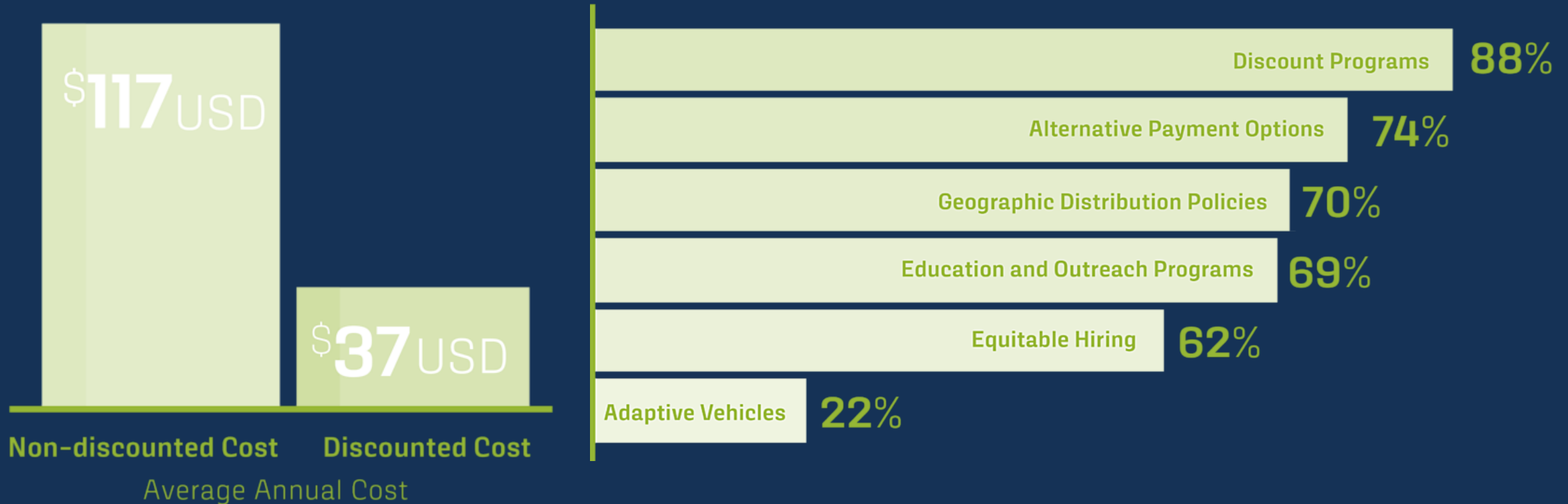
64% of riders reported that they use shared micromobility to connect to transit; **18%** say they use it weekly to connect to transit.

AND

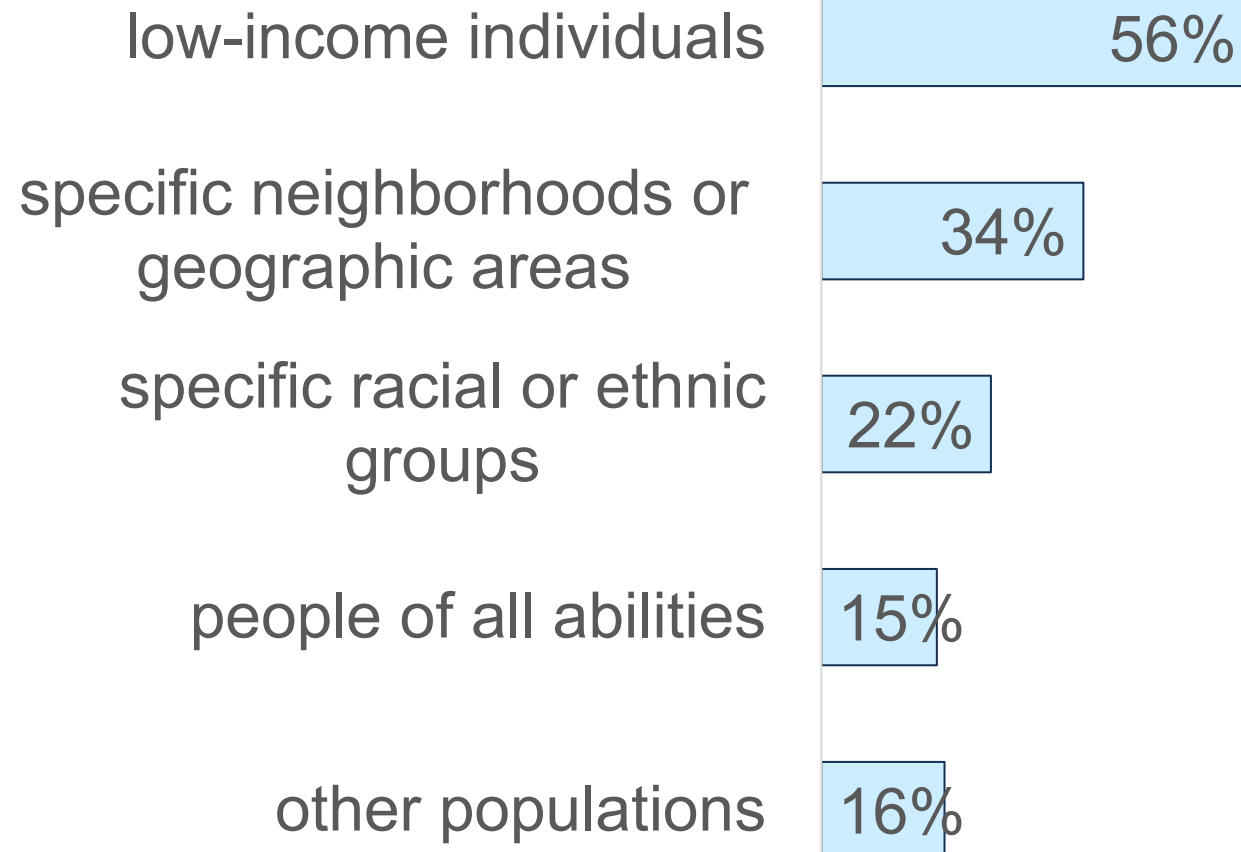
23% of all shared micromobility trips were for the purpose of connecting to transit.



Shared Micromobility Equity Programs



Who are those programs targeting?



“Other populations” included unbanked, people without smartphones or credit cards, and veterans or students.

Lime @limebike

"Smart mobility" means transportation that works for everyone, especially those on the lower rungs of the economic ladder.

#LimeNation

With PayNearMe, Lime Takes Industry Lead On Transportation Equity
Lime's national partnership with PayNearMe delivers on the promise of mobility access to all Americans in a victory for transportation equity.

6:49 AM - 8 Jun 2018

25 Retweets 102 Likes

8 25 102

Integrating Equity into Micromobility

Station siting, service areas, and balancing

- Bike/station locations
- Service area boundaries
- Rebalancing

Payment and fees

- Income-based discount
- Alternative payment structures
- Cash pay option
- Reduction of fees

Education or facilitation programs

- Facilitated enrollment
- Education programs
- Prescribe-a-bike
- Organized rides
- Ambassadors

Marketing, information and materials

- Marketing campaigns - Targeted
- Non-English offerings

Mixed fleet options

- Adaptive bicycles
- Electric bicycles
- Scooters

Internal operations

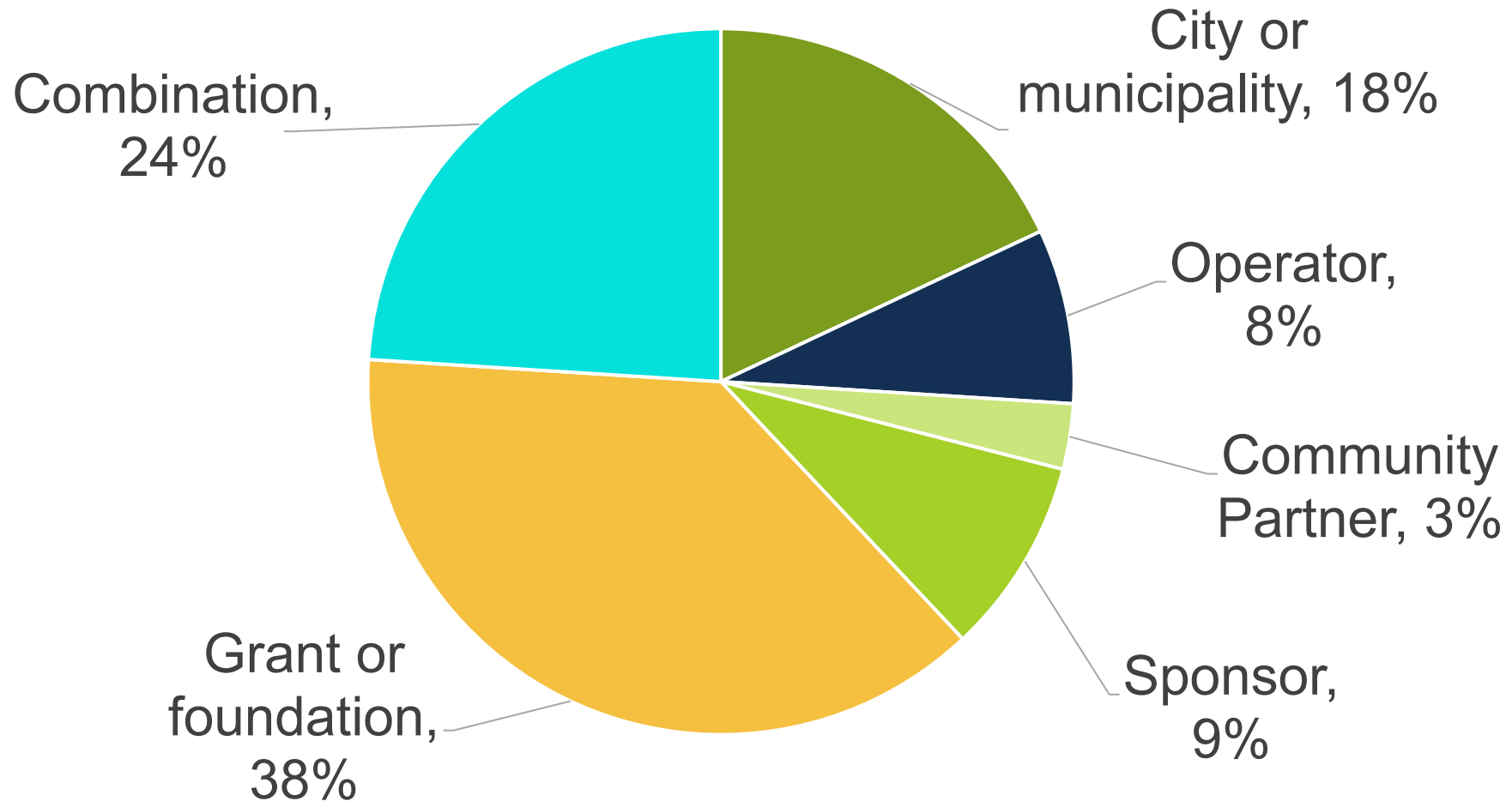
- Hiring practices
- Employee training

Transit integration

<https://trec.pdx.edu/research/bikeshare>



Equity Program Funding Sources



Mobility for the People: *Evaluating Equity Requirements in Shared Mobility Programs*

- **Equity requirements are common, but far from universal.** Equity requirements were documented in 62% of the 239 evaluated programs.
- **The most prevalent equity requirements target implementation.** Specifically, many cities/agencies include requirements related to cost and technology access, including requiring smartphone-alternative access (36%), cash payment options (33%), and reduced fares (32%).
- **A key challenge to evaluating outcomes is connecting data to evaluation.** Most programs (83%) require data sharing. Far fewer, however, publish public-facing evaluation reports (27%) or incentivize or enforce meeting equity requirements (15%).



Mobility for the People: Evaluating Equity Requirements in Shared Micromobility Programs

Anne Brown, PhD
Amanda Howell, MURP

Hana Creger, The Greenlining Institute



NATIONAL INSTITUTE FOR TRANSPORTATION AND COMMUNITIES nitc-utc.net

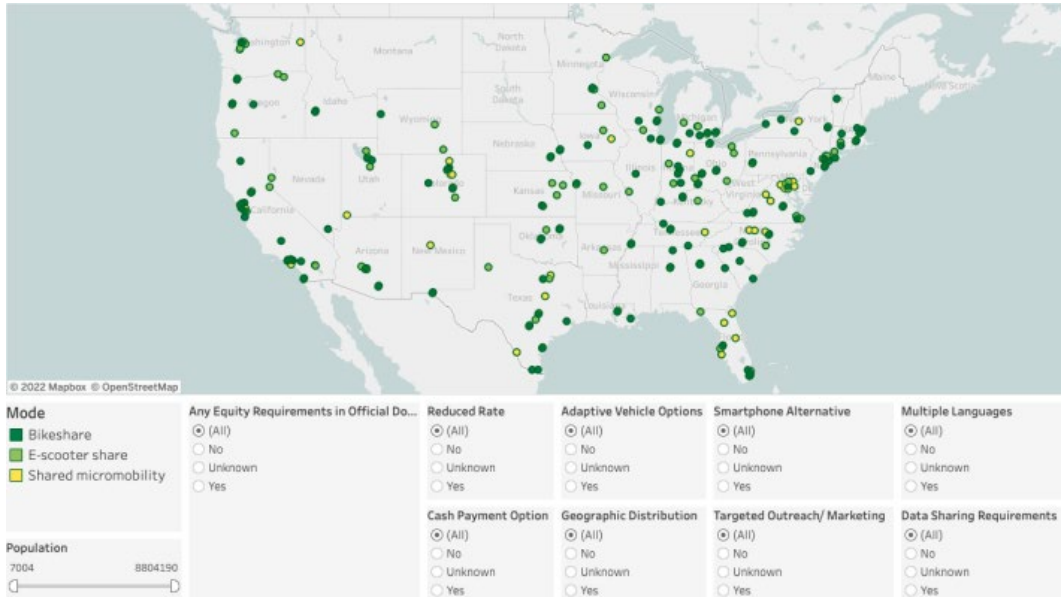


Report: <https://nitc.trec.pdx.edu/research/project/1401>



Operationalizing Equity

US Micromobility Equity Requirements Database



Access the database: [Link](#)

Micromobility Equity Evaluation Tool



Introduction

Technology-enabled micromobility services such as bikeshare and shared e-scooters have expanded mobility for some travelers, but significant barriers still limit their uptake among certain groups. To begin to address these barriers, many cities and professional transportation organizations have established new equity-focused requirements for shared micromobility programs, such as reduced fares for low-income travelers, cash payment options, and geographic distribution requirements.

Purpose

The purpose of this evaluation tool is to help you determine the strength of the connections between your program goals, design, and evaluation metrics, and identify where there are opportunities for growth.

Who should take this evaluation?

The target audience for this tool is city staff engaged in managing, designing, or operating shared micromobility services.

Access the tool: [Link](#)

Barriers and Issues in Implementing Equity Programs

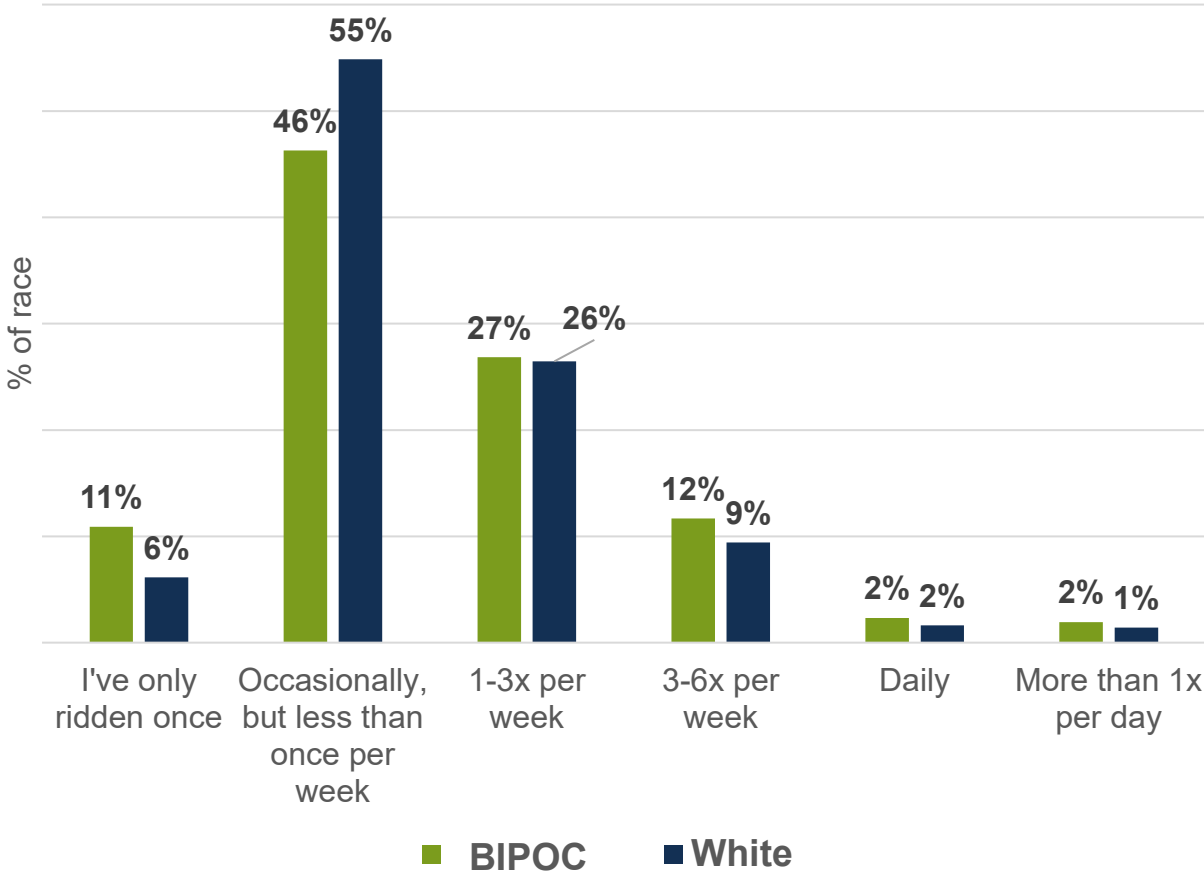
- Limited funding and staffing
- Inadequate data to evaluate equity programs
 - Lack of “before” data for comparisons
 - Lack of other mode data for comparisons
 - Unable to link trips to members or socio-demographic data
 - Survey fatigue, particularly for over-surveyed communities
- Lack of expertise and technical skills, particularly for program evaluation

E-SCOOTER USERS

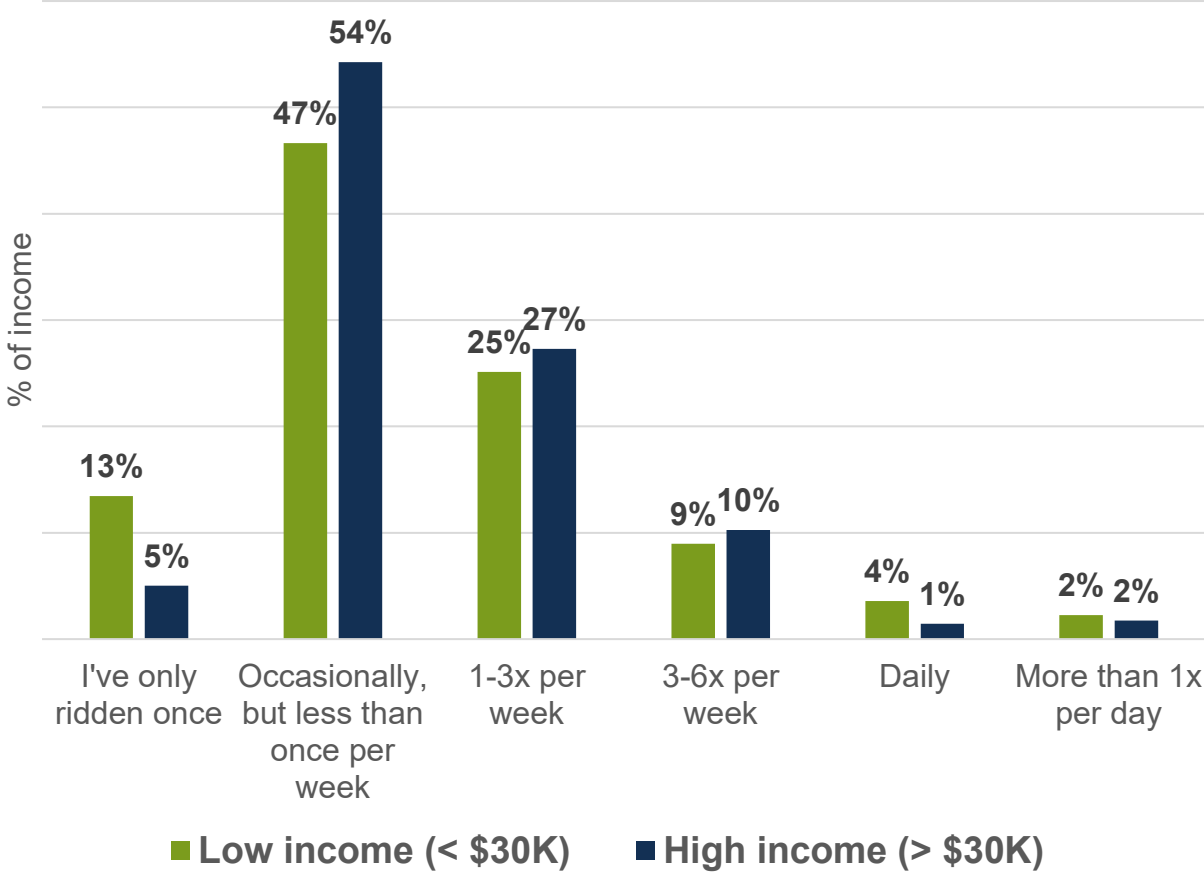
Insights from the City of Portland survey

Are there any differences in frequency?

Race

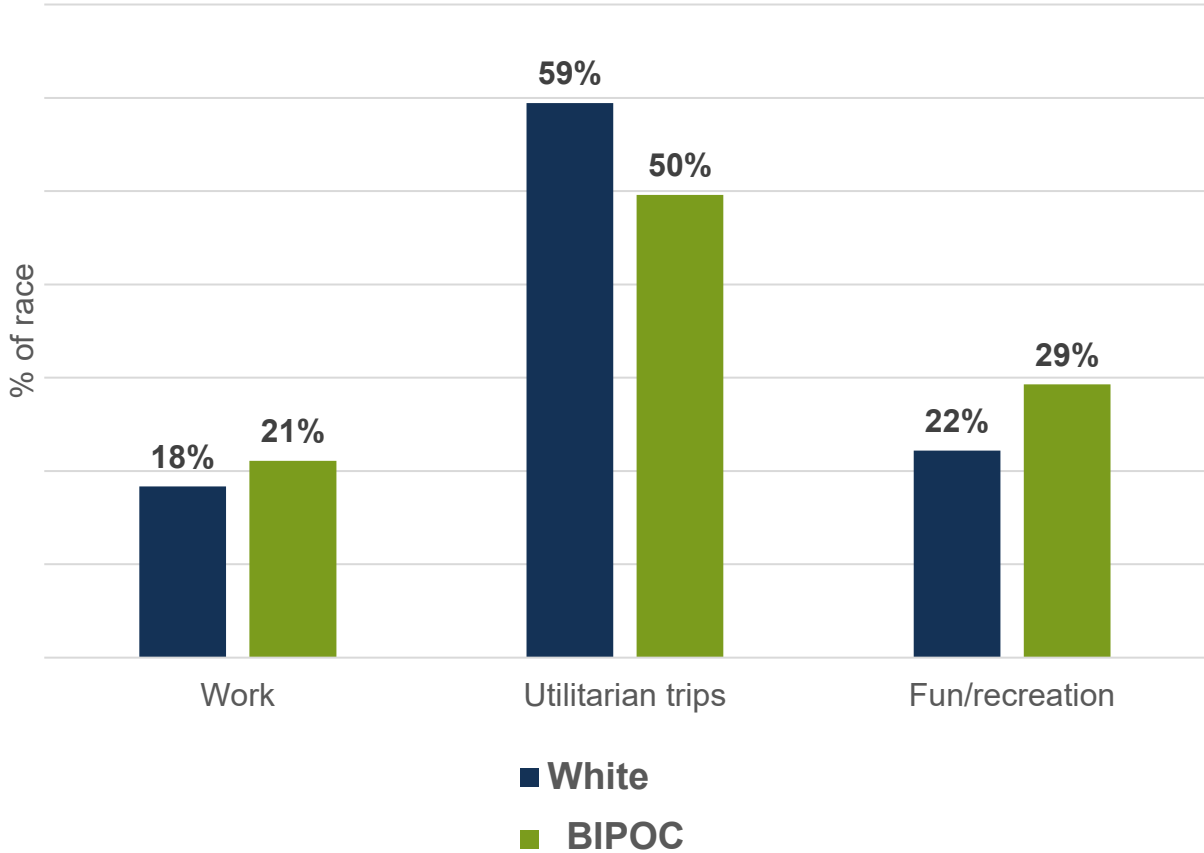


Income

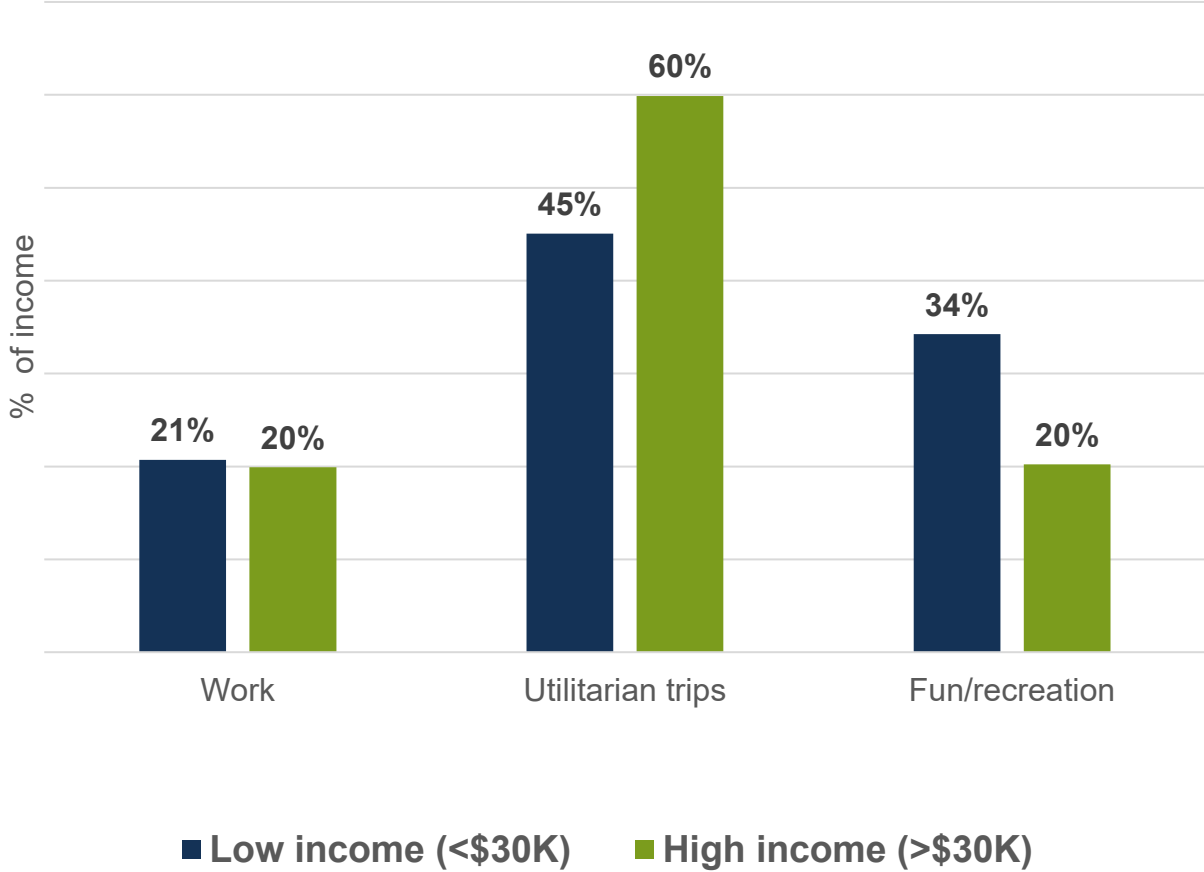


Are there any differences in trip purpose?

Race



Income



Insights from the City of Portland survey

Options to encourage more use of e-scooters

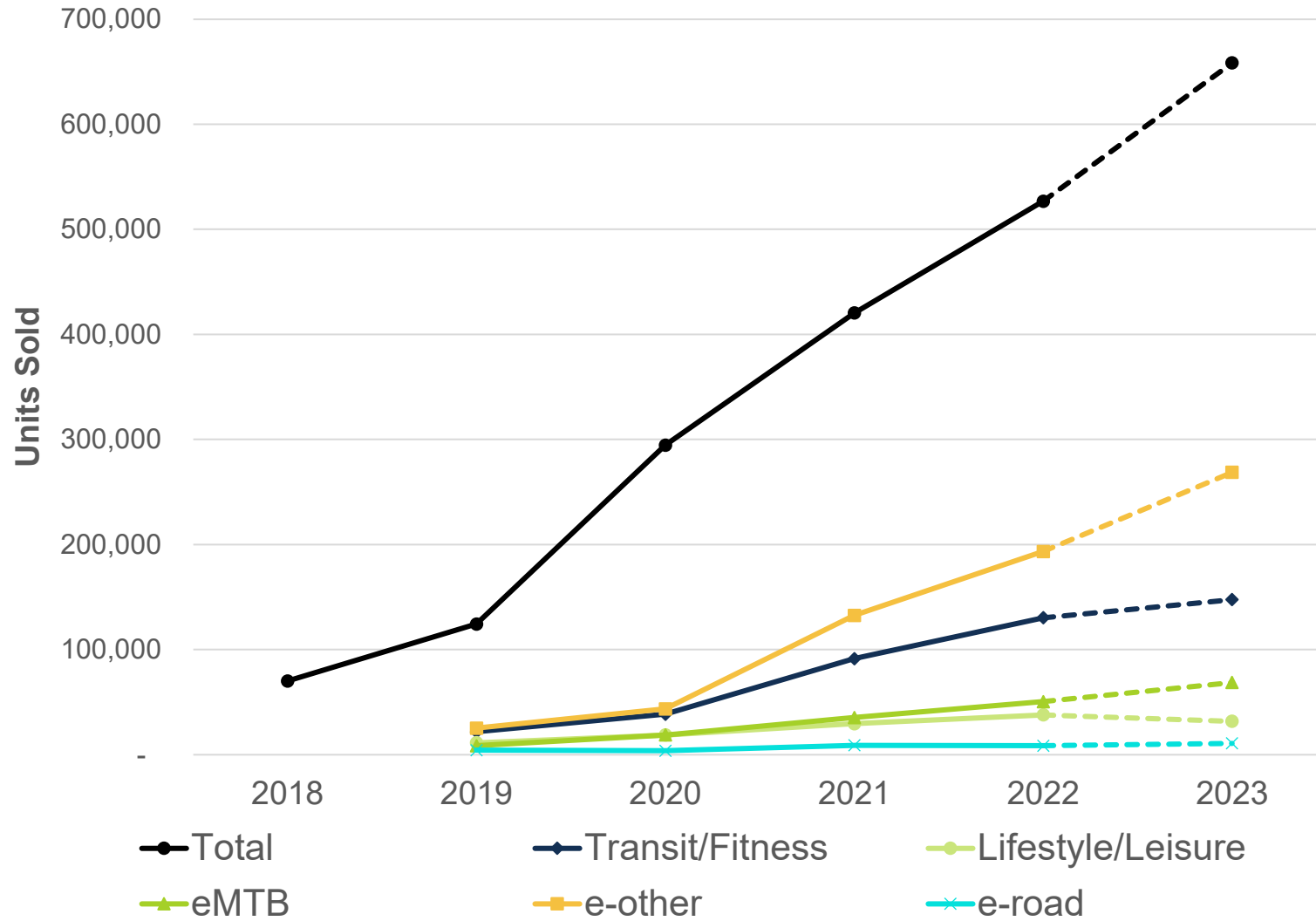
	All	> 55 years	Lower Income	Non-white	Female
Safer places to ride	48%	43%	39%	46%	52%
More scooters available	47%	43%	44%	41%	45%
Lower cost	43%	30%	53%	49%	39%
Longer battery life	23%	30%	29%	27%	24%
More scooters available near transit stops/stations	22%	25%	21%	27%	20%
E-scooters in surrounding cities	18%	5%	18%	23%	17%
Different e-scooter design	13%	17%	13%	12%	13%
None of these changes would encourage me to use e-scooters more often	6%	10%	5%	3%	5%
Easier options for renting without a smartphone	4%	2%	8%	7%	6%
More locations to pay in cash	3%	0%	7%	6%	4%

E-BIKES




Find out more here: <https://trec.pdx.edu/e-bike-research>

U.S. Unit Sales, E-Bikes and E-Bike Sub-Types

NPD Group data, representing 1/3 of the total U.S. market



Evolution of E-bike Regulations

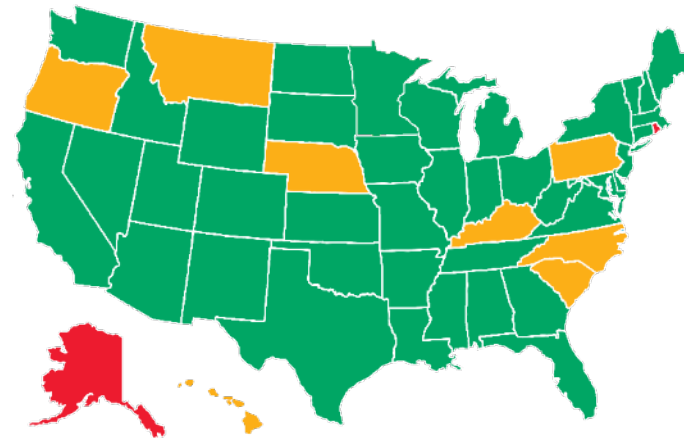
 MODEL LEGISLATION	<ul style="list-style-type: none">» States that have enacted PeopleForBikes' model law, which defines and regulates three classes of electric bicycles within states' motor vehicle codes, gives riders similar rights and duties to that of traditional bicycle riders.
 ACCEPTABLE	<ul style="list-style-type: none">» Regulated as a bicycle» Passengers allowed» No age minimum» No licensing or registration required» Can use existing bike infrastructure
 PROBLEMATIC	<ul style="list-style-type: none">» Regulated as a moped or motor vehicle» Confusing equipment + use requirements» Confusing licensing + registration requirements» Confusing access to bike infrastructure

Class 1: pedal-assist only, ≤ 20 mph

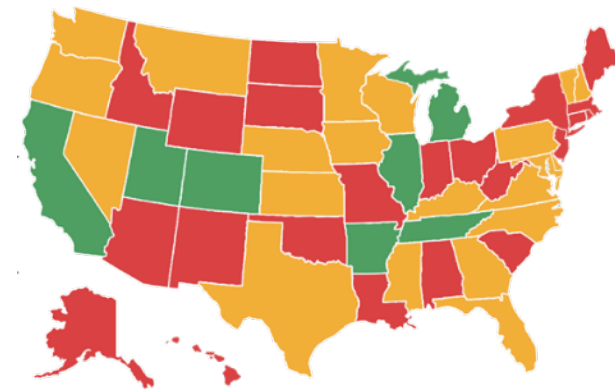
Class 2: with throttle-assisted, ≤ 20 mph

Class 3: pedal-assist only, ≤ 28 mph

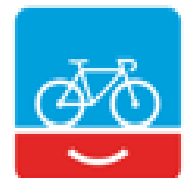
All classes limit the motor's power to 750W



2023



2017



peopleforbikes

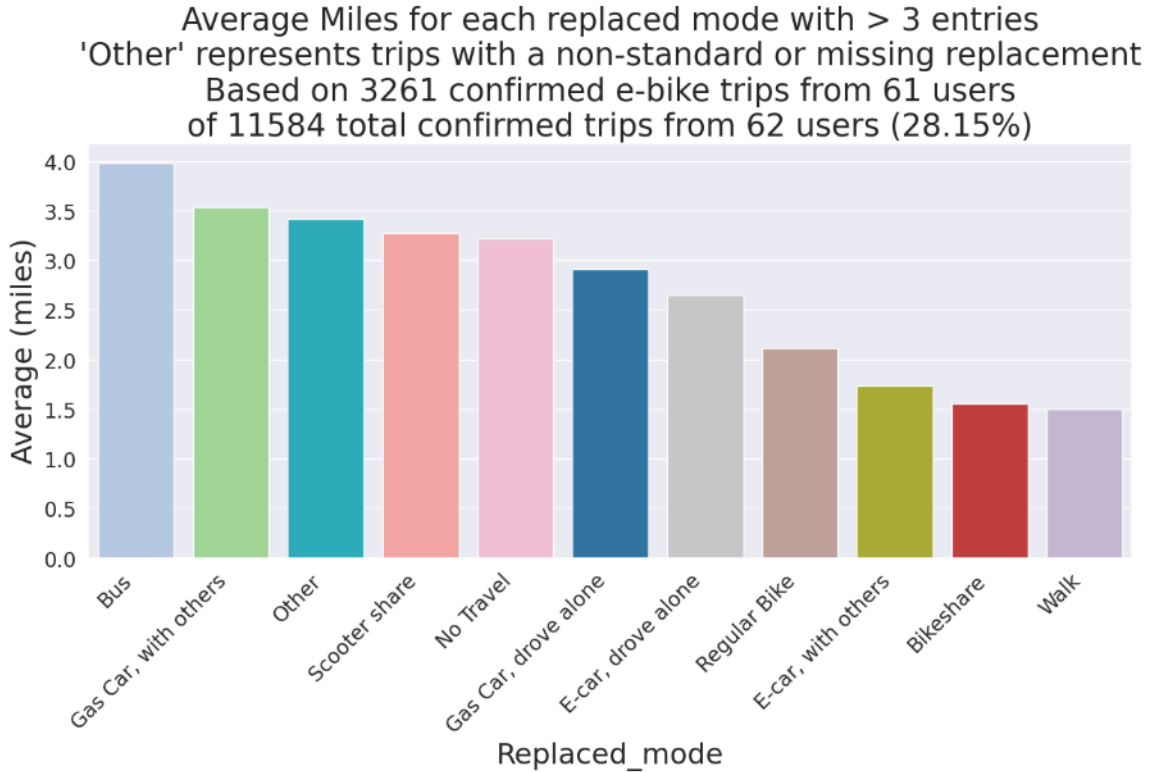
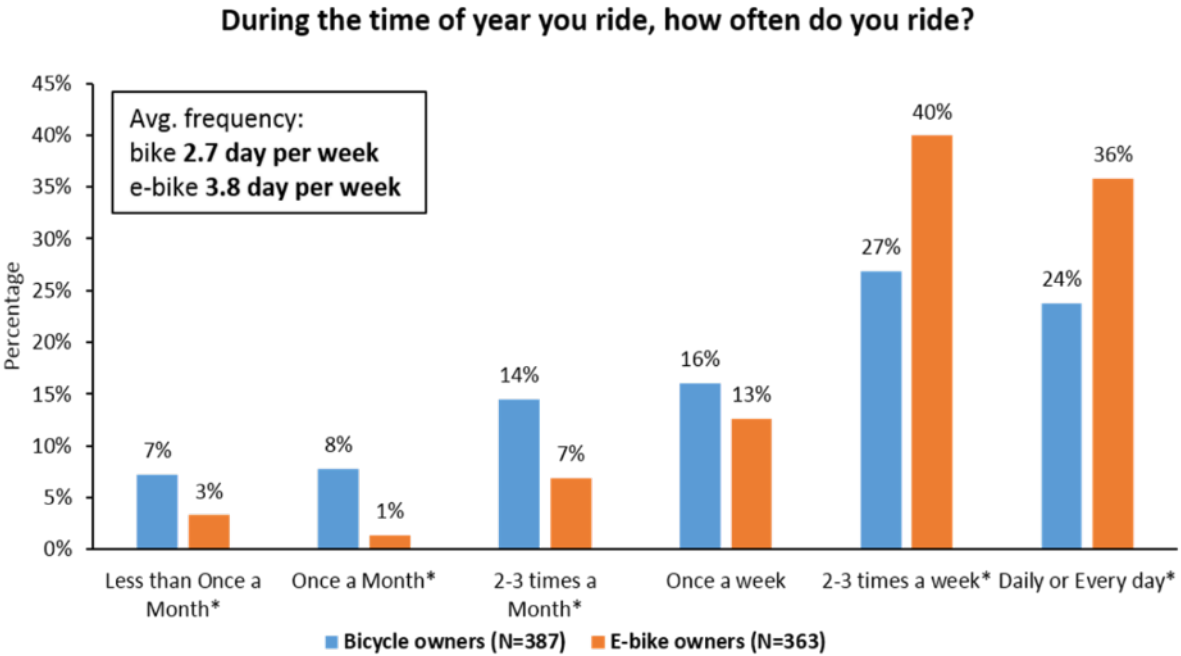
Breaking Barriers to Cycling



E-bikes are getting more people biking and replacing VMT

From nationwide surveys & studies:

- E-bikes diminishes issues related to terrain and distance
- E-bike riders travel farther than bicycle riders
 - For bicycle riders 55% ride daily or weekly; after e-bike purchase, 94% ride daily or weekly.
 - 73% of e-bike riders tend to ride to more diverse destinations.
- E-bikes result in more car-substitution & VMT reduction.

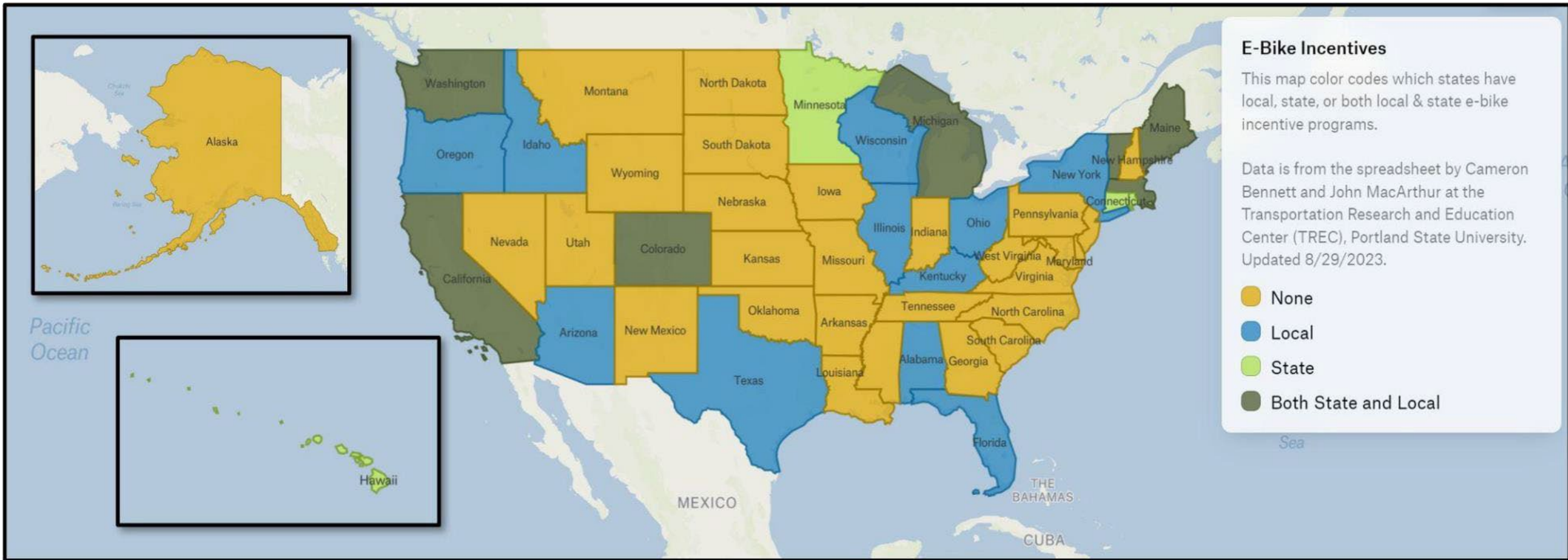


NREL: <https://ccebikes-openpath.nrel.gov/public/>

How Do Get More People Riding and Riding More Often?

- **Increase Awareness**
 - Lending libraries
 - Outreach
 - E-bike share
- **Sell More E-bikes**
 - Incentives
 - More types of e-bikes at different price points
 - Equity-focused programs
- **Create More Safe Places to Ride to More Locations**

E-bike Incentives Programs in the US



“e-Bike Incentives are Booming in the US”, Anthony Cherolis, September 19, 2023, <https://ctnewsjunkie.com>

E-bike Incentive Tracker: <https://trec.pdx.edu/e-bike-research>

States with E-bike Incentive Programs

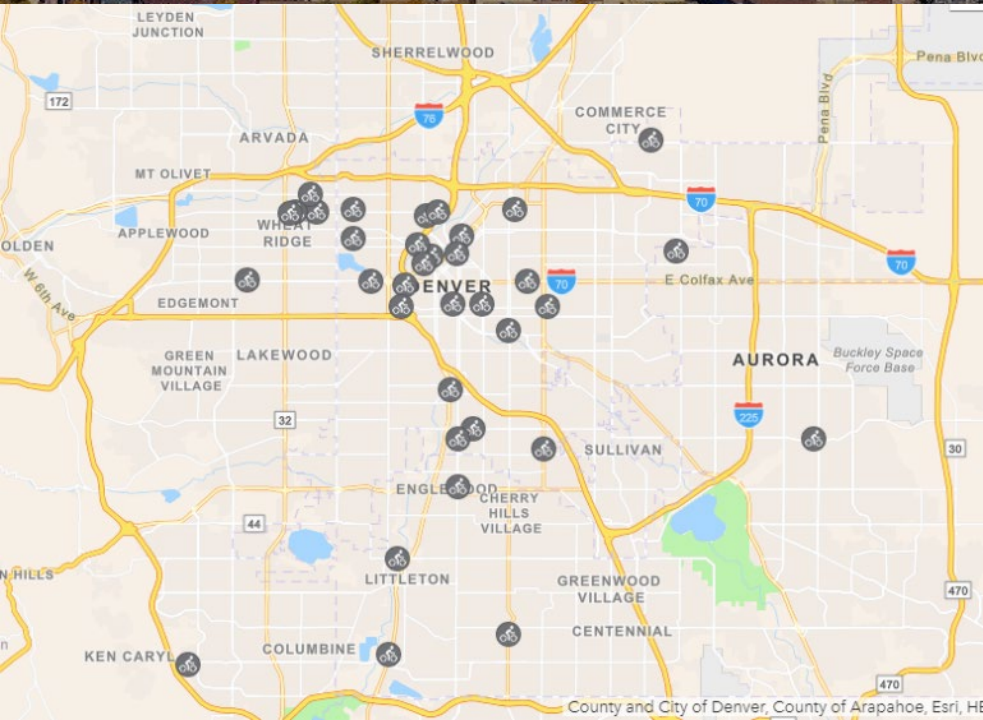
State	Status
California	Active (soft launching)
Colorado	Active
Connecticut	Active
Hawaii	Active
Maine	Approved
Massachusetts	Approved
Minnesota	Approved
Rhode Island	Active
Vermont	Active
Washington	Approved

Corvallis, OR

An aerial photograph of Corvallis, Oregon, showing a wide river with two bridges crossing it. The city is built on a hillside, with a mix of residential and commercial buildings. In the background, there are rolling hills and mountains under a clear blue sky.

- \$1,200 flat value incentive (less \$200 of purchase price)
- Point-of-purchase distribution with application
- Value established using **local price sensitivity survey** conducted by program administrators
- Restricted to those making less than 80% of the median income for the county

Denver, CO



Point-of-sale discount with application

- ~~\$400~~ **\$300** available to the general public
- \$1,200 low-income subsidy
- Additional ~~\$500~~ **\$200** for cargo bikes
- **Adaptive e-bike rebate program: \$1,400**

- Full-suspension mountain bikes or conversion kits are not covered.
- All 30 + participating bike shops have a brick and mortar location
- State of Colorado launched an income-qualified e-bike rebate program. However, one can not use both rebates to purchase the same e-bike
- **6,697 e-bike vouchers have been redeemed in Denver (as of September, 2023)**

E-bike Libraries

What is the purpose of the library program?

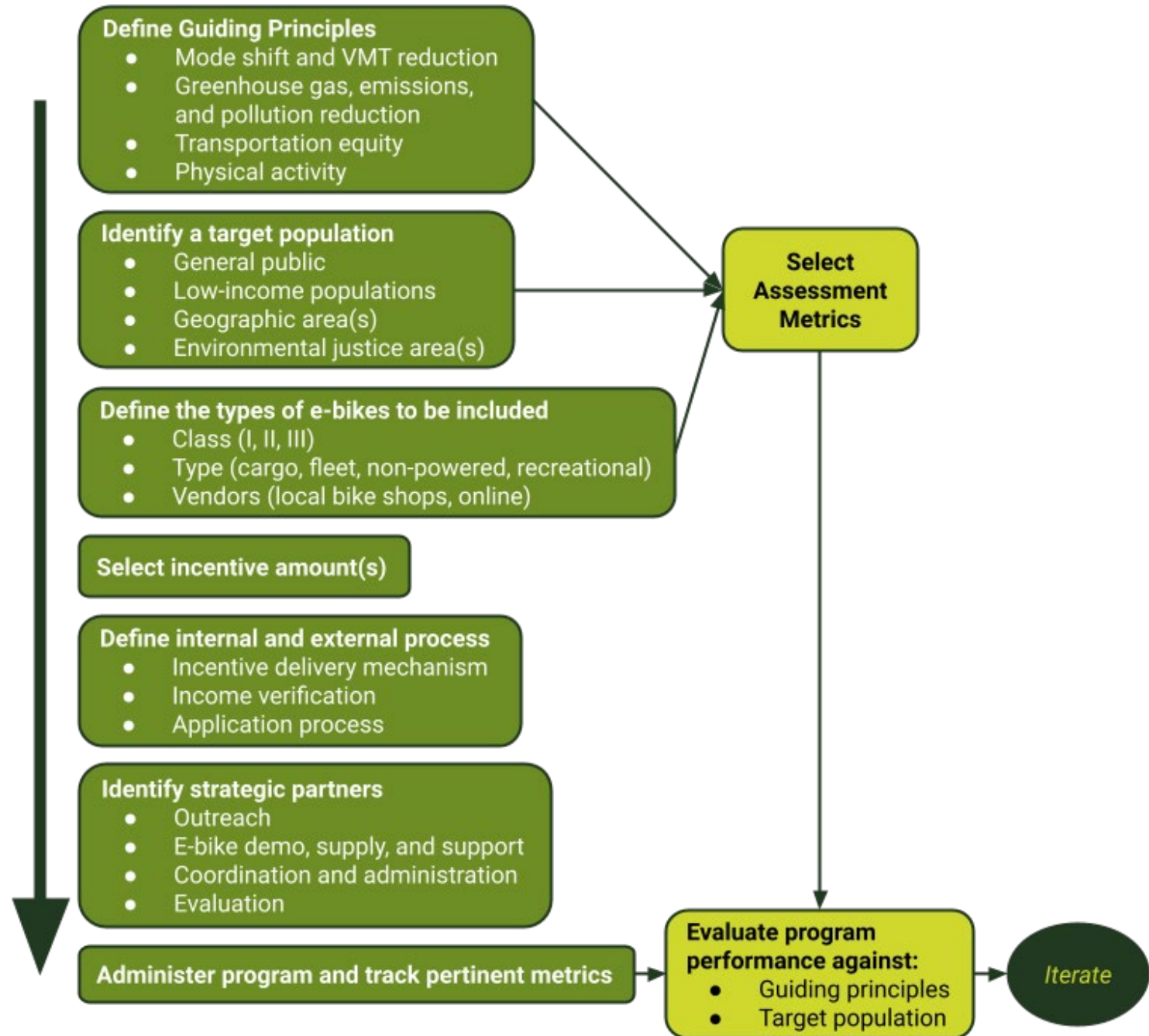
- Ride to Purchase
- Community Resource
 - Open - Anyone
 - Closed – e.g., retirement communities, employees, affordable housing locations, colleges
- Lending programs – short term (weekly – monthly)



Recommended Program Design Framework



Bennett, MacArthur, Cherry and Jones. "Using E-Bike Incentive Programs to Expand the Market – Trends and Best Practices" (2022). https://pms.trec.pdx.edu/media/project_files/E-bike_incentive_White_Paper_5_6_2022.pdf



More Information is Needed

- Evaluation of programs on achieving outcomes
 - Decreased vehicle miles traveled/emissions
 - Enhanced access and mobility for underserved communities
 - Increased physical activity and other health outcomes
 - Decreased traffic congestion
- Understanding the benefits of program, such as CO2 reduction, but also potential benefits include *safety, congestion mitigation, local economic development, and physical and mental health benefits* that may outweigh CO2 benefits but are more difficult to quantify.
- Explore how to streamline administrative process to minimize overhead cost
- Determine the most cost-effective incentive levels to achieve outcomes

ADAPTIVE & INCLUSIVE MOBILITY

MacArthur, J., N. McNeil, A. Cummings, and J. Broach (2020) Adaptive Bike Share: Expanding Bike Share to People with Disabilities and Older Adults. Transportation Research Record (TRR) Vol. 2674(8) 556–565, DOI: 10.1177/0361198120925079

Adaptive Bicycles



Trikes/quadracycles



Tandems



Hand cycles



Electric bikes/scooters

Bike Library Model

- Pick-up location, rental store usually near recreational access
- Specific hours of operations, reservations
- Staff to assist sizing and questions
- Parking or storage for personal equipment
- Various types of equipment available
- Cost per hour/day, discount programs

MoGo



Integrated Model

- Integrated into existing bike share system, same pricing
- Limited model types
- Limited access for some, parking
- Various pricing models
- No storage



Integrated Scooter Models

Lime Able program

- Reservations: Riders can reserve an adaptive vehicle
- Time Period of Use: 24 hour period
- Convenient: free delivery of the vehicle at your location
- Rental Cost: Rentals are free of charge (\$5 refundable deposit returned upon successful retrieval of device)

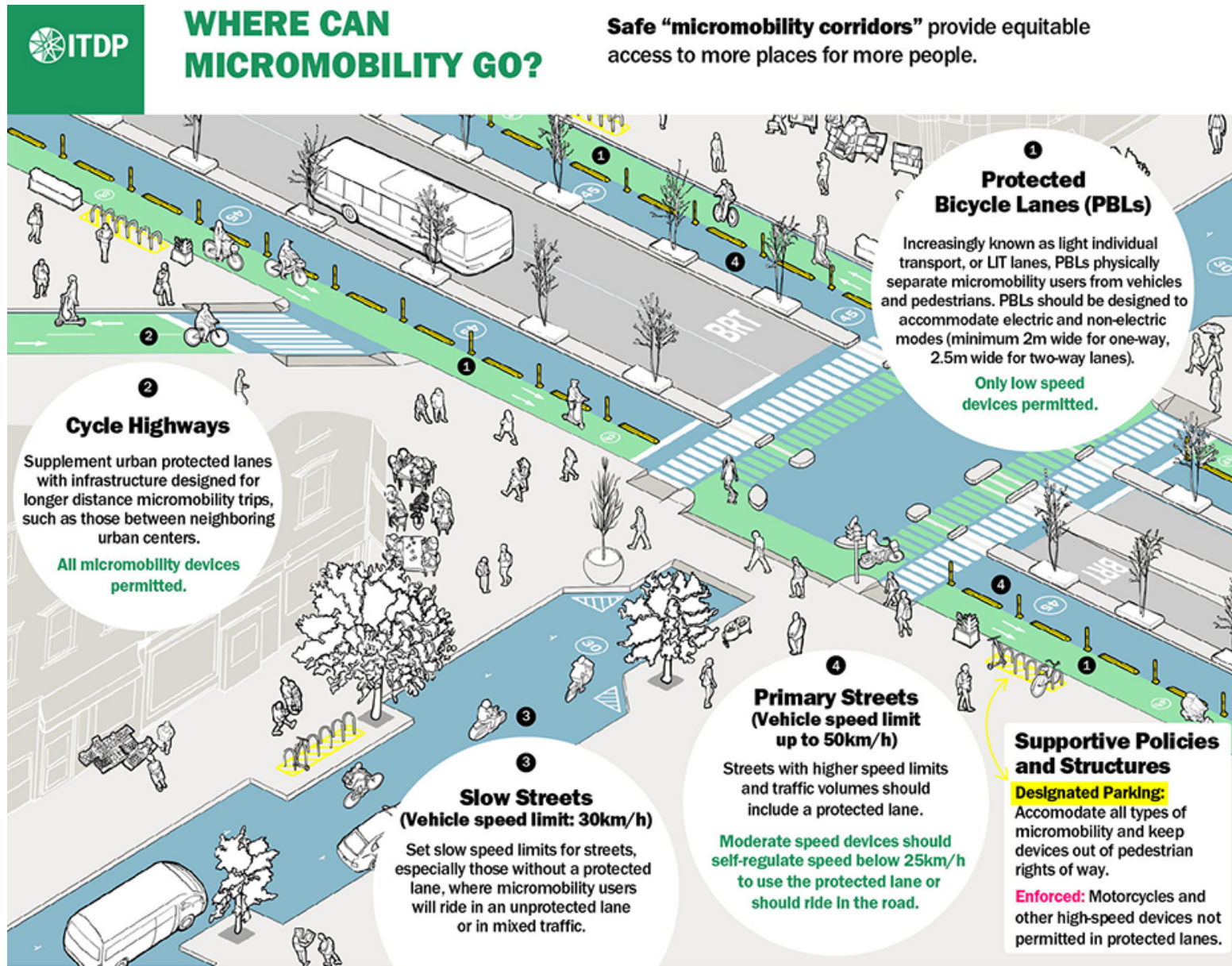


Challenges facing the programs and operators

- Who to serve and how
- Integration
- Cost
- Logistics and density
- Parking and storage
- Personalized assistance/fitting
- Maintenance
- Types of bikes or scooters or other devices/vehicles
- Local regulations on e-bikes and e-scooters

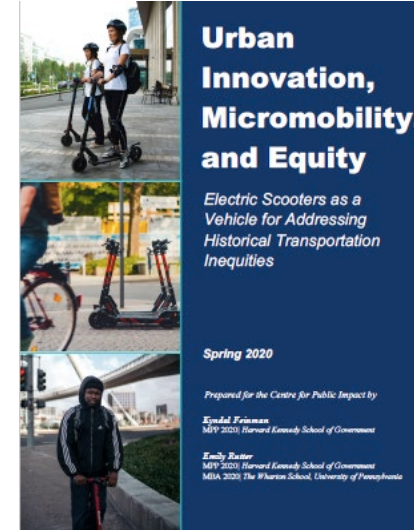
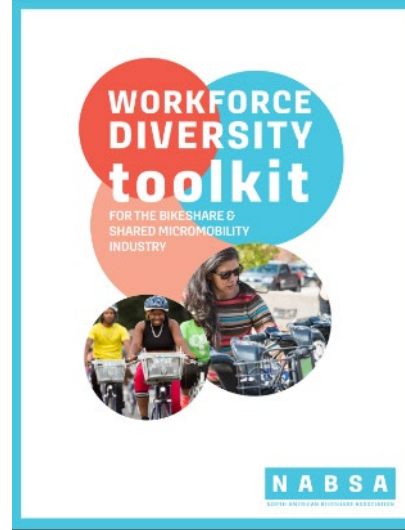
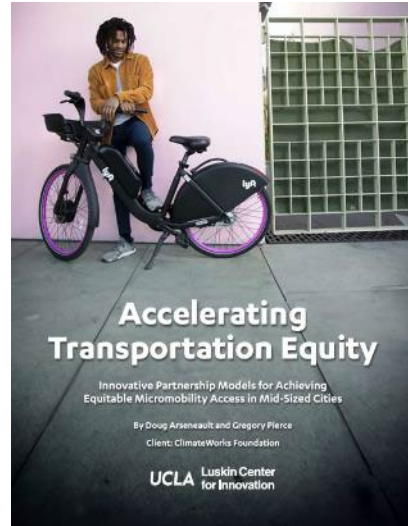
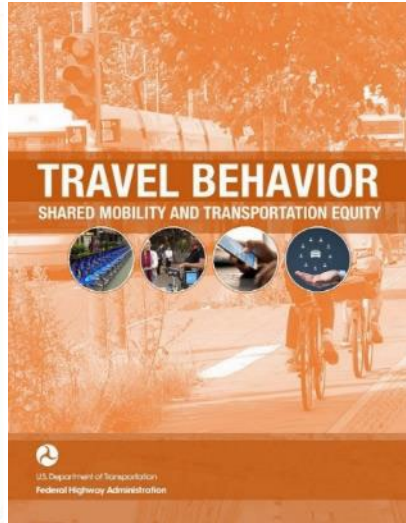
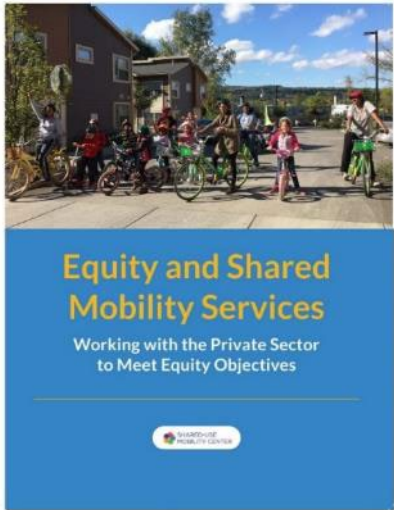


In the end it is really about infrastructure



Source: Institute for Transportation and Development Policy

Resources



Additional citations

- Bennett, C., J. MacArthur, C. Cherry, & L. Jones (2022). Using E-Bike Purchase Incentive Programs to Expand the Market – North American Trends and Recommended Practices. White Paper. Portland, OR: Transportation Research and Education Center (TREC). <https://nitc.trec.pdx.edu/research/project/1507>
- Jones, Bennett, MacArthur and Cherry (2024) Consumer purchase response to e-bike incentives: Results from a nationwide stated preference study. <https://doi.org/10.1016/j.trd.2024.104114>
- Kittelson & Associates & Forth (2022) Electric Micromobility in Oregon A TEINA Supplemental Report January 2023. Oregon Department of Transportation (contributing author) <https://www.oregon.gov/odot/climate/Documents/EMicromobilityTEINAFollowupFinal.pdf>
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- McQueen, M., J. MacArthur & C. Cherry (2020) The E-Bike Potential: Estimating regional e-bike impacts on greenhouse gas emissions. *Transportation Research Part D: Transport and Environment*. Vol. 87, 102482.
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- McNeil, N., J. Dill, J. MacArthur, J. Broach, & S. Howland (2018) *Breaking Barriers to Bike Share: Insights from Bike Share Users*. NITC-RR-884c. Portland, OR: Transportation Research and Education Center (TREC).

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Equity in Bike Share & Micromobility

<https://trec.pdx.edu/research/bikeshare>

