RUTGERS
NEW BRUNSWICK

making Micromobility smarter & safer

State of the Practice in Micromobility: Evolving Norms and Policies

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New Jersey's E-Bike & E-Scooter Law

VEHICLE TYPES	PROPULSION METHOD	POWER SOURCE	MAX ASSISTED SPEED (MPH)	LICENSE & REGISTRATION	HELMET	PARK ON THE SIDEWALK?	TAKE ON TRANSIT?
LOW-SPEED ELECTRIC SCOOTER 	Kickstart and throttle	Electric	19mph	No	Under 17 years old	If not blocking access	Yes*
LOW-SPEED ELECTRIC BICYCLE 	Pedal and optional throttle	Electric (<750W)	20mph	No	Under 17 years old	If not blocking access	Yes*
MOTORIZED BICYCLE 	Pedal and optional throttle	Gas or Electric (<50cc/<1.5BHP)	28mph	Required	Required	No	No

http://njbikeped.org/new-law-legalized-e-bikes-and-e-scooters-in-new-jersey/

** Restrictions may vary by agency. PATH and NJT restrict non-collapsible vehicles during peak travel times. Bus racks have limited availability and may not fit all bikes.*

E-mobility devices make it easier to:

- Save on gas, parking, and rideshare costs.
- Access destinations without needing to walk or drive.
- Reduce carbon emissions.
- Make "first-mile" and "last-mile" connections for bus and train trips.
- Climb hills and keep up with traffic without getting sweaty.
- Help people with limitations due to age, physical fitness levels, or disabilities.

Low-speed e-bikes and e-scooters are regulated like bicycles. Drivers of low-speed e-bikes and e-scooters:

- Must ride in the same direction as traffic and obey all traffic lights, signs, and signals.
- Are advised to wear helmets to minimize potential head injury. Helmets are required in NJ for youth under age 17.
- Must park devices without blocking pedestrian and/or wheelchair access.
- Should not ride on sidewalks. Off-road trails generally do not allow motorized bicycles, but may allow e-bikes and e-scooters. Regulations vary by municipality and county. Check all local ordinances and policies. Ride slowly in areas with pedestrians.

RUTGERS Edward J. Bloustein School of Planning and Public Policy

NEW JERSEY Safe Routes

For more information, visit the NJ Bicycle and Pedestrian Resource Center at njbikeped.org or the NJ Safe Routes Resource Center at saferoutesnj.org. 01.13.22

New Jersey's E-Bike & E-Scooter Law

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njbikeped.org/micromobility

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NJ BICYCLE & PEDESTRIAN RESOURCE CENTER

Educate. Encourage. Empower.

www.njbikeped.org

NEW JERSEY
Safe Routes to School

www.saferoutesnj.org

Contact:

NJ Bicycle & Pedestrian Resource Center
njbikeped.org
Telephone: (848) 932-3714
Email: bikeped@ejb.rutgers.edu

Contact:

NJ Safe Routes Resource Center
saferoutesnj.org
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Email: srts@ejb.rutgers.edu

RUTGERS–NEW BRUNSWICK
Edward J. Bloustein School of Planning and Public Policy
Alan M. Voorhees Transportation Center

Delivering micromobility safety

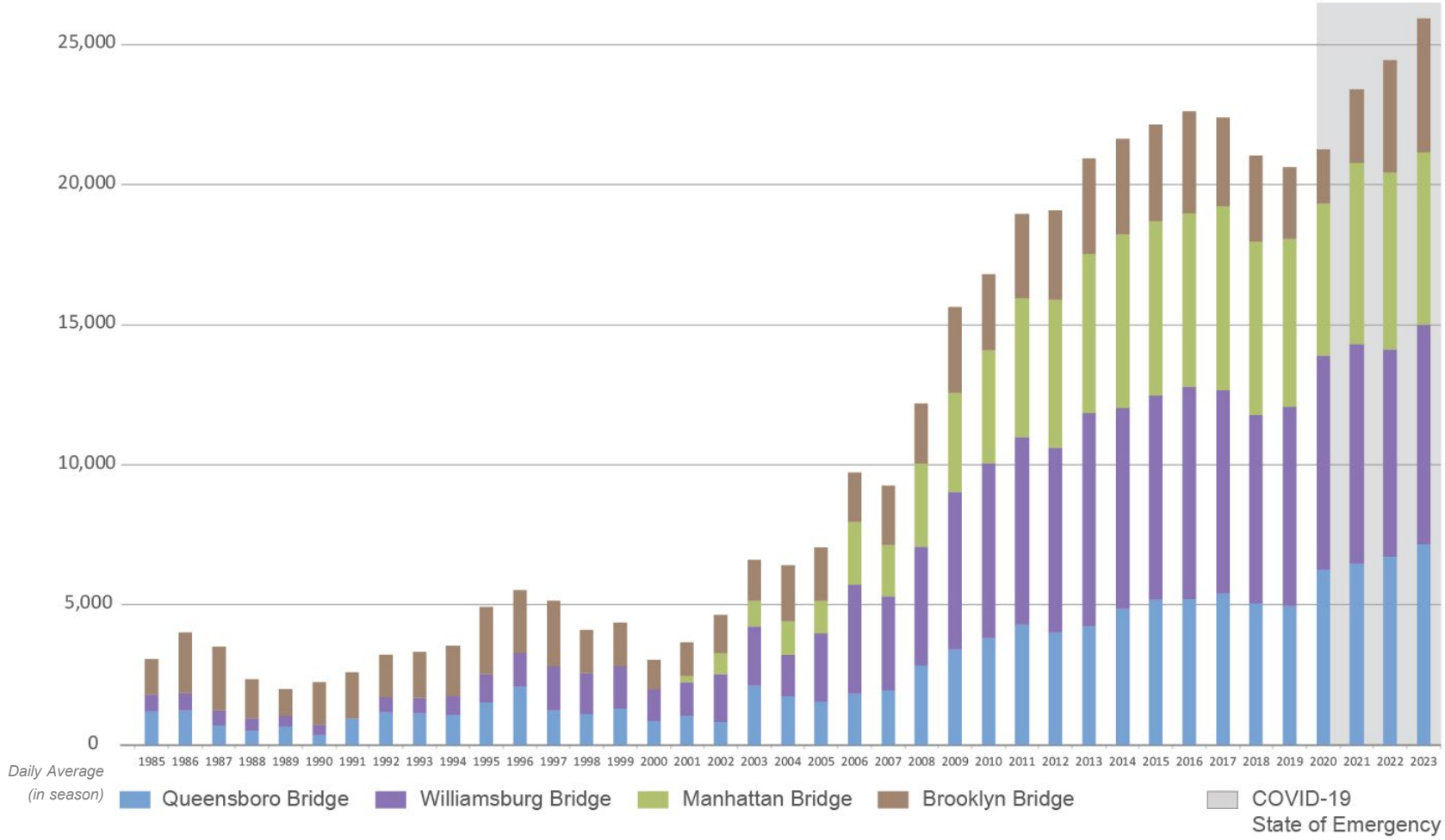
Irene Figueroa Ortiz, Policy Advisor

March 2024

NEW YORK CITY DOT

Two-wheelers are more popular than ever

East River Bridge Bike Counters (1985-2023)



Food delivery workers in NYC

- Over 60k people working part- or full-time as food delivery workers in NYC[1]
- E-bikes are a popular mode of travel, particularly in Manhattan
- Highest mileage micromobility users
- Most/Many restaurants rely on third-party delivery apps
- Workers dispatched by 3rd party delivery apps are independent contractors responsible for their own equipment

[1] Data from DCWP's Minimum Wage Study

NYCHA

Two Dead in NYCHA Housing Blaze Ignited by Exploding E-bike Battery, Officials Say

BICYCLES

Where and Why E-Bikes Catch Fire in NYC — And What Can Be Done About It

Most of the battery-related fires take place in working-class residential neighborhoods in Queens, Brooklyn and The Bronx.

E-bike batteries have caused 200 fires in New York: 'Everyone's scared'

Buildings are banning e-bikes amid deadly battery fires

NEWS

Cyclists say e-bikes, scooters are making NYC bridges more dangerous, with 'laughable' enforcement

New York's E-Bikes Keep Catching Fire, and It's Getting Worse

MANHATTAN BRIDGE

Horrific Crash on Manhattan Bridge Bike Path Underscores Moped Crisis

Illegal and legal mopeds are forbidden yet are increasingly common on the span as delivery workers shift to faster vehicles to make their meager living.

9:28 AM EDT on July 27, 2023

Dodging mopeds on the Brooklyn Bridge

James Groenier, 22: I was on the Manhattan approach to the Brooklyn Bridge, and there was a moped driver that very aggressively went around me. On the bridge, that driver took the yellow dividing line as if it was their own lane. Tons of cyclists had to dodge and weave because that moped driver was taking up both lanes. That same day, there was another moped that approached and I had to get off my bike and stand next to the concrete barrier because they were not giving me space and probably going about 30 miles an hour. There's usually a cop that sits on the Manhattan approach. I stopped and asked the officer, "Hey, that moped almost caused a dozen cyclists to get hit. He was not supposed to be on the bridge. What are you guys doing to stop this?: He said, "As long as they can fit past the bollards, they're allowed on the bridge." That is false and not the law, but I wasn't gonna argue.

'We're Fighting Over Inches' New York cyclists on their near misses and crashes on the city's bridges.

As told to John Surico

DELIVERY WORKERS

Deliveristas Turning to Gas-Fueled Mopeds: 'I Don't Have a Place to Charge the E-Bike'

Workers say that longer delivery distances are also prompting the switch.

MICROMOBILITY

The Moped Crisis — An Analysis: The City Needs a Systemic Fix, Justice for Workers and Accountability by Tech Giants

Mayhem — and, more accurately, the perception of mayhem — on the streets of the city is provoking a new backlash against delivery workers. But are poor workers really the ones to blame?

12:00 AM EDT on August 23, 2023

METRO

Why pedestrians should take caution on moped-heavy Queensboro Bridge

By Ben Kesslen

Published Jan. 16, 2022 | Updated Jan. 16, 2022, 3:03 p.m. ET

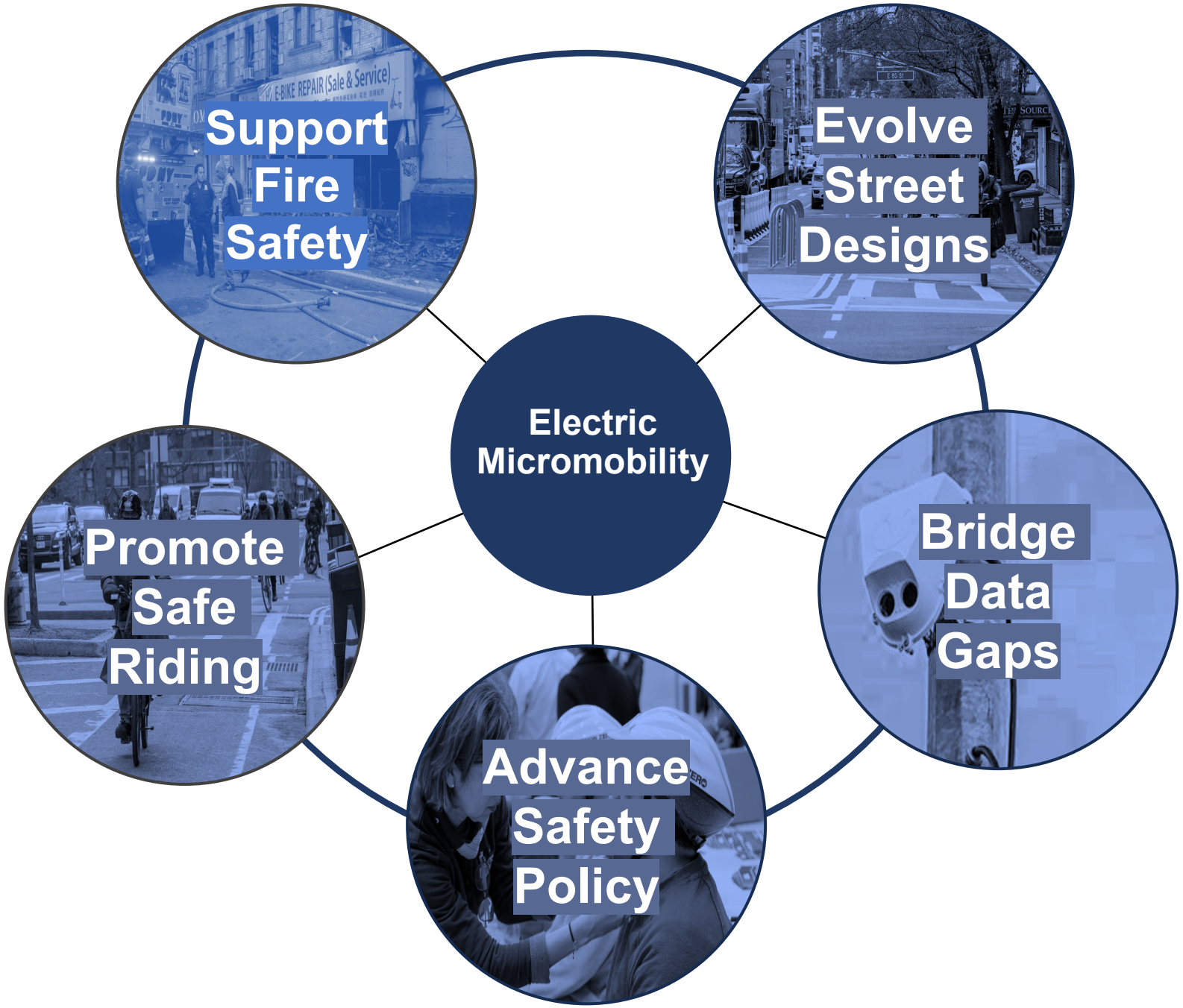
E-Micromobility Action Plan

- Released in March 2023 by Mayor Adams
- Citywide action plan, over 15 City entities involved in its development

Goals

- Promote the safe use of electric micro mobility
- Address fire and street safety issues resulting from the growing use of these electric devices

NYC DOT's Comprehensive Policy Approach



Key e-micromobility issues

Street Space Allocation

- Increased speed & mass disparities between vehicles
- Over capacity bike lanes

Fire safety

- Demand for micromobility electrification & EV charging
- Popularity of substandard mobility equipment

Data Gaps

- Limited data hinders DOT's ability to quantify travel patterns & crash risks

User Behavior

- Knowledge gaps on rules of the road for different vehicles
- Growing adoption of illegal devices
- Lack of registration & insurance (mopeds)

Key e-micromobility initiatives

Evolve Street Designs

- Pilot-test **street designs** to safely accommodate bikes, e-bikes, and standing e-scooters in bike lanes

Promote Fire Safety

- Pilot public **e-bike charging** solutions
- Establish an e-bike **trade-in program** to remove substandard equipment

Bridge Data Gaps

- Establish a network across the city of **computer vision sensors**
- Undertake **data collection & analysis** to bridge gaps in information
- Process **historical data**

Advance Safety Policy

- Promote **training** and **educational material** on safer operation of e-micromobility
- Advocate for requiring **moped registration** at point of sale
- Engage **3rd-party delivery apps** and **other stakeholders** in promoting public and worker safety

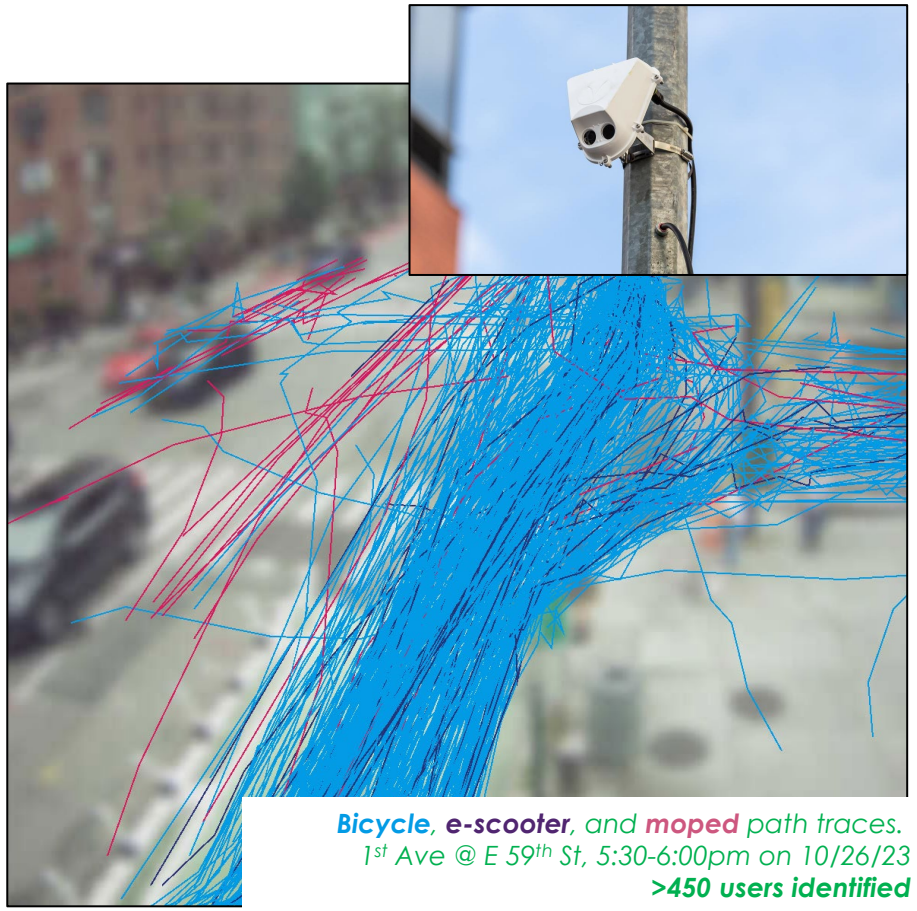
Monitoring Micromobility Use Patterns

Testing new technology to automatically detect and count cyclists, e-scooters & mopeds

- Piloting the use of Computer Vision Sensors to develop a continuous data stream while addressing privacy concerns
- Data will be used to understand patterns over time, measure changes in use, identify safety needs, & build a micromobility volume estimation model

Point of contacts: Carl Sundstrom (csundstrom@dot.nyc.gov) & other data efforts: Rob Viola (rviola@dot.nyc.gov)

Sensor on Flushing Ave (BK)



***Bicycle**, **e-scooter**, and **moped** path traces.*
1st Ave @ E 59th St, 5:30-6:00pm on 10/26/23
>450 users identified

Micromobility Lanes

Pilot-testing street designs to safely accommodate bikes, e-bikes, and standing e-scooters in bike lanes

Key design elements:

- 9-10 ft. wide lanes
- Delivery Worker layover spaces
- Passing zones (where not able to accommodate a continuous wider lane)

Point of contact: Carl Sundstrom (csundstrom@dot.nyc.gov)

Bike lane overcrowding (1st and 2nd Aves, MN)

New 10 ft wide PBL *(9th Ave, MN)*

E-bike Battery Charging Pilot

DOT Studio testing public battery charging options with delivery workers

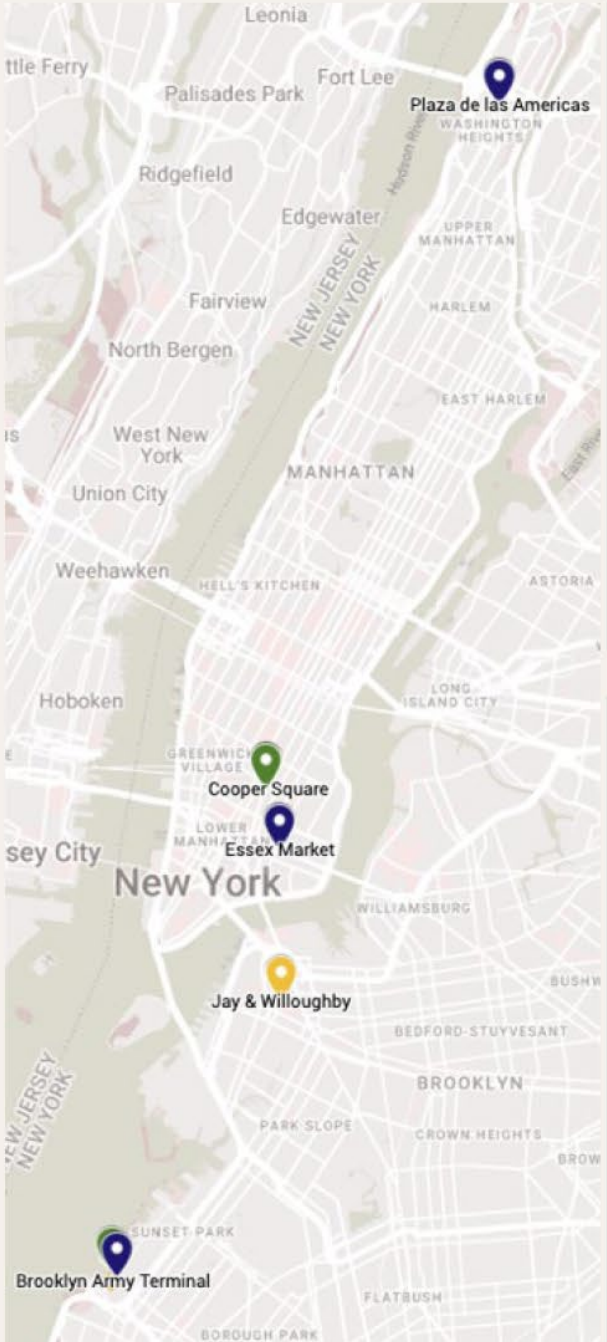
- 6-month pilot program
- Collaboration with Newlab, EDC, & FDNY
- Up to 100 delivery workers to receive free-of cost charging services
- 5 pilot locations in Manhattan & Brooklyn
- Program will help inform long-term investment and policy in e-bike charging infrastructure, including Parks Dept and NYCHA e-bike charging projects

Point of contact: Irene Figueroa-Ortiz (ifigueroaortiz@dot.nyc.gov)

Three charging technologies to be tested

BATTERY-SWAPPING CABINETS

DIRECT VEHICLE CHARGING

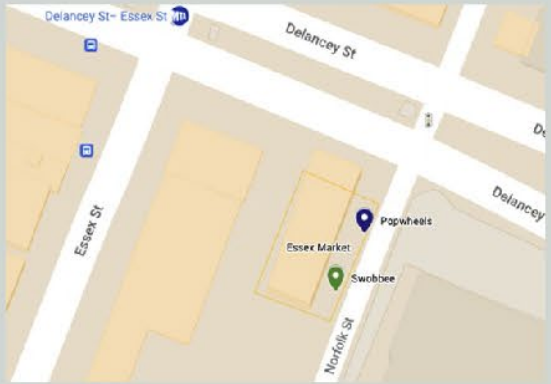


COOPER SQUARE, MANHATTAN

Swobbee
Popwheels
Swiftmile

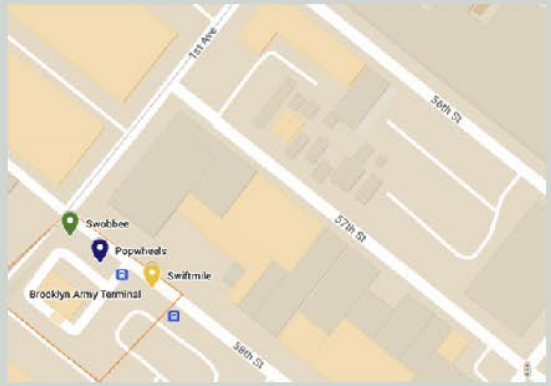
ESSEX MARKET, MANHATTAN

Swobbee
Popwheels



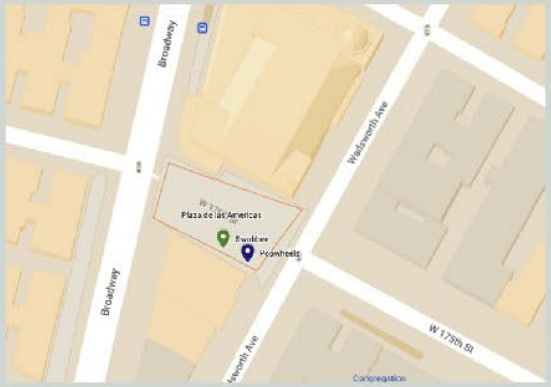
BROOKLYN ARMY TERMINAL, BROOKLYN

Swobbee
Popwheels
Swiftmile



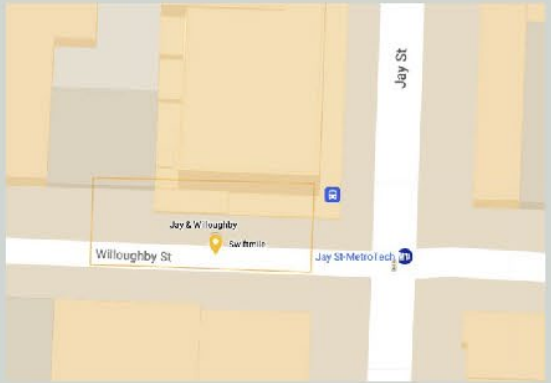
PLAZA DE LAS AMERICAS, MANHATTAN

Swobbee
Popwheels



JAY STREET AND WILLOUGHBY, BROOKLYN

Swiftmile



Swobbee
Popwheels
Swiftmile

VISION ZERO
Building a Safer City

Newlab

NYC
Eric Adams
Mayor

NEW YORK CITY DOT
Ydanis Rodriguez
Commissioner

DOT STUDIO

E-bike Battery Charging Pilot

Research and development program

- Conduct qualitative research to document user experience
- Analyze system- and station-level data
- Prepare a report outlining lessons learned

Point of contact: Irene Figueroa-Ortiz (ifigueroaortiz@dot.nyc.gov)

Thank You!

Irene Figueroa-Ortiz (ifigueroaortiz@dot.nyc.gov)
Policy Advisor, Office of the Commissioner
NYC Department of Transportation

VISION ZERO
nyc.gov/visionzero

NEW YORK CITY DOT

NYCDOT | nyc_dot | nyc_dot | NYCDOT

Bicycle, Scooter, Pedestrian Access to NJ TRANSIT Survey Results

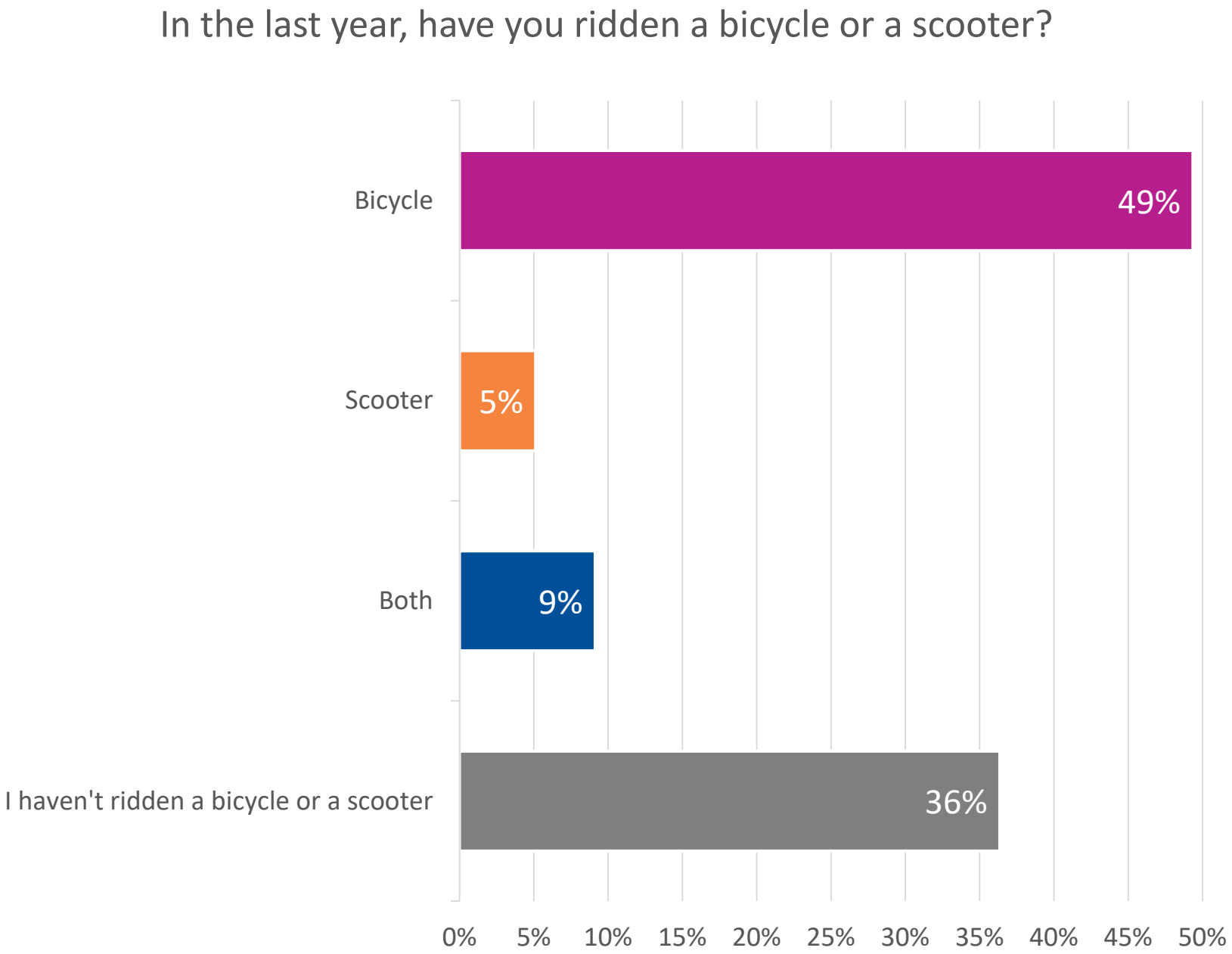
About the Survey

15,503 valid survey responses received.

First ever Bicycle, Scooter, Pedestrian Access to NJ TRANSIT survey.

The survey was open from April 17, 2023 – May 22, 2023, and was intended to create synergy with NJT's Earth Week promotions and national "Bike to Work Week".

Outreach was conducted via email, in-person tabling events, QR code flyers were hung at over 35 NJT facilities and on 475 bicycles and 30 scooters.



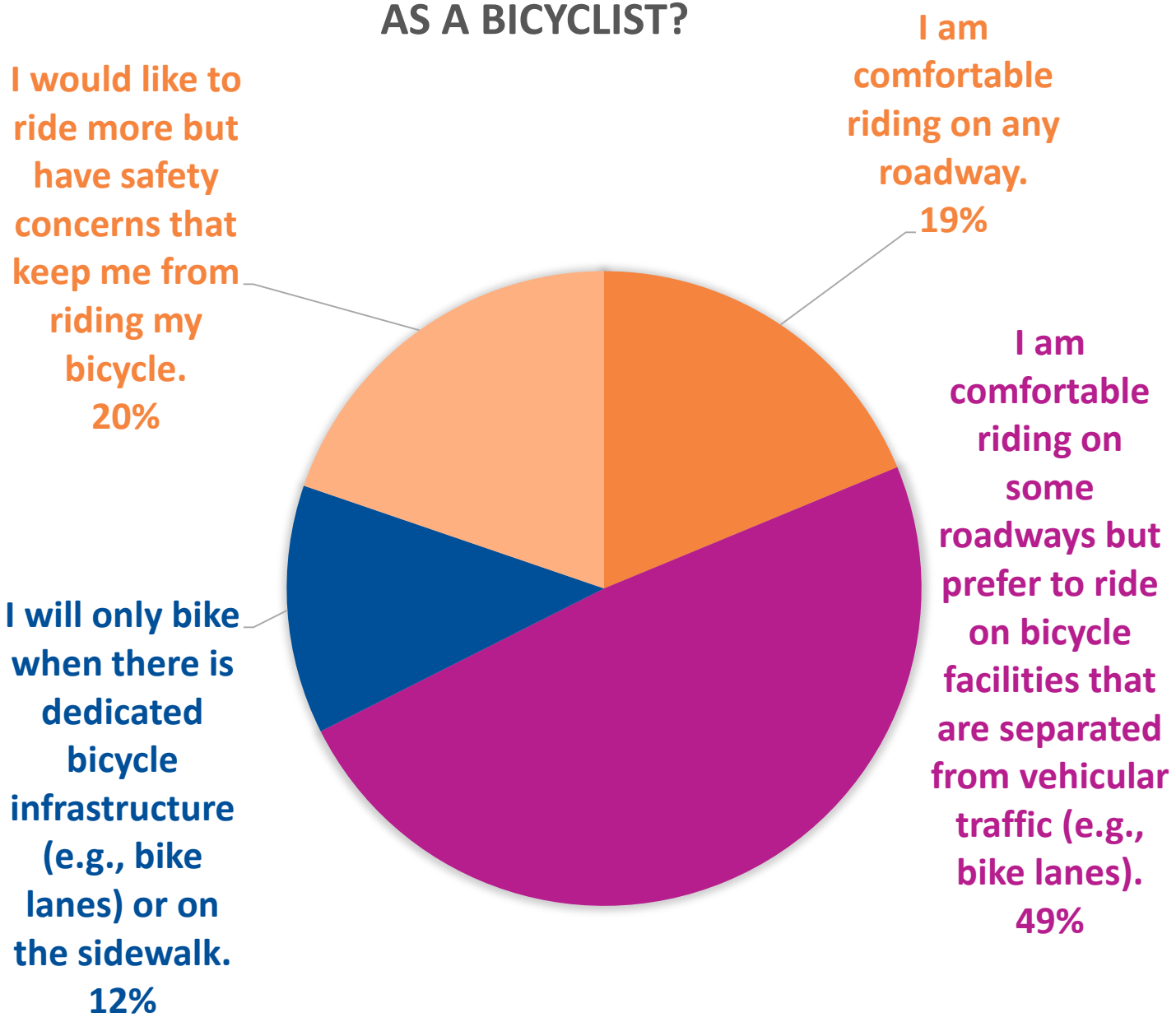
In the past year, have you ridden a bicycle or a scooter?

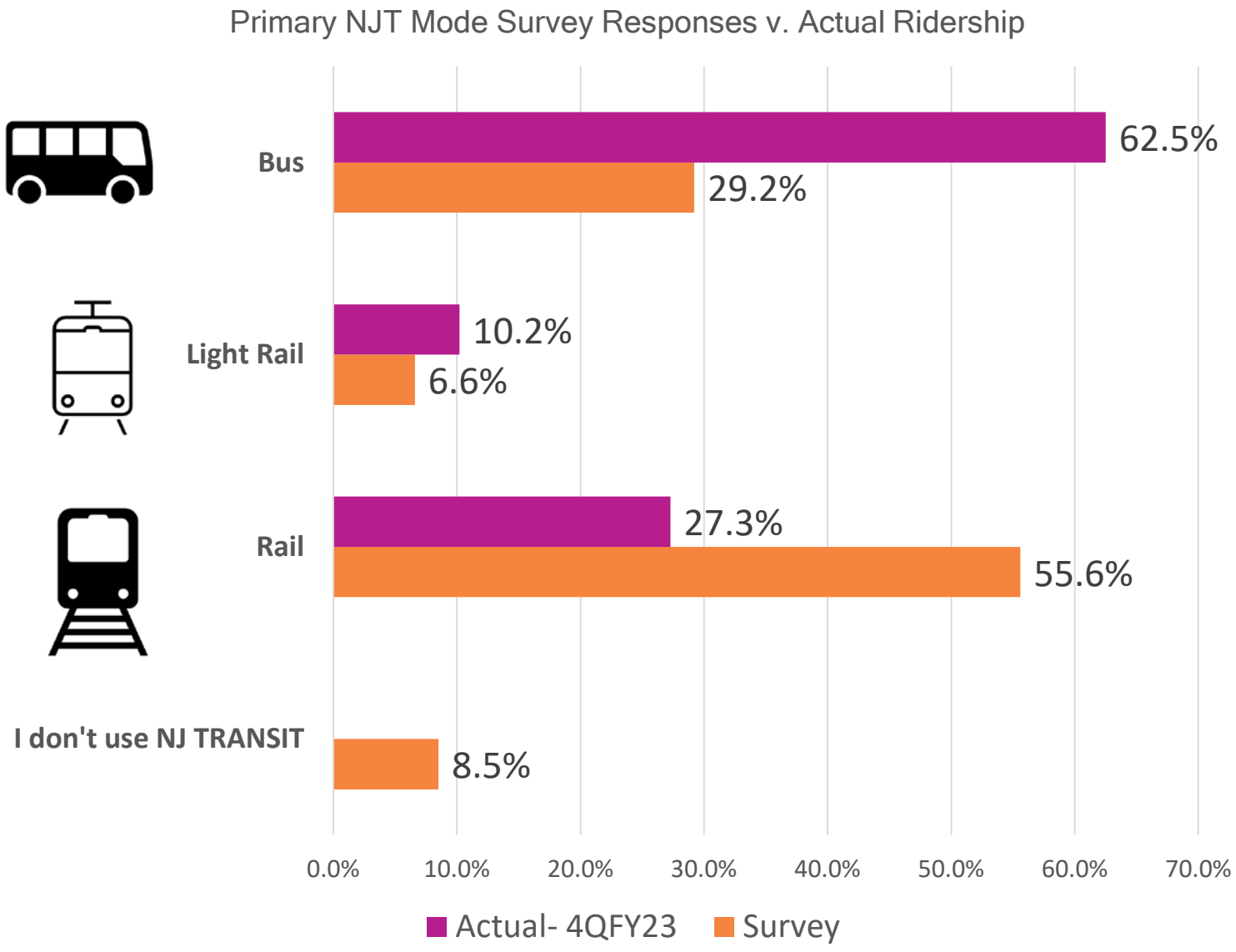
- Almost 60% of respondents have ridden a bicycle in the past year
- 14% of respondents have ridden a scooter in the past year
- 36% of respondents had not ridden either micromobility device.

Comfort is key…

- Only 4-7% of cyclists nationally report being comfortable riding with traffic (rated ‘highly confident’).
- 5-9% of cyclists prefer separated facilities but will ride on bicycle lanes or shoulders (rated ‘somewhat confident’).
- Between 51 – 56% of cyclists will only bike if there are off-street or separated bicycle facilities, or will opt to bike on the sidewalk (rated ‘interested but concerned’)

WHICH OF THE FOLLOWING BEST DESCRIBES YOU AS A BICYCLIST?

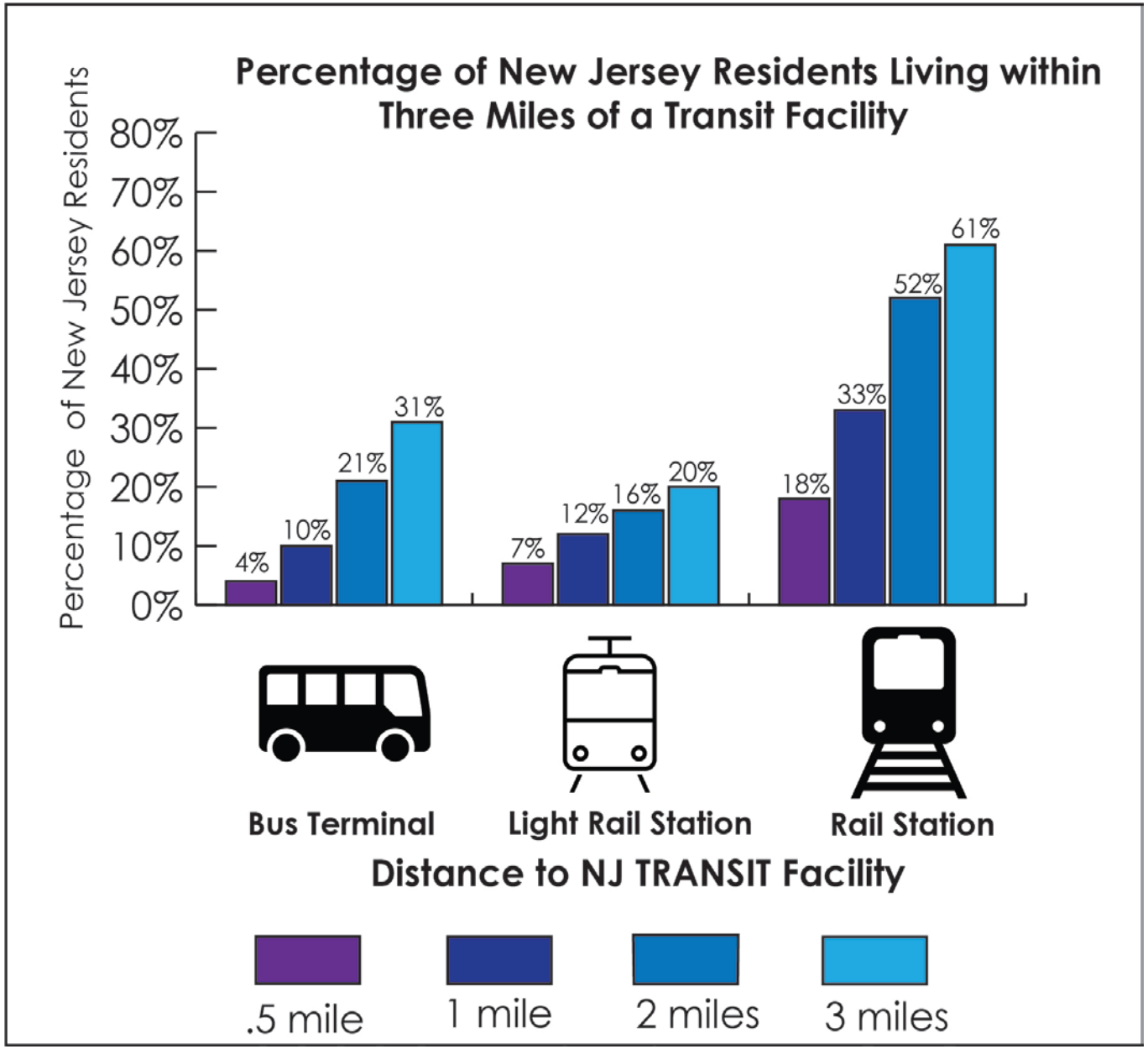




Which NJ TRANSIT service do you primarily use?

- Survey shows almost an inversion between actual rail and bus ridership.
- However, across sociodemographic metrics the survey was representative of New Jersey residents.

~NJ TRANSIT Quarterly Ridership Trends, Fourth Quarter, Fiscal Year 2023, October 2023

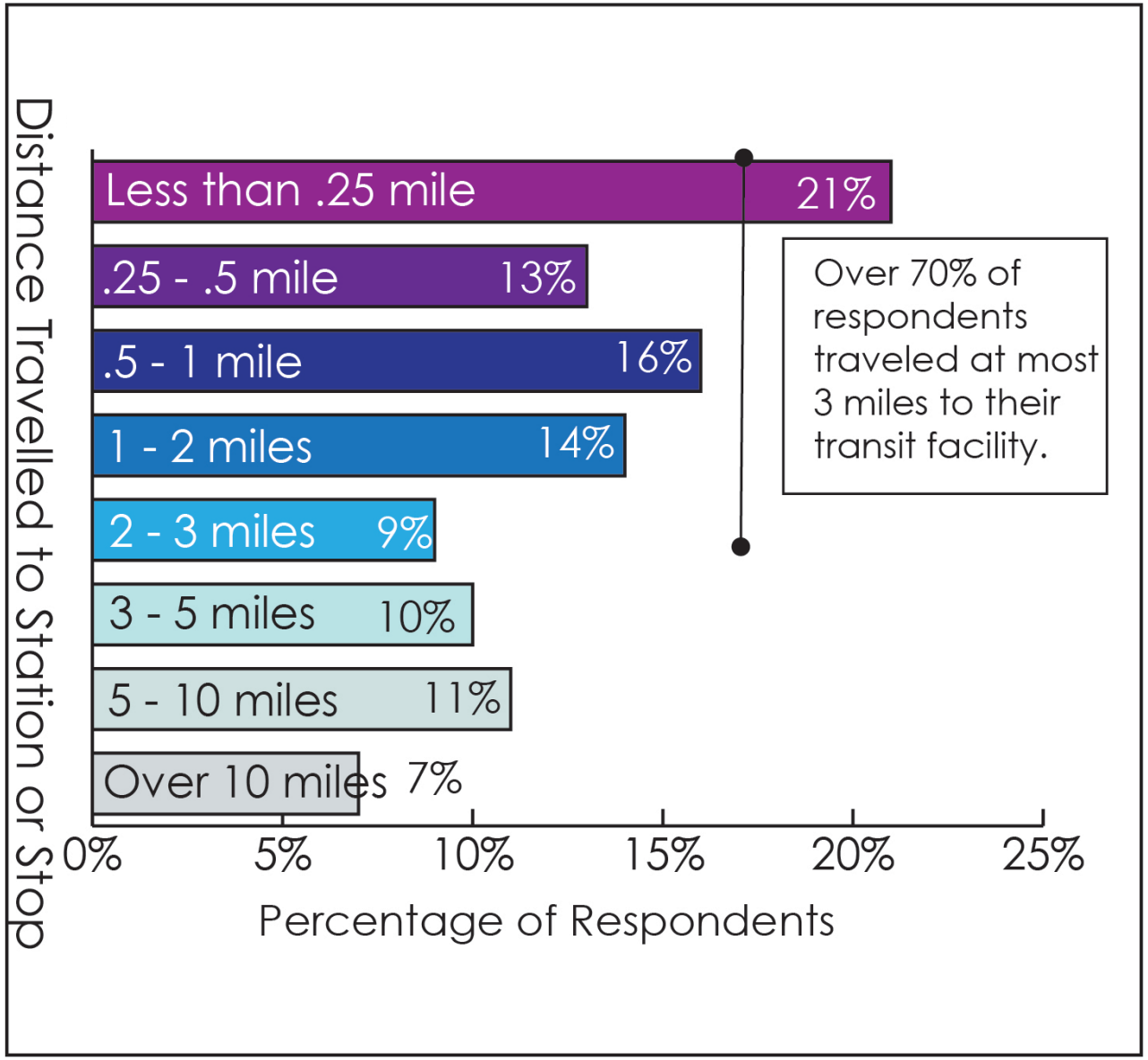


Percentage of New Jersey Residents Livin within Three Miles of a Transit Facility

- ½ mile
  - 4 % Bus Terminal, 7% Light Rail Station, 18% Rail Station (includes other heavy and commuter rail lines)
- 1 Mile
  - 10% Bus Terminal, 12% Light Rail Station,33% Rail Station
- 3 Miles
  - 31% Bus Terminal, 20% Light Rail Station, 61% Rail Station

Sources: US Census Five-Year Estimates (2017-2021), NJT OGIS

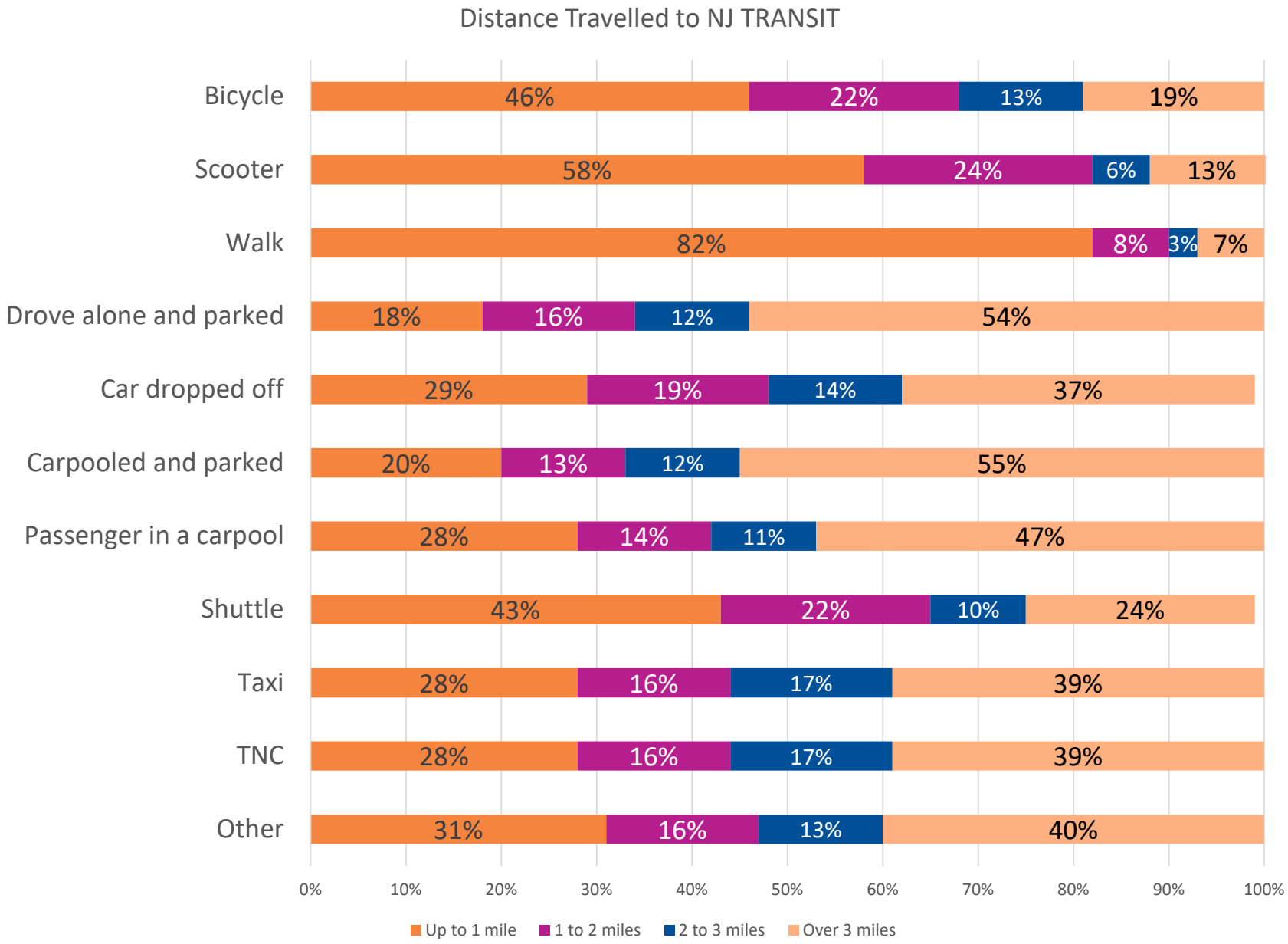
(Going the) Distance to Transit Station or Stop



- 50% of respondents live within 1 mile of their transit stop or station, which equates to a 5-minute bicycle or e-scooter trip or a 20-minute walk.
- 73% of respondents live within 3 miles of their station or stop, which equates to an hour-long walk or a 20-minute bike or e-scooter ride.

Access Mode Distance Traveled to NJ TRANSIT

- Up to one mile travelled:
  - 82% of walk trips
  - 58% of scooter trips
  - 46% of bicycle trips



Access Mode by Primary NJT Service

- Selection bias
  - Bicycle and scooter customers were **overrepresented** in the BSP survey as compared to the CSS responses
  - Walk customers were **underrepresented** in the BSP Survey data.
  - Variances between the two surveys' All Modes category is due to the underrepresentation of bus respondents in the BSP.

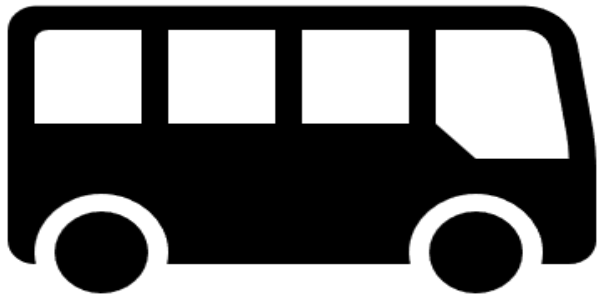
BSP Access Mode	Bus	Light Rail	Rail	All Modes
Bicycle	6.9%	11.9%	11.3%	9.9%
Scooter	2.9%	3.4%	2.3%	2.6%
Walk	64.7%	49.1%	25.0%	39.4%
All Automotive Modes	25.5%	35.6%	61.4%	48.1%

Customer Satisfaction Survey (CSS) Spring 2023	Bus	Light Rail	Rail	All Modes
Bicycle*	0.8%	1.2%	1.4%	1.0%
Scooter**	0.3%	1.0%	0.4%	0.4%
Walk	79.7%	67.0%	23.8%	64.4%
All Automotive Modes	19.2%	30.8%	74.4%	34.2%

*Bicycle and Bicycle Share were combined
**Scooter and Scooter Share were combined





What is the primary reason you selected your access mode?

- Bicycle: Exercise/Health (37.4%)
- Scooter: Save money (29.3%)
- Walk: Distance to station or stop (45.4%)
- All automotive modes: Convenience (47.3%)

What would encourage you to walk to your station or stop?

(Select up to two responses)

- Provide or improve crosswalks at intersections (12.1%)
- Provide or improve lighting along sidewalks (9.9%)
- Provide and maintain benches, trees, and shade along sidewalks (8.3%)
- Nothing (39.0%)

Photo source: https://www.historicswedesboro.com/2014/10/new-crosswalks-and-pedestrian-safety-features/

What would improve your experience walking to your station or stop?

(Select up to two responses)

- Improved sidewalk conditions (25.9%)
- Provide and maintain benches, street trees, and shade along sidewalks (24.9%)
- Provide or improve lighting along sidewalks (16.5%)
- Provide or improve crosswalks at intersections (15.3%)

Photo: https://www.reliance-foundry.com/blog/11-benefits-street-trees

What would encourage you to start or increase the number of times you bicycle or scooter to your station or stop?

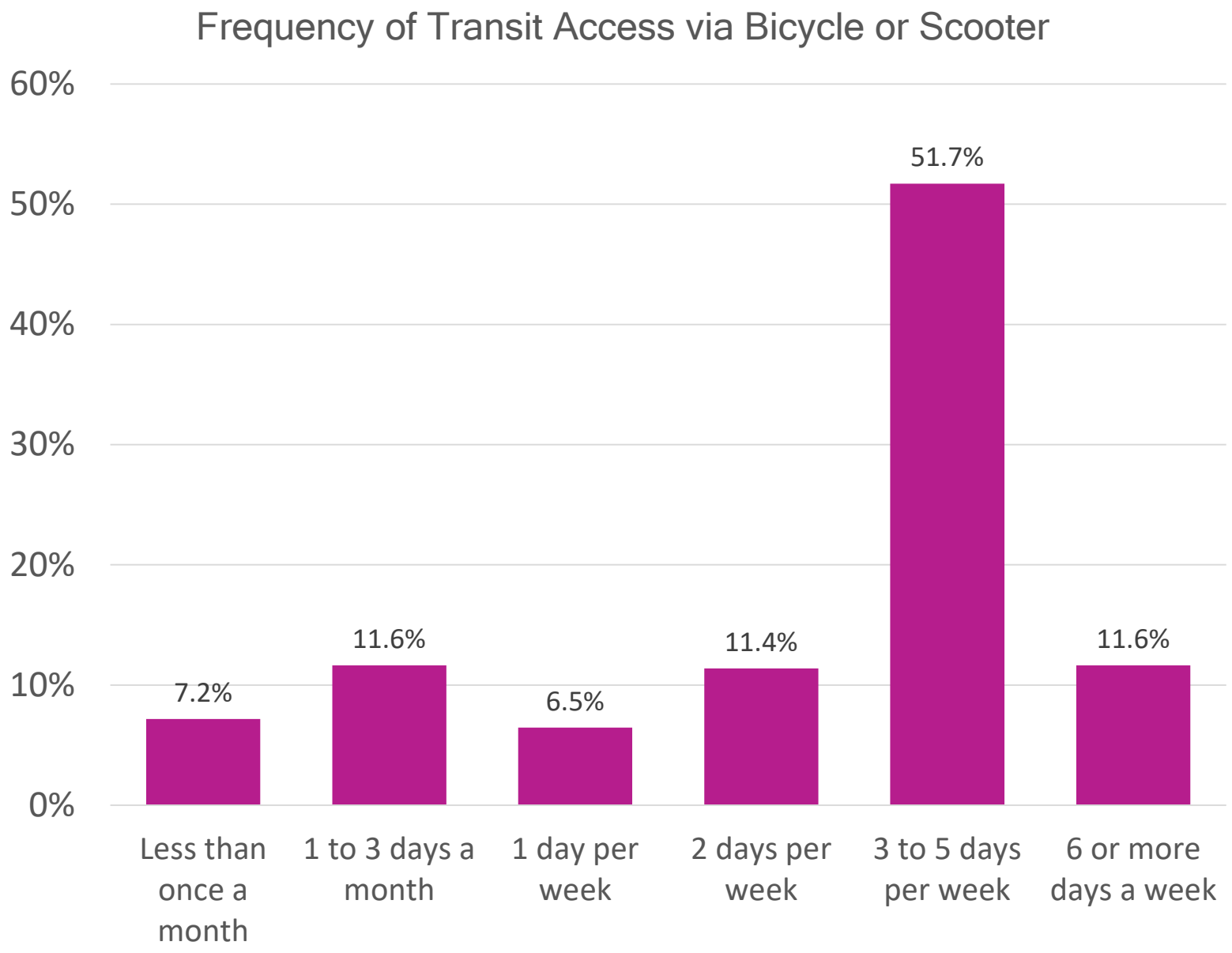
(Select up to two responses)

- Provide more bicycle paths that separated from cars (20.3%)
- Secure bicycle/scooter parking (15.4%)
- Provide more on-street bicycle lanes (14.5%)
- Provide safe ways to cross busy streets (8.0%)
- A bike share or scooter share program (7.9%)
- Nothing (23.9%)

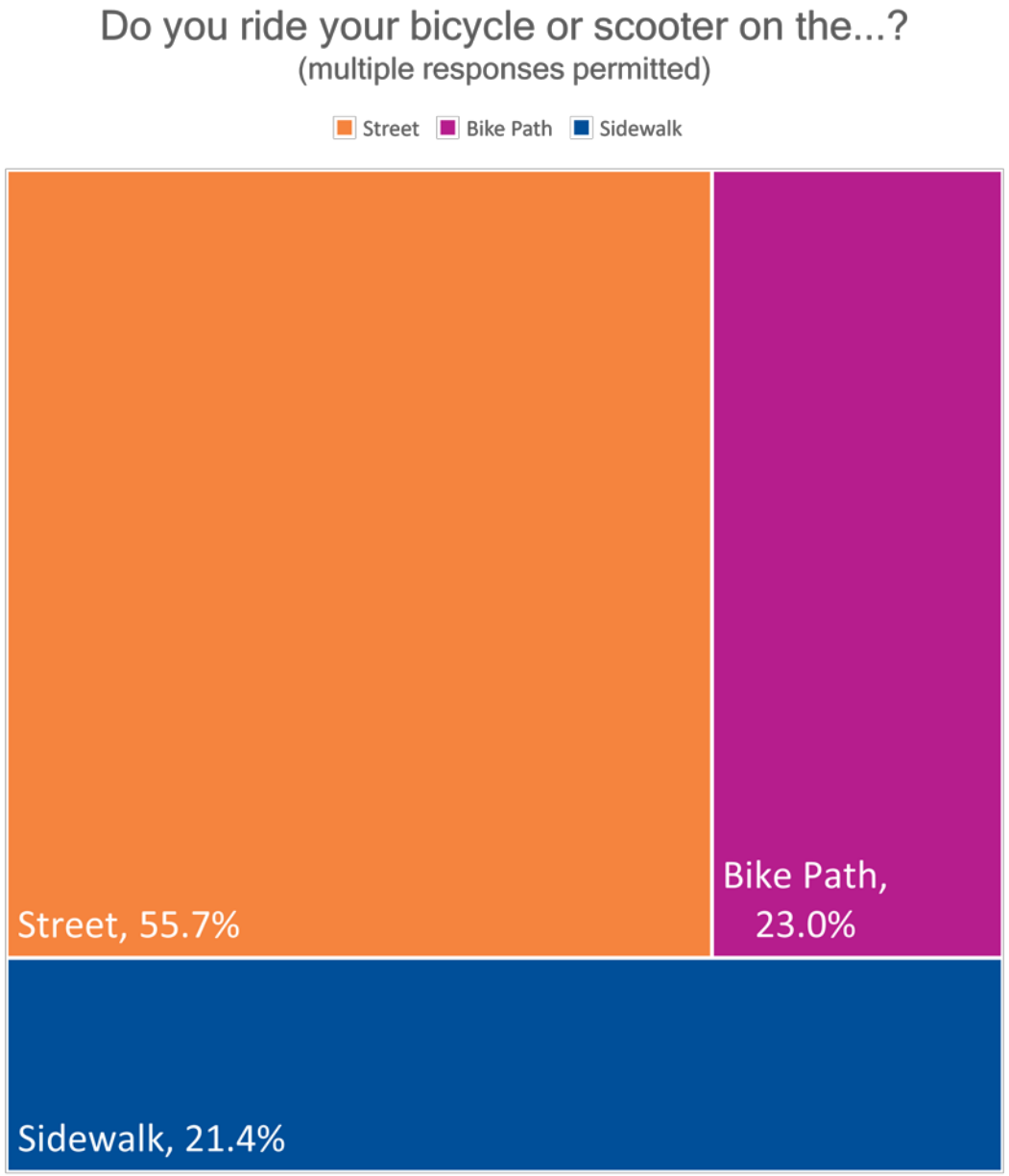
Photo: https://www.hobokengirl.com/protected-bike-lane-vision-zero-hoboken-jersey-city/

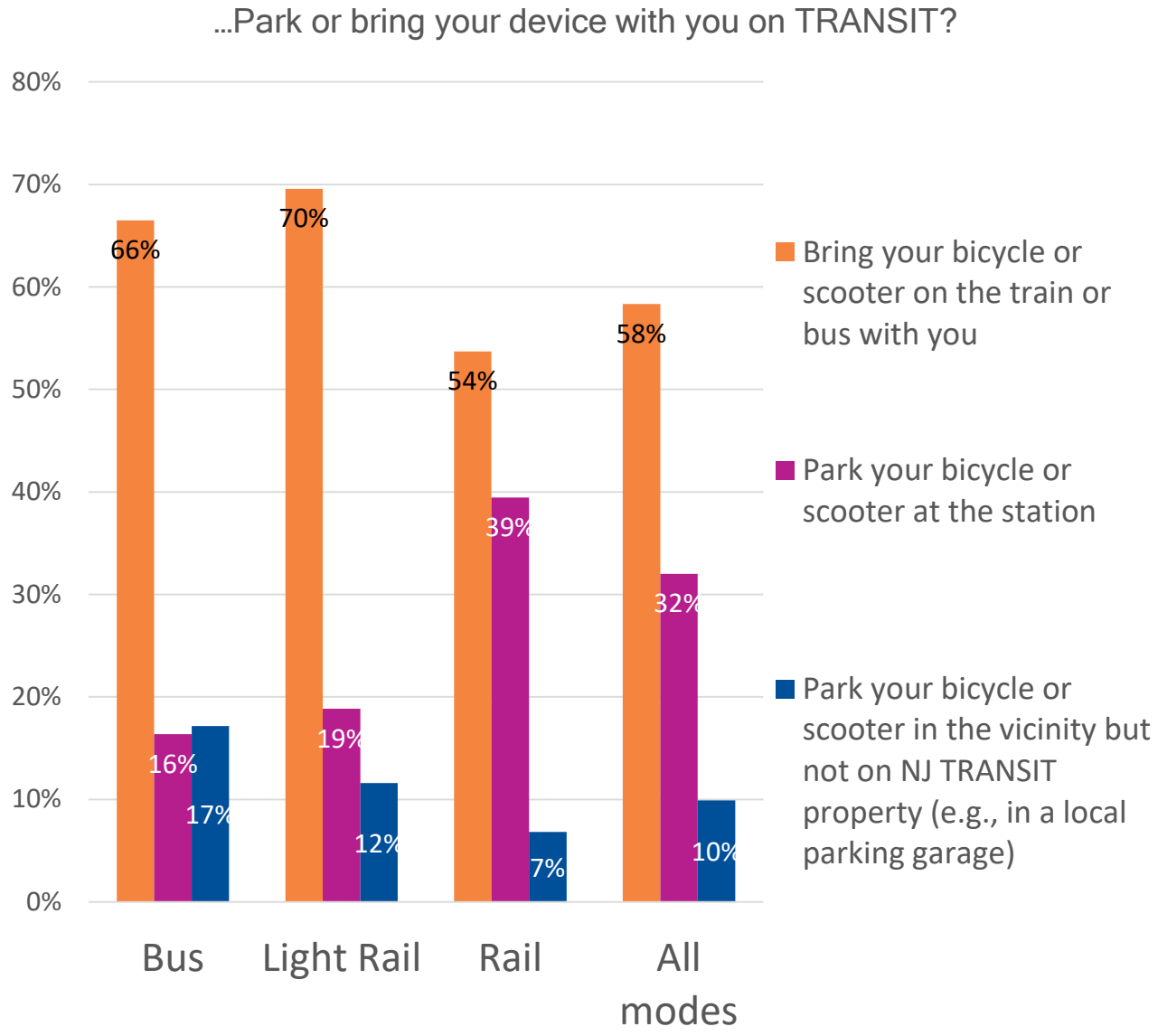
Bicycle and Scooter Access and Parking at NJ TRANSIT

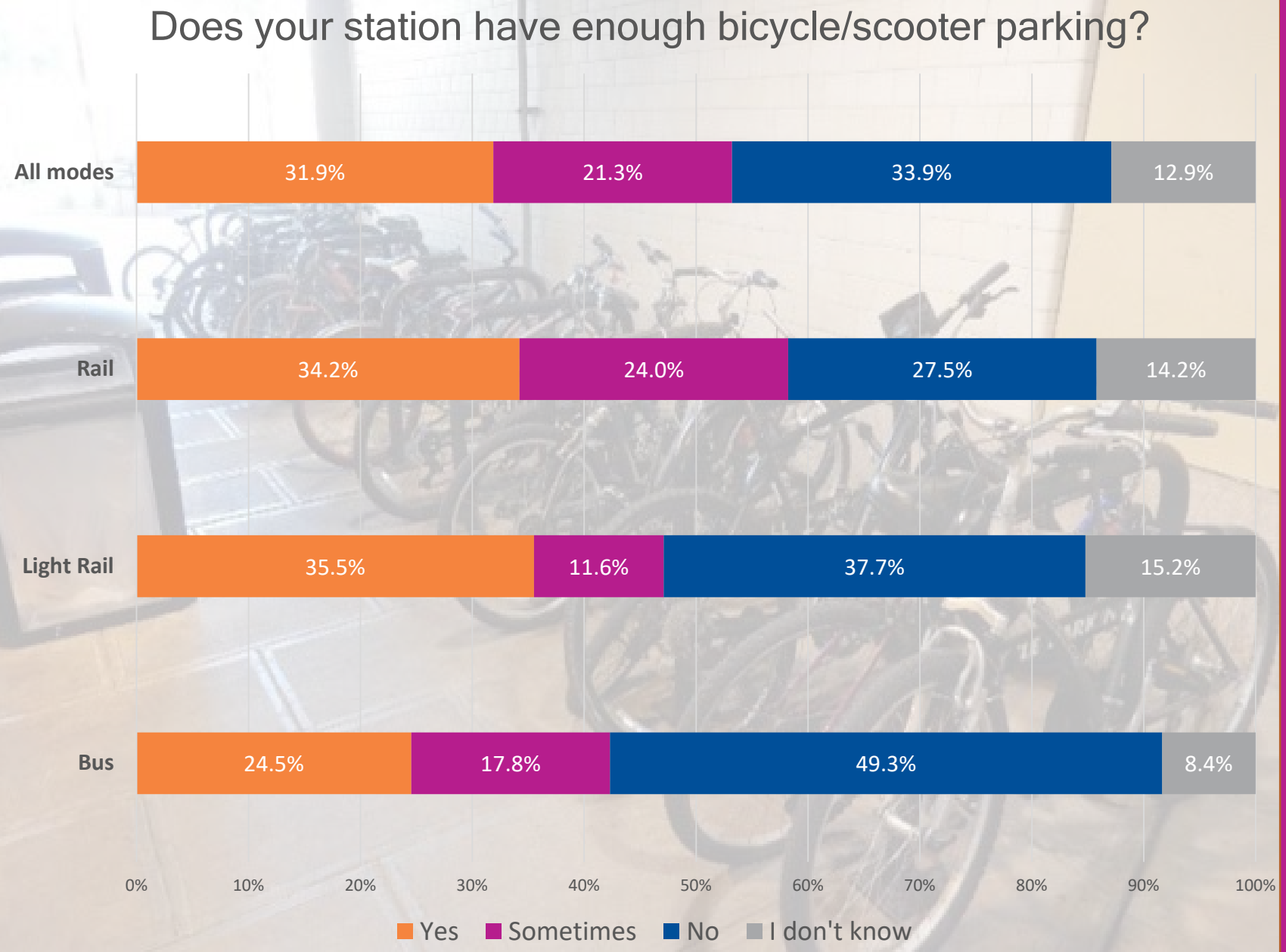
- Over 60% of respondents bicycle or scooter to NJ TRANSIT at least three days a week
- Over 25% of respondents cycle or scooter to NJ TRANSIT 5 days a week



When you ride your bicycle or scooter to NJ TRANSIT, do you typically….







Does your station or stop have enough bicycle/scooter parking?

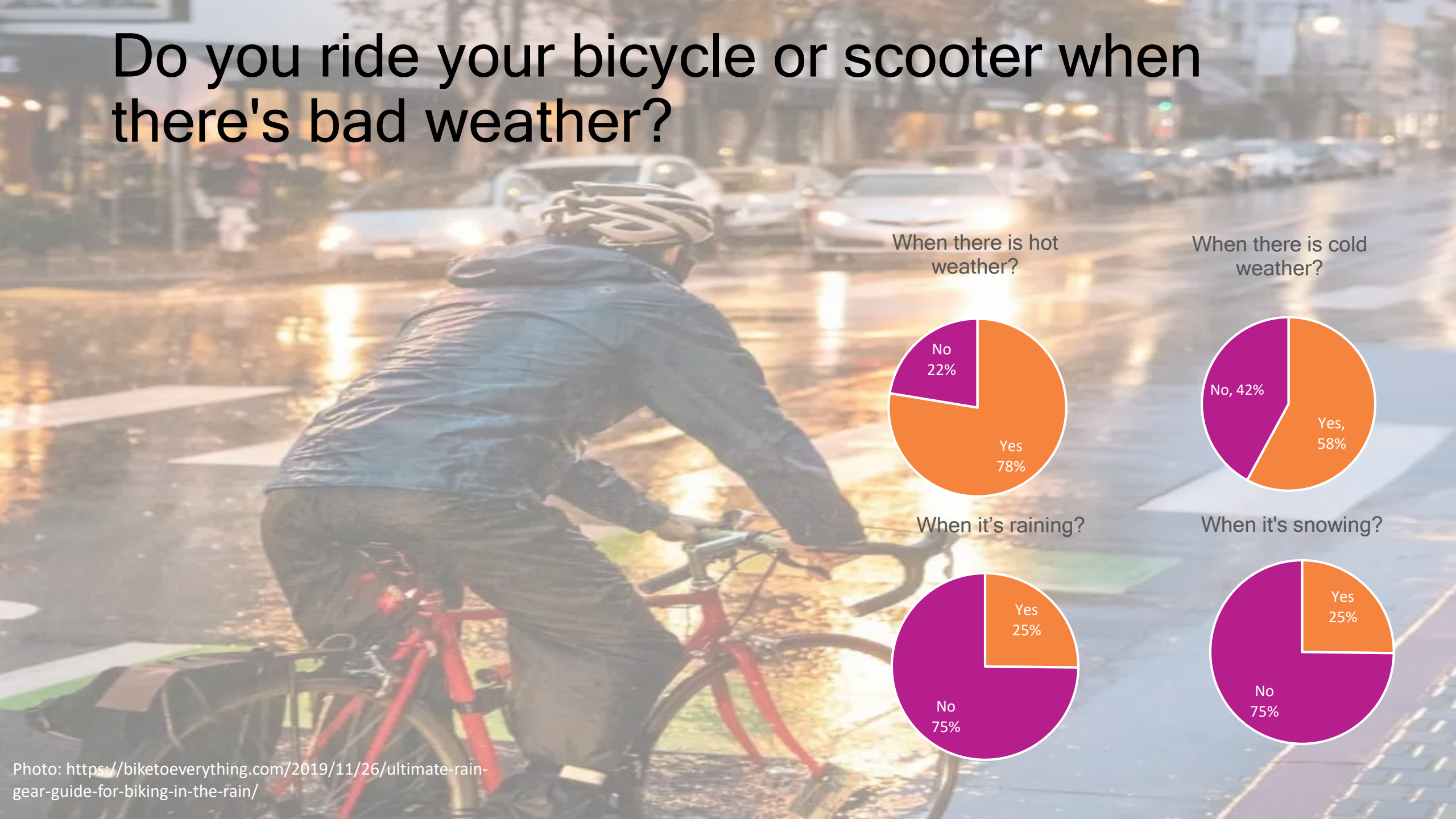
- Bus rider respondents report insufficient bicycle/scooter parking at the highest rates (49.3%)
- Rail and Light Rail respondents report sufficient bicycle/scooter parking at similar rates (34.2%, 35.5% respectively)
- Note that many respondents *perceive* a lack of sufficient parking, but there is adequate parking at many stations and stops.

How likely are you to use…?

Very likely or somewhat likely to use….	All modes	Bus	Light Rail	Rail
Bike racks	69%	72%	63%	68%
Bike lockers	73%	75%	75%	71%
Bike stations	80%	75%	86%	81%
Bike- or scooter-share program	70%	77%	73%	67%

Photos: (top right) https://twitter.com/ShabazzStuart/status/1630636281444089868
(bottom right)https://jerseydigs.com/jersey-city-hoboken-announce-partnership-with-citi-bike/

Do you ride your bicycle or scooter when there's bad weather?



When there is hot weather?

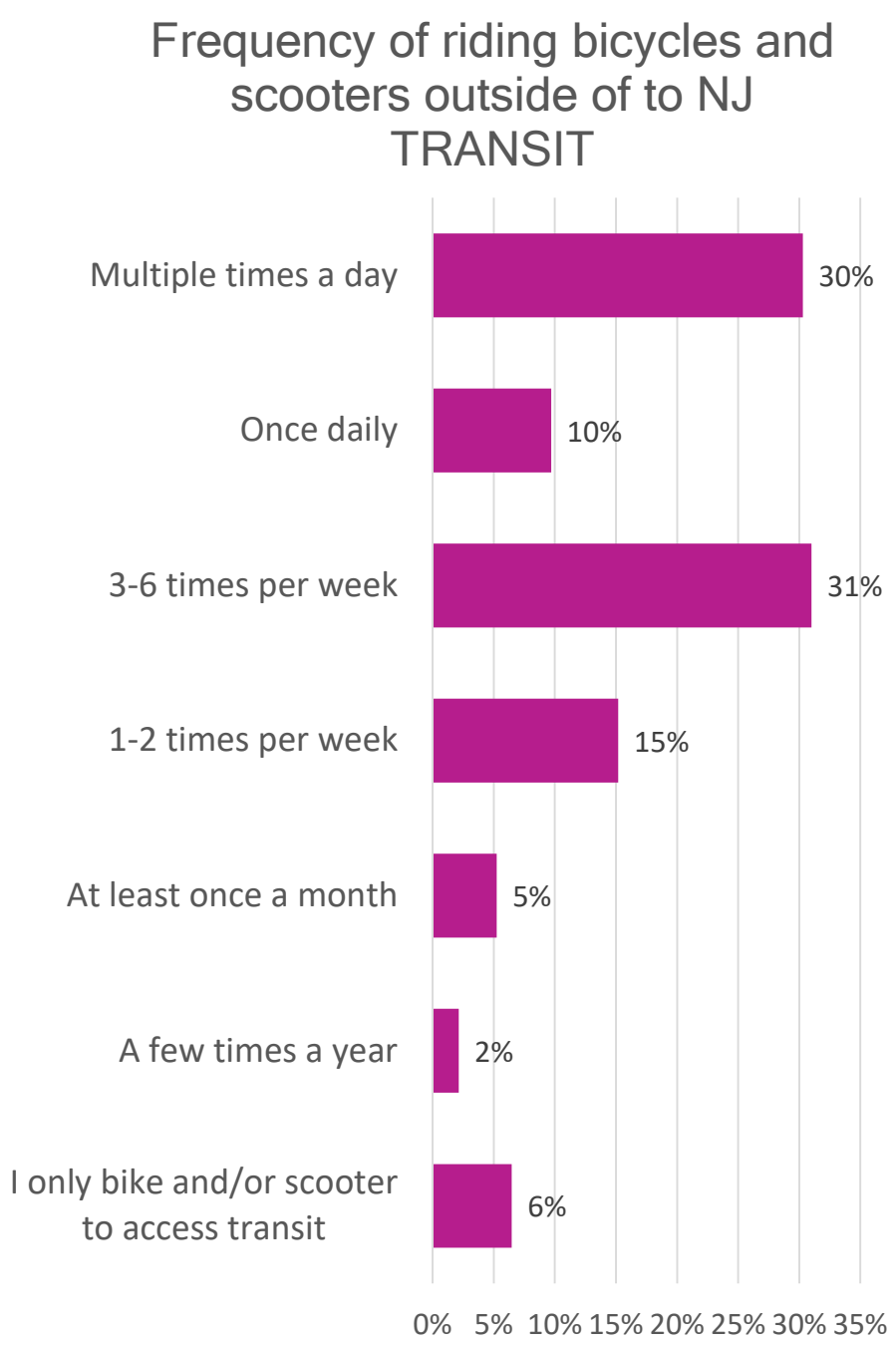
When there is cold weather?

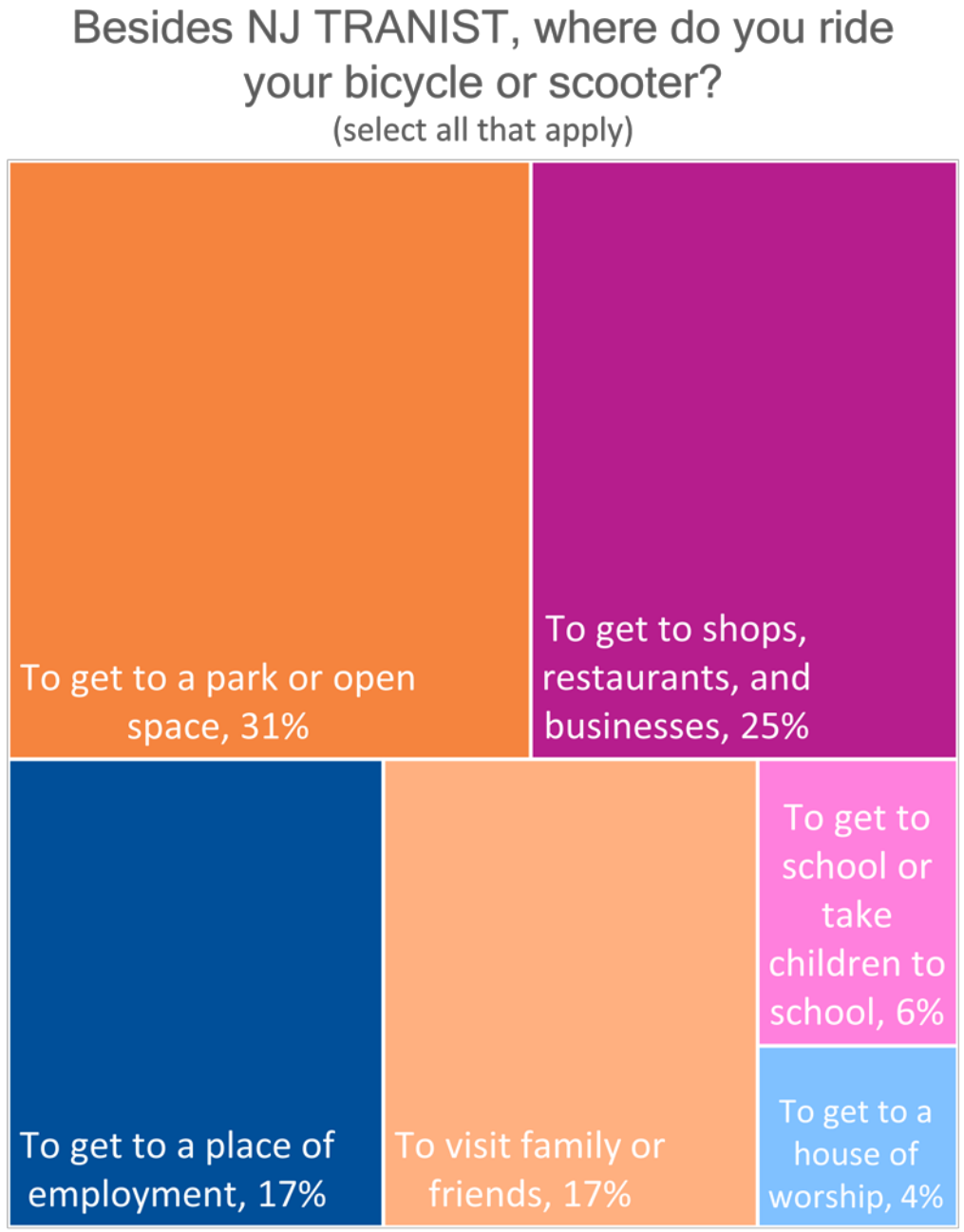
When it’s raining?

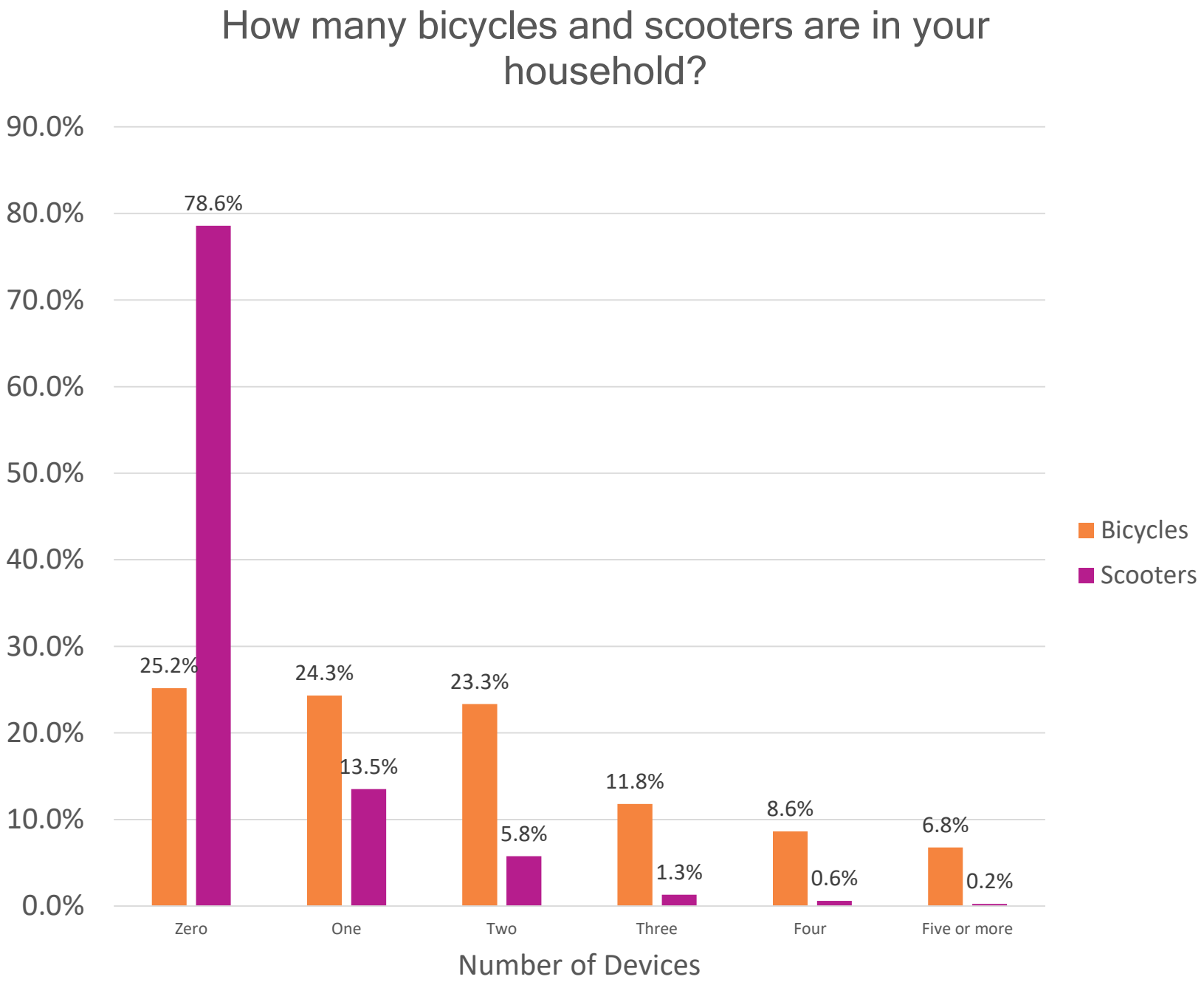
When it's snowing?

Photo: https://biketoeverything.com/2019/11/26/ultimate-rain-gear-guide-for-biking-in-the-rain/

Non-NJ TRANSIT Bicycle and Scooter Usage







How many bicycles and scooters are in your household?

- 6.5% of reported cyclists in the past year do not have a bicycle at home
- Almost 31% of scooter riders do not have a scooter at home

What are the challenges in riding your bicycle or scooter to your station or stop?

Respondents are challenged by:

- Lack of:
  - Bicycle Lanes
  - Secure Parking
- Traffic
- Weather
- Driver Behavior
- Roadway Conditions
- Lighting

Thank you!

How does a campus adjust to e-scooters?
Findings from Virginia Tech's partnership with an e-scooter provider

Ralph Buehler, Professor, Urban Affairs and Planning

This research was conducted in collaboration with the Virginia Tech Transportation Institute and a graduate-level studio class in Virginia Tech's Masters of Urban and Regional Planning program.

SAFE-D
SAFETY THROUGH DISRUPTION

Micromobility 2.0 Workshop
Smarter Strategies for Safe Travel

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

U.S. National Science Foundation
WHERE DISCOVERIES BEGIN

VIRGINIA TECH

Research Goals

- Campus as a “living lab” – E-scooter permit linked directly to research projects led by Virginia Tech Transportation Institute (VTTI)
- Build knowledge about e-scooter usage, safety, user behavior, and non-user perceptions
- Trace changes over time in e-scooter usage, rider behavior, and non-user perceptions
- Identify policies, infrastructure, regulations, and other factors for successful e-scooter system deployment
- Larger study included custom sensors mounted to 50 e-scooters (gyroscope, accelerometer, high-res GPS, forward-facing camera)

Timeline

2019

Sept: Pilot launch

August: Pre-launch survey

Oct: Post-launch survey & End-of-ride survey in app

2020

March: Pilot paused due to COVID

2021

August: Pilot resumed

Nov: Panel survey 1

2022

Jan: Fleet cap lifted & parking corrals mandated

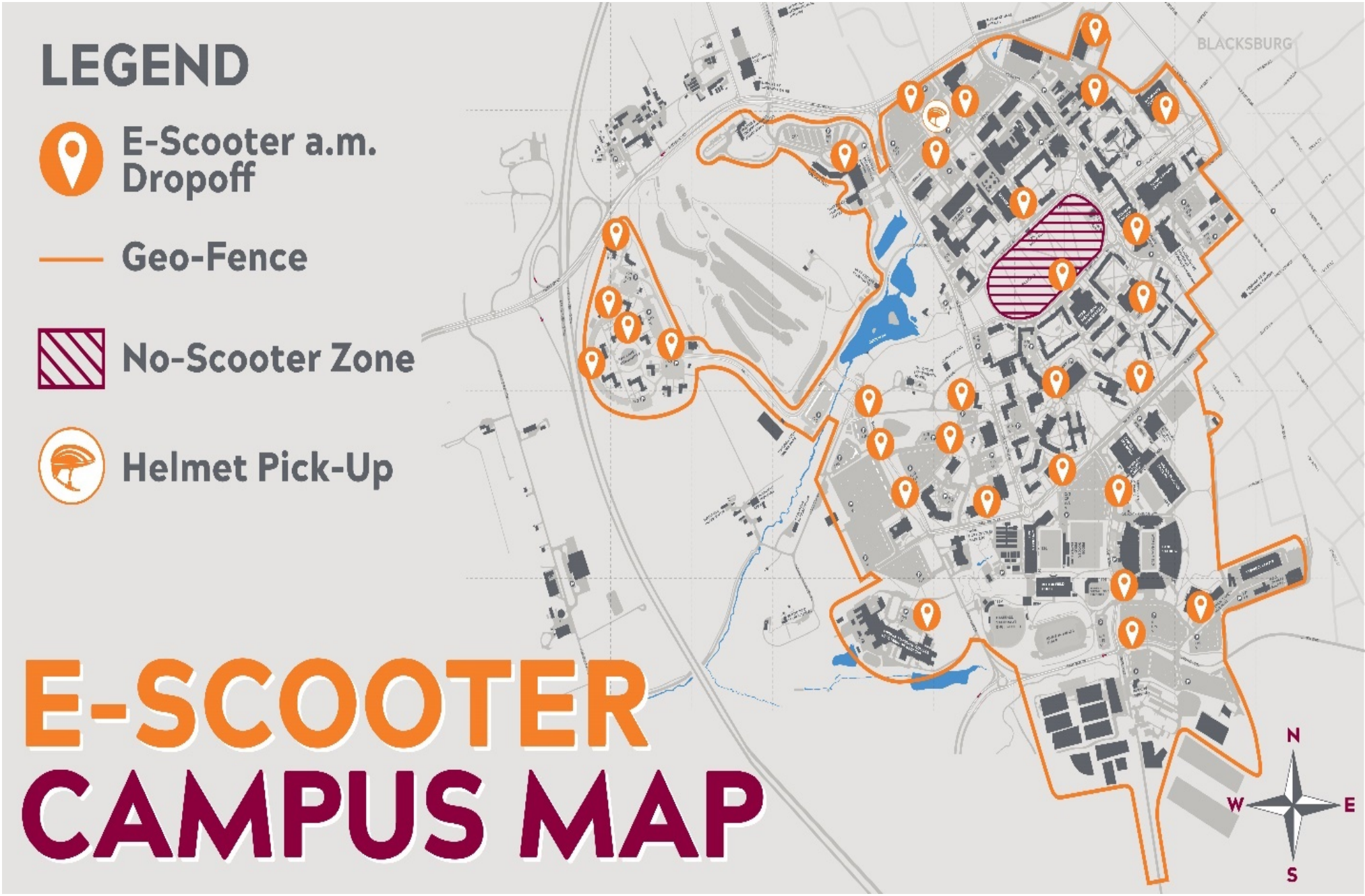
March: Corrals removed

April: Panel survey 2

May: Pilot ended

GPS data collection/instrumented scooters & Student involvement in research and studio classes

Study Context



Usage of E-Scooters During Pre-COVID Phase of Pilot Study

	Phase 1 (Aug-Nov 2019)	Phase 2 (Nov 2019-March 2020)	Entire period (Aug 2019-March 2020)
Number of trips	72,315	48,321	120,636
Mean trips per day	1,417	478	794
Mean trip length (mi)	0.78	0.65	0.73
Mean trip duration (mins)	7.8	6.5	7.3
Mean travel speed (mph)	6	6	6
Days with inclement weather	7	19	26

Overview of 4 Selected Studies

- **Rider route choice**
  - Zhang, W., Buehler, R., Broaddus, A., Sweeney, T. "**What type of infrastructures do e-scooter riders prefer? A route choice model**.," *Transportation Research Part D: Transport and Environment*, Vol. 94.
- **Falls of e-scooter riders**
  - White, E., Guo, F., Han, S., Mollenhauer, M., Broaddus, A., Sweeney, T., Robinson, S., Novotny, A., Buehler, R. 2023. "**What factors contribute to e-scooter crashes: A first look using a naturalistic riding approach**," Journal of Safety Research
- **E-scooter travel behavior**
  - Buehler, R., Broaddus, A. Sweeney, T., White, E., Mollenhauer, M. 2021. "**Changes in Travel Behavior, Attitudes, and Preferences among E-Scooter Riders and Non-Riders: A First Look at Results from Pre and Post E-Scooter System Launch Surveys at Virginia Tech**," *Transportation Research Record: Journal of the Transportation Research Board, April 2021.*
- **E-scooter parking corrals**
  - Buehler, R., Broaddus, A. Sweeney, T., White, E., Evans. C. 2023. **An Exploration of the Decline in E-Scooter Ridership after the Introduction of Mandatory E-Scooter Parking Corrals on Virginia Tech's Campus in Blacksburg, VA**" *Sustainability* 15, no. 1: 226. https://doi.org/10.3390/su15010226

Study 1: Density Map of Matched E-Scooter Routes

Campus Transport Infrastructure

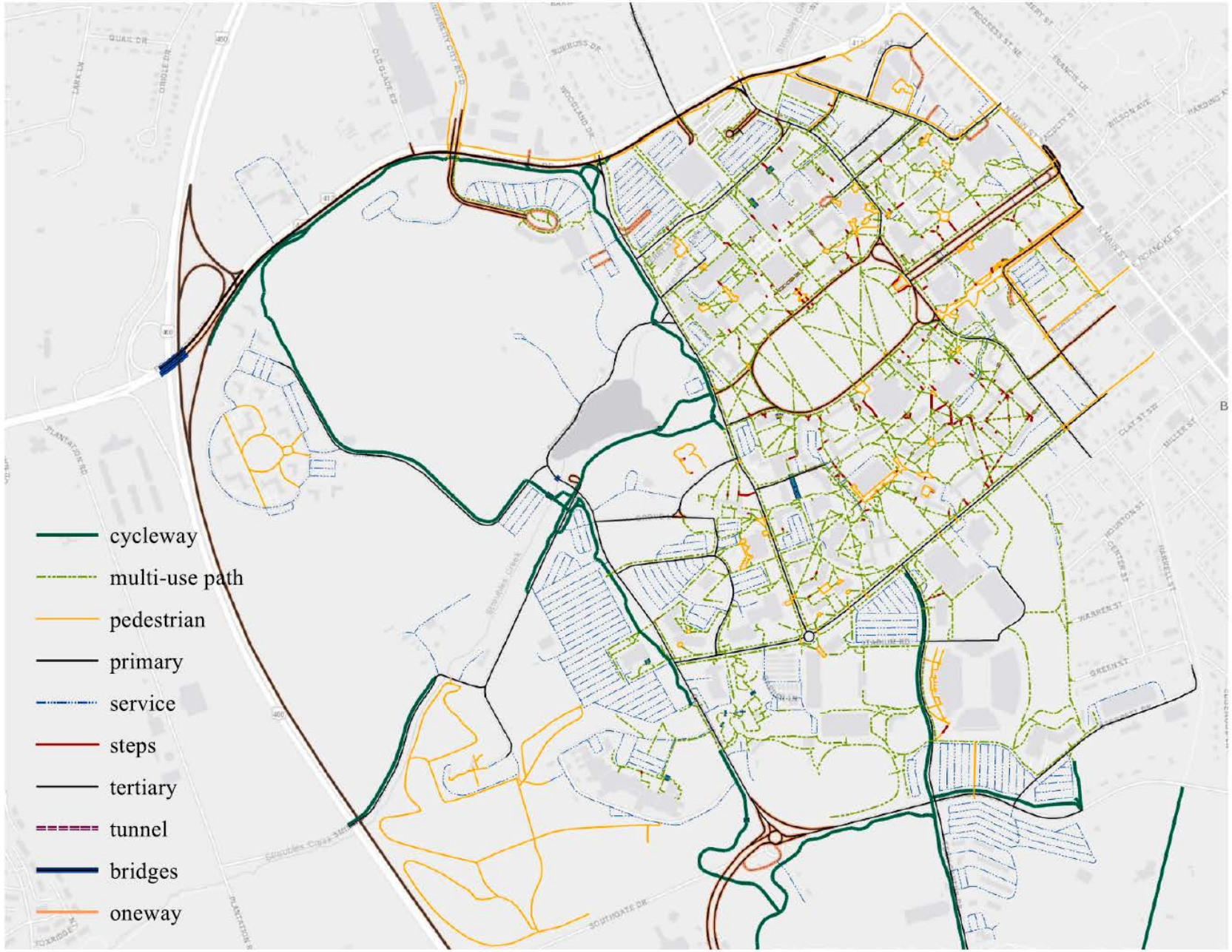


Fig. 3. Transportation infrastructures on VT's campus.

Study 1: Key Results

- Recursive logit model with dynamic choice sets
- E-scooter riders…
  - tend to prefer shorter routes
  - are not sensitive to the slope of the road
  - tend to favor bikeways and multi-use paths, but also local road with low speed limits (15mph)
  - do not like steps and tunnels through buildings

Study 2: Falls

Fig. 1. Typical forward camera view of the E-Scooter DAS.(Data acquisition system)

Study 2: Frequency of Precipitating Factor Types

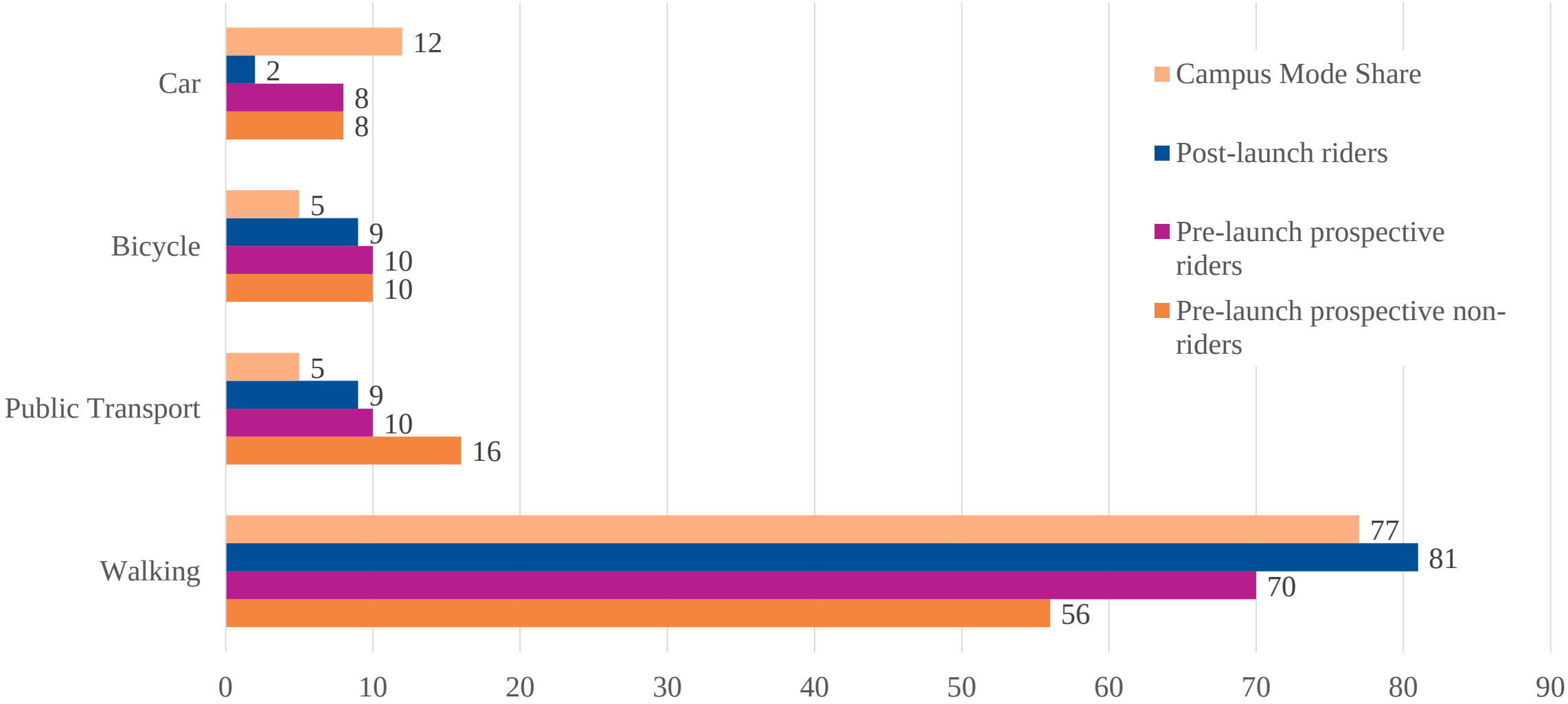
SCE= safety critical even

Precipitating Factor Category	Precipitating Factor Details	Crashes	Near Crashes	SCE Total	SCE Percentage
Infrastructure	Loss of control related to infrastructure	47	25	72	47%
	Conflict with fixed infrastructure element	19	8	27	18%
	Conflict with plant	2	1	3	2%
	Subtotal	68	34	102	67%
Presence of Other Road Users	Conflict with pedestrian	1	13	14	9%
	Conflict with another e-scooter	3	8	11	7%
	Conflict with bicycle	0	3	3	2%
	Conflict with parked vehicle	1	1	2	1%
	Subtotal	5	25	30	19%
Rider Behavior	Loss of control related to riding behavior	10	6	16	10%
	Loss of control related to excessive speed	2	4	6	4%
	Subtotal	12	10	22	14%
Total		85	69	154	100%

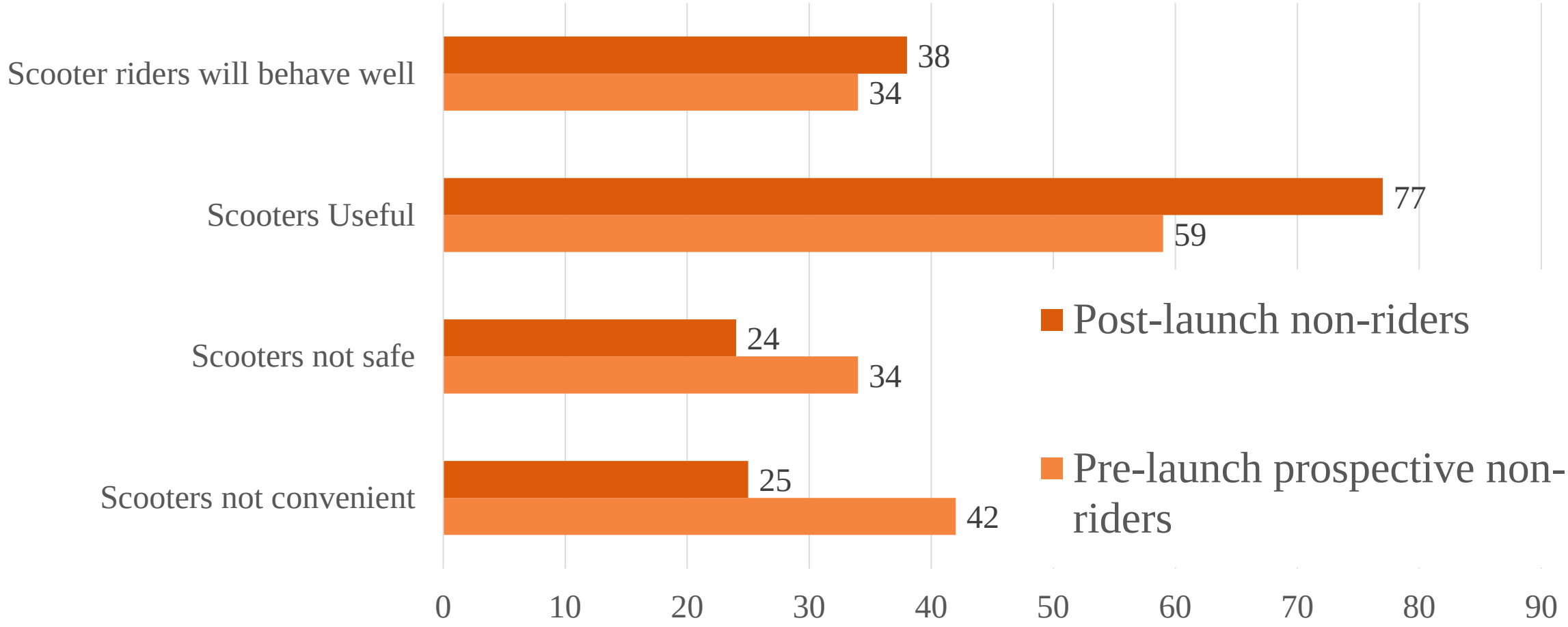
Study 2: Key Results

- Infrastructure is a major risk factor for e-scooter riders
- Transitioning between different surface types increases risk
  - Transitions between sidewalks to/from roadways through curb cutouts can double risk
  - Riding on rough and/or soft surfaces doubles the risk (up to 27 times on grass)
- Aggressive riding can increase risk by 10 times
- Riding in groups is twice as dangerous as riding alone

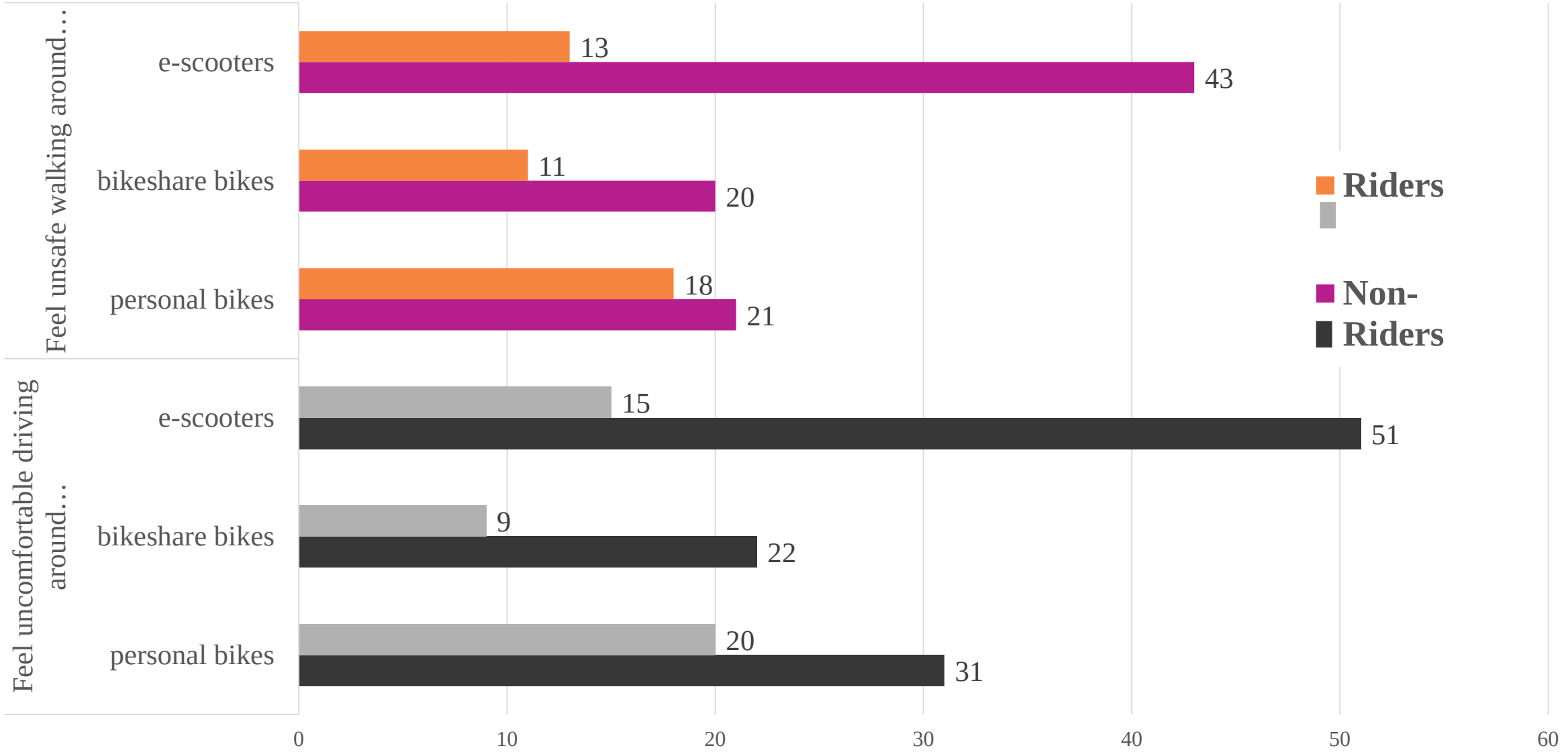
Study 3: “If not by E-Scooter, how would you have taken your most recent trip?”



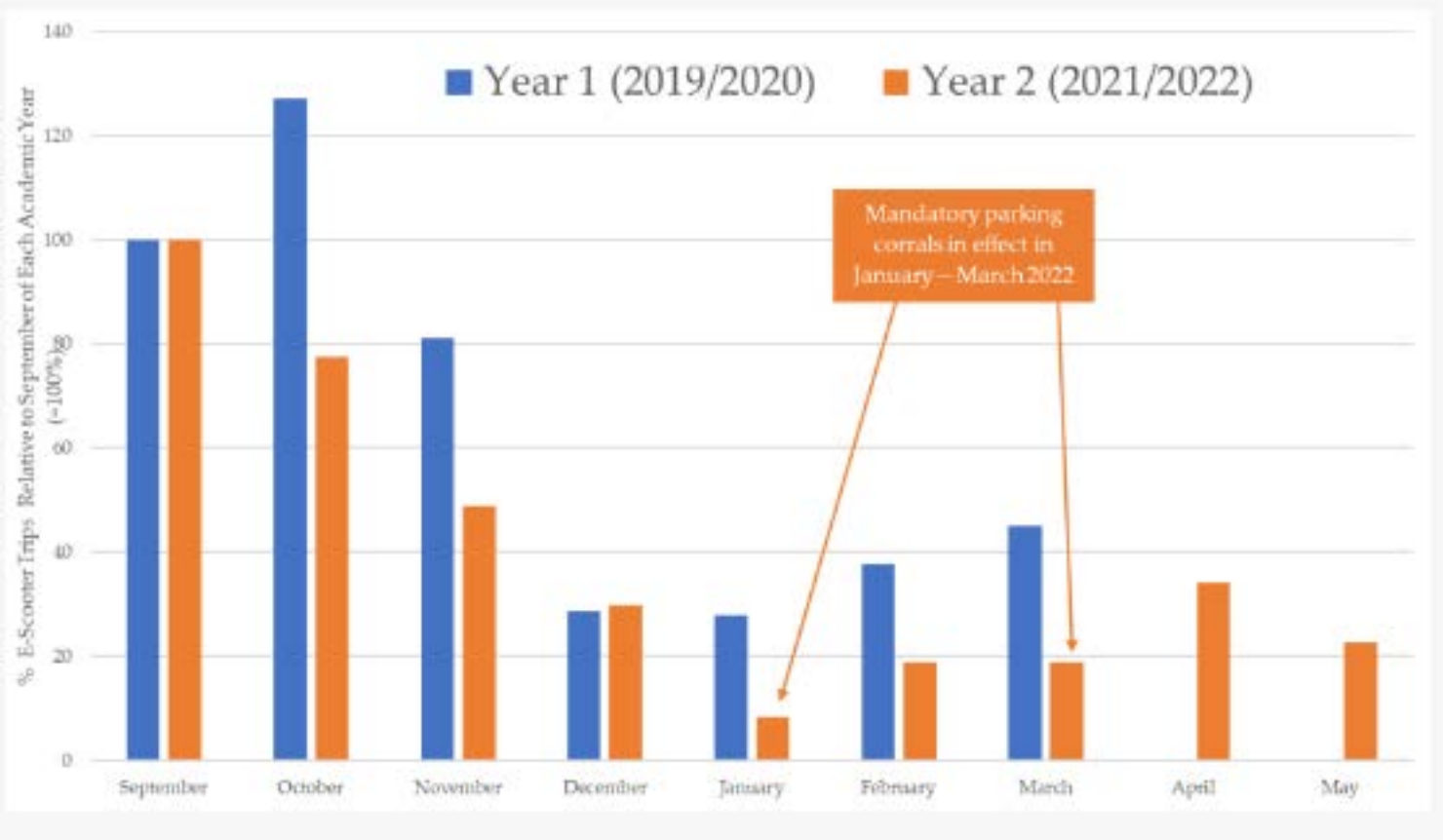
Study 3: Changes in Perceptions by Non-Riders

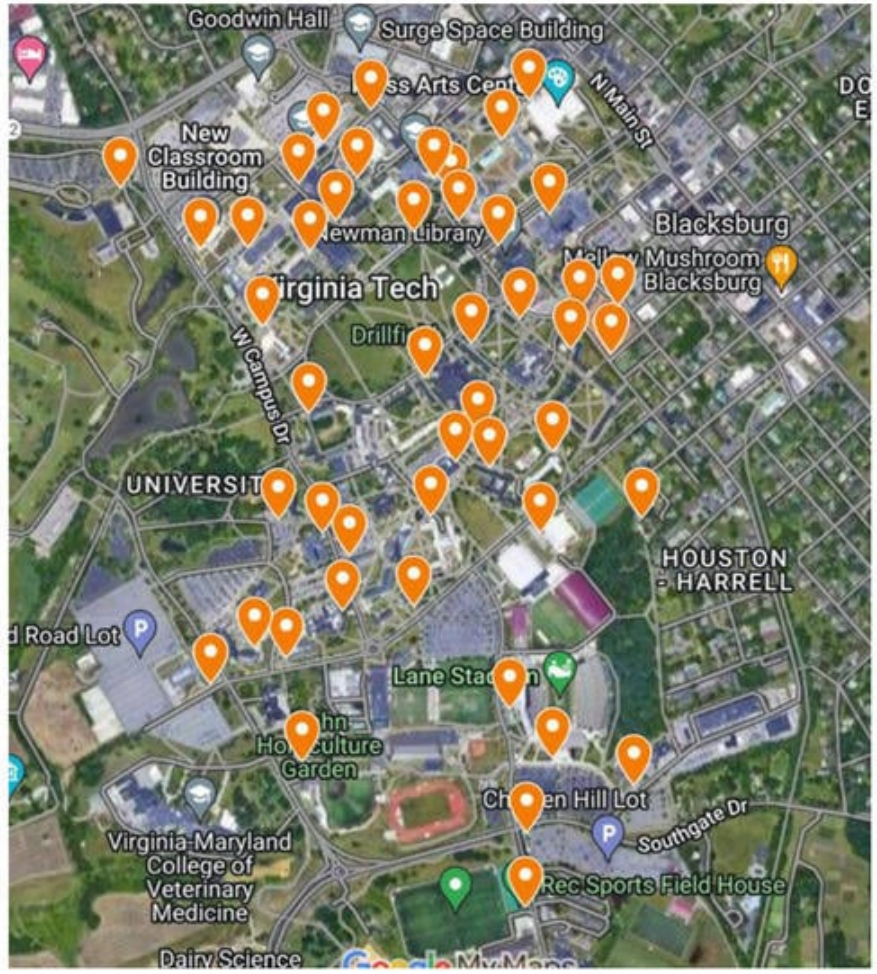


Study 3: Perceived Comfort Walking and Driving Around E-Scooters for Riders & Non-Riders



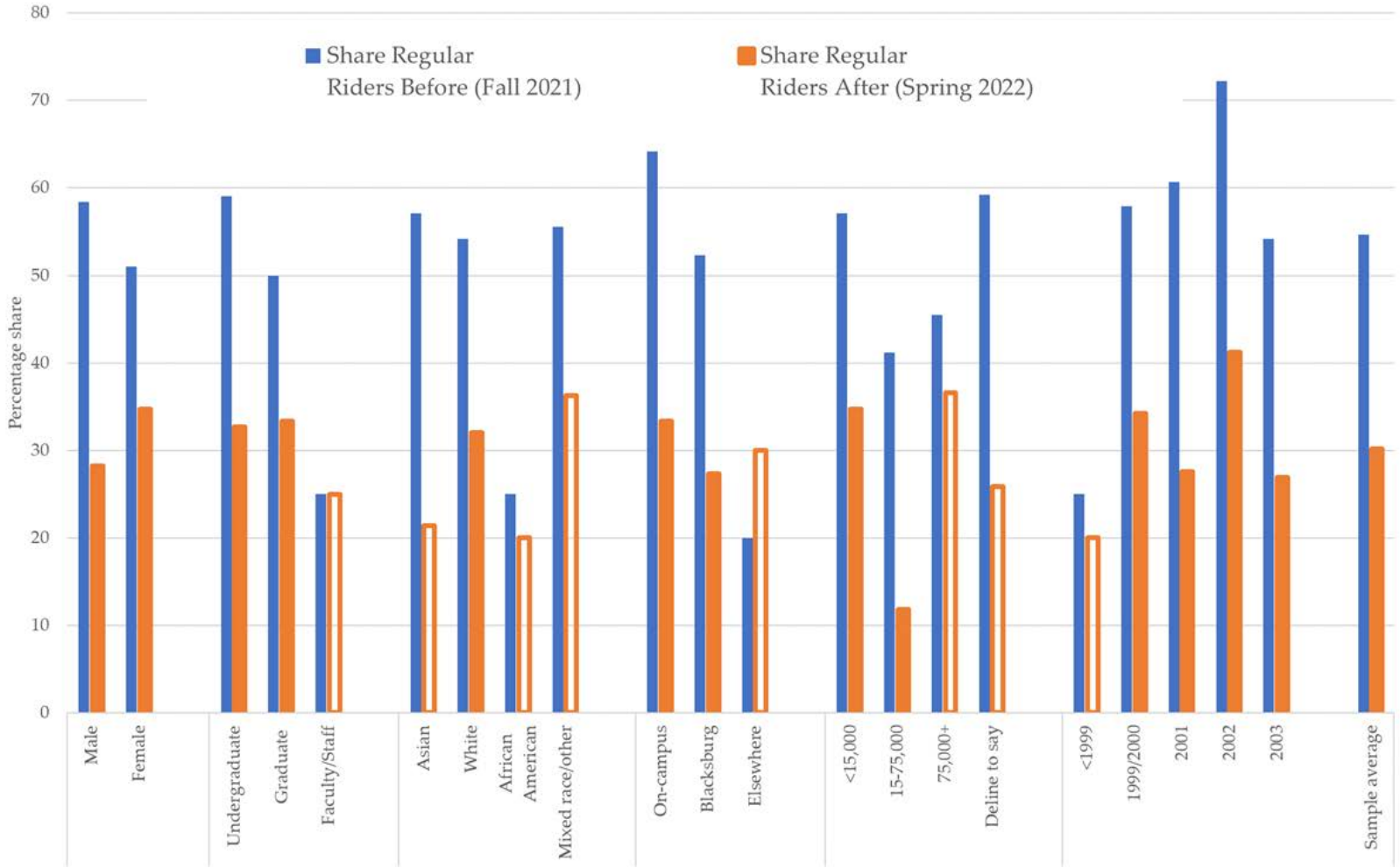
Study 4: Trend in E-Scooter Trips on Virginia Tech's Campus in Blacksburg, September 2019-March 2020 and September 2021-May 2022





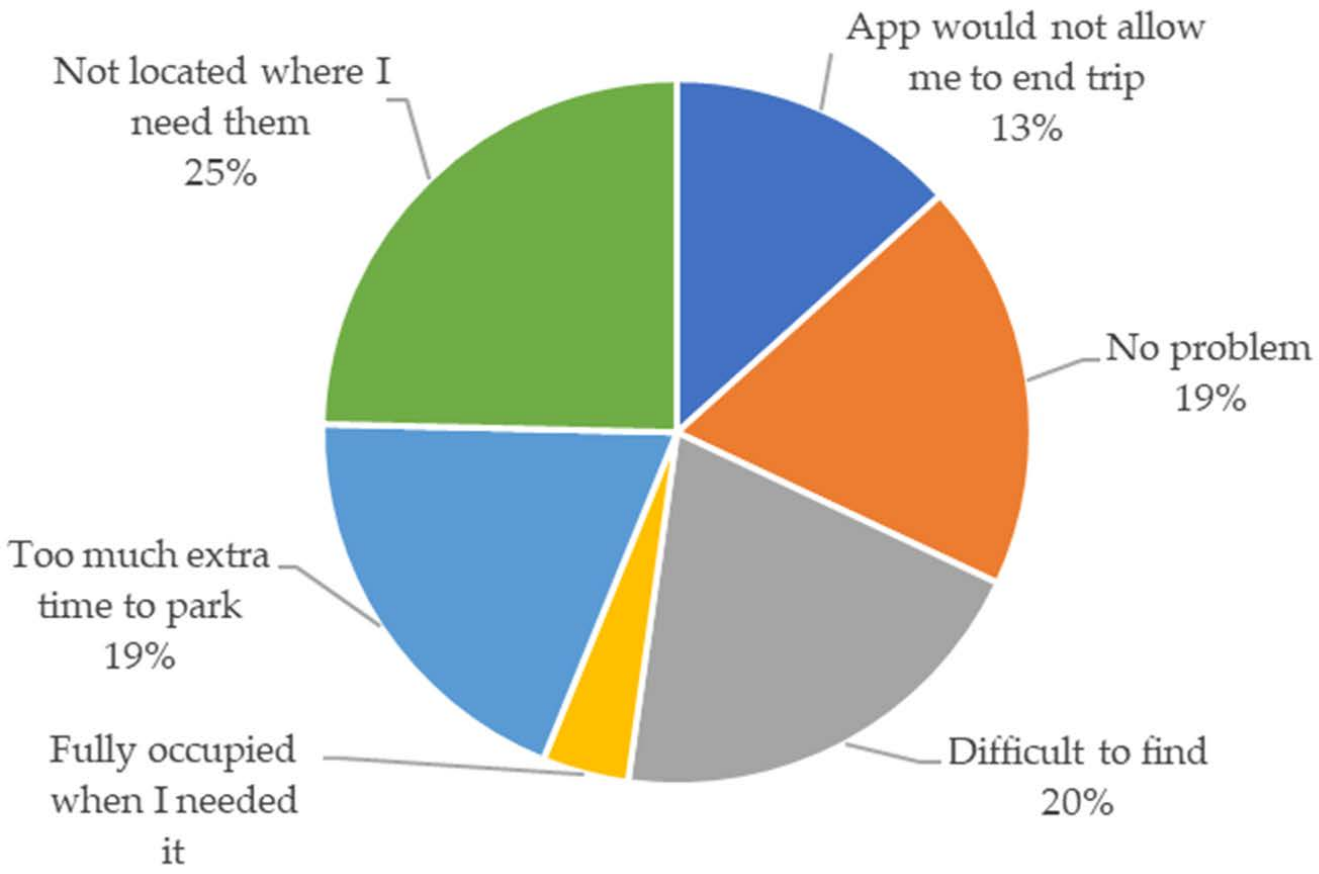
(Note: for comparison of ridership trends, each period is indexed to September=100% of each period).

Study 4: Percentage shares of regular riders for each sub-group (Fall 2021 and Spring 2022)



Note: Solid dark-orange bars indicate a statistically significant change ($p<0.05$) between fall 2021 and spring 2022. Light-orange bars that are not filled indicate changes that were not statistically significant at $p<0.05$. Statistical significance was assessed using t-tests based on population proportions (share of individuals ranging from 0-1) as well as chi-square tests for two categorical variables.

Study 4: Problems Reported by E-Scooter Riders After the Introduction of Mandatory Parking Corrals



- Importance of egress times for e-scooter rides—with up to 80% of riders desiring less than 2 minutes between their e-scooter and their trip origins or destinations.

Overall

- Campus can serve as “living laboratory”
- Integration of student in research
- Partnership can serve goals of various stakeholders
  - Research
  - Teaching
  - Cutting edge knowledge for e-scooter provider

Sources

- Zhang, W., Buehler, R., Broaddus, A., Sweeney, T. "**What type of infrastructures do e-scooter riders prefer? A route choice model**.," *Transportation Research Part D: Transport and Environment*, Vol. 94.
- White, E., Guo, F., Han, S., Mollenhauer, M., Broaddus, A., Sweeney, T., Robinson, S., Novotny, A., Buehler, R. 2023. "**What factors contribute to e-scooter crashes: A first look using a naturalistic riding approach**," Journal of Safety Research
- Buehler, R., Broaddus, A. Sweeney, T., White, E., Mollenhauer, M. 2021. "**Changes in Travel Behavior, Attitudes, and Preferences among E-Scooter Riders and Non-Riders: A First Look at Results from Pre and Post E-Scooter System Launch Surveys at Virginia Tech**," *Transportation Research Record: Journal of the Transportation Research Board, April 2021*.
- Buehler, R., Broaddus, A. Sweeney, T., White, E., Evans. C. 2023. **An Exploration of the Decline in E-Scooter Ridership after the Introduction of Mandatory E-Scooter Parking Corrals on Virginia Tech's Campus in Blacksburg**, VA" *Sustainability* 15, no. 1: 226. https://doi.org/10.3390/su15010226

Micromobility 2.0

State of the Practice: Evolving Norms and Policies

3/22/2024

Alex Keating
Head of Policy and Partnerships, Veo

Why Are We Here?

52%

of all daily trips in the US are less 3 miles

Bureau of Transportation Statistics, 2021

72% of these short trips are taken in cars

National Household Travel Survey, 2010

730 million trips on shared bikes and e-scooters in the U.S. and Canada since 2010.

125
MILLION TRIPS
in 2021

130
MILLION TRIPS
in 2022

SHARED MICROMOBILITY IN THE U.S. AND CANADA: 2022 NACTO

<17%

Average percentage of population in cities use existing stand-up scooters

Veo x New Jersey

1.6M+

Trips taken in Newark and New Brunswick

120k+

Unique users have taken trips on Veo seated and standing scooters

The goal:

Replace car trips with light electric vehicles

State Of The Industry

Bird scooters flying around town

by **Matthew Hall** September 26, 2017

RIDEABLES / TECH / CARS

Ford buys e-scooter company Spin for $100 million

Photo by Justin Sullivan/Getty Images

By Dami Lee

Nov 7, 2018, 10:22 PM GMT+1

TECH / TRANSPO / RIDEABLES

Lime lays off 13 percent of its employees

Photo by Amelia Holowaty Krales / The Verge

/ About 80 employees have been let go

By Jay Peters, a news editor who writes about technology, video games, and virtual worlds. He's submitted several accepted emoji proposals to the Unicode Consortium.

Updated Apr 30, 2020, 9:20 AM PDT

0 Comments (0 New)

Startups

Bird to go public via SPAC, at an implied value of $2.3B

Aria Alamalhodaei @breadfrom / 4:34 PM GMT+2 • May 12, 2021

Comment

TRANSPO / RIDEABLES / SCOOTERS

Ford sells electric scooter unit Spin to Berlin's Tier

Image: Spin

/ The automaker had been mulling a sale for almost a year

By Andrew J. Hawkins, transportation editor with 10+ years of experience who covers EVs, public transportation, and aviation. His work has appeared in The New York Daily News and City & State.

Mar 2, 2022, 7:30 PM GMT+1

0 Comments (0 New)

Bird acquires Spin scooters from Tier for $19M

Rebecca Bellan @rebeccabellan / 12:32 PM PDT • September 19, 2023

Comment

Transportation

Helbiz's Wheels acquisition fails to impress investors

Rebecca Bellan @rebeccabellan / 3:14 AM GMT+2 • October 26, 2022

Comment

Image Credits: Helbiz


Bird stock grounded
Share price
$25
20
15
10
5
0
Jan
2022
Apr
Jul
Oct
Jan
2023
Apr
Jul
Oct

TECH

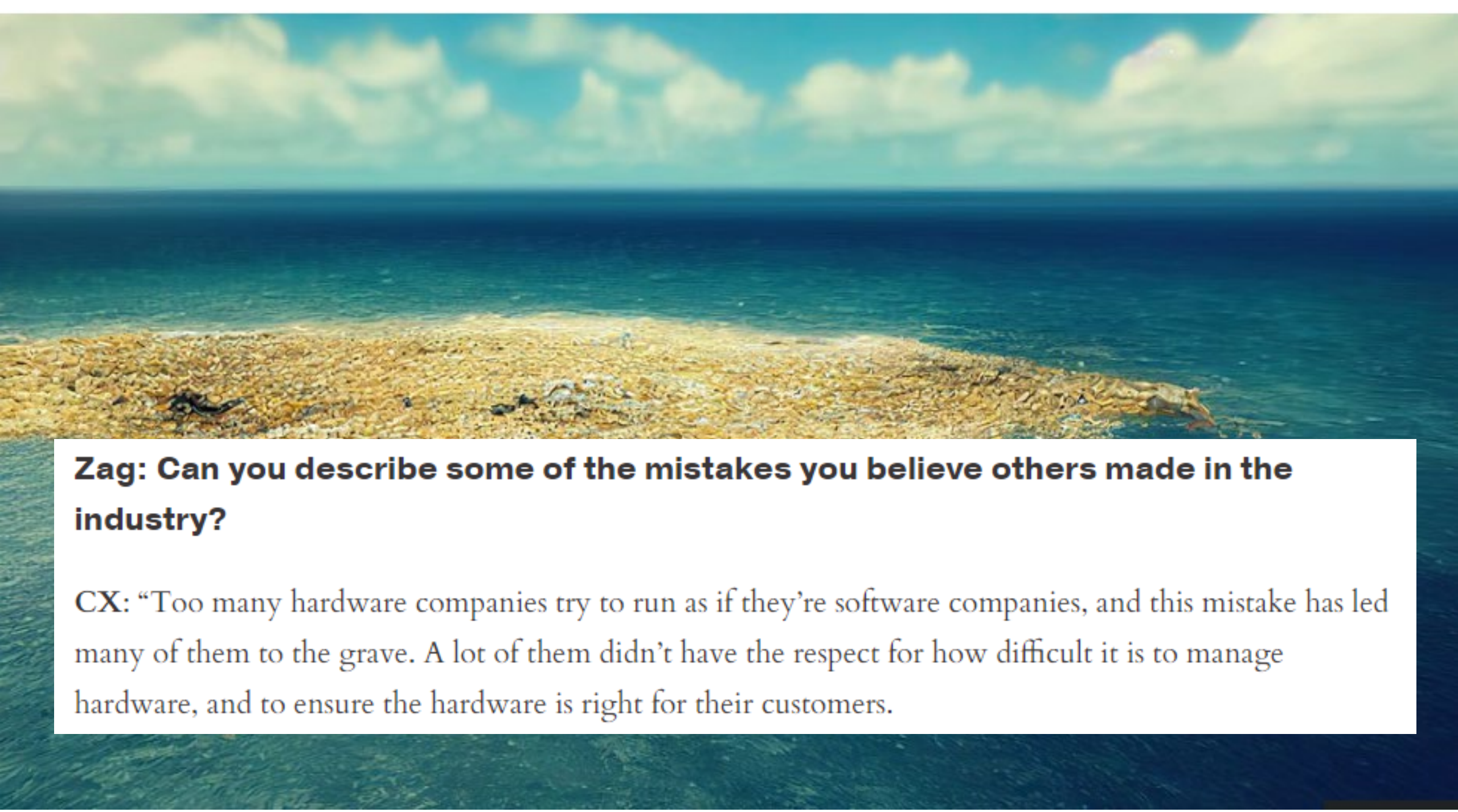
Electric scooter company Bird files for bankruptcy

PUBLISHED WED, DEC 20 2023•2:28 PM EST | UPDATED WED, DEC 20 2023•2:40 PM EST

Superpedestrian to auction 20,000 e-scooters after shutting down

Sean O'Kane @sokane1 / 6:05 PM PST • January 3, 2024

Comment



Zag: Can you describe some of the mistakes you believe others made in the industry?

CX: "Too many hardware companies try to run as if they're software companies, and this mistake has led many of them to the grave. A lot of them didn't have the respect for how difficult it is to manage hardware, and to ensure the hardware is right for their customers.

Woman Founded & Lead since

since 2017

Diverse & Accessible

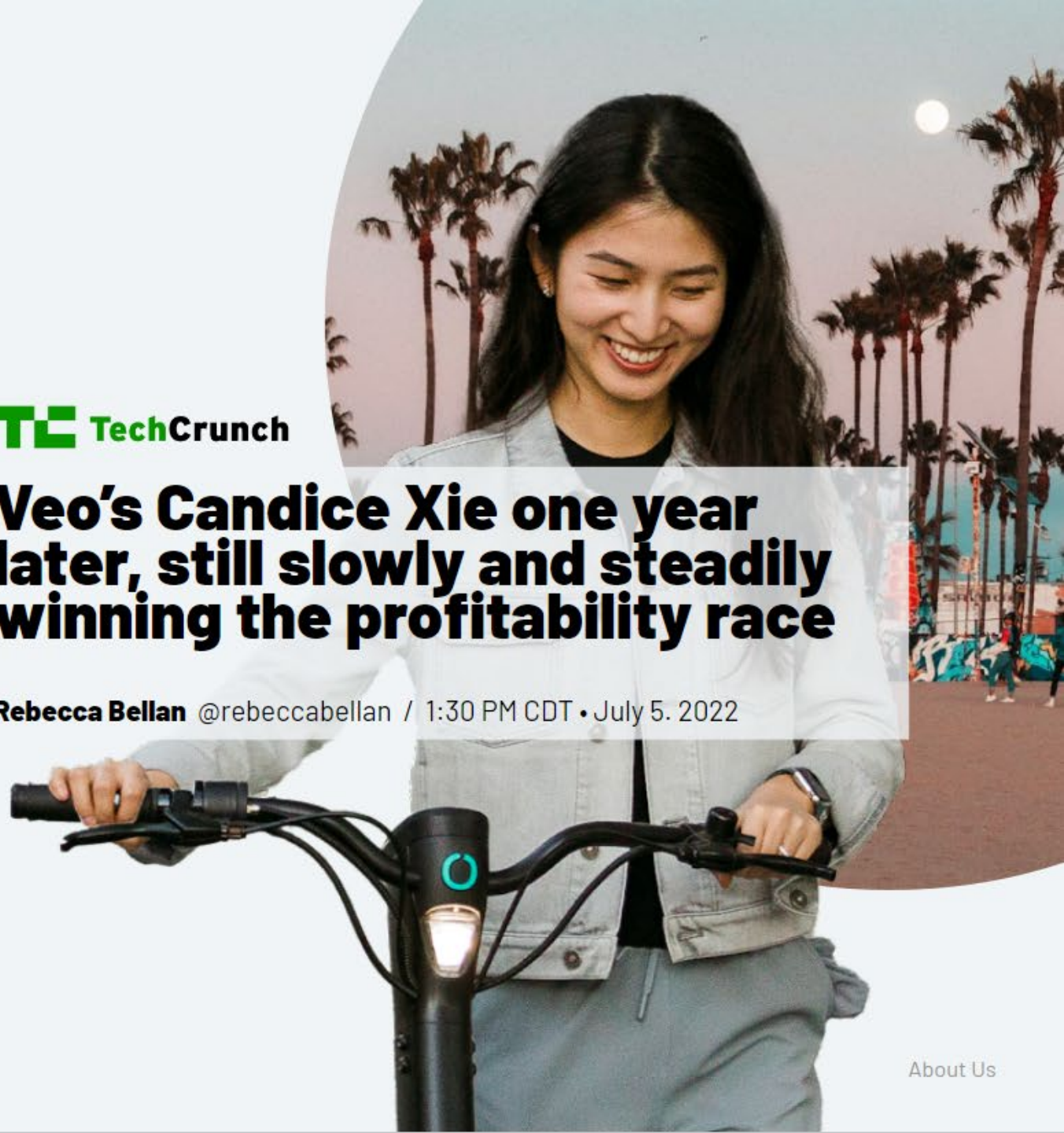
fleet options

Sustainable & Scalable

business model drives profit and responsible growth

Focused & Specialized

in long-term partnerships that deliver on commitments



Micromobility to the

Next level

Halo
Pedal bike

Apollo
2 seater e-bike

Astro
Stand-up e-scooter

Cosmo
Sit-down e-scooter

Halo-e
Class I e-bike

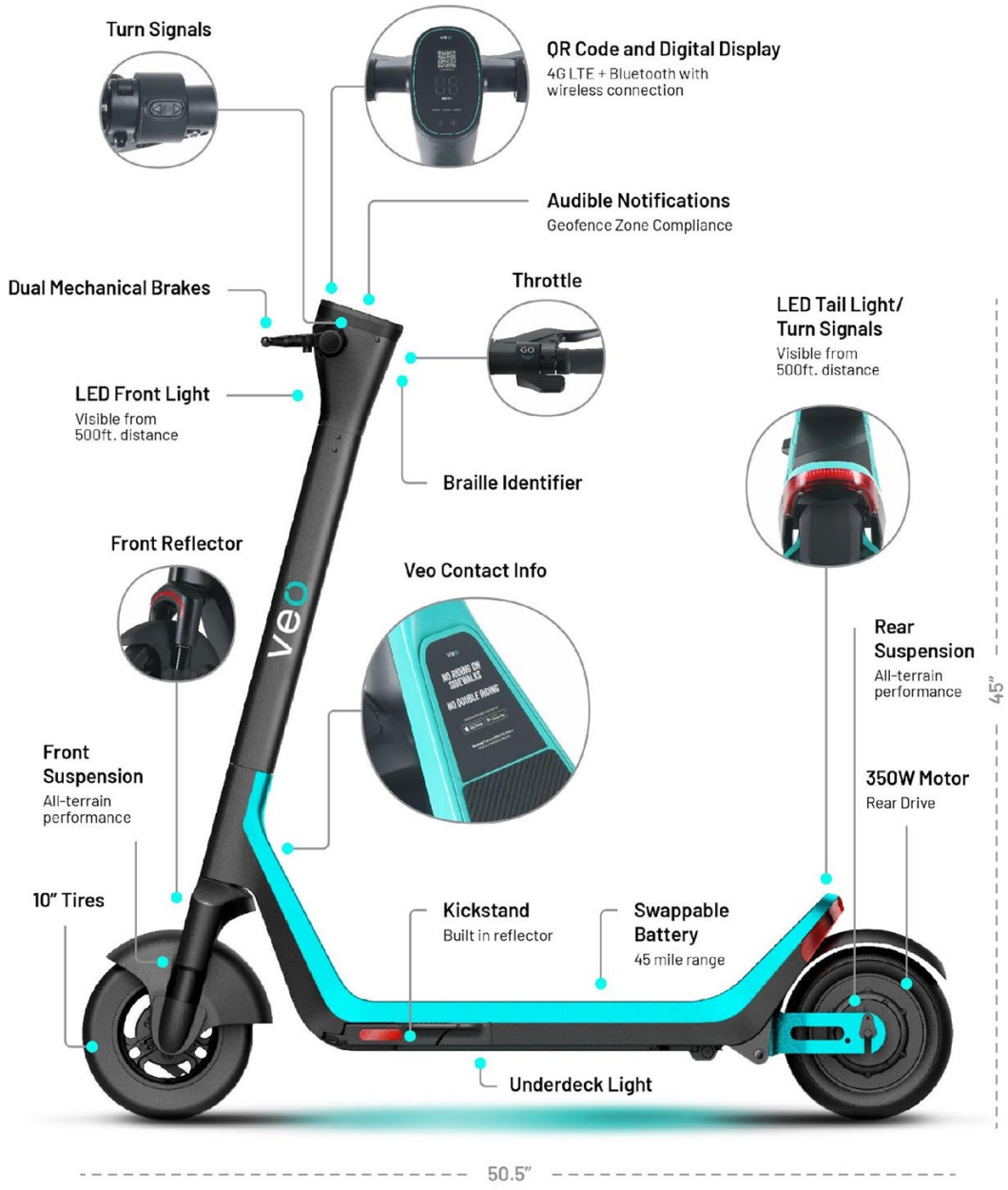
Micromobility & Safety

In-House Design, Manufacturing, and Safety Testing & Certification

ASTRO 4

Veo's newest stand-up scooter:

- Front and Rear suspension improves safety and performance on city streets
- Integrated Turn Signals
- 15 mph max throttle speed with customizable geofencing
- Waterproof field-swappable battery
- "Veo Voice" - Audible on-vehicle notifications and Bluetooth audio hookup for handsfree navigation

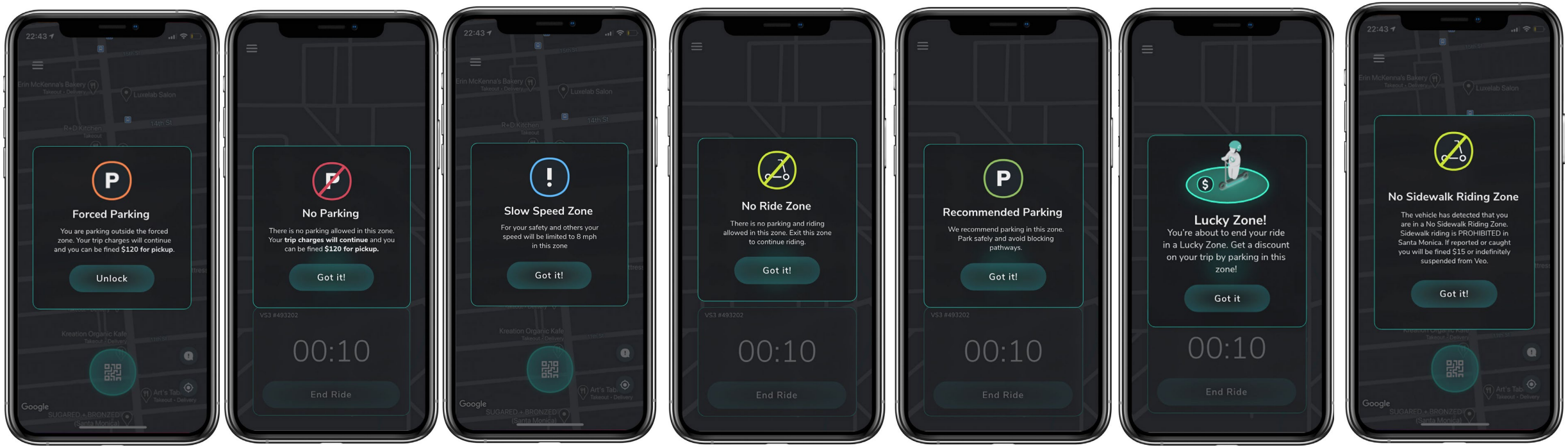


COSMO

Innovation for safety & accessibility:

- Seated e-scooter that fits a wider range of rider needs, preferences, and trip types
- 15 mph max throttle speed with customizable geofencing
- Waterproof field-swappable battery
- Front suspension
- Active brake light
- “Veo Voice” - Audible on-vehicle notifications

Customizable Geofencing



Veo Voice and Rider Behavior

"Please do not ride on sidewalks"

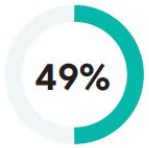
"This is a no ride zone, please use the map to navigate away from this area."

Why do you use shared vehicles?

Participants could select more than one option.

to get where I need to go quickly

to have fun



to travel at a moment's notice

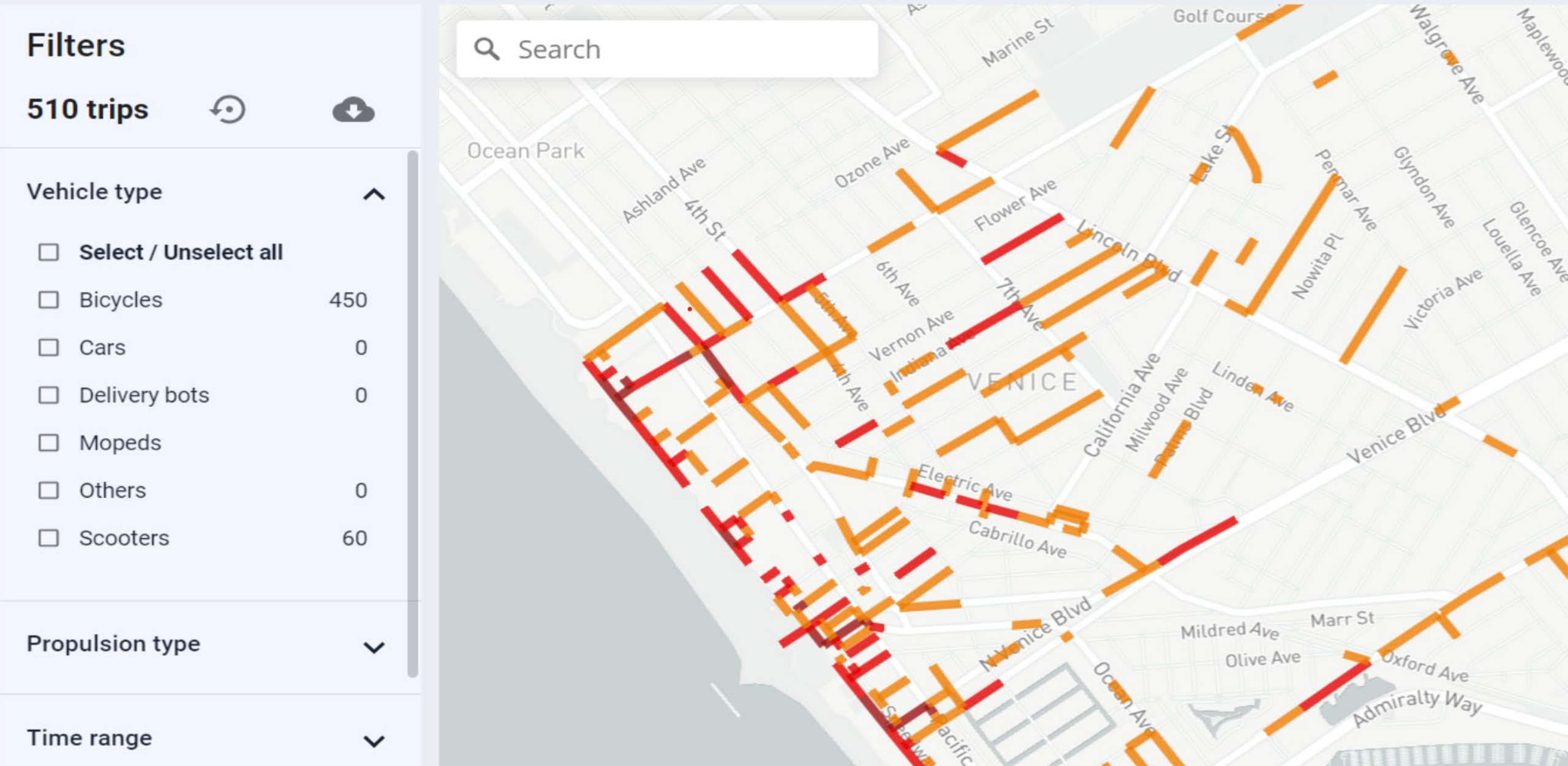
to help the environment / avoid car ownership costs

"I like to feel safe while getting to my destinations while also getting there in a timely manner and with Veo I can do just that."

- Rider in the Bronx, New York City, NY

What would increase your feelings of safety while riding with Veo? Choose as many as you like.	
Bike lanes and safer street improvements (eg. physical barriers separating bike lanes from traffic, car-free streets)	47%
Safety enhancements to Veo vehicles (eg. enhanced suspension, brighter vehicle lighting, blinkers on my vehicle)	41%
Ensuring cars are not blocking bike lanes	30%
Having vehicles available in central, well-lit locations	22%
Policies to create a safer riding environment for people using scooters and bikes (eg. speed camera enforcement for cars)	17%
Having the option to use a helmet that comes with the vehicle	17%
Reducing the potential of conflict with police/authorities	14%
Having a helmet that I own and bring with me to ride	11%
Ability to enable a slow riding mode that limits the speed of my vehicle	9%
In-app tips about safe riding	8%
Community education programs that teach safe riding practices	8%

Improving Safety and Planning with Data



Thank You!


Driving isn't easy,
but saving a life is.
SPEED
LIMIT
25
Slow down.
VISION ZERO
LAMAR
2000
Gibraltar
TRANSMISSIONS
GT

RUTGERS
NEW BRUNSWICK

making Micromobility smarter & safer

State of the Practice in Micromobility: Evolving Norms and Policies

Leigh Ann Von Hagen, AICP, PP (Moderator)

Managing Director

Alan M. Voorhees Transportation Center
Bloustein School of Planning and Public Policy
Rutgers University

Simone Gore, AICP

Manager, Project Development

NJ TRANSIT

Irene Figueroa-Ortiz, AICP

Policy Advisor

NYC Department of Transportation

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Ralph Buehler, PhD

Professor, Urban Affairs and Planning

Virginia Tech