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Webinar: Scooting to Healthy and Safe Mode Choices

Kristina M. Currans
University of Arizona

Nicole Iroz-Elardo
University of Arizona

John MacArthur
Portland State University, macarthur@pdx.edu

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Scooting to a New Era in Active Transportation: Examining the Use and Safety of E-scooters

Kristina M. Currans, UArizona
Nicole Iroz-Elardo, Willamette U
Reid Ewing, UUtah
Dong-ah Choi, UUtah
Brandon Siracuse, UUtah
Torrey Lyons, Idaho National Lab
Quinton Fitzpatrick, UArizona
Julian Griffee, UArizona

Special thanks to our technical advisory committee and partners:

- *Andrew Bemis; Stefanie Brodie; Shaunna Burbidge; Heidi Goedhart; Brendon Haggerty; Krista Hansen; Jon Larsen; and John MacArthur.*
- *Partners in this work include City of Salt Lake City and City of Tucson.*

Study Questions:

Are micro-mobility options synergistic, substitutive, or complementary to conventional transportation modes for different trip purposes and activities?	User Survey (Fall 2019) in Tucson in Partnership with the City of Tucson
How do micro-mobility users interact with different types of active transportation infrastructure?	Tucson User Survey + Observations of travelers with different infrastructure in Salt Lake City (Spring/Summer 2021)

- Supplementary Findings:
  - Review of agency requirements around shared e-scooter programs (Griffee-led, pre-pandemic)
  - Observations of parked e-scooters and e-scooter users in Tucson (Appendix, pre-pandemic)

Why mode substitutions?

- Unique opportunity to observe a new modal option as it's introduced into the current transportation landscape
  - How are they used? For what? By whom?
- Implications ranging from GHG reduction to public health to increasing destination access

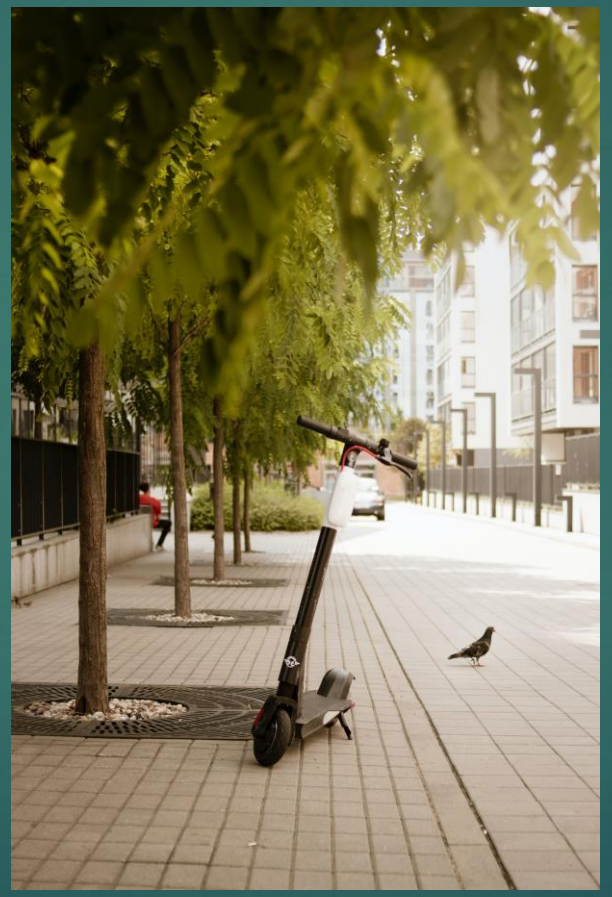


Photo by Dominika Roseclay

Substitutions

Complements

Synergies

Mode Substitution (Tucson)

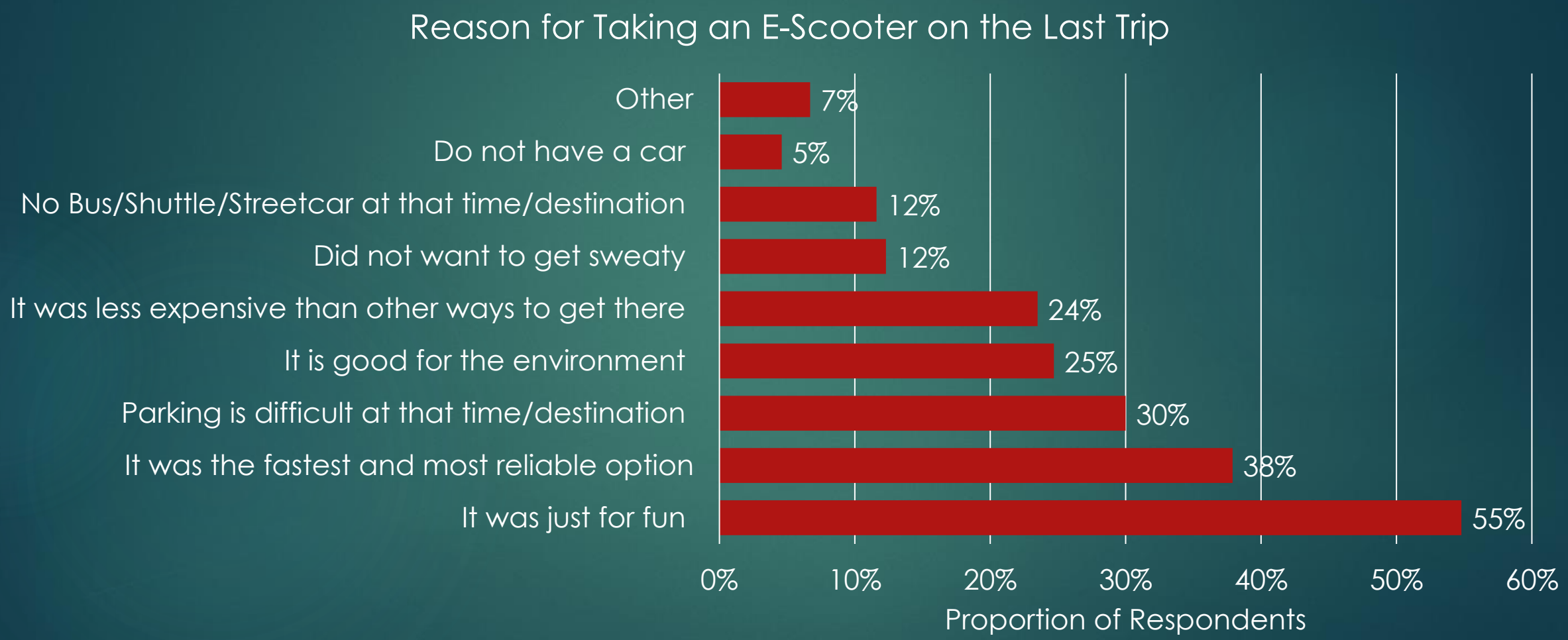
Prior Studies

Type	Mode Substitution	Portland (2018)	Rosslyn, Virginia (James et al 2019)
Vehicle	Personal Vehicle	19 %	7 %
	Ride Hailing Service	15 %	39 %
Active	Walking	37 %	33 %
	Biking	5 %	12 %
Transit	Public Transit	10 %	7 %
New Trip	Trip would not have been taken	8 %	---

Tucson (2019)

Type	Mode Substitution	Tucson (2019)
Vehicle	Personal Vehicle	23.8 %
	Vehicle – Passenger	0.7 %
	Ride Hailing Service	12.4 %
Active	Walking	0.5 %
	Biking (bike share)	3.3 %
	Biking (personal)	35.7 %
Transit	Public Transit	2.7 %
New Trip	Trip would not have been taken	6.3 %

Mode Substitution (Tucson)



Mode Substitution (Tucson)

Demographic Notes

- Users with annual incomes between $25-$75k were more likely to take a new trip with an e-scooter
- Those with higher incomes are less likely to replace active and transit trips, and more likely to replace personal vehicle travel
- Riders between 30-50 years of age were more likely to replace transit trips, but those in their 40s were less likely to generate new trips all together.
- Riders greater than 50 were less likely to replace shared vehicle trips

Alternative Mode Availability

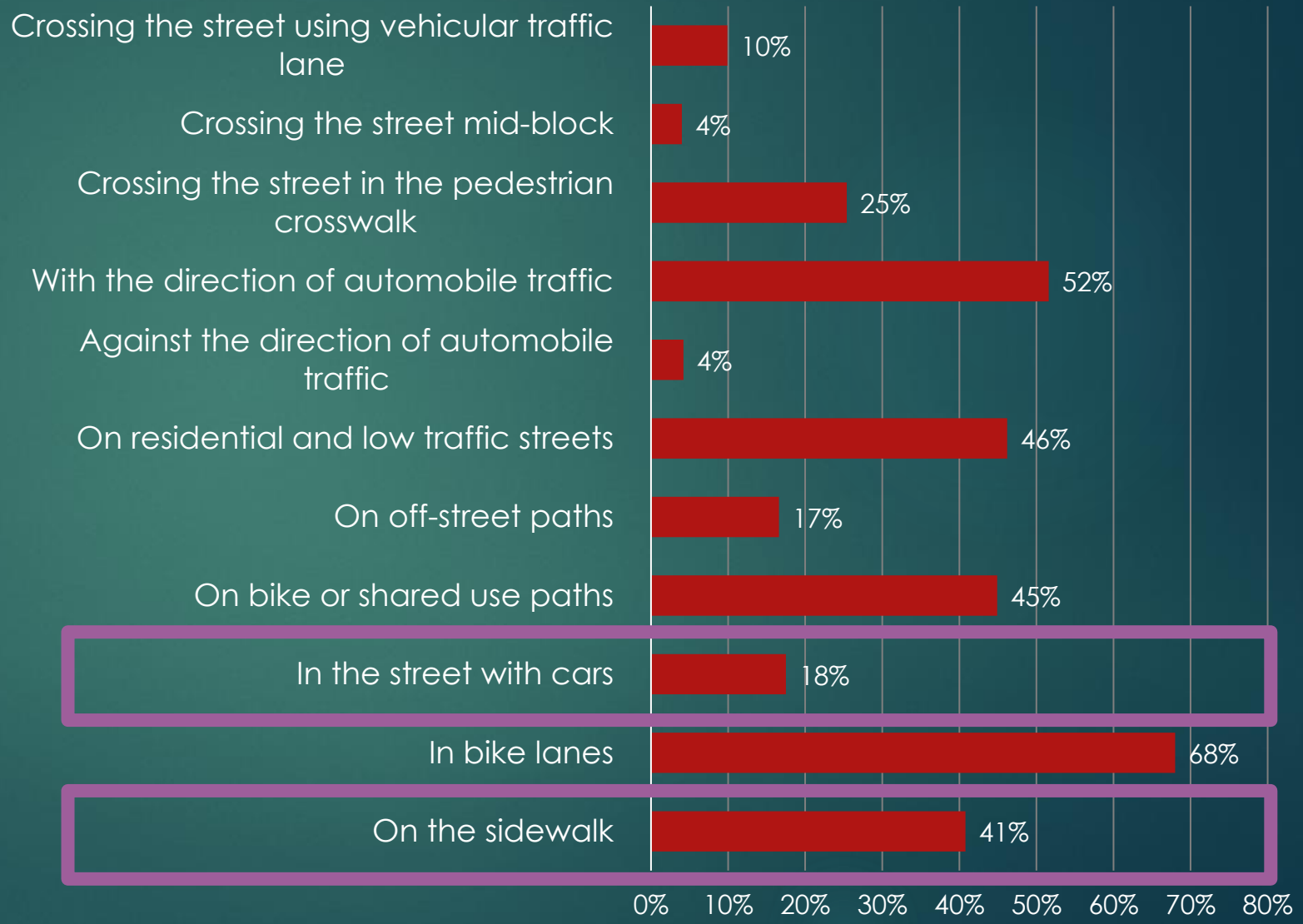
Available	More Likely to:	Less Likely to:
Workable Bike	Replace active trips	Replace shared vehicle trips
Bikeshare Membership	---	---
Transit Pass	Replace transit trip	---
Parking Pass	Replace active travel	Replace personal vehicle trips

Mode Substitution, Synergies (Tucson)

Trip Purpose	Likelihood the Use of E-scooter:				
	Generated a New Trip	Replaced…			
		Active	Transit	Shared Vehicle	Personal Vehicle
Go to or from work	- - -				- -
Go to or from school	+	- -			
Go to or from a bus/streetcar stop			+ +		
Social and/or entertainment activities				+ +	
Go to or from restaurants	+	-			
Just for fun		-		-	-
Shopping or errands		-			+
Site seeing		-			

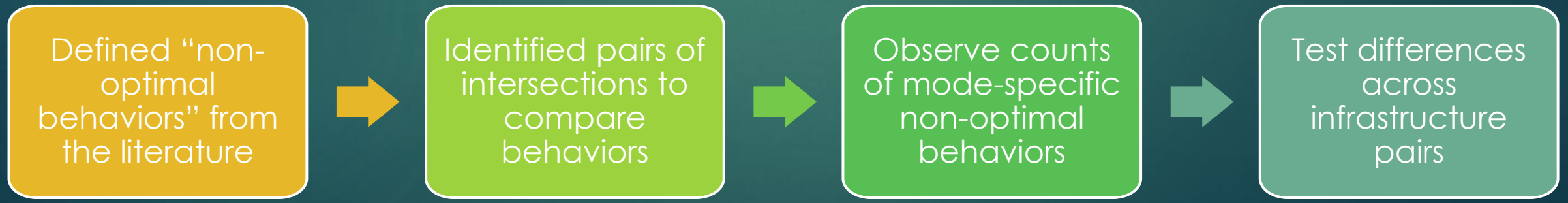
Stated Riding Preferences (Tucson)

- 25% prefer to ride with other e-scooter users and 11% with bicyclists
- Preferred to ride on campus (11%) and downtown (50%)
- Only a third agreed they prefer to ride slower than 15 miles per hour
- Riders tended to prefer day-time riding (48%) to "in the dark, early morning or the evening" (18%)



How do users interact with different types of infrastructure?

- Do **bike lanes** correspond with improvements in optimal behavior rates in areas with and without rail transit?
- Does the presence of **rail transit** correspond with higher rates of non-optimal behavior with and without bike lanes?
- Do **larger facilities** correspond with higher rates of non-optimal behaviors?



Observed Behaviors (Salt Lake City)

Type	Factor recorded	Definition
Scooter User Behaviors	Riding on sidewalks	Scooter user riding in sidewalks or crosswalks
	Riding on vehicle lanes	Scooter user riding on vehicle lanes (not including sharrows) when no bike lane is provided
	Signal violation	Scooter user running red lights
	Distracted riding	Scooter user using electronic devices or headphones while riding
	Cluttering	Scooter not parked properly (e.g., left in a vehicle lane or vehicle parking space, obstructing the movement of pedestrians)
	Two or more passengers per scooter	Two or more people riding together on one scooter
	No helmet	Scooter user with no helmet
Bicyclist Behaviors	Riding on sidewalks	Bicyclist riding in sidewalks or crosswalks
	Riding on vehicle lanes	Bicyclist riding on vehicle lanes (not including sharrows) when no bike lane is provided
	Signal violation	Bicyclist running red lights
	Distracted riding	Bicyclist using electronic devices or headphone
Pedestrian Behaviors	Walking not using sidewalks	Pedestrian walking on bike lanes or vehicle lanes
	Signal violation	Pedestrian running red lights
	Distracted walking	Pedestrian using electronic devices or headphone while walking
Driver Behaviors	Signal violation	Driver running red lights
	Not yielding	Driver not stopping or slowing down for scooters, bicyclists, pedestrians or other vehicles at conflict points
	Taking over other spaces	Driver taking over crosswalk or bike lane space

Sources: (Cooper et al., 2012; Diependaele, 2019; Dommes et al., 2015; Gillette et al., 2016; Hatfield & Murphy, 2007; Haworth & Schramm, 2019b; Høye, 2018; Klauer et al., 2015; Lyons et al., 2020; PBOT, 2018; Russo et al., 2018; Sparks et al., 2019; Useche et al., 2018; Zhang et al., 2019)

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Observed Behavior Findings (Salt Lake City)

E-scooter Riders…		
Used sidewalks…	**Less** when bike lanes were available (no rail present)	35% with bike lanes vs. 80% without bike lanes
	About the same with and without bike lanes when light rail transit present	82% with bike lanes vs. 76% without bike lanes
	About the same at our six-lane vs. four-lane facilities	97% on six-lane vs. 80% on four lanes

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Violated traffic signals	**Less** at intersections with bike lanes	1% without bike lanes vs. 14% with bike lanes
	Less at larger intersections	0% at six-lane intersection vs. 12% at four-lane

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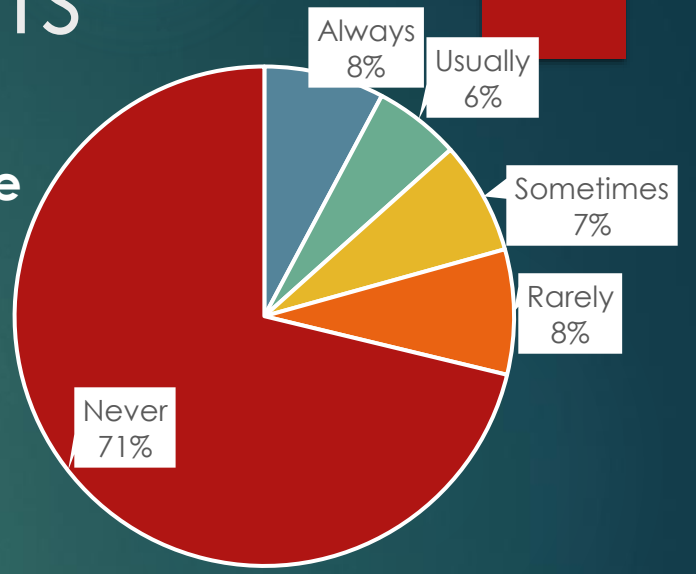
Violated traffic signals	**Less** at intersections with bike lanes	1% without bike lanes vs. 14% with bike lanes
	Less at larger intersections	0% at six-lane intersection vs. 12% at four-lane
Had distracted behaviors (music, phone)	**More** on facilities with bike lanes (no rail present)	35% with bike lanes vs. 5% without bike lanes

Caveats and parting thoughts

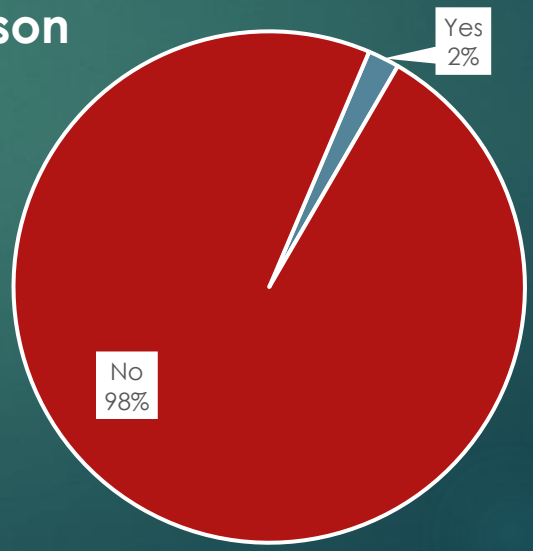
- Survey data provides *stated* use
- Observations here are limited to those behaviors that can be observed
- Designed to compare behaviors within groups of mode users and across different facility types
- Cross-mode comparisons should not be made from this data
- Reflect two different regions

Stated Helmet Use in Tucson

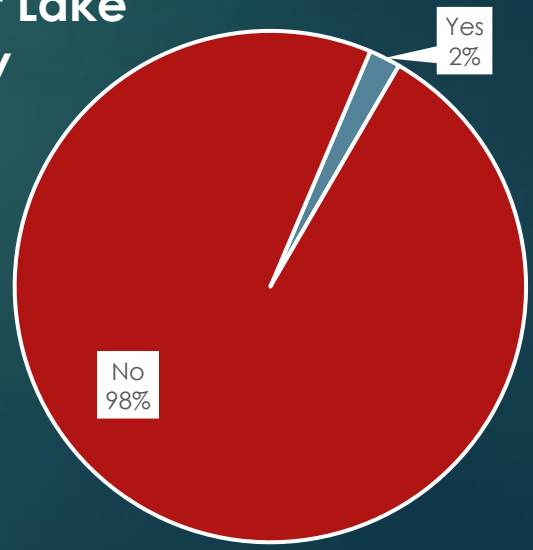


Observed Helmet Use

Tucson



Salt Lake City



NITC-1358

E-Scooters and Public Health

Presented at *Scooting to healthy & safe mode choices.* NITC Webinar, 6/7/2022 10am

Nicole Iroz-Elardo, Willamette U*
nirozelardo@willamette.edu

Kristina M. Currans, UArizona

Special thanks to:

- *Andrew Bemis; Brendon Haggerty; Krista Hansen*
- *Partners in this work include Multnomah County and City of Tucson.*

**This research presented today was completed while Dr. Iroz-Elardo was a faculty member of UArizona. You can now find her at Willamette University.*

Study Questions:

Are e-scooters healthy?

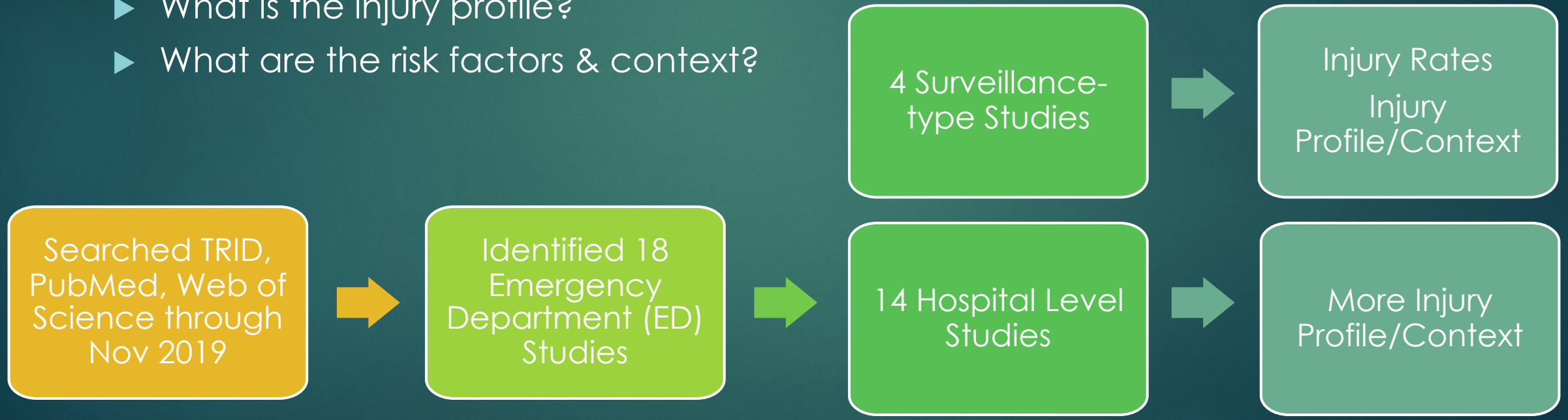
Conceptualizing what we would need to know to analyze more than safety

Prepare for input into off the shelf public health & transportation tools.

- Supplementary Findings:
  - What do we know about e-scooters and injury outcomes?
  - Iroz-Elardo, N. & Currans, K. (2021). Injury burden of introducing e-scooters: A systematic review of e-scooter injury studies using emergency department record review, 2015-2019. *Transportation Research Record*. doi: 10.1177/03611981211032216

What do we really know about injuries from e-scooters?

- What study designs are the best available evidence to understand e-scooter rollouts and safety?
  - prior to ICD10 code assignment in 2019
- What is the injury profile?
- What are the risk factors & context?



4 Surveillance Studies

- Alexandria, VA (Jan-Aug 2019)
- Auckland, New Zealand (Sep18 - Apr19)
  - ED: 20.3/100,00 trips
  - ED + primary care: 64/100,00 trips
- Austin, TX (Sep-Nov 2018)
  - 20.3 /100,000 trips
  - Also did follow-up interviews
- Portland, OR (Jul-Nov 2018)
  - 24.1/100,000 trips

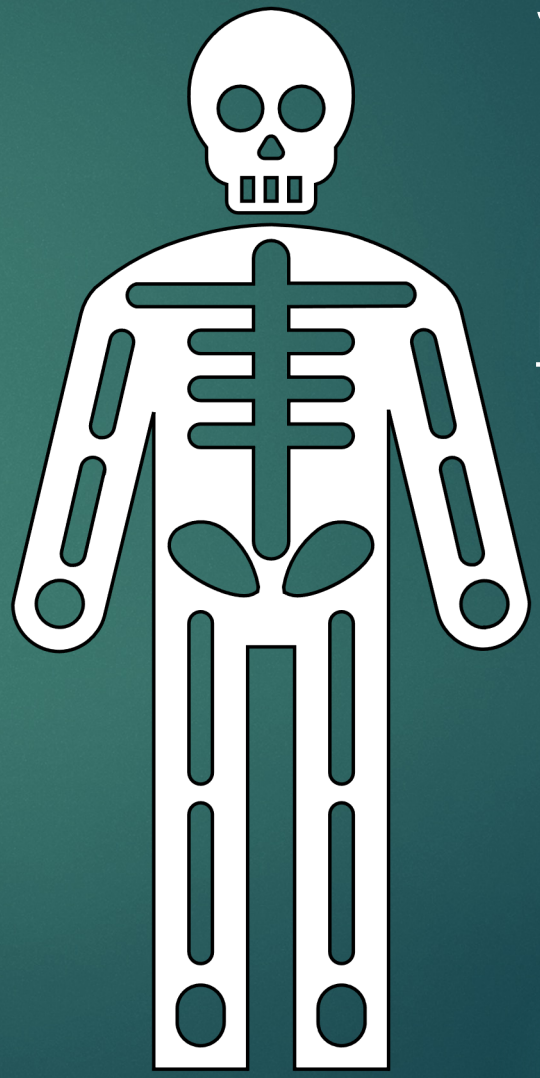
20.3-24.1 ED visits per 100,000 trips

For every 1 ED visit, another 2 additional visits for injuries requiring doctors care.

Common Injured Person is Roughly

- **Male**
  - This might just reflect who is riding
  - **When incorporating Portland ridership demographic data as exposure….**
    - **38.2 / 100,000 female trips**
    - **20.5 / 100.000 male trips**
- **30 years old**
  - Again, should consider exposure
  - Best guess is that under 20 and over 60 are most at risk
- **Probably riding in the evening (Austin)**
  - If time is reflective time of crash

Where & what kinds of injuries?



30-60% Head & Face

Includes 5-15% presenting with TBI or concussion

24-39% Extremity fractures or dislocations.

Arm/wrist fractures are pretty common.

Context for Crash

Situational Context	Austin	Range
Single Person Event	73%	73-92%
Collision with stationary object	10%	3-14%
Collision with vehicle	10%	3-14%
Pedestrian injured by e-scooter	6%	<1-8%
Crash on Sidewalk	33%	33-44%

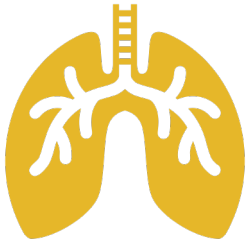
Situational Context	Austin	Range
Speed	37%	---
E-scooter malfunction	19%	3-19%
Documented Helmet Use (Brisbane excluded)	<1%	0-6%
Intoxication	29%	9-48%
Night/Evening Ride	39%	36-66%
Weekend	39%	29-57%

Data Lessons from Surveillance Surveys – Emerging Technologies

- **Brief window when shared system dominates**
  - Rates from vendors thus good denominator
  - Data agreements with city as condition of operation
- Needed a single payer health system OR **cooperative health department**
  - No ICD code until 2019- using surveillance system on admission notes
  - Injury data from health department
    - This is difficult data to get for a hospital system if you aren't an MD w/ privileges
    - Public health cannot let non-health dept people pull/see this data

Considering Health More Broadly

Physical Activity



Air Quality

Safety

Mobility

Physical activity basics

Prevents chronic disease

- Diabetes
- Hypertension
- Heart Disease
- Stroke
- Cancer
- Depression

Physical activity basics

Time

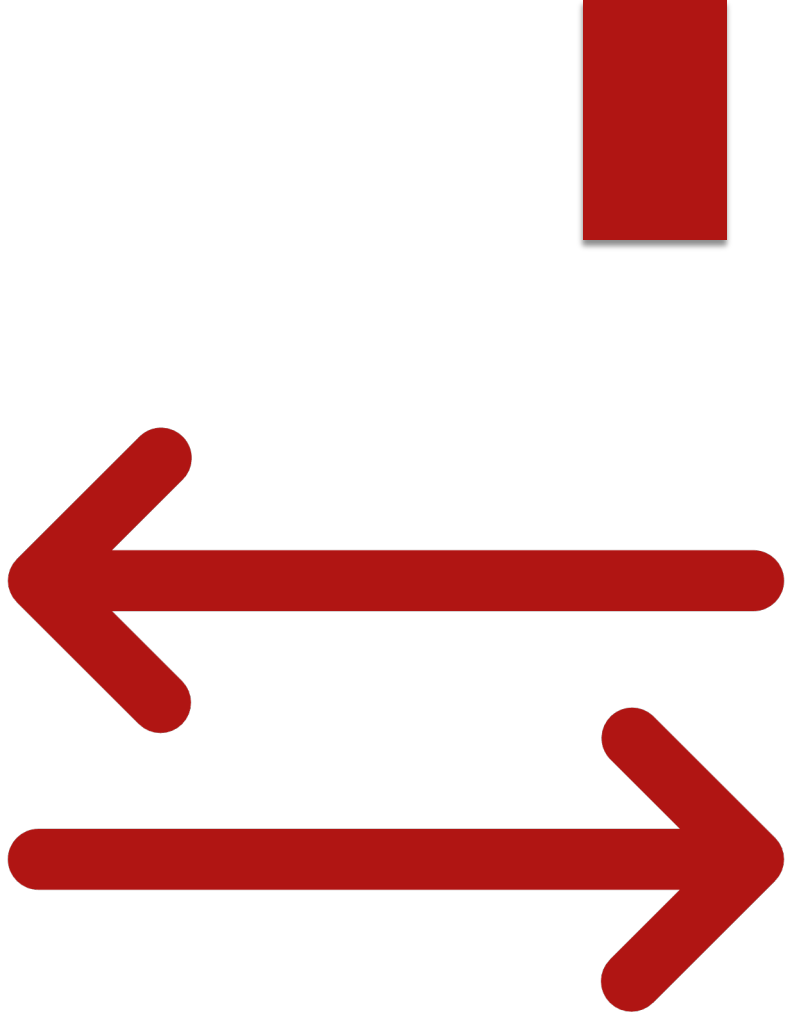
- Recommended 30 minutes of moderate activity daily
- Can come in bouts of under 10 minutes
- Most effect comes from that first 10-20 minutes

Exertion

- Moderate to vigorous (MVPA)
- Most people overestimate, so we put accelerometers and/or heart monitors on people

E-Scooter Physical Activity: What do we need to know?

- Mode shift/substitution
- Trip distance & time
- Do e-scooter trips include a walk to get the e-scooter?
- Physical exertion levels



E-Scooter Mode Substitutions

What riders self-report as alternate

- If I didn't take this trip by e-scooter, I would:
  - Car
  - Walk
  - Bike
  - Take Transit
  - Not go

Many (but not all!) studies are showing disproportionate substitutions from active trips

E-Scooter Trip Distance & Time

Main Mode of Trip	Assumed Trip Length	Average Trip Time
E-Scooter	**<1 mile**	**13-14 minutes**
Walk to Transit	0.5 miles	8-10 minutes
Walk	1 mile	15-20 minutes
Bike	3 miles	15 minutes

How far will people walk to a shared e-scooter?

- Notable that the walk to transit trip is enough to get daily 30 minutes of activity in a round-trip commute to work.
- E-scooters are typically more convenient (and less walking) in dense areas. But if you are relying on them from home, maybe not.
- This is an under-studied area and will vary drastically by context & built form.

E-Scooter Exertion Levels

- Not a lot of data
- Sanders et al (2022) suggests very little exertion

Main Mode of Trip	Light	Moderate	Vigorous
Auto	28%	8%	1%
E-Scooter	**33%**	**8%**	**6%**
Transit	48%	15%	4%
E-Bike	50%	26%	3%
Walk	40%	43%	6%
Bike	56%	33%	4%

Adapted from Figure 2 in Sanders et al (2022). *Insights from a Pilot Investigating the Impacts of Shared E-scooter Use on Physical Activity Using a Single Case Design Methodology*. J Transport Health.

On Balance, E-Scooters Increase Physical Activity Only if Shifting from Auto

Shifting to E-Scooter from….	Physical Activity Time	Exertion	Overall
Car	Increase	Increase (Slight)	**Net Health Gain**
Walk, Walk to Transit	Even to Slight Decrease	Decrease	Net Health Loss
Bike	Even	Decrease	Net Health Loss
E-Bike	Decrease (Slight)	Decrease	Net Health Loss

Q&A